Familiar Science.

JAMES PRESCOTT JOULE.

One of the most distinguished scientists of the present century died at Sale, near Manchester, England, on the 11th of last October. James Prescott Joule was born at Salford, near Manchester, in the year 1818. His health was so delicate that he was not sent to school, but received his first elementary education from his mother. At the age of fifteen he commenced his scientific studies, under the tuition of the eminent chemist, Dalton, the discoverer of the atomic weights, who was at that time President of the Manchester Literary and Philosophical Society. Under the direction of his instructor he made some more or less important investigations upon the constitution of gases and vapors, and the effect upon them of heat, but his first personal researches were made in 1838 upon the subject of magnetism. In 1830 he discovered the principle of magnetic saturation, or the limit beyond which it is impossible to increase the power of a magnet.

About this time he suggested an electric unit to express the power of the current. As the molecular weight of water was at that time considered to be nine, he proposed to use as unit of quantity that amount of electricity which would decompose nine grains of water. Although this unit has never been accepted, an international congress of electricians has recently given his name to a practical unit of electric work, based on the modern system of electric measurements. The ampere, which now replaces Joule's proposed unit, is the current which will deposit .0014888 grammes of silver in one second.

Joule's greatest fame, however, is due to his demonstration of the great principles of the conservation of energy, and the mechanical equivalent of heat. Count Rumford, in the last century, experimented upon the development of heat by the friction produced in boring a cannon, and in August, 1843, at a meeting of the British Association, at Cork, Joule, after referring to Rumford's researches, stated that he was "convinced that, by the will of the Creator, the great principles of Nature are indestructible; each time that a mechanical force is exerted in any way, an equivalent quantity of heat is always produced."

At this day, when the doctrine of the conservation of force is disputed, and is one of the corner stones of science, it seems strange that the new theory was by no means unanimously accepted by the leading scientists of the day. Even Faraday was not convinced of its truth for several years, and Miller and Graham likewise doubted it at first; but Sir William Thomson comprehended the truth and importance of the generalization from the very first, and at once became a firm supporter of Joule's theories, and was a co-worker with him for many years.

This discovery of the connection between the great forces of Nature was an epoch in scientific history, and was to physics, what the discovery of oxygen and the true nature of combustion was to chemistry. His other work alone would have given Joule a high rank in the scientific world, but it has been almost completely overshadowed by this great physical and mathematical generalization, which he was the first to formulate in definite terms.

The accompanying portrait is reproduced from La Nature.
metals lithium, sodium, and potassium, which very closely resemble each other in their chemical relations, form a group by themselves; as likewise do the non-metallic elements fluorine, chlorine, bromine, and iodine, which are distinguished by the ease with which they all unite with hydrogen to form powerful acids, as well as in many other ways. There are seven of these groups, besides another one which comprises certain metals related to iron and platinum, the place of which in the system is not well fixed.

This remarkable and important principle, which is called the "periodic law," was first pointed out by Newlands, in 1864, but was more fully developed and brought into general notice a few years ago by Mendelejeff and Meyer, who are generally credited with its discovery. Briefly stated, it may be expressed that, The quantivalence and many other chemical characteristics of the elements are a function of their atomic weights, and it is, undoubtedly, the key to many chemical mysteries which at present we cannot well understand, and much additional study will be necessary before we shall know how to use the key properly, and comprehend the full significance of the law of nature which is dimly hinted to us in this periodic grouping of the elementary bodies.

When the elements are arranged as above described in groups and series, we find that they are not continuous and unbroken. Many blank spaces remain to be filled by elements possessing an atomic weight between that of their nearest neighbors. It is a striking proof of the truth of this theory that, since it was first brought forward, some of these vacancies have been filled by newly-discovered elements. When the original table of groups was drawn up, there was a vacancy between the elements zinc (65) and arsenic (75), which indicated the existence of a trivalent element intermediate in atomic weight between those two metals. Mendelejeff predicted the discovery of this element, and the chemical properties which it should possess, and gave it the provisional name of ekaluminium. Shortly afterwards, the metal gallium was discovered, possessing the predicted properties, and having the intermediate atomic weight of 69.8. Another example is afforded by the metal scandium, which agrees closely in its properties and atomic weight (44) with an element intermediate between calcium and titanium, whose existence was predicted by Mendelejeff, under the provisional name of ekabor.

To what further discoveries this wonderful law may lead, it is impossible to say, but it undoubtedly indicates a closer connection between what have been considered as definite and distinct forms of matter, than has hitherto been supposed. We cannot overlook the hint of an inorganic evolution of the different forms of matter from one primordial substance, analogous to the differentiation of plants and animals from simpler and lower forms of life, now so generally accepted by biologists. But, whatever may have been the conditions governing the existence and manifestations of matter in the early ages of our universe, the impossibility of a change from one form of matter to another at the present time and under the existing conditions, seems almost certain. Not a single fact is known which leads us to suppose that it is possible for the chemist to change hydrogen into oxygen, for instance, or mercury into gold. But, judging from the previous achievements of scientific research, we are on the verge of some wonderful and revolutionary discoveries, which, to say the least, will profoundly modify our present views in regard to the constitution of matter, and the laws governing the phenomena which it exhibits.

**SCIENTIFIC RECREATIONS.**

A very pretty experiment in inertia can be performed with a dice box and two dice, held in the hand as shown in the engraving. It is required to toss the two dice into the box, one after the other. The problem at first sight appears ridiculously simple, and so it is for the first die, but it will be found almost impossible to toss the second one into the box without throwing out the one already of about two inches, remove it from the flame, and bend it into the desired curve. Take plenty of time, as the glass will not harden immediately. In the engraving, a spirit lamp is represented, but an ordinary gas burner gives a broad flame of just the right shape for heating the tube, which should be held in the upper part of it, where it is hottest. A dense coating of soot, or carbon, will be deposited upon the glass by the lamp flame, but it will do no harm, and can be easily wiped off after the tube has cooled. If it is desired to draw the tube out to a point, heat it in the same way, and pull gently but firmly with both hands. If a long, slender point is desired, the tube must be removed from the flame before drawing out; but to make a short, blunt point, heat the glass till it is quite soft, and draw out slowly without removing it from the flame.

The accompanying engravings are reproduced from *La Nature*.

**NATIVE ZINC.**—In the laboratory of the State Mining Bureau in San Francisco a discovery was made recently which is highly prized. In working a specimen of sulphide or blende ore sent from a mine in Shasta County, Calif., a small piece of native metallic zinc was secured. This is the first piece of the character named ever known to have been secured in this country. Late works on metallurgy note the existence in the mines of Victoria, Australia, of the only native metallic zinc known. The Mining Bureau will endeavor to secure other specimens from Shasta County.
1. THE AMEBA

The delightful field of knowledge which modern biology has opened, has scarcely yet been explored by the intelligent general reader, so recently has it been added to the realm of science. It is therefore believed that a series of brief studies, which may serve to guide the reader to an apprehension of the leading facts and principles of the science of life, as known at the present day, may be acceptable to many. Our method will be to study a number of forms of animal life, seeking to find out how they illustrate, in the forms of their bodies and the carrying on of their life-processes, the laws which govern the world of animate nature. Naturally, we shall begin with the simplest of organic beings, and proceed in order toward the highest forms.

What then, is the simplest form of animal life? The word which stands at the head of this article is the name of a typical unicellular animal, found everywhere in pools of stagnant water, which biologists commonly refer to as a representative of the lowest class of animal organisms, viz.: the Protozoa. The ameba is a very tiny creature, visible only by the aid of the microscope. But it is so simple in structure that one can get a quite a correct idea of it from a description. Imagine a bit of uncooked white of egg, spread out flat and of an irregularly rounded form, would look, and you have a very good notion of the appearance of the ameba under the microscope. And a notion obtained in this way is not only correct as to the appearance of the organism, but also as to the nature of the material of which the body is made. For the albumen of which white of egg consists, in its chemical and physical properties is precisely similar to that substance, called protoplasm, which constitutes the bodies of the protozoan animals.

But let us stop here to note a very important distinction: If a bit of white of egg be left to itself, in a little while it wastes away; the oxygen of the air attacks it and converts it into new compounds. But if an ameba be left to itself, under natural conditions, it does not undergo destructive change; it is endowed with a principle of life, by which it can resist the attacks of the oxygen. Thus, while the ameba is a living animal, the white of egg is not. We have found to consist of the same chemical elements as white of egg,—namely: carbon, oxygen, hydrogen, and nitrogen,—it also possesses, in addition to this, a something else—a something which enables it to maintain itself intact against external physical forces. This something is life. We may say that it is a force resident in the protoplasm of which the body of the organism consists, and which, as we have said, is the body of the ameba, as so many other living things. This force is called the vital force, and to correlate it with the physical forces, heat, electricity, magnetism, etc., and just as we do not know the real nature of these physical forces, but know them only by their manifestations, so we do not know the real nature of life, and can only say that it manifests itself by certain phenomena, happening in more or less certain order, according to the conditions of the organism in question. The ameba is an organism, and in fact, a new generation of amebas. Each is destined to grow to its full size, to nourish itself for a while, and then, in turn, by the simple process of self-division, to give rise to a new generation of its kind. Thus, by the simplest process we are able to think of, the function of reproduction—fundamental to the existence of living things—is performed.

The manifestations of life seen in a study of the ameba may therefore be summarized as follows: (1) power of self-movement; (2) power of taking in outside matter as food and converting it into its own substance; (3) power of reproducing its kind.

This sketch of a typical organism of the lowest grade in the scale of life would not be complete if it was not pointed out that the ameba is exactly similar to certain cells found in bodies of all the higher animals, including man. It is well known that the blood consists of a liquid plasma in which float corpuscles of two kinds, the red and white. Now the white blood corpuscles are almost precisely like amebas. Like them, they consist of minute masses of protoplasm, containing in their central part a nucleus; and, like them, they are constantly undergoing changes of form. It is also highly probable that they nourish and reproduce themselves, just as amebas do; at any rate, this affirmation can be made of other cells, especially during the embryonic period of their existence.

In this connection it is instructive to draw this parallel: Of all the forms of animal life, the ameba is the simplest, retaining with the least modification the properties of the elementary form of living matter, viz.: protoplasm. So, likewise, of all the cells of the body, the white corpuscles are the least specialized; unlike the cells which go to make the other solid organs of the body, they have acquired no special distinctive qualities, but retain in the least degree modified, the properties of elementary living matter. In other words, the ameba stands at the bottom in the scale of animal life, and the white corpuscles, and other simple cells, stand at the bottom in the scale of the structural elements that go to make up the body.

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FAUNA AND FLORA OF PRIMITIVE AND RECENT PERIODS.

By JOSEPH WALLACE.

It is singularly strange, in this age of progress and advanced science, to find some people who call themselves learned still persisting that the present fauna and flora are not only as in the primitive periods, but that all known signs of a universal catastrophe of animal and vegetable life can be traced. The most marked change on the earth's surface took place at the close of the Mesozoic or Secondary period, when lycopods, ferns, cycads, and yew-like conifers passed away, and dioctyledonous angiosperms—the hard-wood trees and evergreens of today—succeeded them, but not by any recent or modern process. Some of these ancient forms had already begun to make their appearance in Cretaceous times. Consequently, natural history is complete, because it embraces two classes of organic beings: those which still exist and those which are extinct.

It seems natural in man to be imaginative and susceptible of wild, grotesque, and fabulous impressions. Many, therefore, will say: No doubt, primeval plants and animals of odd and remarkable description are found, but it by no means generally the case. Strange forms occur among petrified remains, as in the case of reptiles. Among these are found various saurians, or species of flying and swimming lizards, as the plesiosaurus and pterodactylus; among the mammals, the dimotherium giganteum. The bird, feasting on the fruit of the present day: for instance, the ornithorhynchus, anteater, sloth, and flying-dragon; and, as a rule, those were just as rare formerly as these are now. The same holds good in regard to size of the organisms. The present equisetaceae, or horse-tails, are usually a foot high (seldom exceeding four feet), and about the thickness of one's thumb; our lycopodaceae, or mosses, are at times between the size of a man, branching stems, which wind along the ground between the
heather. Now we find petrified oolistetes which are as thick as one's arm or leg, and lyceceous which have grown to large trees; but we find nothing in the petrified plants that can compare to our oaks, cedar, pines, and other giant trees,—there is no specimen on record of more than four feet in diameter. And if we are told of the enormous size of the ichthyosaurus, dinothorax, and others among the fossil animals, the mammoth, or elephants preteragut—these are not of such large proportions as the present Asiatic elephant. We can show that our oceans and seas contain gigantic whales which exceed in size the largest types of fossil fauna.

Much has been said about the mammoth in Biblical and natural history. According to some, the name is corrupted from behemoth, or the Russian "mammon," and which did not exceed the largest elephant in size; on the contrary, it could grow on and reach the advanced age that was usual with mammoths.

We know that the body of the northern whale sometimes reaches to sixty-six feet long, and at the fins, forty feet in circumference. The body of the sperm whale is sometimes seventy feet long, by thirty-eight in circumference, and the fin-backed whale exceeds all other animals in length, and often reaches to one hundred feet in circumference.

Now we look in vain for such magnitudes in the earlier periods of creation. The largest crocodiles average from twenty to thirty feet long, but this is considered small in comparison to the fantastic lethaians of the sea and huge land animals of the primeval world. When the bones of the iguanaodon were first found, its length was immediately reckoned to be one hundred and sixty feet; but Prof. R. Owen surprised these superficial reckoners by reducing it to twenty-eight feet, of which three were for the head, twelve for the body, and thirteen for the tail. The haleosaurus and megalosaurus are often supposed to reach from sixty to eighty feet, the mistake in calculation being based on the first find, of the size and massive form of a single bone, which does not determine the degree of the body. Prof. Owen's trustworthy computation puts the length of the former at twenty-five feet at most, and the latter at thirty feet. These are the most colossal land saurians; the longest ichthyosaurus did not attain to more than thirty feet, and the dinothorax did not exceed twenty feet in length.

Generally speaking, although many huge forms of the primitive world do not exist in the present condition of things, yet their places are filled by other massive forms, which show their presence. In the great deposit of stone from Bohemia, which we know as triopoll, is only an accumulation of the flinty coverings of organisms known as diatoms—so minute that no less than 41,000,000 of them go to make up a single cubic inch of stone. There are similar deposits 30 feet thick, and of great extent, in Virginia, known as "infusorians." The first stone, and the chalk in other periods, in the same way are found to consist mainly of the casts of minute shells, from which the lime has been dissolved,—a phenomenon which is being even repeated in various parts at the bottom of the existing oceans, each grain being the cast of a single cell.

The abundance of microscopic life in early periods is beyond calculation; this, of itself, leads us to imagine millions of years intervening between the primitive and present fauna and flora. It seems very probable that some of the great clveys, accumulations of past geological formations may be really the work of a few dense layers of terrigenous thick beds of limestone, extending over vast regions, are also simply the wreck of countless millions of similar humble forms of life. Our chalk is an example, and so is a similar deposit still being formed over large areas of the Atlantic and Pacific at great depths, almost wholly from the debris of minute shells. Whole limestone ranges in Russia, favored by favorable conditions, are covered with a mantle of shells of foraminifera. The petroleum so largely obtained in this country and Russia, may have an animal origin, as the "bituminous schists" of Calabria are impregnated with oily matter, apparently derived from the decomposition of masses of fish in them through long periods. The so-called mammoth"tusks," (literally speaking, the bone money) attains a thickness of many thousand feet, and extends from the Alps to the Carpathians, while it plays a great part in the formation of mountains and hills in Asia Minor, Persia, India, and Africa; yet it is the creation of innumerable disk or money-like shells, though very small.

In comparing the animals and plants of the earlier world with the most recent, the earth's civilization now to the greatest, is the earth's climate. The earth's climate is not the least of the present fauna and flora. It is certain, from the evidence of paleontological records, that a development of animals and plants from a lower to a higher form has been taken place with each period or organic change.

This, of course, can be explained. The earliest formations contained scarcely any but the remains of a low organization—flowerless plants, corals, mollusks, articulars; there are very few signs of fish and reptiles, and, so far as is known, no birds or mammals. In the succeeding strata, more highly organized forms are found; in the Carboniferous period there are some conifers, many fish, and a few reptiles; in the Triassic period, higher reptiles are found quite prevalent, and a few mammals; in the Jurassic and Cretaceous period, a few dicotyledonous plants and endogenous trees, with a great variety of higher reptiles, fishes, and birds; and in the Tertiary period, many dicotyledonous plants and mammals. In all cases, the lower organisms of the animal and vegetable world appear first, and the higher organisms later. Thus, of the radiata, the crinoidae appeared first; of the fish, the tailed ganoid and placoid; of the reptiles, the saurians; of the birds, the marsh and tuffed birds; of the mammals, the oppossums and ceteates. The organic forms differ most from those now existing in the earliest strata, and the differences diminish steadily all through the more recent deposits.

**SCIENTIFIC BREVITIES.**

**IMPROVEMENT ON THE PHOTOGRAF.**—In the present condition of things, it is possible for the photographer to attach to the center of the vibrating diaphragm. The new improvement of G. Bettini is to extend little rods from the stylius to several parts of the diaphragm. In this way greater exactness of tone and speech is obtained, so the inventor claims, and much superior results.

**INHERITANCE OF ACQUIRED CHARACTERS.**—With regard to the question of the inheritance of injuries, a correspondent of Nature writes about an Irish terrier bitch which had a litter by a mongrel terrier whose tail had been cut off with a hatchet. Of the litter, one puppy was without a tail. The Irish terrier belonged to the farmer, and he says that she had had several litters before, none of which were in any way deformed.

**AN INDUSTRY IN ARTIFICIAL SPONGES.**—In the process of creation. M. Oscar Schmidt, professor at the University of Gratz, in Styria, has invented a method by which pieces of living sponge are broken off and planted in a favorable spot. From very small cuttings of this kind, Prof. Schmidt has obtained large sponges in the course of three years, at a very small expense. One of his experiments gave the result that the cultivation of 4,000 sponges had not cost more than 225 francs, including the interest for three years on the capital expended. The Austro-Hungarian government has been so much struck with the importance of these experiments that it has officially authorized the protection of this new industry on the coast of Dalmatia.

**INVISIBLE INK.**—M. E. Picard has published an account of this chemical discovery. It is a mixed acid obtained by a distillation of acid in boiling oxalic acid. He calls it oxalyl acid. The crystals of this acid are insoluble in strong nitric acid, but they dissolve in cold water. Paper written upon with the solution shows nothing in a weak light, but when brought into the sunshine the written characters suddenly appear in deep indigo blue. Paper saturated with the solution and dried in the dark takes on the color of the solution when exposed to the sun, and on this blue surface white characters may be written by dipping the pen in water. The color disappears in contact with water, and the blue writing becomes black when exposed to the heat of a fire.

**ARTIFICIAL MUSK.**—A remarkable oily liquid, having a brown color, and smelling so like musk that it is said, very few noses are able to detect the difference between the natural product and the artificial body, is obtained by a new process. Two parts of isobutyl alcohol, three parts of meta-xylol, and nine parts of chlorate of zinc [Qz. chlorate], are heated together for eight or nine days at a temperature of about 440° or 450° F. In a strong vessel, the pressure inside of which speedily rises to nearly 30 atmospheres, but gradually declines to about a tenth of the pressure at the beginning of the whole is allowed to cool gradually. The crude product so obtained is purified by distillation once or twice repeated, until an oily fluid is the result, which comes over between 220° and 260°; this, when rendered slightly alkaline, is the "musk" in question, and it may be diluted with alcohol, for the use of the perfumer, to any degree of odoriferous strength.

**THERMOMETER SCALES.**—Three scales have survived. The Fahrenheit is the oldest, and dates from 1724. It is used popularly in Great Britain, the British colonies, and the United States.

This scale was primarily divided into 180°; zero was placed at temperature, a point corresponding with 90° C.; the point to which the alcohol rose when placed under the arm of a healthy man was marked 96°; and the temperature of a mixture of ice and salt, then believed to be the greatest possible cold, 0°. In 1748 Fahrenheit again altered his scale; 0° was placed at the freezing-point of water, and the space between this point and that representing the warmth of the human body was divided into twenty-four degrees. The freezing point of water was now 32°. But these long degrees being inconvenient, each was divided into four, and thus, instead of 90°, the freezing point of water became 32°, and the blood heat 96°. A mercurial thermometer thus graduated registered 212° as the boiling point of water.
THE ENGLISH CHANNEL BRIDGE.

The accompanying engraving (from La Nature) represents a view of the proposed bridge across the English Channel, as it will appear after completion. This project is certainly a bold and magnificent conception, and, if ever carried out, the bridge will be the greatest feat of engineering ever accomplished. The preliminary plans have been made for the work, but, before it becomes an accomplished fact, many obstacles—not only natural ones, but financial and political—must be overcome.

The proposed bridge will start from near Folkestone, in England, and cross to a point near the port of Ambleuse, on the French coast. The total length will be about twenty-four miles, but it will deviate from a direct line, in order to cross two banks, or shoals, in the middle of the channel, and obtain the advantage of the shallow water (20 to 30 feet) above them. In the deepest part of the channel the piers must be sunk in 165 feet of water—a feat which will require some skillful engineering.

The piers, of which there will be about 125, will be of solid masonry, and will be built near the shore in caissons, and then floated out into the channel and sunk in their proper places. They will project 60 feet above low water, and on them will rest the steel cylindrical columns, 120 feet in height, which support the superstructure of the bridge, making a clear height of 180 feet above the water, and allowing ample room for vessels with the highest masts to pass freely beneath. The construction and placing of each pier is estimated to take about a year, although, of course, an indefinite number can be constructed at the same time.

The length of the spans will vary, but the widest will consist alternately of 900 and 1,500 feet, each span of the bridge (as shown in the engraving) resting upon two piers. The narrowest span will be 300 feet. Over a million tons of metal will be used in the work, and the cost is estimated at from 175 to 200 millions of dollars. About ten years will be required to complete it, and, if the success is assured, it would seem to be an easy matter to raise the necessary funds.

The commercial and political importance of this bridge, which would give Great Britain direct and unbroken railroad communication with all parts of the eastern hemisphere, can hardly be overestimated, and it would also tend to bind the European nations more closely together and prevent war. Mr. Gladstone is reported to have said that "by either the tunnel or the bridge the peace of the world is assured," and, although this may be rather a sanguine view to take of the matter, there can be no doubt that the result of such direct means of communication would be an unqualified blessing to all concerned, and it is to be hoped that the ridiculous fears of foreign invasion which led the British government to suppress the already commenced tunnel underneath the channel, will not be the cause of the abandonment of the proposed bridge above its tempestuous waters.

A NOVEL ELEVATOR.

The ingenious device for ascending staircases shown in the illustration (on page 6) was exhibited at the Paris Exposition last summer by M. Amiot, under the name of monte-escalier. It is intended as a substitute for the more expensive elevator in private houses, and buildings where the travel from one story to another is small, besides being adapted to narrow and crooked locations, where the regular type of elevator could not be introduced, for want of sufficient space.

The elevating leaves little to be explained in regard to its construction and working. The whole installation may be divided into three parts: the rails, which are attached firmly to the side of the staircase, which may be either straight or curved; the car, which is a platform resting on the rails by wheels; and the motor, which may be either hydraulic, electric, or of any other type, according to circumstances, and which draws the car from one story to the other by means of a chain. The car is provided with a simple means of stopping, starting, or reversing the motion, and safety catches, to prevent its fall in case of the breaking of the chain, can be readily attached to it. No attendant is required, as its operation is so simple that anyone can make use of it without danger, and means can easily be arranged by which it can be brought back to the foot of the staircase by a person standing below, if it has been left at the top by the last passenger.

This invention is much less costly than a regular elevator, and seems to be especially applicable to private houses, stores, small hotels, and similar buildings. It will doubtless come into quite extensive use.

TRANSPARENCIES IN PRUSSIAN BLUE.

Mr. Robert Benecke, of St. Louis, gives instructions in Anthony's Photographic Bulletin, to select glass free from scratches and bubbles, put it in a solution of washing soda for a time, wash, and put it up to dry. Now take one ounce of fine gelatin, such as is used for making dry plates, put it in clean water; wash it a couple of times, squeeze out the water and place it on a clean towel. After about an hour, dissolve the gelatin in twenty ounces of hot water, and filter it through cotton,annel, silk, or buckskin pushed into the neck of a funnel. Coat the plates with the gelatin solution warmed from 120° to 140° Fahr. In cold weather it will be necessary to warm the plates. When the solution is spread evenly over the glass, lay it on a cold marble slab placed horizontally, and as soon as the coating has become stiff enough not to run, set the plates away, leaving the gelatin to harden, at least one hour. After this the plates are ready for development and printing.
THE SCIENTIFIC KNOWLEDGE OF THE ANCIENT GREEKS AND ROMANS.

BY JOHN C. ROPE, PH. D.

II.

SOUND, HEAT, AND LIGHT.

The father of the science of acoustics was the famous philosopher Pythagoras, who was born at Samos, at the end of the seventh century B. C. We are often told that he was led to the discovery of the arithmetical relations of the musical scale by observing accidentally the various sounds which were produced by hammers of different weights striking upon an anvil. Longfellow refers to this old story in his poem "To a Child:"

As great Pythagoras of yore, Stood gazing at the blacksmith's door, And hearing the hammers, as they smote The anvils with a different note, Smote from the varying tones that hung Vibrant on every iron tongue, The secret of the sounding wire, And formed the seven-chorded lyre.

But, unfortunately for the truth of the story, different hammers do not produce different sounds from the same anvil. It seems certain, however, that Pythagoras invented the monochord, which is acoustical principles to the construction of theaters. He explains clearly that sound travels in waves, of air, spreading in all directions from the sonorous body.

Of the laws of heat, the ancients knew practically nothing, having a merely empirical knowledge of the ordinary processes of melting, freezing, boiling, and the like. They developed heat by burning, by friction, and by the concentration of the sun's rays. They knew that steam and air were expanded by heat. Aristotle, who investigated the subject, was prevented from accomplishing anything by assuming at the outset that heat and cold were radically independent things, instead of differing merely in degree. He, however, had recognized a definite melting-point for various metals, and he explains the ready melting of "Celtic tin" by the weak cohesion of its molecules. He also appears to have had some idea of latent heat. Among the Romans, we find the use of a principle of heat by a man who, least of all, would have claimed the glory of being a savant—the grim old censor, Marcus Porcius Cato. In describing the preparation of a certain dish, he says that the ingredients are put into an earthen vessel; this in turn is put into a pot full of water, which is set over the fire. Here we have a suggestion of the method afterwards employed by the Arabs, and familiar to our day, for maintaining a given temperature in water-baths.

In optics, far greater advances were made than in the two departments of physics already reviewed. At first, the idea of the process of sight was a wholly inverted one, for it was supposed that the course of light is from the eye to the object seen, like sound-feelers going out from the organ of vision, which formed a conception of the object viewed by actual contact with its surface. Epicurus and Hiparchus assumed the existence of visual rays proceeding from the eye; and the ancient geometers described spheres which resulted from the union of the beams from the two eyes, those from the right eye turning to the left, and vice versa. They maintained that while the eye could take in a great many objects, a distinct impression was received only where the rays met.

The first to write on the subject was Euclid, a believer in the "feeler" theory. While he made many errors, he showed that the angle of incidence is equal to the angle of reflection, and in one of his theorems gives the germ of the idea of linear perspective. The next in order in the development of the subject is Cleomedes, whose work is largely a compilation of that of Poseidonius, a contemporary of Cicero. He is the first to show a knowledge of the principle of refraction, which he illustrates by the familiar experiment with the coin in water; and he explains the phenomenon of twilight on that principle.

Platonians, or Plutarch, the well-known mathematician and astronomer, wrote on the theory of light, and defined the angles of incidence and reflection for various refracting media. While it was left for Descartes to discover the laws of refraction, Ptolemaïns laid the foundation for later investigations. A work on mirrors, which was formerly attributed to Ptolemaïns, is now believed to be the work of the versatile Heron, who did such good service in the field of mechanics. He gives a description of a helioscop, by which a ray of sunlight was introduced into a darkened room and kept in a given position; of a mirror which distorted the image reflected, and of an apparatus for producing ghostly apparitions on the stage, similar to those now employed for that purpose.

The ancients were acquainted with various optical instruments. Mirrors were known at a very early period. They were made of various metals, and of polished stone. Nero had a mirror of emeralds and Pliny tells us that the made of rubies, though this stone is never found now sufficiently large for the purpose. The mirrors made at Brundisium, from a mixture of tin and copper, were celebrated. The white metal thus produced readily becomes dim, and a sponge with powdered pumice-stone was generally fastened to them for renewing the polish. The use of silver mirrors was very common at Rome. Glass mirrors are spoken of by Pliny and others.

Burning-glasses were known at Athens as early as the time of the Peloponnesian war, for Aristophanes makes one of his characters use one to obtrude a charge against him which was recorded on a wax tablet. The burning-glasses of Archimedes have already been referred to. This instrument was also used by the vestal virgins to refresh the sacred fire, if, by any unhappy chance, it was extinguished.

Magnifying-glasses were known to the Romans, and the short-sighted emperor Nero is said to have used one at the theater. This instrument was similar to our modern spectacles or eye-glasses, rather than to opera-glasses. The vexed question whether anything corresponding to the opera-glass of the19th century, and to the spectacles, seems to have been answered in the negative, although they may have used an empty tube to aid their sight in certain cases.

The question whether the sense of color of the ancients was less developed than our own, has been much discussed; and the attempt has been made to prove that Homer was partially color-blind. Aristotle distinguished only three—or at most four—colors in the rainbow, though he could probably have passed a modern examination for color-blindness.

The subjects of magnetism and electricity must be left for another paper.

[NOTE.—The December number, containing the first article of this series, will be sent free to any new subscriber requesting it.]

EIKONOGEN, A NEW PHOTOGRAPHIC DEVELOPER.

ANDRESEN, of Berlin, has discovered a new substance to which he has given the name of eikonogen or ikonogen, and which is manufactured in Germany. This is a substance derived from aniline, like hydrocyanic acid, of a greenish gray color, sensitive to light, and non-crystallizable. According to M. L'Hote, it is distinguishable from hydrocyanic by means of fuming nitric acid, which acts slowly upon the latter body, blackening the crystals and forming an oxide, yellow and slightly soluble; while it acts very energetically upon eikonogen, forming a yellow-colored matter which turns red with water. Hydrocyanic acid is used for the development of photographic images. The following formulas may be used:

**FORMULA NO. 1.**

- Sulphite of soda .................................. 100 grammes
- Distilled water .................................. 1300 grammes
- Eikonogen ........................................... 55 grammes

**FORMULA NO. 2.**

- Distilled water .................................. 100 grammes
- Sulphite of soda .................................. 90 grammes
- Eikonogen ........................................... 45 grammes

Three parts of the first solution is taken with one part of the second.

To hurry the development, add a few drops of the following accelerator:

- Carbamide of potash .............................. 10 grammes
- Distilled water .................................. 100 grammes

To restrain the development, add a few drops of the following retardator:
The Out-Door World,

Edited by HARLAN H. BALLARD,
President of the Agassiz Association.
[P. O. Address, Pittsfield, Mass.]

Every member of the Agassiz Association will appreciate and reciprocate the cordial greeting given by the editor of the Popular Science News. Let us increase our devotion to the study of the Out-Door World during the year now opening, and strive in every way to render our society more and more worthy of the commendation so kindly bestowed upon it.

The Swiss Cross, which for more than two years has been the "official organ" of the Agassiz Association, is now combined with Santa Claus, the new and beautiful young folks' weekly magazine published in Philadelphia, and will continue its pleasant work of interesting the children in the study of Nature.

In "The Out-Door World" we shall speak to those who are older, and who are approaching a maturity of thought and endeavor that will not rest short of thorough scientific attainment. The publishers of these two journals are in the heartiest accord, and will aid and supplement one another in giving our Association the complete possible representation. By a friendly clubbing agreement, both the Popular Science News (whose regular subscription price is $1.00) and Santa Claus ($2.00) will be sent to any address for $2.25. To this most generous offer we expect an equally generous response from everyone interested in our work.

In addressing for the first time the new audience to which we have thus kindly been introduced by the editor of this journal, a few words may be needed regarding the purpose and scope of our Association. Its aim is to awaken among the people an interest in the personal observation of their immediate natural surroundings. As we have often expressed it, we wish to lead as many as possible along the footsteps of Gilbert White.

To this end we constantly invite persons of all ages and conditions to form local clubs and unite with us. On their part, they are to explore, as best they may, the country within, say, a ten-mile radius of their respective homes; make collections, if they choose, of their representative animals, plants, and minerals; study the geological structure of the rocks above which they live; found local scientific libraries; provide courses of lectures; and, in a word, establish, if possible, permanent scientific societies in their several towns.

On our part, we undertake to help any who need assistance, by directing them to the simplest methods of organization, and the most approved ways of working in the several departments; by suggesting books appropriate to their varying necessities; by putting them in communication with men of high standing, who are able and willing to give them sound answers to the questions that may perplex their inexperience; and by providing for them a regular means of intercommunication, so that they may not only maintain private correspondence and exchange their specimens, but may also have a place in which there may be made a permanent record of whatever may be discovered of general and abiding interest.

To this end we earnestly invite the cooperation of every scientific man and woman who reads this paper. Give us your sympathy, your counsel, your assistance. You will hardly be able to render the nation a better service than by helping to enlist our young men and young women in the conscientious study of Nature and science. We plead for no sentimental smattering. Our young men mean business. Many of them have devoted their lives to science. Some have already attained eminence who began as boy-members of a village Chapter of the Agassiz Association. Help them now, and you will be unconsciously sowing seed that, after many days, shall produce a harvest worthy of your own gathering. You will some day wish to give a scientific lecture; our Association is preparing you an audience. You may embody the results of your life-work in a book; our Association is training those who will buy and read it.

Another leading aim of the Agassiz Association is to increase the quantity, and particularly to improve the quality, of science-teaching in our public schools. Much has already been accomplished in this direction. We have awakened a desire for right and adequate instruction in nearly twenty thousand youthful minds, and have given them a sufficient understanding of what right instruction is, to make them absolutely intolerant of obsolete methods of rote-work and book cramming. You couldn't hire a member of the Agassiz Association to study botany without plants, mineralogy without minerals, or chemistry without chemicals. In this matter we have constantly been in the closest sympathy of belief and endeavor with the "Committee on the Subject of Science in the Schools" appointed a year ago by the American Society of Naturalists. We cannot better sum up our desires than by quoting the words of this committee; for the Agassiz Association also asks for "the active support and encouragement of every parent and teacher who believes that the young should have their natural tendencies and longings for a knowledge of the things of Nature cultivated; their questions about it, which are in every way pure and true, answered; oppor-
POPULAR SCIENCE NEWS.

THE smallest number that can be admitted as a Chapter of the A. A. is four. These may be all of one family, or of several; they may be of any age, and their entrance is entirely free, the only necessary expense being the purchase of the Association handbook, Three Kingdoms, and a subscription to one of the papers that contain our reports. For convenience in reporting, the Chapters are arranged in groups of one hundred, called Centuries, of which there are now ten, though none of them are full. Chapters belonging to the first Century (Nos. 1-100) are expected to send their annual reports to the President by the first of January, and reports from this division are now due. The other Centuries will follow the months in regular order until August. August and September are omitted, as vacation months, and then the eighth Century begins again in October. We shall now present a few extracts from the large number of these reports which have been received during the past few months.

295. Greene, N. Y., [A].—We have added to our herbarium, by collecting and by exchange. Our cabinet of minerals is also enlarged, and we have a large number of slides prepared for the microscope. Correspondence with the Gray Memorial Chapter has proved very interesting and profitable.—L. P. J., Sec.

One or two things in this pleasant letter may need a word of explanation for the general reader. The number (500) shows that this Chapter is the fifth Chapter in the sixth Century. The letter A after the address signifies that it is the first Chapter in Greene, N. Y. The Gray Memorial Chapter is one of a class of societies formed, not by the union of several residents of the same town, but by the association into a "Corresponding Chapter" of widely separated individuals, all interested in the study of botany. It is named in honor of Professor Asa Gray, and has a large and earnest membership. The President is George H. Hicks, Owosso, Mich.

513. Buffalo, N. Y., [D].—We have lectures every week, and every two weeks an essay and discussion. We have had a series of excursions for the collection of wild flowers, and are preparing a herbarium.—Lilian M. Hoffer, Sec.

157. Appleton, W., [A].—We are studying leaf forms and caterpillar changes. A charming book, which we have lately obtained, Inset Living; or Born in Prison, has been a well of delight. With great gratitude for the privileges you have enabled us to enjoy, we are all very sincerely your co-workers.—M. Rogers Winslow, Sec.

If anyone deems it immodest in the editor to feel proud that the book referred to by Mrs. Winslow is the work of his mother, and to think it the best book on the subject yet written for young people, let him read Exodus 20: 12.

250. Pluqa, O., [A].—We have gained a most valuable member in J. W. Dowler, a civil engineer. Our studies are at present confined to archeology, geology, and zoology. In the first department we have nearly five thousand specimens, as this is an excellent field for Indian relics.—J. A. Rayner, Sec.

We have a "Corresponding Chapter" in archeology, like the one in botany already referred to. Membership extends to students. The President is Hillborne T. Cresson, Philadelphia Academy of Sciences; Vice-President, Dr. C. C. Abbott, Trenton, N. J.; Secretary, A. H. Leitch, 41 Mound Street, Dayton, O.

521-527. New York, N. Y., [O].—We have held thirteen meetings since September, five of which were devoted to answering the questions sent by Mr. Wyth, whose course in botany we are still pursuing. Miss Hirsch has taken Professor Guttenberg's course in mineralogy. We spent one field-day at Spyutten Duyvil, May 2, and found, among other flowers, Paeonia trifida, Aralia lyrata, Nepeta glechoma, and Erigeron Annuarunum. One member found an alder-tree in bloom January 4; and some arbutus was found at Cornwall, January 30.—Alice M. Isaacs, Pres.; Daisy L. Stein, Sec.

290. Boston, Mass., [E].—We have begun to study geology, and have made three collecting trips.—John J. Fay, Sec., 41 Allen Street.

355. Hallowell, Me., [A].—Death has visited our little Chapter, removing one of our members. The remaining three are earnestly and steadily at work, adding much to their knowledge, and enlarging their collections of minerals, fossils, woods, etc.—M. Lilian Hopkins, Sec.

340. Oskaloosa, 10., [A].—Our Chapter is in a most flourishing condition. Within the last eight months the membership has increased from twenty-three to fifty. We have rooms in the High School building, where we have our museum. The School Board has also given into our hands the arrangement and care of their numerous scientific specimens. Our work is in chemistry, geology, zoology, and botany; we also have numerous field-meetings.—Mary B. Green, Pres.

48. Fitchburg, Mass., [A].—Hereafter, please address all correspondence intended for this Chapter to "Agassiz Association, No. 48, P. O. Box 1658, Fitchburg, Mass." This will insure its immediate delivery. There are frequent changes in the office of corresponding secretary, but the foregoing address will be permanent.—Ina C. Greene, Pres.

ORIGINAL OBSERVATIONS.

[Continued from The Swiss Cross, Vol. 5, No. 6, p. 184.]

235. A Late-Blooming Pear. (See Note 243.)—A pear tree in our garden lost all its leaves after an August storm. In the warmth of September, after long-continued showers, it put forth a crop of young leaves, blossomed, and continued in flower for three weeks.—C. C. Cruger, Barretony, N. Y.

256. A Mastodon's Skeleton.—I have found what I take to be a tooth and part of a task of a mastodon. The tooth is 7 1/2 inches in length and 3 1/2 in the diameter of its cross-section. It has five transverse ridges, about an inch high, except the last, which is smaller. Each ridge is cut in two by a longitudinal groove, or furrow, which, however, is not nearly so deep as the transverse grooves. The piece of task is 16 inches long, 5 inches in its longer and 2 in its shorter diameter.

The outside is dark colored, and has a perfect polish. The inside is soft, and can be scratched with the nail. Some persons here took it for petrified wood, because three concentric layers appeared on the end; but I think it is ivory, because the broken end shows small lozenge-shaped markings, formed by the intersecting of circular arcs. A fragment heated in the flame of an alcohol lamp gave a distinct odor like that of a burning hoof. Judging from the above, this piece, the task most originally must have been about 8 inches in diameter.—George W. Boot, Ute, Iowa.

257. One of the Tipulidae.—I mail you a small bottle containing two larvae, which I found in the water of a vessel in which was an aquatic plant. Kindly let me know their names, origin, and future. I am not a member of the A. A., but take great pleasure in reading the reports and observations published in your magazine. The body is transparent olive green, rudimentary wings darker.—J. T. L. Green, Philadelphia.

This is apparently a pupous larva of the family Tipulidae, and belongs to that section of the family which have short palpi, among which are Pteronanta, Lianobia, etc. See Ostendacken's Smithsonian publications.—Ed.

A CORDIAL INVITATION is hereby extended to all our readers to join the Agassiz Association, either by organizing local societies, or as individual members. Circulars giving full directions, and containing a fine wood-engraving of Professor Agassiz, will be sent on application. Address all communications for this department to Harlan H. Ballard, President of the Agassiz Association, Pittsfield, Mass.

REPORTS FROM the second Century (Chapters 101-200) should reach the President by February 1.

GLEANINGS.

A CANVAS-BACK DUCK flies at an habitual rate of 80 miles per hour, which is increased in emergency to 120. The mallard has a flight of 48 miles an hour; the black duck, pin-tail, widgeon, and wood duck cannot do much better. The blue-wing and green-wing teals can do 100 miles an hour, and take it easy. The red-head can fly all day at 90 miles per hour. The gadwall can do 90 miles. The flight of the wild goose is 100 miles per hour.

AN ENTERTAINING YARN.—An enterprising Kentucky paper prints the following: "In Woodford County Mr. John D. Burns raised a large drove of turkeys this year, and by placing a bell upon the old mother that led them he accustomed them to follow the sound. When the time came to work his tobacco fields he removed the bell, placing it on his own waist, and while working his crop with the hoe, the hungry turkeys followed the familiar tinkle of the bell, picking the stalks clean of the worms as they followed him up one row and down the other. The turkeys have done the work of five men and saved the crop.

ALUM IN BREAD.—Alum owes its power of bleaching the paste of bread not to the alumina which it contains, or to the combination of this with the earth with the gluten, but to the sulphuric acid liberated by the formation of aluminum aluminate. According to Nothnagel and Rossbach, the prolonged daily use of alum in proportion of 0.05 to 0.1 grn. occasions gastric disturbances not unimportant. The author finds that the artificial gastric digestion of alumured bread effects the solution of all the alum present. Hence it is possible that a quantity of alumina equivalent to 0.20 grn. of alum may enter the circulation daily.
The Popular Science News.

BOSTON, JANUARY 1, 1890.

AUSTIN P. NICHOLS, S.B., . . . . Editor.
WILLIAM J. BOLLE, B.A., . . . . Associate Editor.

The Popular Science News has watched with great interest the development of that admirable society of youth known as the Agassiz Association. Founded in 1875 by Harlan H. Ballard, it has grown, under his devoted care, to national proportions, and has successfully accomplished one of Louis Agassiz's favorite dreams,—the general establishment of local clubs devoted to the personal study of their close environment. During the past fourteen years, no less than fifteen hundred such clubs have been organized, and hundreds of them have remained active, and are growing in strength and vigor. Even those which have been most transient have wrought a good work in engaging the attention of their members, and attaching their interest to objects of essential usefulness.

It gives us pleasure to announce that we have secured the services of Mr. Ballard to conduct in the Popular Science News a department, which is to be called "The Out-Door World." In it will be presented, from month to month, short articles of a popularly scientific nature, largely embodying the results of the personal observations of the members of the Agassiz Association and its friends, among whom are many of the leading scientists of America. There will also be a few selected extracts from the reports of the local clubs,—particularly those which constitute the mature portion of the society,—and there will be frequent hints and suggestions designed to assist teachers of natural science in our public schools. We are glad to know that our journal has always been popular with the members of the Agassiz Association; and, while the new department must greatly increase their interest in us, we feel sure that, on the other hand, the reports of the work of this army of students, from whose ranks are to come our future teachers and men of science, will be read with approving and sympathetic interest by all.

The space formerly occupied by the department of "Home, Farm, and Garden" will be devoted to the interests of the Association, and the articles formerly appearing under that heading will be transferred to other pages of the paper.

A curious observation was recently made by Mr. C. Piazzii Smyth, while examining the spectrum of the light emitted by some vacuum tubes through which a current of electricity was passed. Eleven years ago a quantity of iodine was placed in the tubes in question, which were then nearly exhausted of air and hermetically sealed. When one of these tubes was spectroscopically examined in 1880, no less than 148 lines of the iodine spectrum were visible, and only three very faint hydrogen lines. In the present year, when Mr. Smyth again examined the spectrum given by the same tube, not a single iodine line was left, but hydrogen lines were present in great abundance. The granules of iodine sealed into the tube in 1878 had also entirely disappeared. There was no possibility of an accidental crack or leak in the tube to account for this apparent transmutation of an element, which was certainly a most remarkable phenomenon, and, as Mr. Smyth observes, leads us to speculate whether this change is not an infinitesimally small part of the progress of everything to turn into hydrogen, and for assisting thereby the whole solar system to explode some day into a so-called hydrogen star.

Professor S. P. Langley has been making some investigations upon the temperature of the moon's surface,—a work requiring the utmost care and skill, and the use of instruments of the greatest delicacy. Contrary to the usually received opinion, that the surface of the moon exposed to the rays of the sun through the long lunar day becomes heated to a very high temperature, Professor Langley comes to the conclusion that the mean temperature of the sunlit lunar soil is much lower than has been supposed, and is most probably not greatly above 32° Fahr.

Great interest was excited last November among archaeologists, by the announcement by Professor Horsford, formerly of Harvard College, of his discovery of the site of the ancient and traditional city of Norumbega, which he claims was founded by the Northmen, about 1000 A. D., or nearly five hundred years before the voyage of Columbus. The site claimed for the ancient city is near Watertown, Mass., a few miles west of Boston, in the valley of the Charles River. Professor Horsford claims that there are monuments of the presence of the Northmen on every square mile of the basin of the Charles. As evidences of this, he points to a canal, walled on one side for a thousand feet along the west side of Stony Brook, and to the dry canal near Newtonville. He has also found remains of canals, ditches, delfas, boom-dams, ponds, fish-traps, dwellings, walls, and amphitheaters scattered all throughout the basin of the Charles. The evidence tending to prove the discovery and occupation of the region around Massachusetts Bay long before the date usually assigned to the discovery of this continent, is constantly growing stronger, and there seems to be little reason to doubt that the "Vinland" so well known to the old Norse adventurers, was a part of the country re-discovered in later centuries which still bears the name of New England, in honor of the native land of the adventurous navigators who for the second time brought it to the knowledge of the old world.

A genuine case of hydrophobia recently occurred in Haverhill, Mass. The patient—a strong, healthy man—was bitten by a dog about six weeks previous to the attack. The characteristic symptoms of spasm of the throat and periodic general convulsions, were so well developed as to leave no doubt as to the nature of the disease. Death occurred very suddenly, after several days of severe suffering. The keeping of dogs is a custom handed down to us direct from our savage ancestors, and is a practice unworthy of civilized beings. But as long as mankind insists upon the companionship of these useless and dangerous beasts, the risk of such lamentable accidents as the above will be always present, and fatalities from the dreadful disease will continue to be reported.

In a paper read before the Danish Academy, M. Paulsen gave the results of numerous determinations of the height of the aurora. These results were very variable, some auroras being observed as low as 1,000 feet, while others were apparently at a height of 42 miles, and one aurora was estimated to be over 500 miles above the earth. These observations, therefore, lead to the conclusion that auroras are by no means confined to the highest parts of our atmosphere, but that they occur almost indifferently at all altitudes. M. Paulsen inclines to believe that in the temperate zone, auroras only appear in the higher layers of the atmosphere; whereas, in the auroral zone, properly speaking, the phenomenon is generally produced in the lower layers.

Mr. H. W. Wiley has been making some investigations upon the boiling-point of the solutions of certain salts, and finds that it is closely related to their molecular weights, so that it is quite possible to obtain the approximate molecular weight of many chemical compounds by careful observations of the boiling-point of their solutions. This relation, apparently, only exists in the case of a limited number of salts, and his observations also lead him to believe that substances containing water of crystallization exist in solution in a modified form, and the influence of this modification on the boiling-point of the solution must be determined by largely extended observations.

FLUORESCENCE.

A beautiful mineral occurs in various localities known as fluorite, or fluor spar, the name being given from its use as a flux in metallurgical operations. When pure, it is
colorless and transparent, but often occurs beautifully colored in various tints. Whatever its own color may be, when a ray of light is transmitted through it, the crystal appears to become partially self-luminous, shining with a faint blueish light, very hard to accurately describe in words, but easily recognized after being once seen. This phenomenon, which is by no means confined to fluor-spar, is known as fluorescence.

Fluorescence is due to the property possessed by many bodies of changing and increasing the length of certain waves of light, so as to render them visible to the eye. The solar spectrum, as is well known, is formed by the decomposition of white light into its component parts, of different colors and wave-lengths. Commencing with the red rays, which have the longest wave-lengths, and passing along to the violet, the wave-lengths continually decrease, until they fail to produce the sensation of light upon the eye, and are transformed into actinic or chemical rays. But the ether-waves still exist, although invisible, and, in passing through any fluorescent substance, they are so lengthened as to be transformed into light, and cause the peculiar illumination. There are also ether-waves at the opposite, or red, end of the spectrum, which are too long to produce the sensation of light, and appear as heat, but there is no fluorescent substance which will shorten them into visibility. The action of such substances is always in the direction of lengthening the waves.

Sulphate of quinine is a beautifully fluorescent body. If a solution of this salt is placed in the sunshine, it will glow with a bluish tint, and if a convex lens is placed between the solution and the light, the path of the converging rays in the solution is very plainly shown. This experiment forms a most excellent demonstration of the laws governing the action of such lenses upon light.

Characters may be painted upon a screen with a solution of sulphate of quinine, or any fluorescent substance, and will be quite invisible by ordinary light, but if the ultra-violet rays of the spectrum are allowed to fall upon them, they become visible at once. Owing to the great actinic power of these rays, a photograph of such a screen will show these invisible characters upon the finished plate. Certain mysterious "spirit photographs" have been produced in this way.

Among other notably fluorescent substances are resinule, a substance extracted from the horse-chestnut; madder, chlorophyll, common kerosene oil, and quite a number of recently discovered hydrocarbon compounds. One of these shows the phenomena so strongly that the name fluorescine has been given to it. Some of these substances are used in photography in the preparation of the so-called ortho-chromatic plates, by which colored objects may be photographed in their proper relations of light and shade, without the disturbing effect of the varying actinic power of the different colors.

Glass colored yellow by uranium is highly fluorescent, and characters traced on paper with a solution of stramonium are almost invisible in daylight, but appear instantaneously when illuminated with the flame of burning sulphur. The distance on either side of the light spectrum at which these invisible ether-waves may be found is unknown, but it must be very great. A spectrum has been obtained from the electric light six or eight times as long as the ordinary visible one, and these waves may exert a distinct influence in many ways of which, at present, we have no comprehension. They may even produce sensations in some of the lower forms of life of which we can form no conception, just as certain persons can hear acute sounds to which others are deaf. The whole subject of radiant energy—which includes light, heat, electricity, actinic force, and probably many other forms—is just beginning to be comprehended, and no one can say what revelations the future study of the subject may lead us.

[Originally Reported For The Popular Science News.]

THE BRITISH ASSOCIATION AT NEWCASTLE.

The last meeting of the British Association for the Advancement of Science, at Newcastle, has left, both upon scientists and their hosts, an impression of unwonted success. The social arrangements have been all that could be desired, and the excursions admirable in every respect—that of Saturday (to the vicinity of Durham) being made meritorious by the conferring of the honorary degree of Doctor of Civil Law upon the officers of the Association. This imposing ceremony took place in the chapter library of the Cathedral, within whose lady chapel repose the bones of the venerable Bede, England's first historian. The decorated shrine that once adorned the spot has long since passed away, leaving only a marble slab with the inscription: "Hoc est in fossa Beda venerabilis ossa."

Gratifying as it was that one learned body should, with all pomp of circumstance, show its appreciation of another, it was still more gratifying to the Association to receive in Newcastle itself—a district owing its prosperity to the practical applications of science—distinct acknowledgments of the value of their immediate utility. These were rendered by the Mayor on more than one occasion, the most impressive being that of Mr. Baker's lecture on the Forth Bridge, when the various trades companies of the city presented an address to Professor Flower, as president of the British Association, recognizing that only as the result of long series of complicated researches, undertaken solely for the discovery of truth, has this triumph of engineering skill been possible.

Mr. Baker's lecture on the Forth Bridge was one of three provided by the Association for what are termed the working classes, the object being to return some of the courtesies of the city by fostering an Intelligent Interest in science through the addresses of specialists who know how to reduce sound scientific principles to popular language. The appreciation of an account of this stupendous enterprise by its chief engineer, had been shown Saturday afternoon. The gates, when only 3,500 could be allotted; and the workmen assembled in the hall, repeatedly, and with intense enthusiasm, expressed their intelligent interest in Mr. Baker's clear explanations and magnificent series of lantern illuminations. Scarcely less attractive did the "Hardening and Tempering of Steel" prove in a district where the use of steel is of such great importance, and in developing his subject, Professor Roberts-Austin emphasized the absolute dependence of industrial progress upon the investigations of pure science. Pure science, itself, was also presented to a large and attentive audience by Mr. Walter Gardiner, who, in his practical illustrations and examples of "How Plants Maintain Themselves in the Struggle for Existence," gave a memorable lesson in Darwinism, and one much needed just now, when scientific terms and phrases are entering common speech without carrying with them the definite ideas to which in scientific use they are attached.

Truly, Darwinism was in the air at Newcastle, forming, under one aspect or another, the great discussion of the meeting. In his presidential address on the first evening, Professor Flower, after making some practical and arrangement remarks of natural history collections, a subject on which he, as director of the Natural History Department of the British Museum, must command the attention of all who would present their specimens to the best advantage,—brought the weight of his vast biological knowledge to the consideration of recent criticisms of Darwin's great hypothesis. Taking for granted that few, if any, original workers at any branch of biology now entertain serious doubt of the doctrine of evolution, and that all recognize an innate tendency in very organic being to vary from the standard of its predecessors, he discussed the agents by which, when it has asserted itself, this tendency is controlled or directed in such a manner as to produce the permanent, or apparently permanent, modifications which we see around us. In opening their respective sections on the following day, Professor J. S. Burdon Sanderson directed the attention of biological workers to fundamental questions in physiology bearing on the elementary mechanism of life, the problems of which most urgently need solution: while Sir William Turner called on his large audience of anthropologists to consider the question of a physical basis for heredity (the perpetuation of the like), and for variability (the production of the unlike), especially in its bearing on the transmission from parents to offspring of characters acquired by the parent. This latter topic, which just at present is greatly moving the biological world, came up for full discussion on Friday, in connection with Professor Osborn's "Ascertained Characters," from Mr. Francis Galton on "Feasible Experiments on the Possibility of Transmitting Acquired Habits by Means of Inheritance," and from Professor Osborn on the paleontological evidence in this direction. Again it was brought up on Monday, in a large assembly of biologists and anthropologists, by Mr. G. J. Romanes, in connection with "the characters," and many men of world-wide reputation taking part in a debate presided over by Canon Tristram, the first church dignitary and almost the first naturalist to accept the then new and unpopular doctrine of Darwin.

But Darwinism, though the greatest, was by no means the only subject to excite wide interest, even in the sections of biology and anthropology, in the
The average temperature the past autumn has been 51.60°, while the average in nineteen autumns has been 51.8°. The details are shown in the table. Only three autumns in nineteen years have been warmer than the present, viz.: 53.5° in 1881, 52.51° in 1877, and 52.35° in 1875.

The face of the sky, in 99 observations, gave 38 fair, 16 cloudy, 26 overcast, and 10 rainy, with no trace of snow,—a percentage of 42.2 per cent, while the average in nineteen Novembers has been 42.4, with extremes of 40.0 in 1885, and 74.4 in 1874. Only one November in nineteen years has been more cloudy than the present. The following mornings were noted foggy on the 1st, 9th, 17th, and 19th, that of the 9th was peculiarly dark, and the darkness continued through most of the day. And yet we had several very fine days in this very gloomy month: the 4th, 7th, 14th to 16th, 26th, and 29th were so noted.

The per cent. fair in the last nineteen autumns was 56.3, with extremes of 41.8 in 1885, and 69.2 in 1886, showing the present to be an extreme. Only three autumns in nineteen years have fallen below even 52 per cent. fair.

**METEOROLOGY FOR NOVEMBER, 1889.**

**WITH REVIEW OF THE AUTUMN.**

**TEMPERATURE.**

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<tr>
<td>At 7 A. M.</td>
<td>39.17°</td>
<td>50.6°</td>
<td>11.4°</td>
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<td>At 12 M.</td>
<td>47.52°</td>
<td>61.3°</td>
<td>13.8°</td>
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<tr>
<td>At 5 P. M.</td>
<td>45.10°</td>
<td>56.1°</td>
<td>11.0°</td>
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<td>Average</td>
<td>46.07°</td>
<td>55.2°</td>
<td>9.13°</td>
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<tr>
<td>White Month</td>
<td>46.00°</td>
<td>58.4°</td>
<td>12.4°</td>
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| Last 19 Novemvers     | 33.75°  | 51.14°   | 17.39° |
| Autumn of 1889        | 51.6°   | 68.2°    | 16.6°  |
| Last 19 Autumns       | 51.88°  | 67.5°    | 15.6°  |

The lowest point of the mercury the last month, at the hours of observation, was 29°, on the morning of the 16th, and this was also the coldest day, with an average of 37.35°. The 30th was the next coolest, at 30°. The highest point of the month was 64°, on the morning of the 31st,—a very unusual occurrence for the warmest observation of an entire month to be in the morning. The wind had been southwest, but changed to the northwest soon after that morning observation, carrying the mercury down to 38° on the following morning,—a fall of 26° in twenty-four hours. The 31st was also the warmest day at 58°. The entire month was 5° above the average, and the warmest November in nineteen years. The extremes of temperature in November have been 31.12° in 1873, and 43.5° in 1889,—a range of 12.38°. The frosts of the season have been very few and light, thus far: three in October, and seven in November, only two of which have been severe—those on the 16th and 17th.

The amount of rainfall the past month was 5.76 inches, while the average for the last twenty-one Novembers has been 4.17, with extremes of 1.15 in 1882, and 7.45 in 1877. The amount in November has exceeded the present five times during this period, viz.: 6.87 in 1876, 7.45 in 1877, 6.25 in 1878, 6.39 in 1885, and 7.28 in 1888. The largest amount the present November was 2.41 inches, on the 27th and 28th; 1.99 inches on the 19th, and the remainder in smaller quantities, well distributed. The amount of precipitation since January 1 has been 54.39 inches, while the average for the same months in twenty-one years has been only 43.16, showing an excess this year thus far of 11.19 inches.

The amount of rainfall the past autumn was 13.96 inches, while the average for the past twenty-one autumns has been only 12.6 inches, with extremes of 3.42 in 1874, and 21.47 in 1888,—a remarkable range of 18.05 inches.

**PRESSURE.**

The average pressure the past month was 30.01 inches, with extremes of 29.35 on the 22d, and 30.52 on the 26th and 27th,—a range of 1.17 inches. The average for the last sixteen Novembers has been 29.925 inches, with extremes of 29.980 in 1878, and 30.193 in 1880,—a range of 0.25 inches. The sum of the daily variations the past month was 6.45 inches, giving a mean daily movement of .215 inch, while this average the last sixteen Novembers has been .232 inch, with extremes of .277 and .253. The largest daily movements were .36 on the 28th, and .55 on the 15th, and .39 on the 13th. There were five principal barometric waves during the month, with elevations or depressions of the 5th, 12th, 16th, and 26th, and depressions on the 3d, 10th, 14th, 22d, and 28th.

The average barometer during the present autumn was 30.008 inches, while the average for the last sixteen autumns has been 30.001, with extremes of 29.88 in 1875, and 30.070 in 1880,—a range of .189 inch.

**WINDS.**

The direction of the wind the last month gave 11 N., 10 NW., 34 W., 5 W., 18 N., 18 W., 4 S. E., and 14 S. W.; 12 NW., 34 W., 5 W., 18 N., 18 W., and 4 S. E.; 12 NW., 34 W., 5 W., and 18 N. The westerly winds in November, for the last twenty years, have uniformly prevailed over the easterly, by an average of 47.9 observations, and the northerly over the southerly,
with four exceptions, by an average of 14°—thus indicating the approximate general average direction for November to be W. 17° 17′ N., showing the past month to have been a near average. The relative progressive distance travelled by the wind the past month was 56.06 units, and during the last twenty Novembers 1,003 such units, an average of 53°—showing less opposing winds the past month than usual.

The direction of the wind the last autumn was W. 23° 30′ N., and the distance travelled 14.6 units; and during the last twenty autumns the average direction has been W. 13° 30′ N., and the distance travelled 2,181 such units,—showing that the winds have been 10°2′ more northerly, and less opposing winds, the last autumn than usual. B. W. N. ATICK, Dec. 5, 1889.

[Special Computed for The Popular Science News.]

ASTRONOMICAL PHENOMENA FOR JANUARY, 1890.

The earth is in perihelion on the morning of January 2. Mercury comes to eastern elongation on the evening of January 13, when it is a little less than 19° distant from the sun. At the beginning of the month it is about 15° distant, and sets an hour later. It can probably be seen any evening during the first half of the month, when the sky is very clear, down to southern horizons. The dawn sunset. During the latter half of the month it rapidly approaches the sun, and, passes inferior conjunction on January 29. Venus is still a morning star, but is too near the sun to be conspicuous. At the beginning of the month it is about 12° distant, and by the end the distance is only 2°. It will pass inferior conjunction on February 13, and will then be an evening star until next December. Mars rises about 1.40 A. M. on January 1, and at about 1 A. M. on January 31. During the month it moves somewhat rapidly eastward through the eastern part of the constellation Virgo. It is gradually approaching the earth, and will be a quite conspicuous object during the spring months. It will pass opposition with the sun on May 27, when it will be brighter than it has been for nearly two years. As it is near the earth and on January 1, Jupiter is not in good position for observation in January, on account of its nearness to the sun. It passes conjunction on the morning of January 10, and becomes a morning star; by the end of the month it has receded to a distance of about 17°, and may possibly be seen in the early morning twilight. "Saturn is in the constellation Leo, and is moving slowly westward toward the bright star of the constellation Ursa Major, the brightest of the fixed stars. Nearly on the same line, and east of Orion, is Procyon, the principal star of Canis Minor. Near the eastern horizon is Leo; above this, Cancer, and above Cancer and near the zenith is Gemini. On the north-east is Ursa Major, the two pointers being nearly as high as the pole star, and the handle of the dipper solution for Orion. The farther part of Ursa Minor is under the pole, and the brightest stars of Draco are very close to the northern horizon. Per- seus is near the zenith in the northwest; below it is Cassiopeia, and Cygnus is on the horizon. Andromeda is a little north of west, below Perseus, and Pegasus is just below Andromeda. Pisces is just west of Pegasus; above Pisces is Aries, and that of Taurus. With the large and small groups of the Pleiades and Hyades. Cetus is in the southwest, and Eridanus a little west of south. M.

LAKE FOREST, ILL., Dec. 2, 1889.

QUESTIONS AND ANSWERS.

LETTERS of inquiry should enclose a two-cent stamp, as well as the name and address of the writer.

Questions regarding the treatment of diseases cannot be answered in this column.

K. T., Bombay, Ind.: Is there any chemical substance, which, when sprinkled over combustible bodies, will cause them to ignite?

Answer.—Phosphorus can be dissolved in bluish liquid at the moment, and when the solution is poured upon porous bodies, like paper or wood, it will spontaneously inflame as the liquid evaporates. This "liquid fire" is, however, an extremely dangerous substance to handle, and we would not advise any experiments with it.

F. D., New York: What causes the fatal effect of nicotine on the body?

Answer.—The most active cause is, undoubtedly, the shock given to the nervous system, but there is also a chemical decomposition of the bodily fluids, and a direct burning action, all of which may all to the result. Just how electricity causes a nervous shock, no one knows, any more than we know what electricity really is.

H. R., New York: Where can any fusible alloy which will melt at about 145°?

Answer.—The following mixture melts at a temperate between 150° and 160°, and is the most available alloy of which we have knowledge. Bismuth, lead, tin, and copper are made equal parts in weight after the bismuth and tin are melted together, and the copper is added last. This is a poor fusible alloy, but is good enough for many purposes where it can be used to advantage.

G. F. B., Boston: Please give directions for making a mixture for blowing large and strong soap bubbles.

Answer.—We have given this recipe several times, but repeat it, as there may be others who have overlooked it. Take shavings of the best Castile soap, and make a saturated solution in warm water. Let it stand in a closed vessel for a day. If the shavings have settled, let the clear liquid and add to it from one-third to one-half its bulk of glycere. Shake well and it is ready for use.

LITERARY NOTES.


This is the first volume of a series of eight on chemical technology. It is the most exhaustive work that has been issued for some years, including, as it does, much that has never before been published, and is most valuable to the arts and manufactures. The magnitude and importance of this work deserves a more extended notice than the space of the column will allow. It is a complete compendium of all the existing knowledge on the subject of fuel, which, it may be remarked, is the very foundation-stone of nearly all industrial processes. We can recommend the work as indispensable to all who have control of any industrial establishment where the question of fuel is to be taken into consideration. The work is profusely illustrated, and the mechanical-executions are of the highest quality of all books published by this well-known house.

Mumm’s History of Rome. Abridged by C. Bryant and P. J. K. Hendy. Chas. Scribner’s Sons, New York. Two English teachers have done an excellent work for schools and colleges in condensing Mumm- sen’s six-volume classic in a handy book of 442 pages. The task has been performed with skill, judgment, and with a constant regard to educational purposes which cannot fail to win the favor of teachers and students. The 20-page index is a commendable feature.


This is a handsome octavo of 740 pages, with 630 illustrations, devoted to experimental physics. It comes in handy for school teachers, since they are opening their eyes to the value of practical work in this department of instruction. It will be equally useful to those who are well equipped with illustrative apparatus, and those who have to depend on such appliances as they can construct for themselves from cheap and simple materials. The hints for laboratory work are naturally full with ingenious, and ingenionous. The entire ground of school physics is covered by the book: the properties of bodies; rest, motion, and their effects; magneto-motors; mag- netic action; and chemical reactions; astronomy; the laws of gases; sound, heat, light (including photography, etc.); magnetism: electricity, in all its forms: lenses; telescopes; microscopes; projection; and the mechanical operations con- nected with the manipulation of glass and metals. A brief note on photography is also given.

The J. G. Cupples Co., of Boston, have published a full account of Dr. Brown-Sequard’s alleged new discovery which has recently created such much interest in medical circles. It includes Dr. Brown-Sequard’s original paper, Dr. Vario’s ex- aminations, and complete and important literature of the subject, together with a biographical sketch and portrait. Price, 50 cents.

The J. B. Lippincott Co., of Philadelphia, have published a valuable work on Foods for the Fat (price, 75 cents), by Nathaniel E. Davies, of the United States Public Health Department. It gives many useful hints in regard to diet, and other means of avoiding the evil of corpulence and decreasing the bodily weight, together with recipes and directions for making the dishes in the book available for persons troubled with an excess of adipose tissue.

A Hand-Book for Sugar Manufacturers and Their Chefs, by Guilford L. Spencer, contains all the necessary tables and information required in the important industry of sugar-making and refining. Many of the tables have never before been published in this country, and will be found of great value to those in charge of such establishments. Published by John Wiley & Sons, New York.

From D. C. Heath & Co., Boston, we have received Rick’s Natural History Object Lessons (51 cents), Nicholas Kitt’s Wolf-fish in the Underwater, and Victor Hugo’s Nas Jargot, all scholarly productions of the highest degree of merit, and worthy of examination by teachers and school committees.

Everybody’s Hand-Book of Electricity, by Edward Trevert, is a useful and popular little book, which everyone interested in the modern applications of electricity will recommend, and with pleasure and profit. Danuerr, Upham & Co., Boston. Price, 25 cents.

Paper dealers, etc., received: Temperance Literature and Publications of the Woman’s Temperance Publication Association, 161 LaSalle St., Chicago; Highway Improvement, by Col. Albert A. Pope, Boston; The Transfer of the United States Weather Service to a Civil Bureau; Graphic Methods in Teaching, as a practical volume which contains the usual State and National Agricultural Reports.
IS CRIME A DISEASE?

In recent times the idea has become very prevalent among a certain class of sentimentalists that crime is not an indication of innate depravity, but a symptom of mental and physical disease, or an inheritance from some criminal ancestor, and, therefore, the much-abused murderer or robber is not a bad man, but only an unfortunate one, deserving of pity and care rather than punishment. A sick man, they say, ought not to be imprisoned, and one who is staggering under a load of homicidal tendencies bequeathed to him by his grandfather, is not worthy of death, even if he does occasionally send some of his less unfortunate fellow-beings into the next world. This idea is carried out to its logical conclusion in a somewhat noted book, *Looking Backward*, written by Edward Bellamy, where, in his assumed ideal state of society a thousand years hence, the few criminals that are left are considered as victims of atavism, or a reversion to previous types of humanity, and treated in hospitals instead of jails—an idea scarcely more absurd than the other ultra-socialistic theories of that most preposterous work. We doubt very much that if a man should assault and rob Mr. Bellamy some dark night, he would turn and offer him a prescription for the cure of his "atavism."

To a certain extent, the above ideas are correct; a man physically and mentally sound is less likely to commit criminal acts than one with a diseased body or abnormal mental action, and the history of the notorious Jukes family proves beyond question that from a single criminal ancestor may spring a long line of descendants, a majority of whom will be enemies to the welfare of society. But, granting that a tendency to crime may be inherited, it must originate somewhere, and if a man's ancestor may have been a spontaneous criminal as it were, another man of the present day may also be laying up, on his own responsibility, a heritage of crime for his unborn descendants.

It has been suggested—and the plan has met with general approval—that criminals should not be allowed to marry and reproduce their kind to the injury of posterity. This would be a most excellent method of reducing the criminal population, if the prohibition of a legal marriage to such persons would ensure their leaving no descendants. Unfortunately, the victims of "atavism" have inherited a tendency to look upon the marriage laws of modern society as distinctly superfluous, and we fear that the total number of children born among them would not be very greatly reduced by any such enactment.

Practically, it is of very little consequence whether crime is a disease, an inheritance, or an original manifestation of "pure cussedness." The criminal is an enemy to society under any circumstances, and society has a right to protect itself from him. A rabid dog is not to blame for his condition, but we shoot him just the same, as a matter of protection; and, for the same reason, it is right that a murderer should be put out of a world in which he is not fit to live. If a man is not able to live among his fellows without robbing them or otherwise injuring their property or persons, let him be removed from among them and permanently confined where he can do them no harm. It is not a question of punishment or revenge, but of self-protection.

If the abnormal tendencies can be eradicated, and the criminal made a useful member of society, every effort should be made to that end; but, if crime is a disease, it seems—at least in its more serious manifestations—to be an incurable one. The percentage of reformed criminals is discouragingly small, and that of those convicted for subsequent offences disproportionately large. The best treatment of such persons is a perplexing question, but the right of self-preservation is paramount to every other consideration, and the morbid, unwelcome sympathy shown by an increasing class of people towards those who are so much out of harmony with their social environment, will only result in great injury to the orderly and law-abiding classes of society, without causing any decrease of crime or conferring any permanent benefit upon the criminals themselves.

WE EAT TOO MUCH.

A recent writer in an English medical journal shows conclusively that, while certain classes, owing to the stress of poverty, cannot obtain the nutriment they really need, the majority of people eat too much. Fortunately a moderate degree of over-eating does not appear to be markedly injurious. The digestive apparatus, though compelled to do more work than is really necessary, proves equal to the demands made upon it and does not break down or get seriously out of order. This is but one illustration out of many that might be given, showing how the marvellous mechanism of the human body adopts itself to conditions more or less abnormal. It is lucky for the average man that physiological laws are not of Medo-Persic inflexibility. He can violate them to a limited extent without incurring the penalty, though he finds that, if he goes beyond that point, the punishment is swift and sure.

Careful investigations prove that the daily "destructive metabolism," or, in plain English, the inevitable waste and wear of the body, which is the measure of the work it does, varies but little for different occupations. A diet of from twelve to fourteen ounces of chemically dry food, if the ingredients are in proper proportion and readily digestible, is sufficient to keep the average worker in good health. One part of nitrogenous to seven or eight parts of non-nitrogenous food is found to be a fair combination. A very small addition of stimulants appears to increase the amount of possible work; but moderately free drinking diminishes it. Women eat less than men, after making allowances for differences in weight and work. Where a man eats nineteen ounces, a woman of the same weight and equally active habits eats only fourteen or fifteen ounces. This latter allowance, as will be seen from the figures given above, is more than enough for a hard-working man, even when all meat is excluded from the diet. It is no uncommon thing, however, for a man of average size and activity to eat double this amount, or from twenty-five to twenty-seven ounces of chemically dry food in a day. In fact the writer to whom we are indebted for these statistics does not hesitate to assert that the majority of people in England eat literally twice as much as they need.

We are inclined to think that excess in eating is at least no less common in this country than in England. The abundance, variety and cheapness of food are naturally favorable to this over-indulgence. If we do not "live to eat," we are very far from making it the law of our diet to "eat to live." The palate is tempted to intemperance by appetizing dishes when it would be fully satisfied with a normal amount of plain and wholesome food. Probably there are few of our readers who will not have to confess that often the appearance of the puddings or pies revives the appetite which had been completely appeased by the meat and its concomitants in the preceding course of dinner. We feel that we have had enough, but the new and savory appeal to our love for the good things of the table is too much for us. We have been eating because we were hungry; we now go on eating because we enjoy doing it. It is not necessary, but it is "nice." Let us congratulate ourselves that, though gluttony and intemperance are fatal sins and cannot escape their punishment, moderate over-indulgence in eating is, as we have said, apparently a venial offense against the laws of health; but let us beware of presuming too much upon the mercy with which Nature tempers Justice in the enforcement of these laws.

A CASE OF GLANDERS.—Much interest was felt alike by native and foreign physicians in Vienna, in the recent case of Dr. G. Hoffmann, assistant in the Hygienic Institute at Vienna, who fell a victim to glanders whilst conducting experiments with the virus, and who was said to have contracted the disease by using upon himself a hypodermic syringe with which he had made the inoculations of animals with the cultures of the bacteria. It is now authoritatively stated that this method of infection has been disproved by the post-mortem examination, which showed the respiratory mucous membrane to be the starting point of the infection.
SUTURE OF THE QUADRICEPS FEMORIS-TENDON.

- Dr. W. T. Bull presented to the section in surgery at the New York Academy of Medicine, Nov. 11, 1889, a young man, aged 17, who, on the 29th of last April, was admitted to the New York Hospital with a cut across the knee received from a circular saw. The injury was three-quarters of an inch above the patella, laying open the joint and demodling the internal condyle of the femur of its cartilage, and severing the quadriceps femoris. A three-inch incision was made upward from the center of the wound, and the ends of the tendon were approximated and sutured with catgut. A drainage-tube was inserted and removed on the fourth day. The patient was up and around, with his limb in plaster of Paris, on the tenth day. He was discharged at the expiration of the fourth week, and the plaster dressing was removed three weeks later. Motion had gradually been restored to the joint, and at the present time the power of extension was normal, and there existed no interference with flexion.

Dr. R. G. Wienen, at the same meeting, showed a patient whose tendon he had sutured at a point below the patella. The operation had been done in this case some five years ago, by Dr. Sand of the Roosevelt Hospital, and with good results as to union and motion. In December last the patient had fallen down stairs, and had ruptured the tendon once more, when he came under the speaker's care at Charity Hospital. The patient was 35 years old. The patella was found to be four inches above the joint, and the power of extension was entirely absent. On the 29th of June an incision nine inches in length was made, laying bare all the tissues down to the joint. No remains of the patellar tendon could be discovered. It was impossible to make the patella approach its proper relation to the joint, and the operator then divided the quadriceps femoris tendon above the patella, and, after restoring the latter to its proper position, drilled both it and the tibia, and secured the patella to the latter with stout wire. The continuity of the tendon above was then restored by suture. After a lapse of two weeks, primary union was found to have resulted throughout.

Dr. A. M. Philp's presented to the Academy of Medicine, New York, lately, a boy, about 7 years of age, who had been submitted to excision of the astragalus for tubercular disease of the ankle-joint. The disease relapsed, other bones becoming involved, and a surgeon had condemned the case for amputation. The patient then came under Dr. Philp's care, and he opened the joint, followed simultaneously down to the bones, incapacitating all the bone out of the periosteal covering except the cuneiform. After suitable dressing without ligature of the vessels, the Esmandrach was taken off and the cavities allowed to fill with blood. The dressing was not changed for three weeks; union was primary; at the end of five weeks the bones had become solid, there having been reproduction of the bone down to the bone, excepted. There was a very good motion of the ankle-joint, the child walking as well as he had ever done. The operation was done last May. A plaster of Paris dressing was worn some time after the fifth week.

Dr. Philp also presented an Italian girl, who, when 5 years of age, had had extensive osteo-myelitis, involving nearly the entire tibia, fibula, and femur. The knee was ankylosed at a right angle. The patient had lain in bed five years. The question was debated whether to amputate or to expose the knee. The latter method was adopted in November last, and it was Dr. Philp's intention on cutting down an aperture which can be closed without operation, making the end of one bone concave and the other convex, but he found tubercular or fatty degeneration in the interior of the femur and tibia, and consequently scraped them out, leaving only the shell, which he coated in a straight line by wires, allowing the cavities to fill with blood. When the first dressing was changed, at the end of five weeks, the cloths had organized and formed bone union.

Dr. Powers inquired of Dr. Philp what histological changes took place in the reproduction of bone through blood-clot. Dr. Philp replied that the blood-clot itself was not supposed to organize, but that it acted as a framework for the growth of the cell-tissue which took place in it, constituting the normal elements in that particular locality. As the new tissue formed, the blood-clot became absorbed.

Dr. Robert Abbe presented a woman to the New York Academy of Medicine on whom he had excised the sheath of the extensors of the thumb and index and little fingers because of the growth of a tuberculoid disease, showing the results of a case of tuberculous inflammation. The case was interesting in connection with the question of secondary operations to free divided tendons. Notwithstanding complete removal of the sheath of the tendons in this case, and in other cases, freedom and power of motion had afterward been complete. The wound, of course, must be kept antiseptic, and primary union take place, without any pus. In his case, only voluntary motion was restored; this was begun on the sixth day.

Dr. Curtis related the case of a girl who, last winter, had suffered from an attack of cellulitis in the hand. When he saw her she had entirely recovered, but the right fore finger was bound down by adhesions in the tendon at the metacarpophalangeal joint. He laid back a flap, found the tendon and its sheath bound together in a mass of fibrous tissue, dissected them apart, put the finger in extension, closed the wound, kept up active motion, and had a result of normal power and motion.

Dr. P. de Tullio, assistant to Professor Cantani in the University Clinique at Naples, has lately suggested (London Medical Record) a method of applying cold air directly to the interior of the lungs in cases of pulmonary hemorrhage. The apparatus consists of a metal box through which run several tubes, which communicate with an outer larger tube leading to a mouth-piece, which the patient holds between his lips. The box is filled with ice, or with a mixture of snow and salt, so as to cover the tubes. Air is then pumped with a suitable bellows into the tubes, and in its passage through the box containing the refrigerant substance it becomes cooled down to 0° centigrade. This is ascertained by means of a thermometer introduced into the tube at some distance beyond the box, through an aperture which can be closed with a cork. Dr. de Tullio reports three cases in which severe hemoptysis was arrested by this plan, when drugs, ice to the chest, and the other usual measures had failed. It does not, of course, cure the condition on which the bleeding depends, but it is an effectual remedy for the symptom.

According to the Deutsche Medizinal-zeitung, Lichtwitz maintains that Edison's phonograph fills the requirements for an acoumeter. It is possible, he asserts, to arrange phonograms by means of which the hearing can be accurately measured. The operation of the apparatus is simple. The ear-piece is applied to the ear while the knee is performed, and a phonogram which is audible to the patient is sounded. The acometric scale is then descended until a phonogram is reached which cannot be heard. This marks the limit of hearing for that ear. In this manner the source of sound remains always at the same distance from the ear, and only the intensity of the tone differs.

Milk sugar in cardiac dropsy is regarded by Germain See as the most reliable and least harmful diuretic. He attributes the good effect of milk diet almost exclusively to the lactose. One hundred grammes (35 oz.) of lactose will produce an enormous diuresis, increasing the daily discharge in twenty-four hours to two and one-half liters, and daily over-reaching this, until on the third day, four to five and one-half liters are voided. Milk sugar, therefore, removes cardiac dropsy surely and rapidly, and only fails if Bright's disease complicates it.

M. G. See has recently pointed out, before the Academy of Medicine, that iodide of potassium, far from being a poisonous body, now recognized to be the result of tuberculous inflammation. The case was interesting in connection with the question of secondary operations to free divided tendons. Notwithstanding complete removal of the sheath of the tendons in this case, and in other cases, freedom and power of motion had afterward been complete. The wound, of course, must be kept antiseptic, and primary union take place, without any pus. In his case, only voluntary motion was restored; this was begun on the sixth day.

Dr. Rodriguez Mendez, professor of hygiene in the Medical Faculty of Barcelona, has just published in a new Spanish journal, La Medicina Practica, some notes of a case of a peculiar affection of the fingers and nails which appears to have been due to the patient's trade, that of a confectioner. Ponceet, of Paris, and Albertin, of Lyons, have also noticed the existence of this affection among those who are engaged in the cooking of a confectioner. Dr. Mendez's patient was a man about 40 years of age. His trouble was a combination of onychia and paronychia, caused by immersing the hand in hot and cold syrups.

G. W. Watson, in the Ohio Journal of Dental Science, says: "I have very good authority for saying that diseased roots and teeth have a great deal to do in starting tubercular trouble in the lymphatic glands of people predisposed to this disease. Tubercle bacilli, gaining admission to the jaw through the diseased teeth, specifically infect the structures in their neighborhood. It would be right, therefore, for us to look well to the teeth of patients having a tubercular tendency, and see that they keep their mouth in a thoroughly healthy and aseptic condition.

The cases of antifebrin poisoning are multiplying. Dr. Pauw Chesinger (Med. Rec. Med. Wochenb.-repts) reports one such case—that of a strong man, 34 years old, who took at intervals of one hour five powders, each containing one gramme of antifebrin, for the relief of a supposed fever, when violent diarrhoea ensued, which confined him to his bed for ten days.

Dr. E. F. Wertheimer (Med. Rec. Med. Wocheb. Report) reports another case in which a girl suffering from pain in one side of her head, took four grammes of antifebrin as a remedy. Nausea, eructation, pain in the
A curious case of poisoning is reported from New South Wales (Australasian Med. Gaz.). A woman who was suckling twins took a dose of chlorodyne at night and suckled the twins afterward. In the morning they showed signs of narcotic poisoning, and died during the day.

SEMMOLA declares that the administration of antipyrin in continued fevers, produces a poisonous rather than a beneficial effect, the reposed securing being at the expense of vital force.

Dr. KONIGSTEIN, while giving directions in his class on the uses and prescribing of spectacles, said that green glass as a protection against strong rays was worse than useless, and did more harm to a sensitive eye than good, as they allowed the yellow rays to be transmitted, and unnecessarily irritated the eye. As a protection against strong rays, the blue or smoked glasses were the only real protection. The blue should be light.

SEMMOLA proposes sulphur as the coming antiseptic, most serviceable, he thinks, for use in dressings of the alimentary canal.

A EXPERIMENT IN COLOR-BLINDNESS.

Examination of several color-blind persons having convinced me of the practical value of a compound tassel of green and gray silk cords as a preliminary indicator of defective color-vision; and, moreover, having studied Professor William Pole's interesting memoir, describing his own case, which is illustrated by a diagram, showing bands of "neutral gray" appearing to him in the middle of the green and at the deepest red, or crimson, of Chevreul's colored cercle chromatique; I felt very desirous of trying an experiment to see for myself whether it was possible, by the administration of a small dose of santonine,—which is said to cause temporary color-blindness,—to realize in my own case the imperfection of vision which seems common to most color-blind patients.

Such an experiment I made on the 29th of August; but, before proceeding to describe the result, I would mention that I have good proof of my being blessed with the possession of a normal sight; for in the course of a long experience with coal-tar colors, and having frequent occasion to compare observations with regard to slight differences of tint with my six colleagues, I have never perceptibly deviated from the consensus of the laboratory staff, and may fairly claim to be reliable on this score.

On a fine day, provided with an ample selection of chemical specimens and colored objects, and Ladd's direct vision spectroscope ready to hand, I took, fastening, a small dose of santonine, a grain and a half, dissolved in a small quantity of alcohol and diluted with water. In less than five minutes the drug had taken effect; the white table-cloth appeared of a purple-gray, the crimson became slate-gray, and all objects were seen as through spectacles of that precise tint. A rapid survey was made of my varied collection of objects, and I went into the garden to use my spectroscope. I could see all the solar colors in unbroken series with scarcely perceptible variation; the Fraunhofer lines were there as usual (not thinned), the violet extending up to the usual limit, and with the red end, with slightly diminished brilliancy, but hardly apprehensible absorption; there was no neutral gray heard in the green, but this portion of the spectrum appeared quite normal and splendidly brilliant. The observation was repeated a few minutes later with the same result.

Turning to my colored specimens: Nickel, copper, and iron sulphates, lodite and chrome of lead, ultramarine, and ammonio-sulphate of copper, were quite normal; oxalate of cobalt had lost its delicate pink color, nor nitrate of uranium its well-known shade. On the other hand, scarlet lodite of mercury was bleached, and a fine sample of carmine appeared more like crimson. By running my eyes along the book-shelves in my library, I soon noticed that Colwin's Chemistry—Cavendish Society series—and other old-fashioned green bindings assured a kind of slaty appearance, crimson backs appeared as maroon, dark brown was converted to chocolate; but I could see violet quite well, brightening deep pretty much as usual; the Chemical News, bound in scarlet, appeared red, and neutral gray bindings looked only darker in color. I could see quite distinctly the difference between light-green and slate-gray tassels, so that my condition was not so abnormal as many of my color-blind friends, who fail to see any radical tint-distinction between these two dissimilar colors.

Now a word of caution. I had taken only 0.5 grain, which might be reckoned a case,—"2 to 10 grains" is the stated quantity in Maitland's Extra Pharmacoogynia; other authorities say more,—but at the end of fifteen or twenty minutes, the tension upon my nervous system proved so serious that I feared the worst consequences. I felt so giddy and depressed, with a kind of mild tetanus, that I was obliged to resort to an emetic,—mustard and warm water,—which soon gave me relief. I would earnestly warn my readers of the danger of repeating this experiment; and now, on fuller inquiry, I learn that santonine is a drug reported to be "sometimes uncertain in its action," and occasionally developing "poisonous symptoms from its depressing effects on the nervous system." I had read of Dr. W. G. Smith taking a 5-grain dose to induce color-blindness, without dangerous consequences, and resolved to take a very much smaller quantity, 1/4 grain, in the first instance, well knowing that more than this had often been given to children. Perhaps taking it in the state of solution, and before breakfast, or a wrong dose, made all the difference. However that may be, I shall never again try ophthalmic experiments with santonine, although I have given a specimen against doing so without proper medical advice.

My object is accomplished: I wanted to search for Professor Pole's neutral gray bands in the solar spectrum, as he sees them in Chevreul's famous cercle chromatique diagram, but did not find them. Nor, it may be added, do any of my color-blind friends see any break in the solar spectrum, although we know that the heavy green pigments are by them so often mistaken for gray. Furthermore, it does not appear that santonine gives the same kind of color-blindness as commonly presented by the natural defect, or my color test of green and gray would at once have indicated it. —Read by Prof. John SPILLER, before the British Association.

ON THE DILUTION OF COW'S MILK IN INFANT FEEDING.

The writer, in September, 1856, had occasion to consider this question in his daughter's case, owing to the mother's deficiency in milk. The food used as a substitute on that occasion has proved so successful in more than one case that it merits recording.

The formula is mainly based on a process devised by Professor Frankland in rearing one of his own children. In his paper (published December, 1854)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Woman</td>
<td>Ass.</td>
</tr>
<tr>
<td>Cow</td>
<td></td>
</tr>
<tr>
<td>Casein</td>
<td>4.7</td>
</tr>
<tr>
<td>Cow.</td>
<td>4.9</td>
</tr>
<tr>
<td>Butter</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>13.5</td>
</tr>
<tr>
<td>Milk-sugar</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>14.5</td>
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</tbody>
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Prof. Frankland gives the percentage amounts of the different constituents of human, ass's, and cow's milk as follows:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casein</td>
<td>4.7</td>
</tr>
<tr>
<td>Cow.</td>
<td>4.9</td>
</tr>
<tr>
<td>Butter</td>
<td>3.5</td>
</tr>
<tr>
<td>Milk-sugar</td>
<td>5.0</td>
</tr>
</tbody>
</table>

These figures for human and cow's milk differ in several respects from the averages deduced from a wider range of analyses which are quoted by Mr. Thomas Mabon in a paper published in the Pharmaceutical Journal, the most notable differences being those of sugar and fat; but on referring to the minimum and maximum figures found by Professor Leech, from analyses of eighty samples of human milk from different sources, it will be seen that the cow's milk was often blackened, and the addition of a one-third more milk-sugar, but this was found by the writer somewhat tedious, except to a specially trained person.

The process of dilution with water was adopted because it was simpler, and would enable the food to be prepared in a few minutes whenever it was required.

Taking Professor Frankland's figures for the average of fresh cow's milk, as quoted, it will be seen that it is diluted with water in the proportion of three parts of the former to two parts of the latter, the average amount of constituents is modified as follows:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh cow's milk</td>
<td>3 parts</td>
</tr>
<tr>
<td>Casein</td>
<td></td>
</tr>
<tr>
<td>Cow.</td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td></td>
</tr>
<tr>
<td>Sugar</td>
<td></td>
</tr>
<tr>
<td>Ash</td>
<td></td>
</tr>
</tbody>
</table>

From these figures the writer compiled the following formula. The albuminoids, fat, and milk-sugar are by calculation made to approximate as nearly as possible to the average of these constituents in human milk.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Milk-sugar</td>
<td>2 drachms</td>
</tr>
<tr>
<td>Fresh cow's milk</td>
<td>6 fluid ounces</td>
</tr>
<tr>
<td>Pure water</td>
<td></td>
</tr>
<tr>
<td>Salt</td>
<td>5 grains, or a sufficiency</td>
</tr>
</tbody>
</table>

Mix gradually the oatmeal, milk-sugar, and salt, so that no lumps are formed in the mixture, then add the milk and butter, and heat to the boiling-point in a clean, enamelled saucepan. The product should be made up to the measure of half a pint, if necessary, and given lukewarm with a spoon when required.

The diet was introduced as a useful attenuant, and it has been found to act as a laxative, and also as a direct fat and heat-producer in the process of digestion. The process of feeding with a spoon is at first troublesome, but it is to be preferred to the use of a feeding bottle, as, if care be taken to have all the vessels employed scrupulously clean, the infant will enjoy an immunity from throat abscesses, croup, milk diarrhea, and other diseases that follow in their train.—George Smith, in the Pharmaceutical Journal.

The Stomach-Brush.

A DENTAL journal publishes the following, translated from the German: In 1713 there was published a pamphlet entitled "A Complete Account of the most Useful Stomach Brush which is now to be
FORMYL AMIDOPHENOL ETHER.

One of the most recently patented synthetie compounds that has made its appearance in Germany is neither a hypnotic nor an antipyretic, but is said to act to an extraordinary degree on the stomach cord, giving rise to this wish. In the pamphlet there is a drawing of the stomach-brush: it resembles a pipe-cleaner, but, of course, is larger. The stalk is made of four wires twisted together, covered with thread, silk, or small ribbons; it is twenty-six inches long. The brush at the end under is two inches long and one and a half broad, and is made of goat's-hair hair; but, when which have been accustomed to use it for three or four weeks, a horse-hair brush is substituted, this hair being somewhat stronger, and so the effect is better. The application of this most excellent brush is very simple. It is pressed through the throat down into the stomach, which, by drawing up and down of the brush, is cleared. Thereafter cold water or brandy is to be drunk, and the operation is repeated till the cleaning is perfect. The cure is repeated every morning. The author says, according to the British Medical Journal, "At first you will find it rather troublesome to get the brush down, but when you put it in your mouth and on your palate, draw in breath and wind, and press it gently and gradually down, and, without any particular trouble, it will reach the stomach. After eight or fourteen days' practice it would come as easily as your roller or drinking." Of course, the daily application of the stomach-brush is the infallible remedy or preventive of all diseases that can be imagined. "Whoever uses this cure requires no other medicine, for it is good against all cold, hot, and poisonous fevers; it gives a good appetite for eating; it is good against asthma, hemorrhage, headache, chest complaints, coughs, consumptions, apoplexy, gout, whooping-cough, dyspepsia, dysentery, quinsy and the tongue, quinsy in the throat, ulcers, abscesses, cardially; it favors digestion, strengthens the heart, drives away pimples on the skin, is against choking in the stomach, etc., makes too fat and asthmatic and swallowing up people thin and, on the other hand, makes meagre and thin people fat. The great effect, however, is produced only when there is a pastache, some dyspepsia, dysentery, quinsey in the tongue, quinsy in the throat, ulcers, abscesses, cardially; it favors digestion, strengthens the heart, drives away pimples on the skin, is against choking in the stomach, etc., makes too fat and asthmatic and swallowing up people thin and, on the other hand, makes meagre and thin people fat. The great effect, however, is produced only when there is a pastache, some dyspepsia, dysentery, quinsey in the tongue, quinsy in the throat, ulcers, abscesses, cardially; it favors digestion, strengthens the heart, drives away pimples on the skin, is against choking in the stomach, etc., makes too fat and asthmatic and swallowing up people thin and, on the other hand, makes meagre and thin people fat.

HAIR-BALLS FROM THE STOMACH.

At a recent meeting of the New York Pathological Society, Dr. T. Mitchell showed some hair-balls from the stomach of a pig. The balls were made up of the hair of the pig, which had been licked off and swallowed. The hair of the pig had been removed from the hair of the body, and with it were bits of scrubbing materials. A reporter of the Pittsburgh Dispatch "does up" an amputation for the deletion of his readers, and explains the great care taken "to keep small insects out of the wounds." "After the leg was severed from the body," says the writer, "the stump was scraped very carefully; the doctors, however, were kept flowing constantly over the wound to kill any insects that might be drawn by the wound. The doctors hold that the air is full of poisonous germs, which are attracted to a wound where blood flows. All the linens and gauze which are used in operations, are soaked for twenty-four hours in 10 per cent. in strength. This is done to prevent the slightest irritation after the operation has been performed."

The Nutmeg in Medicine.

Many familiar culinary substances have been found to have valuable medicinal properties, at least in household therapeutics; but the nutmeg, so far as we are aware, has not been among the number. Its use has now come, however, for Dr. J. O. Shoemaker tells us in the Medical Bulletins, that it is useful in the treatment of summer diarrhea, many cases yielding readily to doses of half a grain of the powder, this is said to be effectually relieved by it, when opium has failed and chlorine is objectionable. In delirium tremens it can be employed with safety and benefit, when any other sedative would be dangerous. For itching and irritable hemorrhages an ointment of two drachms of powdered nutmeg, one drachm of tannic acid, and one ounce of lard, is an excellent application.

Pamphlet Advertises a New Cure for Stomach Wounds.

The American Journal of Medical Science, for December, contains a pamphlet, entitled "The Treatment of Stomach Wounds," which is said to have been written chiefly for the use of small practitioners and has been much gratified with the result. As a tone in all issues of debility and weakness, anemia, chlorosis, etc., it cannot be surmounted."

The Media Memora.

A School for Children's Nurses.—A long-cherished plan of a training-school in New York has been assumed by Miss C. H. Leiter, and such a school is expected to be in operation by January 1st. Quarters have been taken in the Nursery and Child's Hospital, at No. 57 Lexington avenue. A regular six months' course in training of the care of children is to be adopted. This will include instruction in matters of hygiene, such as the care of the nursery, ventilation, preparation and administration of food, and dressing and washing children. A post-graduate course will provide instruction in some of the simpler methods of medical treatment of children.

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THE STANDARD OF LENGTH.

In the United States and England the standard of length is the yard, and the question arises, How long is a yard? It may be said in answer that a yard is simply an arbitrary standard which tradition says is based upon the length of the arm of Henry VIII. At present the yard is the distance between two marks upon a certain bar, kept in the Tower of London, and if it should be destroyed, the exact standard could never be replaced.

To avoid this uncertainty, and obtain a fixed and unvarying standard, the French, in the last century, made an accurate measurement of a quadrant of the earth's circumference, and, taking the ten-millionth part of this distance, gave it the name of metre, and adopted it as the standard of length. This length, which is equal to about 39.37 inches, is now in universal use on the continent of Europe, and is authorized as a legal standard in nearly all civilized countries. Considerable discussion has arisen as to whether the original measurement was perfectly accurate, and it seems probable that there was a small error, so that if the standard metre now kept in Paris should be destroyed, a re-measurement of the quadrant of the earth would not give us exactly the same metre. However, the error in any case is a very minute one, and the chances are very small that the original standard will ever be destroyed, to say nothing of the fact that the numerous copies distributed among the various nations of the world do not appreciably differ from it.

The accompanying engraving shows the form of these standards, which have been copied with most scrupulous care from the original metre at Paris. It is probable that they do not differ from the standard over two ten-thousandths of a millimetre, or one five-millionth part of the entire length. These standard bars (1) are cast from an alloy of platinum with ten per cent. of iridium, forming a metal almost as hard as steel, practically intransitable, and not acted upon by chemical reagents. The measurements are marked upon the surface A, (1), and the peculiar shape of the bar is especially calculated to endure a strain without bending; and, in fact, a slight deflection—as shown, much exaggerated, in 2—will not materially alter the length of the face on which the scale is engraved. It has been proved that a weight of eighty pounds may be placed on one of these bars, while supported at the ends only, without permanently altering its shape.

The standard of weight is the gramme, which is the weight of a cubic centimetre of water at 4°C.—its point of maximum density. Practically, the standard at Paris is a block of the platinum-iridium alloy weighing one thousand grammes, or one kilogramme. Copies of this standard of weight have also been made for the several nations comprising the International Metric Conference, and it is believed that they do not vary more than one hundred-millionth from the original—a dimension which is utterly unappreciable.

A meeting of the International Conference was held at Paris last September, when the work of the committee who prepared the various standards was ratified, and the standards accepted for the respective nations. The successful completion of this work, which has been in progress for about fifteen years, marks an epoch in scientific progress, and denotes an amount of care, skill, and accuracy on the part of those having the work in charge, which cannot be realized by anyone except those directly concerned in it. The simultaneous destruction of these widely scattered standards of measure and weight is almost impossible, but even in such a remote contingency, another measurement of the earth's circumference would practically give us back our metre, with no important change from its original length.

[Original in Popular Science News.]

THE PROTO-HELVETES, OR LAKE-DWELLERS OF SWITZERLAND.

By Ada M. Trotter

The little town of Morges is picturesquely situated on a bay formed by the waters of Lake Leman. It boasts, among other attractions, a beautiful view of Mont Blanc. The castle (now used as an arsenal), the church, the quaint houses, with the castle of Villeneuve on the heights, are very ancient—supposed to date back to the Roman occupation of the country. The ancient city, however, which attracts the attention of scientists to this charming spot, is not the Morges visible to the eye. Those stone implements and the rude pottery which the Museum of Antiquities at Lausanne displays as from the "ancient city of Morges," belong to pre-historic times, dating back to ages before the Romans set foot in Helvetia.

But if the Lacustres, or lake-dwellers, were a pre-historic race, how are we to learn anything about them? The archaeologists, to whom we look for the solution of this problem, do not fail us; one by one they have wrested the objects in the museums from the bottom of the lake, and from them they have evolved a history of the habits and customs of this interesting people. The lakes of Switzerland kept jealous guard of the secrets committed to their charge. A mere accident revealed the pre-historic occupation of the country. A bone implement, rudely fashioned, was found by a scientist in a marsh. A small thing this; still, falling into the right hands, enough to open out a new field of archaeological research.

But, before we follow the labors of the patient men of science, it will be well for us to take advantage of the opportunity this visit to Morges affords us, to see for ourselves the site of one of the cities of the Lacustres. We must take a boat, for the palafittes* of this primitive people were built on

*Term universally used to express "lake-dwelling," from the Italian Palafitte.
plies, between 100 and 150 yards from shore. The boatman barely moves the water with his oars, as he directs our attention to the vestiges of the ancient city. Fortunately, the azure lake, this glorious April day, is clear, the lake, without a whisper from the wind, to ruffle its serenity. We see the piles in irregular groups, some two to three yards below the surface. Those of the most ancient stations are merely trunks of trees driven deep into the mud. They stand from one to three feet in height, in semi-circular form, with intervals that look like passages between the groups. As we move shallower, we pass a boat, at which are two scholarly looking men,—fishing? Yes, fishing; though the quality of the fish they hook would scarcely satisfy the mundane appetite. These fishermen belong to the coterie of scientists whose researches have lifted the veil from the past of the Proto-Helvets. "They work here," says my boatman, "every clear day and all day long. The difficulties which attend these labors may be realized by a glance at the piles beneath the dazzling, moving waters, between which are the objects sought, covered with the mud or gravel of at least three thousand years. The work has to be carried on by means of special apparatus. Today, a magnifying-glass a foot in diameter floats close to the boat. One of the professors bends over this instrument, as he makes use of his dredge; the other, in their duality manipulating a long pole.

Drifting here upon the breast of Leman, the majestic head of Mont Blanc confronting us with his crown of dazzling brilliance, with the men of science to aid us in our effort, can we not reconstruct upon these sunken plies the city of this ancient people?

Who were the Proto-Helvets? Why did they build their dwellings in this laborious manner on the lake? A learned archæologist* tells us that the Lacustræ were colonists from Asia,—not by any means savages, as we understand the term. Professor Virchow, who has made an exhaustive examination of the skeletons found among the palafittes, corroborates this statement. The conformation of the skulls shows the race to have been Aryan, and of a high forehead, capable of carrying a large amount of hair,—if not more—development than ourselves. Further proof may be found, if needed, in the objects ranged in the museums, which demonstrate the evolution of the Proto-Helvæte from the earliest Stone Age to that of the comparative civilisation of the Bronze. It must not be forgotten that the forests extending to the shores of the lakes were then haunted by wild beasts. The stone weapons were insufficient protection against the ravages of these enemies, and we may suppose that the colonist was driven to erect his dwelling on the lake, as a defensive measure.

It was impossible to make any mental picture of these dwellings until about ten years ago, for all on the lakes of Switzerland had been destroyed by fire. M. Frank, however, inspector of the forests at Schussenried (Wurtberg), was fortunate enough to find a palafitte of the Stone period in a marsh which he was surveying. It was in a perfect state of preservation, and by its means we can gain some idea of the dwellings of the Lacustræ. It was built on piles, in the shape of a right angle, ten meters long by five meters wide, and was divided into compartments, communicating by a passage made of three beams. There was only one door, which faced the south, and was one metre in width. The outer room, in which a pile of flat stones and debris of charred bones indicated a fire-place, was the kitchen, or living-room; perhaps, also, in the cold season, a shelter by night for the domestic animals.

The Inner and more spacious compartment was probably the sleeping-room. The floors were formed of round poles lying close together; the walls and roof were formed of the same material, in the circular form of an old-fashioned bee-hive. Thus, taking this palafitte for our model, we can build our city of Morges with the mind’s eye. We see in the Lacustræ an industrious people, busily at work, having their work-shops on the platforms surrounding their dwellings. Here they fashioned their weapons, their pottery, and their utensils of horn, bone, and wood.

And, now, having seen the vestiges of this race in one of the eastern lakes, let us pass to the western lakes of Switzerland, where the archaeological work has been carried on with much greater success. The rectification of the courses of the rivers Aar and Thielle, with the construction of canals, necessary to dry the marshes of Seeland, lowered the level of Lakes Neuchatæ, Bienne, and Morat. The stations of the Stone Age became dry, and those of the Bronze almost so. The researches could be carried on all the year round, and without the use of the cumbersome engines hitherto considered indispensable. In the eastern lakes, the scientists are confined to the months of winter, when the waters are at their lowest level.

The Stone stations laid bare revealed such dis-similarities that Prof. Dr. Gross found it necessary to sub-divide the age into three periods, taking the objects found in the palafittes as exponents of his theory.

The products of the first period are very primitive. The hatchets are small, unpolished, roughly shaped, and the tools of horn and bone equally unfinished. The mineral used for the stone implements is always that of the country, the softest, most easily worked, being most frequently used,—such as the molasses rock. The pottery is made of coarse clay, without the aid of a turning-wheel, and shows by its clumsiness the very infancy of the potter’s art. No trace of ornamentation is found on arms, tools, or pottery. The large number of stations which produce rude handiwork gives the impression that the men of that age three centuries must have passed ere the Lacustræ arrived at the perfection which the palafittes of the second period display.

This second period is one of continuous progress. The museums show hatchets and hammers which would do credit to our own skilled workmen. The weapons and utensils of horn, bone, and wood are beautifully finished, and the pottery takes graceful forms, even showing crude traces of ornamentation. A very interesting feature of this period is the presence of foreign minerals, not merely in arms and implements, but in beads and small ornaments. Hatchets in nephrite, jadelle, and chloromalakite are found in the proportion of five to eight of indigenous material. It is impossible to solve the origin of these foreign minerals. Still it is certain that they came from the Asiatic minerals. The theory that the first colonists brought them to the country is contradicted by the fact that only indigenous mineral is found in the earliest stations of the Stone Age. Dr. Gross thinks it probable that the Proto-Helvætes of this second period held commercial relations with other nations, thus obtaining the handsome stone they required for their weapons and implements. This would seem to be the more probable explanation, since directly copper was introduced the foreign mineral disappears. Metal quickly supplanted even these beautiful minerals, which are capable of such great polish. Arrow-heads of stone, flint, and bone are found in all three periods of the Stone Age. That these objects served another purpose has lately been proved by M. de Fellenberg, who found a curious instrument of wood, at the station of Fenil, in which these heads, fastened with resin, form a strong saw. Two indentations are made in the handle for the grip of the workman. The palafittes furnish sufficient proof of the intelligence and industry of the Lacustræ. This second period of Stone finds them feeling their way towards a stage of civilization which requires more of life than merely food and shelter. The innumerable objects in horn, bone, and wood display skilled workmanship. Among these may be cited: arms, tools, harpoons, small goblets, head, bracelets, tassels, handles, knife and spear, needlemakers, bone weights, combs, hair-pins (perforated, sometimes, so that they may be fastened by a thread to the hair), and well-shaped spoons. Bone, being a material less easily worked, was reserved for articles requiring greater strength, such as polagnards, arrow-heads, and combs for carding flax. The debris of wooden objects has brought to light an unequivocal sign of progress among the Lacustræ of this period—notthing less than a yoke for oxen. It is interesting, also, to note among the fragments of cups, plates, and dishes, a variety of small boats, shovels, etc.,—evidently playthings for children. Bows, the complements of the arrow-heads, are rarely found. Communication with the shore was made by means of bridges and boats. The piles give evidence of this, and frequently groups of two or three piles were piled together, the latter abounding mere trunks of trees hollowed by fire. A boat was lately dug out of the mud at Vinyang (Lake Bienne), which is well preserved and of a different shape. The stern is square instead of round, the bow is pointed, notches are cut in the sides for the oars, while there is a place in the bottom for a false keel to keep the water out. This ship, carefully preserved by means of hard wood applications of linseed oil, is now in the museum of Neveu-ville. The palafittes were also supplied with ladders long enough to reach from the bottom of the lake to the platform on which the Lacustræ performed his daily work. Dr. Gross has one in his collection. Teeth of animals (wolf, bear, and dog) were perforated and worn as amulets.

The period of this art that is termed by archeologists the epoch of copper, which means, in fact, the transition stage of the age of Stone to that of Bronze. This transition period is recognized as a separate epoch in the evolution of other races besides that of the Lacustræ. In Hungary, for instance, (according to certain authors), objects of pure copper are as numerous as those of bronze. North America furnishes more than a hundred instruments in copper from one State (that of Wisconsin), all of which appear to have been fashioned with a hammer. Copper, in its native state, lends itself perfectly to the fabrication of tools and arms, as it can be shaped into polagnards and arrow-heads by means of a pebble. The operation of smelting ore demands a certain amount of technical skill and art, and the makers of this art are the Nasca. The palafittes deliver up objects evidently moulded, proving that the Lacustræ was not without elementary ideas of the art. The epoch of copper is largely represented in the western lakes. But, until the discovery of the station of Fenil (Finly), the conclusions drawn with regard to this transition period were more conjectural than certainly. This station was recently found. This station of Fenil, situated on a little Gulf of Lake Bienne, exposed to the north wind, was entirely buried in sand and mud, thus escaping the notice of the savants, until the peasants—In making a ditch—came upon this rich archeological bed, more than a meter below the surface of the soil. Though but a third of this station has as yet, been examined, the rich yield of

copper objects has thrown new light upon the transition period. The old supposition that the Lacustré imported his metal implements was overthrown by the proofs furnished at Fenil to the contrary, amid the debris of the palafittes. But, though the chisels, beads, pipe-nards, etc., were home-made, the metal was certainly imported. Fenil is the exponent here, also, for several ingots of pure copper have been found at this station, made in portable form, for the rings by which they were suspended. The copper poignards are riveted to the wooden handles; small copper plaques (dress adornments) are also furnished with rivets. This is a great advance, even on the neat handbook of the second period. It is evident that during this transition period—which lasted only until the Lacustré found that an alloy of tin with the copper produced a harder, more beautiful, and more serviceable weapon—the implements of stone fell into disuse. There was no longer a demand for the foreign minerals, and the importation ceased. The workman was wrestling with the problem of metalurgy. The Stone Age was practically dead. The pottery of the transition age of copper is distinguished by grace and elegance of design; also by a special mode of ornamentation, obtained by means of tying threads at equal distances around the vases, found also on the urns in the tombs of northern Germany. Other forms of decoration also appear—the series of lines crossing one another, and impressions made by the fingers, being, perhaps, the most frequent. Remains of baskets, linen tissues, and nets belong to this period, and, from the station of Locres, Dr. Gross obtained a complete spittle, formed of wood, surrounded with thread; it only lacked the stone shuttle. Several shuttles have been found, furnished with wooden cylinders, and a clew of thread, which, if it were not charred, would seem to be of modern handwork.

Such, in brief, are the distinguishing characteristics of the three periods of the Stone Age, which lead us from the earliest ages of the Proto-Helvetico to his artistic triumphs of the "beautiful age of Bronze." **

Among the bones of animals found in the debris of the palafittes, we have those of the ox, horse, goat, pig, sheep, cat, stag, roe-buck, beaver, hedgehog, bear, wolf, wild-boar, fox, frog, otter, hare, swan, duck, pigeon, pike, carp, etc. Remains are also found of fruits and cereals; of fruits—the apple, acorn, nut, plum, raspberry, strawberry, mulberry, pea, bean, lentil, chestnut, etc.; of cereals—wheat, oats, barley, millet, etc.

It is not possible to do more than approximate to the length of time between the advent of the first colonists to the lakes and the beginning of the Bronze Age. Dr. Gross thinks that at least twenty or thirty centuries must have passed, judging from the number of the stone stations, and the gradual progress of the workmanship of the objects found in the palafittes.

The waters of the lakes have been faithful guardians of the secrets confided to their care. Perchance, the clumsy implement which the patient professor in the boat at Fenil has just succeeded in wresting from the "sands of time," has been in hiding for at least two thousand years. And the hands that drove the piles into the lake, upon which we have built our phantom city, have been dust—how long?

**Prof. Decor.**

**EASY METHOD OF OBTAINING OXYGEN.**—It is proposed by C. F. Gohring to prepare pure oxygen by adding permanganate of potash to peroxide of hydrogen rendered slightly alkaline by ammo-

This action is accompanied by intense itching, and the animal may be scratched out, but not until it has started a sore which will take from a day to a week or more to heal. It is a curious fact that some people are never troubled by these parasites, no matter how much they are among them. It has also been noticed that persons from other parts of the continent will find several more than the natives of the part of the country where they abound. After one or two seasons, a stranger becomes acclimated, and is not excessively irritated by them. I well remember my first season's experience, but subsequent summers I did not fare worse than the average persons.

The methods of treatment are numerous, for, although the sores are not dangerous, they are very disagreeable, and many things have been tried to cure them up quickly. Among the principal applications are raw salt pork, bacon fat, water of ammonia, chloroform, ether, carbolic acid and glycerine or oil (80 grs. to 1 oz.), sulphur ointment, salt water, bicarbonate of sodium solution. The most effectual method is to look for the individual insects by aid of a magnifying-glass, and remove them with a pin-prick. There are, however, before they get located, and will travel with considerable rapidity. Children become quite expert at catching them when on the flesh, and I have known of more than a score being removed at one hunt before any had found time to take hold of the flesh. The fat salt pork grease is the most popular application for the sores, but the glycerine and carbolic acid is undoubtedly as effectual. The pustules should be opened and the pus removed before it is lotion applied.

Judging from the immense numbers that make themselves manifest by attacking man every year, the chigger must be a very prolific animal. Its mode of life shows that vegetation is its normal food. But, like the man-eating tiger, the chigger that once tastes human blood has no more use for its former food, and perishes in a vain attempt to devour all mankind.

To the microscopist, the chigger is an object of interest. It makes an interesting and popular mount. In order to obtain the animal in all its glory, it should be caught while seeking a lodging place on someone's body. Place it directly into glycerine and mount in the same medium while the animal is endeavoring to swim; then you will have a perfect specimen, in good position to study. Examine with a 4 to 1 inch objective.

The literature on the subject is exceedingly scarce, the article by Prof. Riley to which I have referred being the only one of that note which I have been able to find.

**THE RAINY SEASON OF FLORIDA.**

BY PROF. THOMAS R. BAKER.

The rainy season of Florida usually begins early in June, and continues about three months. This year it began on the 15th of June, and ended on the 24th of September, its time—both of beginning and ending—being quite clearly defined. This season is characterized by not only frequent, but by frequently excessive, rains. For many successive days there may be showers every day, but there may be intervals of several days—as was the case during the rainy season of this year—when no rain falls. There is an average of about one heavy rain a week during this season.

Recent observations are some interesting facts on this subject from the notes of a local meteorological observer of this place (Orlando): From the beginning of the rainy season (June 15) to the end of June, rain fell on fourteen days. Rain fell on fifteen days during
July, twenty-one days during August, and eleven days during September. There were three heavy rains in June, six in July, six in August, and one in September. During the June part of the rainy season there was a rainfall of 10.23 inches; in July the rainfall was 9.41 inches. In August it was 11.69 inches, and in September (to the end of the rainy season) it was 6.02 inches. The total precipitation during the rainy season was 36.96 inches.

The rains of this season are sometimes produced, as rains ordinarily are, from clouds that have slowly formed; but the typical rainy season shower comes with little warning from an almost cloudless sky, is of short duration, and is followed very soon by a clear sky again. During some rainy seasons there is a great deal of thunder and lightning, while there is very little during others. The season of this year was one of many thunder-storms, the accompanying lightning being often very vivid and abundant, while last year's rainy season had but few thunder-storms.

The cause of this season of abundant rains may be learned from a study of the nature and direction of the winds that prevail in this region during the summer months. The United States (except Alaska) extends through two wind zones, the variable and the sub-tropical, and Florida lies in the sub-tropical zone. In this zone the easterly trade winds prevail in the western part of the United States, but in the eastern part the trade winds are 'broken' from the same zone, as the Gulf of Mexico. These monsoons, warmed by the Gulf Stream, on account of which the temperature of the western coast of Florida is several degrees warmer than that of the eastern coast in the same latitude,— and heavily charged with moisture, meet the colder trades in this region, and to this occurrence the rains of our rainy season are largely due.

The rainy season, occurring as it does during the hottest months of the year, is of immense benefit to the climate and vegetation of Florida. If excessive exposure to the direct rays of the sun can be avoided, a Florida summer, with its almost constant breezes, and cool nights, is much more tolerable than the summer weather of many regions of the North, especially the region in the vicinity of mountains. Vegetation is very luxuriant during this season,—indeed, the rainy season is the great plant-growing season of Florida, for two important conditions of plant growth, heat and moisture, are then abundantly supplied. It is during this season that citrus trees,— and hence, also, their fruit,—make their most vigorous growth. If our long summers were dry, and our winters were wet, living in Florida would be far less desirable than it is,— for our winter climate, as well as that of our summer, would suffer thereby,— and the products of the soil would be of far less value than they are. Indeed, if this were the case, the citrus fruits might not be successully produced in Florida. The Florida orange would certainly not be the superior fruit that it is.

An interesting matter connected with heavy rains in Florida is the readiness with which the soil in most places receives the water. It might be supposed that an average of three inches of rain a week for twelve successive weeks,— the average during our last rainy season,— would fill the soil beyond its capacity for holding water, and that much of the rain-water would flow off. But this is not the case; most of this large amount of water, which were it to fall on clayey soil, would produce floods, quietly sink into the sand, and is lost to sight. Only when rain falls rapidly and in large quantities, are surface streams formed, and these soon disappear. The surface soil of central and southern Florida is composed of sand and vegetable mould, and this stratum is succeeded by almost pure sand, extending to the depth of several feet, and under lying this there is usually a stratum of clayey sand, called "hard pan." Sand follows this, and a second layer of hard pan is usually met before solid rock is reached.

Although winter is called the dry season of Florida, it is not to be understood that it is always driest season, as there is often less rain during the spring and autumn months than during the winter. The rainfall during March, April, and May of this year was 1.77, 2.45, and 2.08 inches for the respective months, and that for October and November was only 1.84 inches, while last winter was quite wet, the rainfall during January and February being 15.08 inches. These facts lead to the conclusion that Florida really has no dry season. It would be more correct to classify her seasons, so far as precipitation is concerned, as the rainy season, and the season of irregular rains.

ORLANDO, Fla., Dec. 13, 1889.

SCIENTIFIC BREVITIES.

Hot Water Plants. — J. Walter Fewkes has an interesting paper in the May number of the American Naturalist on the vegetation of hot springs. That vegetation may exist in these hot springs—the highest temperature on record in which it occurs is 206° F.—indicates that vegetation may have occurred at a much earlier stage of the earth's history than has been generally supposed. The prevailing form of vegetation in these heated waters is alge. Diatoms also occur, but sparingly. They have been found in Nevada at a temperature at which the vegetation of hot springs is most flourishing, but usually occur in great abundance in the cooled waters of hot springs.

Combined Fresh Water, Brine, and Gas Wells. — One of the most remarkable things of which Pittsburg boasts is the combination well that has been struck on Liberty street. It produces at one and the same time cold water, pure and sweet; salt water, and a flow of gas that, when ignited, illuminates the entire surroundings. The well was drilled some time ago, to get a supply of pure cold water for use in a bakery in the summer and during flood times, when city water is not desirable. At 100 feet the fresh water was struck, and at 200 feet the salt water and gas were found. Two casings were inserted,— one for the salt water and gas, the other for the fresh water,— and now, when the engine is started and the gas lighted, spectators behold the wonderful sight of fresh water, salt water, and fire all coming out of one well at the same time.

Twenty Years of Science. — The editors of Nature (London), on the occasion of the twentieth anniversary of the establishment of the magazine, take occasion to review the progress of science during that period of years. In the physical sciences, the development of the atomic theory and the establishment of a connection between the theories of electricity and light, have been the main achievements; in chemistry, the proclamation of the periodic law of the elements and the development of organic chemistry; in astronomy, the development of the spectroscope, the use of photography, and the extension of the nebular hypothesis; in biology, the firm establishment of the Darwinian doctrine, the development of the study of bacteria, and, later, the effort to determine the position of the Lamarckian principle, have been the main features. In botany, the key-note has been the study of protozoa and cell-life; in geology, the greatest advance has been in the application of the microscope and the study of rock structure.

Practical Chemistry and the Arts.

NOVELTIES IN PHOTOGRAPHY.

The applications of instantaneous photography are constantly increasing with the greater sensitiveness of modern plates, and the more powerful developers which are being almost daily discovered. Apparently, there is no limit to the brevity of the time in which the sensitive gelatine film may receive and retain a luminous impression, and photographs have been taken in such a minute fraction of a second, (0.000076), that the element of time is not worth consideration, and they may be considered as absolutely "instantaneous" pictures.

In Fig. 1 an instantaneous view of an eruption in the crater of Vesuvius is shown. It is necessarily somewhat obscured by the clouds.
of steam, but the masses of lava and scorie in mid-air are well shown, and indicate the quickness of the exposure. The picture was taken by a French amateur, M. Luys, on the 27th of September last.

Fig. 2 is an excellent view of a man in the middle of a high jump. The remarkably awkward position of the body is noticeable, and shows how easily the eye is deceived by quick movements. No artist would venture to draw a man in such a position as a truthful representation of the attitude in jumping, but the eye of the camera cannot be deceived, even by the most rapid movements.

Fig. 3 is a reproduction of a photograph made without any lens, a metal plate pierced with a hole 3:10 of a millimetre (1:100 of an inch) taking its place. The time of exposure in a good light was 1 minute, 18 seconds. A sheet of pasteboard may be substituted for the metal plate.

Although the 'pin-hole' objective cannot replace the usual lenses in all cases, it has some advantages over them besides its cheapness and portability. Spherical aberration is avoided, the focal distance can be varied at pleasure, and in copying engravings and drawings in line or stipple, a very soft and pleasing picture is obtained, in which the lines or dots are blended together, and the details of the artist's work are not so unpleasantly prominent as when the copy is made by a regular photographic objective.

This method is worthy the attention of amateurs, and, after a few experiments in regard to the time of exposure, very satisfactory results can be obtained. It is important that the edges of the hole be perfectly sharp and clear, as the presence of a fringe of fibres of pasteboard or metal would have a very injurious effect upon the finished picture.

The engravings are reproduced from La Nature.

CANARY-SEED is composed of albuminoids, 13.8 per cent.; fat, 5.4; extractives, 50.7; indigestible fibre, 8.2; ash, 6.8; and water, 15.1.

III. MAGNETISM AND ELECTRICITY.
Our word magnetism is derived from Magnesia, the name of a town of Lydia in Asia Minor. In the neighborhood of this place there was found a kind of stone, variously called Magnesian stone, Lydian lodestone, or simply lodestone, which was observed to have the power of attracting iron. This stone, our londstou (or, more properly, lodes stone), was known to the Greeks as early as the fourth century before our era. According to Pliny, the Romans knew four other localities which furnished the mineral: Magnesia in Thessaly, (to which our English dictionaries erroneously refer as the place from which the name was derived), Ethipia, Beotia, and the Troad. Plato observed that the armature of a magnet itself became magnetic; and Lucertius, in his great poem on Nature, speaking of the lode stone, says: 'It often produces a chain of rings hanging down from it. Thus you may sometimes see five and more suspended in succession and tossing about in the light breeze, one always hanging down from the one above it and attached to the lower side, and each one in turn from the other experiencing the binding power of the stone, with such a constant current the force flies through all.' He explains the attraction by assuming the existence of an ethereal force which poured forth from the lodestone or magnet itself, and permeated the pores of the magnetized object. Plutarch appears to explain the phenomenon from the same principle. The magnetic power of the earth itself and the phenomena arising from it were, in spite of some wild theories to the contrary (It has even been claimed that the ancients were acquainted with the mariner's compass), completely unknown in that day. There were, however, stories of all kinds suggested by the power of the lodestone, the best known being that of the 'magnetic mountain,' which drew the iron nails from the planks of ships that came too near it, and caused them to fall to pieces. Ptolemy, the geographer, gave the exact latitude and longitude of this remarkable mountain, whose existence was firmly believed in.

Still less did the ancients know of electricity. It was known from the time of Thales, who lived at the beginning of the sixth century B. C., that electron, when rubbed, had the property of attracting light objects. What is meant by electron in this connection is not certainly known; amber, a mixture of gold and silver, tournarine, a certain enamel, and platinum are some of the conjectures of those who have discussed the question. However this may be, it was afterwards learned that amber was the best material for generating this kind of electricity, and its origin was attributed by the imaginative Greeks. They spoke of a soul in the amber, as the Chinese physicist Kuo-pho did in his Poem In Praise of the Magnet. Plato's view was that the amber contained a flame-like essence, but gave it out only when the pores of its surface were opened by rubbing. This essence, when given out at the same action as the magnet, but, by reason of its lightness, did not attract only the lightest and driest substances. Pliny, too, speaks of a flame which pours out of amber. The connexion of this frictional electricity with the external manifestations of atmospheric electricity, and with the shocks given by electric fishes (found in the Mediterranean and Red Seas), was never suspected by the ancients.

IV. CHEMISTRY.
There can be no question that some of our chemical experiments may lay claim to a very high antiquity. According to Plutarch, whose etymology is electricity, this attraction was personified by a certain Greek (Plutarch, indeed, by no means attributed this to electricity), Alexander von Humboldt, the Greek word for chemistry, from which our own word comes, was derived from an Egyptian word, kemi, originally meaning black, which was later a designation of the whole land of the Nile; so that chemistry was synonymous with the black art! The first known Greek chemist (more properly a metallurgist) was Theophrastus, who lived by no loss an authority than Alexander. In a book of his On Minerals he treats of the extraction of metals from the ore, and describes the various compounds which were formed in the process. Among these are white lead and verdigris, which he states to be earths, expressly distinguishing them from stones or minerals.

Unfortunately this is the only work on chemistry written before the Christian era which has come down to us, although we know from references of Pliny that such books existed. Their loss is particularly to be regretted, because it is possible that they might have thrown some light on the subject of polychromy, by telling us what al the Greeks derived from chemistry in the preparation of the colors with which they decorated their statues and adorned their temples.

The encaustic painting of the Greeks has been especially discussed. Cato the Censor, who has already been referred to in these papers as having a practical knowledge of an important principle of heat, expresses some remarkably sound views about the rusting of metal objects and the oxidation of metals under the influence of the air, and upon the evaporation of water from springs to produce salt.

The writers of the first century of our era bear witness to the chemical progress of earlier times. We find from their reviews of the past achievements, that various chemical preparations were used in medicine, especially in the composition of salves, and that alloys and amalgams of many kinds were familiar. He distinguishes the oxides of copper, lead, and zinc from one another. The only acids that appear to have been used are vinegar (acetic acid) and sulphuric acid; to the former he attributed a dissolving power far greater than it really possessed. In his passage of the Alps, Hannibal, for example, is said to have dissolved rocks which barred his progress by the agency of vinegar.

The process of distillation was used by the ancients. Aristotle refers to this operation, which is clearly described by later writers, together with the distillate and the rest of the apparatus. The progress in the knowledge of alloys is seen in the Roman coins of small denominations. These at first were made simply of copper, but from the time of Commodus they were composed of bronze with a varying proportion of zinc.

Soaps were known to the ancients, but were merely mechanical mixtures, not chemically. One of the supposed soaps found at Pompeii proved to be nothing but fuller's clay.

Alchemy began in the first century of our era, and the atomic theories of the philosophers are said to have led to the attempt to change the baser metals to the nobler ones. Towards the end of the fifth century B.C. this pseudo-science became very popular, and there were numerous groups of alchemists at that time. The prolific writer, Hermes Trismegistus, wrote a book called Tabula Smaragdina, professing to teach the art of making gold, which was translated at Nurenberg in 1541.

In the concluding paper of this series the remaining departments of science will be briefly considered.

ERRATA.—In the preceding paper Boethius was mistranslated Bocchus, and Ptolemaus (three) to Ptolemaidas.
ZINC.

BY GEORGE L. BURDITT.

Zinc, sometimes called spelter, is one of our most useful metals, and is widely distributed, although it never occurs alone. Sulphide of zinc and carbonate of zinc are its chief sources, and from these compounds it has to be distilled. The first step in the extraction of zinc is to reduce the ore to an oxide. Carbon being drawn through an oxide of zinc and carbonic acid gas, \( \text{ZnCO}_3 = \text{ZnO} + \text{CO}_2 \). Sulphide of zinc roasted gives oxide of zinc and sulphur dioxide, \( \text{ZnS} + \text{O}_2 = \text{ZnO} + \text{SO}_2 \).

To get pure zinc from the oxide, the oxide is mixed with coal and heated in a retort. The zinc volatilizes, and comes out of the mouth of the retort as a vapor. Cadmium is always mixed with the zinc, and cadmium vapor comes out first. It is lighted, and burns with a brown flame. As soon as the zinc vapor begins to come off, the flame changes to green. An iron cap is then placed over the mouth of the retort, through which the vapor passes, and is condensed into a fine dust. Gradually the cap becomes hot and melts the dust into liquid zinc, which runs into moulds and is cast into blocks.

The process described is called the Belgian process; there are two others, the Silesian and the English. The Silesian process differs only in the retort. The mixture of ore and coal is put in and heated, and the vapor passes out through a tube bent at right angles to the retort. The tube is kept cool, but not cool enough to condense the vapor into solid zinc. If this should happen, the pipe would become clogged and the retort would burst. In the English process, the retort consists of a tightly covered crucible, through the bottom of which passes a pipe. This pipe is stopped with a wooden plug, and the mixture of ore and coal is put into the crucible and heated. As the mixture grows hotter, the plug is converted into charcoal, allowing only the zinc vapor to pass through. The reaction which takes place in the furnace is, in all cases,

\[ \text{ZnO} + \text{C} = \text{Zn} + \text{CO}_2 \]

The pure zinc obtained by either of these processes is a bluish-white metal, having a metallic lustre and a crystalline fracture. It does not rust easily, and takes a good polish. Owing to this polish, it is used for making stage jewelry. Under the most favorable conditions, however, it rusts slightly, becoming covered with a thin film of zinc. At ordinary temperatures it is brittle, and when heated to 1000°—1500° it becomes malleable, and is rolled into sheets. The specific gravity is 7.13, and the melting-point 419°. It is quite volatile, burns with a green flame, and is one of the metals that expand on cooling.

Next to iron, zinc is the cheapest of the useful metals, and, on account of this, has a number of uses. It is used in the dynamite battery. In this case, pure zinc would be very expensive to use, and it is not easily dissolved by acids. Impure amalgamated zinc is cheaper, does just as well, and is readily dissolved in acids. Galvanized iron is iron coated with zinc to preserve the iron. If the zinc begins to rust, a galvanic current is formed, the hydrogen collecting on the iron, thus preserving it. Zinc has also been used to form anode for zinc plating in making hydrogen, and is used in many places where iron and tin cannot be, on account of their rusting. Oxide of zinc, not being attacked by sulphuric acid, is used in making white paint for laboratories.

IN YE OLDEN TIME.

When the "Best Friend," through the stupidity of its negro firemen, who held the safety-valve down a little too long, to avoid the annoyance of escaping steam, a special platform car was placed between the engine and the first car of the train, and loaded with bales of cotton as a means of protecting the passengers.

In the early days of the South Carolina Railroad, before the telegraph came to be the handmaid of the progress of the world, and when horrid depots in the arrival of trains were of less importance than are minutes now, the good people of Charleston were notified of the approach of a train by a flag displayed from the steeple of the railway station. It was the duty of an employee to keep a lookout from this steeple, and hold the flag when he should catch the first glimpse of the smoke and steam of the locomotive.—Railway Age.

INDUSTRIAL MEMORANDA.

HYDROGEN OCCULDED IN STEEL.—The theory of Dr. Mueller concerning the character of the gas occluded in steel, has been confirmed in a striking manner. The inventors of the famous Mannesmann tubes and the makers of many steel objects, by rolling them eccentrically from a solid bar, sent to the Charlottenburg laboratory two tubes closed at both ends, a partly finished product, therefore. The steel contained 0.46 carbon, 0.26 silicon, 0.022 phosphorus, 0.01 sulphur, 0.23 manganese, and a trace of copper. The hollow cavity contained 911 c. cm. of gas at a pressure of 750 mm. Chemical analysis showed that this gas was composed of 99 per cent of hydrogen and only 1 per cent of nitrogen, confirming Mueller's theory that the gas occluded in steel castings is hydrogen.

COMPRESSED AIR AS MUTIVE POWER IN FRANCE.—The use of compressed air as a motive power for tramways in France is extending. The system adopted is that invented by M. Mekarski, director of the Nantes tramways, which have been open since 1879. Two years ago the system was successfully applied on the tramways at Noget, in the neighborhood of Paris, where it was received with great approval by Professor Bernouilli and Limoges. This year it will be substituted for horse power on the tramways of Lyons. The Inventor asserts that his system is far more economical than horse traction,—the cost of coal per day of a machine equal to 8 or 10 horse power being only $1.00,—much cheaper than electricity or steam power, and that machinery is simple and does not require a skilled mechanic who should be able to understand French and English. In a recent report, states that the tramways of that town, which are worked by the system of M. Mekarski, alluded to above, continue to give satisfaction. The cars are comfortable and run smoothly with little noise. They do not interfere with the general traffic in the streets, and their impurity from accidents is remarkable. The average speed is about eight miles per hour; but it can be easily increased or moderated, and in case of need an almost instantaneous stoppage effected.

The Out-Door World.

EDITED BY HARLAN H. BALLARD.

PRESIDENT OF THE AGASSIZ ASSOCIATION.

[FO. ADDRESS, PITTSFIELD, MASS.]

PROF. GUTTENBERG'S COURSE IN MINERALOGY.

About a year ago, Professor Gustave Guttenberg, then teaching in the Erie (Penn.) High School, undertook to give an Agassiz Association course of lessons in mineralogy. His plan is simple, and modeled somewhat after the excellent course previously conducted for us by Professor W. O. Crosby, of the Boston Society of Natural History. The course is conducted by correspondence.

Each pupil receives a set of minerals in a neat case, together with text-tubes, litmus paper, and streak-plate. Accompanying this case is the first lesson, in the form of a pamphlet, containing necessary definitions and concise instructions for a series of observations on the first twenty-five specimens, which are numbered, but not labeled. There are blanks, on which the pupil records the results of his work. When the first blank is properly filled, it is returned to Professor Guttenberg, who corrects it, makes needful suggestions, and returns it, together with labels for the specimens already examined. For all this work he makes no charge, and for the case of minerals and instruments, and the printed pamphlets, he makes only the nominal charge of one dollar. He divides the whole work into four grades, two of which were issued up to last August. Professor Guttenberg then received an appointment as professor of biology of the Central High School of Pittsburgh, Penn., and his removal to his new post has caused a little delay in the issue of the third grade. This will soon be ready, however, and may be had upon application to him. All members of the A. A., and all subscribers to the Popular Science News, are cordially invited to take up this course of lessons. One who begins it in complete ignorance of mineralogy, will be surprised to find himself easily led along to a familiarity with all the more common forms of rock and mineral, and brought to a stage of progress whence advancement to higher work in deterministic analysis will be easy and rapid.
branches among its members, by circulating papers and notes on local geology and geological phenomena, and by the exchange of specimens. The final organization will be effected February 20, and it is earnestly hoped that a goodly number of members will have enlisted by that date. All interested are invited to correspond with Amadeus Grub, (Secretary of Chapter 132), 154 Maple Street, Buffalo, N. Y., at their earliest convenience.—Professor Franklin W. Barrows, George T. Wardwell, Amadeus Grub, Organizing Committee.

NEW YORK CITY ASSEMBLY OF THE A. A.

At a meeting of the New York City Assembly of the A. A., December 19, it was unanimously resolved, that,

Whereas: Having been informed in a comprehensive communication of our President's efforts to secure an official organ for the A. A., and of his ultimate full measure of success;

Resolved: That the Corresponding Secretary be instructed to inform the President of the A. A., officially, of our entire satisfaction with the magazines selected—the Popular Science News, and the combined Santa Claus and Swiss Cross.

Resolved: That this Assembly heartily wishes the undertaking and its projectors the thorough support and success which they deserve.

Resolved: That, inasmuch as this Assembly, being a constituent body, can take no direct action in the matter, each Chapter be requested to appoint one canvasser to secure as many subscribers as possible to one or both magazines.

THEODORE G. WHITE, Cor. Sec.

This action of the New York City Assembly is exceedingly gratifying. That Assembly was the only one of our larger bodies which happened to hold a meeting after the arrangements referred to had been completed, and before the issue of the first number of the magazines. It was, therefore, the only one to which special notice of our action was sent. There has not yet been time to hear from other Assemblies and Chapters since the issue of the first installment of "The Out-Door World." Indeed, at the date of this writing (December 30), on account of unavoidable delays, the January News is just off the press; but, if the whole Association shall be equally hearty in endorsing the new departure, the future of the A. A. will be brighter than ever before.

We hope to make the personal observations of our members a special feature of this department, and to that end we solicit as prompt and full notes of such observations as possible from everyone interested. When convenient, let these notes be accompanied by pictures—photographs, india-ink drawings, or even pencil sketches.

We acknowledge reports of continued interest and activity from Chapters 53, 107, 108, 120, 158, 165, 199, 234, 257, 347, 354, 356, 531, 399, 404, 414, 444, 452, 478, 481, 494, 513, 524, 603, 664, 957, 965, and 972.

REPORTS FROM CHAPTERS.

58. Philadelphia, Penn., [D].—I think the results of our work are very obvious. Two of us are doctors of medicine and a third is a student in medicine. The Chapter address is 1314 Franklin Street.—Joseph McFarland, M.D.

923. Columbus, O., [C].—During the past year we turned our attention entirely to the study of mineralogy. In this we were very kindly aided by Prof. Lord of the Ohio State University, who gave us a very interesting lecture on the subject. For the purpose of study, we bought a good collection of minerals, a large cabinet for specimens, and several good books. Besides the Chapter collection, individual members have made collections of minerals from the neighborhood, which abound in sand-banks of glacial origin. Regular meetings were held every two weeks throughout the year.—S. C. Kershaw, Cor. Sec.

977. Fort Leavenworth, Kan., [A].—We have twelve members, and are getting on quite smoothly. Some are studying chemistry, using Cooley's text-book, and are making analyses of different dyres; some are studying botany, using Gray's book, and are working up the forest trees that grow in this vicinity; others are studying geology, with the help of Shaler's geology and Overman's mineralogy, and are learning the characteristics of rocks and the geological structure of this region. We all enjoy our work immensely.—S. L. Bayard Schindel, Sec.

524. Fall River, Mass., [B].—Ourlocal Chapter and the Wilson Ornithological Chapter (213) have progressed since my annual report that I wish to write of them again. We have increased our membership, and have secured a room in the Y. M. C. A. building. We have had interesting debates, and papers of exceptional excellence have been read. The Ornithological Chapter has reached a membership of fifty-three. The plan of observation work laid out for our members is succeeding finely, and we have on hand a large amount of valuable notes and lists. To illustrate our work, on December 3, 1888, two ornithologists, Mr. Strong and Mr. Curtis, of Wisconsin, joined us. Through their efforts, we now have some Wisconsin members, organized into a committee, and studying the bird-life of their respective towns.—J. B. Richards, Pres.

264. Plainfield, N. J., [A].—Chapter No. 264 (A) reorganized in November in four divisions, for the study of insects, minerals, flowers, and birds. At the meetings of the insect division, the caterpillars found in the vicinity of Plainfield were studied. Specimens were brought to every meeting, and drawings were made and descriptions written of each kind. During the winter months, the mosquito, earth-worm, fly, and ant were studied. Much interest has been shown in this division, and the members are waiting for the spring to continue the work. The meetings of the mineral division began in November, and have been held in the science room, where the members had all the necessary apparatus for the blow-pipe and chemical tests of the minerals. Twenty-five members have studied quartz, calcite, and copper with its numerous ores. A little study on the formation of rocks has also been taken. One excursion to an old copper mine was made in the autumn. The flower division has held regular meetings. There are ten members. They have studied the evergreens and the trees about Plainfield, and have just commenced the study of the roots of plants. Illness and removal of members have interfered with the work of the bird division, but there is great interest in the study of birds. All the early-comers have been spotted, and the specimens in cases have been studied.—William Moore, Sec.

267. Pittsfield, Mass., [C].—While we were in Waterbury, Conn., last winter, we collected between 400 and 500 good cocoons of those beautiful silk-moths, Saturnia spinis and Atlas, also a large number of the Eriogyna and Luna. In Great Barrington, Mass., and the vicinity, on one day, we collected 75 specimens of Crocophaga prague and about 50 of Vanessa antida, besides some very fine Papilis, including Cres-phanthes. We expect daily in exchange from Germany 300 lepidoptera and 500 coleoptera.—Theodore A. Schurr, Pres.

353. Philadelphia, Penn., [K].—During the past year we have held twenty-seven meetings, and have increased our membership to fifteen, seven having joined since last report. At each meeting one of the members is appointed to prepare an essay for the next meeting, when it is read and discussed; after this, if there are questions to be asked, they are in order. At every meeting we have the use of the microscope for examining objects that may interest us.—Theo. G. Brinton, Sec.

365. Hyde Park, Ill., [A].—We have at present thirty-five members. Our President is Mr. Wm. L. Lloyd. We have held meetings every two weeks during the year, and they have been much more interesting than hitherto.—Grace M. Lane, Sec.


382. Brooklyn, N. Y., [F].—Our work last winter was chiefly in analytical mineralogy, in connection with which we read and discussed a portion of Prof. Crosby's "Common Minerals and Rocks." During the summer the members visited various localities, and brought back notes of observations, also several additions to the collection, such as a fragment of rock from the Rocky Mountains, containing a number of trilobites of various sizes; lichens of various kinds, one weighing over seven and a half pounds; and a wasp's nest, eighteen inches in diameter. An interesting oak-gall, resembling white spun glass with rose-colored spots, was observed, and a praying mantis and leaf insect brought from Virginia. Photography has been of absorbing interest to several members, who have taken some creditable impressions. Several notes in the Swiss Cross concerning snakes hiding in their parent's open mouth, are indorsed by an observation made by one of our members near White Plains, N. Y., who killed a black snake, four feet long, and, after death, at least a dozen tiny snakes, three to four inches long, crawled out of its mouth and were very lively. We have received for our cabinets from County Westmoreland: labradorite and crocidolite, or tiger eye, a bottle lying-down, and tropical sea-weed, also Alex. Agassiz's "Expedition of the Blake." Our average attendance is seven; membership, eight.—Henry S. Fullerton, Cor. Sec.

387. Baltimore, Md., [E].—Johns Hopkins University.—During the year we have had sixteen meetings, fairly well attended, and at one time our ranks
were greatly increased. We gained, as active members, J. Ames and S. Cone, and as honorary members the following gentlemen, most of them professors in the University: H. Newell Martin, Ira Remsen, Alfred Mayer, Wm. H. Howell, H. V. Wilson, F. H. Herrick, E. A. Andrews, and A. C. Gill. One of our members, Mr. R. G. Harrison, presented to us a very nice chest of drawers for minerals, and at another time we had a good-sized shell-cabinet built for alcoholic specimens. The latter is now quite full. A short while ago we created a junior membership, our active membership being limited to persons 18 years of age and excluding girls. The juniors will have all the privileges of the Chapter, but no voice in its government. In the first part of the year, Mr. Orr, a graduate student of the University, gave us a lecture and demonstration on hypnotism, which we opened to University men, and it proved of a great deal of interest. Dr. Geo. A. Williams, professor of geology here, gave us a delightful lecture on "How to Study Geology," and we derived a great deal of useful information. Our latest step was to raise the yearly subscription and initiation, each to three dollars, hoping that it will be of benefit. As the spring approaches we look forward to many delightful days in the open air.—Edward McDowell, Pres., 117 W. Franklin Street; Charles S. Lewis, Sec., 610 Johns Hopkins University.

449. Fitchburg, Mass., [F.].—Our Chapter is in a "live" condition, and has done some systematic work in botany and entomology. We classify all our work, and keep full reports of what each member accomplishes. We should like to correspond with other Chapters.—G. F. Whittemore, Pres.

397. Tonawanda, N. Y., [A.].—We have gained three members, and now have thirteen. We have held thirty-four meetings, and have given one successful public entertainment. Our President is Mr. J. O. Wilson.—Bettie Fisher, Sec.

533. Madison, So. Dakota, [A.].—We have now twenty-four active members. We meet every week, with good attendance. We appoint three or four members to read papers at each meeting. Mr. Yoder gives us lessons in botany and zoology. We have made two expeditions—one to Lake Madison and one to Lake Herman. We have a case for minerals and about sixty specimens. We have also begun a collection of insects, and one of birds' eggs. We have opened one Indian mound, under Mr. Yoder's direction, and obtained good specimens of beads, arrow-heads, etc.—G. Murray, Sec.

362. Vasca, Wis., [A.].—Two of our members are taking Prof. Guttenberg's course in mineralogy. Another has gathered 150 sets of eggs. The Caspian tern was noted here last spring for the first time.—J. F. Murphy, Sec.

377. Barton, Ross, England, [A.].—The subject at present taken up is entomology, and we are making collections of lepidoptera, coleoptera, and hymenoptera. The Chapter has the advantage of owning a very good microscope. All the members beg to send their best wishes to the A. A. and to record the many great benefits of the good work it is doing.—Frances Madeen, Pres.

Many of the foregoing reports have been unavoidably delayed, and appear out of their regular order; but they are too good to lose, and are much better late than never. Reports from the Third Century (Chapters 201-300) should reach the President by March 1.

ORIGINAL OBSERVATIONS.

258. FLIGHT OF A HUMMING-BIRD.—May 17, in my garden, I saw a humming-bird describe several times the following curve:

[Diagram of humming-bird's flight pattern]

At the lower part of the curve, I could not see him, for his swiftness, and he was then making a very loud humming noise.—G. H. Claybrook, Santa Monica, Cal.

[Written for "The Out-Door World."]

MOLE CRICKETS.

BY R. L. CLAYES,

Of the Agensic Association.

RUNNING the share deeply into the earth, what is this that the ploughman has turned up, in this old-world garden, lying in the village of Bresslauleigh, which is quite in the heart of Merry England? Something which, surely, our American eyes have never seen before. A queer creature, about two inches long, of a velvety-brown color, its body divided into three portions. After a closer look, we observe that its center is of a somewhat grayish tint. Two wings spring from the hinder part; each lengthens into a sort of fillet that stretches far beyond the short wing-covers, reaching, in fact, quite to the end of the body.

But the most noticeable things of all about the stranger are its two wonderful fore-legs. These are enormously large and strong, far more so than its other legs, (which are themselves of no contemptible size), and gradually broaden at their ends into something resembling a hand, terminating in five short, strong fingers.—or, perhaps, claws may be a more nearly accurate name by which to call them. Of these claws, one is star-shaped. It must be that this is that curious creature, the English mole cricket, we think; and we do not wonder that it is so named, for the insect, while very like a cricket, also bears, in some respects, a close personal resemblance to the mole. Especially this is true of these digging feet, which seem to be as distinctly out of proportion to the rest of its body, as would the brawny wrist and hand of a laboring man if it was been protruding from the little dress-sleeve of a two-year-old child. But these stout, broad feet are almost precisely like those of a mole.

The mole crickets live underground, and seldom emerge into the open air; indeed, one may say they never do so, except at night and during fine, dry weather. With their long, strong fore-feet, with which they can work even more expeditiously than the mole, they dig for themselves burrows in the earth, fashioned into galleries leading from a central chamber, and communicating with the upper air by a small aperture. Although the little creature prefers to work in a soil composed of loose sand, and her tunnels are only about one-fourth of an inch in diameter, she manages to finish them very smoothly upon the inside. Her central chamber—which is not far from the size of a couple of hazel-nuts, and used as a living and sleeping-room—is not designed to serve as a cool and shady residence during the warm weather alone. It is sunk deep enough down to be but slightly affected by any sudden change of temperature, and here our little friend retires when winter comes, and falls into that long, death-like sleep which is so common among insects, and is possible even to some among the higher organisms of our globe.

In this cell she passes the greater part of her life quite alone, for mole crickets are not gregarious, or even pairing, but are solitary creatures, each one setting up for him or herself a separate establishment, with chambers and galleries all complete, and meeting with their kind only when they go out to take the air above ground. Even in these rare gatherings they do not seem to be a harmonious little people. The males often fight each other to the death, the combators celebrating the victory by eating up bodily all that is left of his vanquished foe. But, although cannibals upon occasion, and capable of subsisting for months upon even animal food, the mole cricket is really a vegetable-eater. Its ordinary diet is the roots of plants, and in some places it becomes a true pest, through the damage it does to crops, and even grass and flowers, by feeding upon their roots.

In the evenings and nights toward the end of spring and beginning of summer, the mole cricket sounds his love-making song. His chirp, which is somewhat softer in its shrillness and more musical than that of the domestic cricket, is supposed to be produced in precisely the same way, that is, by the friction of the wing-sheaths; indeed, the sound has been made artificially by rubbing together those of a newly-killed insect. This song, which is truly a rather dull, jarring sort of music, has gained for the mole cricket a good many popular names. In some parts of England it is known as chirr-worm, in others as jarr-worm, and again as eve-churr, and as croaker. For another of its names—that of earth-crab—it is indebted to the hard, shelly covering of its limbs and body.

The female lays her eggs in the spring. They are about the size of a sugared caravan seed, and are in color of a grayish-yellow. Each insect lays from one hundred to four hundred. The mother builds a special chamber for their reception, which in size and shape is very much like a hen's egg longitudinally cut in half. This apartment, while placed quite near the surface of the ground, that may benefit by the warmth of the sun's rays, is most carefully guarded. It is entered by a complicated system of winding galleries that surround it on all sides, and are strengthened by fortifications and entrenchments, while circling the whole is a ditch of such size that few insects are capable of passing it.

The mother is devoted in her care of her young. There is a species of black beetle which is one of her most dreaded and dangerous enemies, and which often succeeds in destroying her little ones in great numbers. She watches this creature with the greatest care, placing herself near the entrance of her tunnel when the beetle has fairly got inside it, this cunning guardian jumps upon it from behind, seizes it, and fairly bites it in two. The young ones live together for a considerable time, under their mother's care in the home which she has prepared for them. They are very active little creatures, in both the larva and pupa states, running about in all directions.

The mole cricket is always exclusively neat and clean in its own person, both to the eye and touch, notwithstanding the laborious work it constantly devotes to itself, that is, in the way of burrowing in th. soil to the end of building and fortifying its dwellings and nurseries. The cause of its exemption from impunity lies in a fine down that covers its skin, and, while adding to its beauty by giving it a soft, velvet-like texture, also effectively prevents the adhesion to it of the earth in which the little creature spends so great a part of its life in working.
The Popular Science News.

BOSTON, FEBRUARY 1, 1890.

AUSTIN P. NICHOLS, S.B. Editor.
WILLIAM J. ROLFE, LITT.D. Associate Editor.

The principal object of scientific—and popular—interest the past month has been the so-called Russian influenza, or "la grippe," which has overspread a large portion of the country, and numbered its victims by the thousands if not millions. There is really no explanation to be given of this remarkable epidemic, and the symptoms and general details of an attack are doubtless as familiar to most of our readers. There is some reason to doubt whether the present epidemic is really the true European disease, or a native production occurring coincidently with it. The first cases reported in this country, occurred almost simultaneously with the European ones, and it seems impossible that the infection could have crossed the ocean in so short a time. The first cases in this city occurred in the county jail—perhaps the most unlikely place in the whole city for an import of epidemic to make its first appearance. It is also stated that the United States warships encountered it in mid-ocean on their way to Europe, and that their crews were affected by it. We are afraid, however, that this entertaining yarn was spun for the benefit of the "marines." Whatever its source, the mild and harmless type of the disease is a matter for thankfulness, and, in spite of the persistent and reprehensible sensationalism of the daily press in regard to the matter, serious or dangerous cases have been extremely rare.

The phenomenal weather of the present season is amply sufficient to account for the epidemic, even if a similar disease had not appeared in Europe. Up to the time of writing (January 15th) there has been neither ice, snow, nor frost of any consequence, and the weather of last winter has been exactly repeated. Two such unusually mild winters occurring consecutively, have never been recorded before, and the effect of the unseasonable warmth must be very injurious to the public health, not to mention the possibility of a total failure of the ice-crop, the harvesting of which is such an important New England industry.

The cause of this unusual mild weather is hard to explain. Of course the direct cause is the prevalence of warm southwestery winds, and the absence of the cold northwestery gales which usually blow during the winter months; but what determines the prevalence of one wind over another is at present outside the limit of our knowledge. The story has gone the rounds of the press that the Gulf Stream has been deflected from its course and approached nearer to our coasts, but such a deflection would have but very little effect upon the climate of the sea-board, and none at all upon that of the interior of the country. Both our warm and cold winds blow towards the ocean, and not from it. Besides, it is not true that the Gulf Stream has changed its course, and no observations have been made which would indicate that it is flowing in any other than its usual direction. We have heard this Gulf Stream theory advanced to explain unusually warm weather for the last twenty years, and never with any more basis of fact than at the present time. There is not the slightest reason to believe that any permanent change of climate is taking place, and the average temperature for any long period of years always remains about the same.

M. Moissan, who isolated the element fluorine a few years ago, has succeeded in forming an anhydrous platinum bi-fluoride (PtF₂), by passing a current of fluorine gas over a bundle of platinum wires heated to dull redness in a tube of fluor-spar. At a bright red heat the compound is decomposed, and the reaction gives a comparatively easy method of obtaining fluorine. Very curiously, a dilute solution of platinum bi-fluoride in water may be kept for a few minutes without decomposition. Soon, however, it breaks up into hydrated platinic oxide, and hydrofluoric acid. An analogous compound of fluorine and gold has also been obtained.

Professor Simon, of Johns Hopkins University, has been investigating the peculiar power possessed by a young boy in Baltimore, of causing heavy objects to adhere to his fingers, when closely pressed upon them. The nature of the substance is of no consequence, but the adhesive power is greatest when they possess a clean, dry, and smooth surface. For this reason, the best results are obtained with glass and polished metals. A maximum weight of about five pounds has been lifted in this mysterious manner. The adhesive power is quite variable and uncertain in its action, and a careful microscopical examination of the boy's fingers shows no unusual or abnormal structure of the skin. Professor Simon, while admitting his inability to fully explain the phenomena, which he describes at length in a recent number of Science, considers that they are due principally to atmospheric pressure, and notes several circumstances connected with their manifestations which tend to confirm that theory of their cause.

It has recently been discovered that sulphate of quinine possesses the power of rendering light non-actinic, and that a plate of white ground glass, which has been covered with a strong solution and allowed to dry, may be used in the photographic lantern instead of that of the ordinary ruby color. We have recently seen a bromide print developed by the non-actinic white light produced in this manner, which was perfect in every way and did not show the slightest trace of fogging. If future trials show the method to be a practical one, the use of red light in photography will become a thing of the past. We shall be glad to hear from any of our readers who may make a trial of this peculiar property of the hitherto exclusively medicinal alkaloid.

Some genius out in Indiana announces that he has discovered a process of condensing and solidifying natural gas, so that it can be handled like coal, and that with the aid of a ten-horse-power engine he can reduce enough gas in one day to supply a city of fifty thousand inhabitants with fuel for twenty-four hours. The readers of the Science News will hardly need to be reminded that this is an impossible achievement. The composition of natural gas is perfectly well known, and although it is possible by expensive and complicated apparatus to temporarily liquefy a few grains of any gas, yet the process costs many thousand times its fuel-value, to say nothing of the fact that as soon as the excessive pressure and cold employed in the process are removed, the gas returns at once to its normal condition. The supply of scientific humbugs is unceasing, and we often wonder what will be the next manifestation in that direction.

Some experiments recently made by Mr. Baynes Thomson, upon the deviation of a pendulum when brought near to another body, lead him to believe that the generally accepted theory of a mutual attraction of gravitation between all masses of matter is incorrect, and that the tendency of bodies to approach each other must be explained on other grounds than that of an inherent attractive property. He suggests that the position of two bodies in relation to each other is the determining factor, in that they screen each other from the bombardment of the molecules of the ether. This revolutionary theory is hardly to be accepted without further evidence. An inherent attractive force in matter is not a very satisfactory hypothesis to account for the phenomena of gravitation, but it is certainly more rational than an assumed bombardment of the supposed molecules of a hypothetical ether, the actual existence of which has never been proved.

OLD PROVERBS FROM A SCIENTIFIC STANDPOINT.

There is much true wisdom and scientific observation embodied in many popular beliefs and sayings, even when the logical connection between the premises and conclu-
sions is not at first sight evident. For it was believed for many years that the presence of barberry-bushes in the neighborhood of a wheat-field had an unfavorable effect upon the crop. This was always considered an agricultural superstition until it was found, that, in one stage of its existence, a fungus very destructive to wheat, takes up its lodgment on the barberry-bush, forming the curious growth known as the "cluster-cups."

Sayings in regard to the weather are very abundant, and, although in many cases, such as the alleged influence of the moon, they have no basis in fact, in others they are really dependent upon well-known meteorological laws. Many of the "weather proverbs" have descended to us from our English ancestors, and are not applicable to the climatic conditions of the western world. Among these are the dread of east winds, which in England are cold, dry winds, blowing from the large areas of land lying to the east, forming the countries of Russia and Siberia, while with us the east wind is a moist sea breeze, and rarely or never has a temperature much below the freezing-point.

A very reliable sign of stormy weather is when the sun rises clear and shortly goes into a cloud. This indicates the presence of rapidly condensing moisture in the atmosphere, which is likely to soon fall as rain. A lurid color of the sky at sunrise, halos around the sun and moon, "a rainbow in the morning," and the "sun drawing water" are due to the same cause, and are all omens of stormy weather.

The belief that if "it clears off in the night," the fair weather will not continue, has, apparently, no basis in fact, and as far as our observations go is by no means correct. Fair weather seems to be as likely to come at one period of the twenty-four hours as another.

Sailors say that if a storm clears with the wind "hacking round" to the north, another storm will immediately follow. This can be probably explained by the fact that when the center of a cyclone or rotary storm passes over any point, there is a temporary calm, after which the wind commences to blow from the opposite direction. This sign, however, like many others, is by no means infallible.

When the water in the tea-kettle boils away rapidly a storm is said to be near at hand. It is true that the low atmospheric pressure preceding a storm would slightly lower the boiling-point of water, but we do not believe that the effect would be appreciable. It seems more likely that in this case the common belief is founded more upon theoretical than practical considerations.

The saying that "a green Christmas makes a fat churchyard" is a popular recognition of the unhealthfulness of a warm, open winter. Unseasonable weather of any sort has an unfavorable effect upon the system, and the enervating effect of a high temperature in winter, when the usual cold, bracing weather is to be expected, is very marked.

On Candlemas day (February 2) the woodchuck is said to come out of his hole and look around to see if his body casts a shadow. If it does, he goes back for a longer sleep, but if the sky is clouded he knows that winter is over, and does not return to his former quarters. We are afraid that in New England the woodchuck must very often consider himself a victim of misplaced confidence, but the belief may have arisen from certain weather observations, showing that clear and cold weather about that date was likely to continue, and that storm and rain indicated a more or less early breaking up of winter.

As to the January thaw, the Indian summer, the equinoctial storm, and the dog-days, they have no existence whatever as definite meteorological phenomena. One might as well speak of the January snow-storm, as to consider any particular period of mild weather in that month a special and regular occurrence. These periods of hot, cold, or stormy weather, may occur at any time within their appropriate seasons, but do not recur in successive years with any regularity whatever, and they can only be foretold on the principle of the old-fashioned almanacs, whose predictions of "a-storm—may-be—expected—about—this—time," extended over an entire month.

As to the influence of the changes of the moon, the spots on the sun, the markings of the breast-bone of a goose, and many other similar signs and wonders, upon the changes of the weather, or other terrestrial phenomena, they must be considered as superstitions pure and simple, without any basis whatever, either in scientific theory or actual fact. It is remarkable how much faith ordinarily intelligent people will place on these signs, which every day experience shows to be utterly unreliable, and it can only be accounted for by the fact that the failures are quickly forgotten, while the occasional coincidences are carefully remembered and handed down to succeeding generations. The natural forces and laws governing the weather are entirely irregular in their action, and there is no possible way in which the state of the weather can be predicted for more than forty-eight hours in advance, and even for that length of time the conspicuous failures of the government "indications" show how little is really known about the matter and how suddenly the conditions governing meteorological phenomena may change the manner of their manifestation.

A DOUBLE STATUE.

Among the curiosities at the Paris Exposition was a statue representing the legendary German heroine Marguerite. Viewed from the front, it presented no unusual appearance, but when placed before a large mirror, the reflection from the back of the statue showed the image of Marguerite's lover, Faust, standing, apparently, just behind her.

This remarkable effect was obtained by ingeniously carving the features and figure of Faust in the back of the original statue. The face was formed by the hair of the statue, and the same arms answered for both figures, in one case being held in front, and in the other crossed behind the back. The folds of the robe of Marguerite at the back were modelled so as to form the figure of Faust, and it is to be noted that the illusion was only perfect when viewed in a mirror. If the back of the statue was observed directly, the secondary figure was not so evident. The statue is a most remarkable example of the sculptor's art, and indicates an unusual amount of artistic and mechanical talent.

[Special Correspondence of Popular Science News.]

PARIS LETTER.

Scientific travellers are the lions of the day, and much interest is exhibited in the results of the various expeditions conducted in the heart of the black continent by different travellers. Stanley brings us the results of three years' experience, and, although he has been enabled to accomplish his journey under the most favorable circumstances and with the best equipment which could be provided, he still deserves much credit for his courage. When, however, he speaks of continuing Livingstone's work in Africa, he excites some wonder among those who know the moral character of the great pioneer of civilization in Africa, and have been able to see how very much the temper of both men are dissemblant. Unfortunately Camille Doux, a very young African explorer, has just met with his end. Captain Binger has just returned from his excursion on the Niger, and brings back many important facts; on the other hand, Captain Trivier, a journalist and traveller, has, alone, and without any army of men and luggage, achieved a very handsome feat, crossing Africa from west to east in less than a year, from Congo State to Mozambique, after crossing the lake region, which he found to be...
much agitated in consequence of Stanley's recent passage with his army. All these travellers will surely, Fmfn Pasha being the most prominent, give us a large amount of information concerning the numerous terras incognitas of the old African continent. All Europe is looking to this part of the world, and most nations are struggling to secure the largest and best part of the cake. Concerning the "second Louvre" of the Polynesians, the successful African explorer, Captain Victor Girand of the French navy, has just published a book which is full of information as to the lake region of Africa. He visited the lakes in 1838-1839, and has summed up his experiences in a very interesting work, where information and adventure are mixed in a very palatable manner, and filled with very good extracts. (The mission led under the command of M. Charrin. This distinguished young bacteriologist has shown that if blood serum of a normal animal and of a vaccinated animal be used for the purpose of cultivating the bacillus of the disease (mycoplasma disease in M. Charrin's experiments) a very marked difference is noticed in the behavior of the two cultures. In the serum of the vaccinated animal, the development of mycoplasma is much more difficult and slow and than in the serum of the non-vaccinated animal. It therefore seems that vaccination exerts some direct influence on the blood and renders it unfavorable to the life and growth of the bacillus. This fact is a very important one, and one may expect that the chemical study of the serum may furnish some facts which will help to account for the mechanism of immunity.

Zoologists will be much interested in learning that the scientific results of the campaign of Prince Albert of Monaco are now being published in a series of very handsomely printed large quarto volumes. The Prince, it is known, has been for the past year engaged in the study of oceanic currents in the Northern Atlantic, and of the marine fauna of this part of the world. The results now obtained are numerous enough, and the publication is a timely one. The Prince is to prosecute his researches, and a steam yacht is being built for this purpose.

Anatomical work seems to meet with much favor in France. Two important German treatises have recently been translated in French: Gegenbaur's Human Anatomy, and Krause's Human Anatomy. A third work is now being published on the subject by a Frenchman, Prof. Dehlerie, of Lille.

Prof. Deslouchamps, a well known geologist of Caen, died a few days ago. The teaching of geology is going to be somewhat changed in the course of the next few years, as many aged professors are to retire and be replaced by younger men. The result will not prove unfavorable to science generally, as many of the present professors are too old to give much of their time to original work, and live on their past reputation.


INTERESTING RESULTS OF DECISION OF PLANTS IN THE AZORES BY A CYCLONE.

BY EDWARD G. HOWE.

On the night of September 10-11 a severe cyclone struck Fajal and the other islands belonging to the central part of the Azorian group. The weather on the 10th had been unsettled, showery, and cloudy, but there was no indication of the approaching storm, beyond the falling of the barometer. The mercury continued to fall steadily throughout the next day, and, as night set in, it fell very rapidly—in an hour and a half dropping 30-100, finally reaching 29-19°, when several persons noticed the quivering of the needle. The wind freshened after dark, and by midnight was blowing a hurricane from the S. S. E., which lasted for several hours, the wind hauling from the S. S. E. to the N. W. through the W. The squalls were fierce and incessant, striking the water with such fury that the whole surface of the ocean seemed to be lifted up and flung on to the land in clouds of spray. Houses, windows, shingles, and reeds were literally plucked up from the ground and broken, and leaves torn off or left hanging in ribbons; and, as no rain fell to wash away the salt, every green thing was burned or scorched, and the whole island on the 11th looked as if a fierce fire had swept over it in the night.

The above account of this storm, which occurred at nearly the same date with similar ones all around the globe, was written by Mr. Alexander Dobie of Fajal, who witnessed it all. Reaching Fajal Oct. 1st, he it has been exceedingly interesting to observe the results of the violent defoliation of vegetation by the salt spray. After a brief rest, most of the plants seemed to recover from their surprise, and began to push new leaves; but they seemed unable to stop there, for, many forgetting it was winter, went on to develop new shoots, buds, and young leaves, and even flowers and fruits. The new leaves seemed normal in shape and texture, but pale and small, frequently only in tufts at the ends of the branches. The blossoms—which, added to the usual blooms of the season, made the gardens very delightful—were often remarkably fine and numerous, but seemed to lack substance, fading soon when gathered and dropping paraph and flowers. Should anyone desire further details, I shall be happy to furnish them on application.

Fajal, Azores, Nov. 30, 1839.

[Special Observation for Popular Science News.]

METEOROLOGY FOR DECEMBER, 1839.

WITH REVIEW OF THE YEAR.

TEL. ET FRATRUM.

Average Thermometer.


At 7 a. m. 43.4° 58." 14.8°
At 9 a. m. 43.4° 58." 14.8°

Wholesale 47.0° 53.8° 6.8°

Last 10 Years:

Year 1829: 40.4°
Year 1838: 45.5°

The present December has been remarkable, being the warmest on my record for the last nineteen years; and the year, also, has been a remarkable year, being the warmest during the same period, as shown in the above table. The lowest point reached by the mercury the last month was 10° above zero, on the 4th, and this was also the coldest day, with an average of 14°. The 14th and 15th were the next coldest, each averaging 22°. The highest point reached was 61°, on Christmas day, making an unusually warm Christmas, with an average of 51.3°. The 9th was the warmest day of the month, averaging 53°. Eight days toward the close of the month—the 7th to 12th—averaged 48.7°, ranging from 30° to 62°, and fell below the freezing point twice at the hours of observation—and this approaching mid-winter! The entire month
was 7.84° above the average in the last nineteen Decembers, and only 1.77° below the average of November, while the average difference between these two months is 9.51°. Five Novembers in nineteen years have been colder than the present December.

The temperature of the entire year was 2.70° above the average of the last nineteen years, which is an excess equivalent to 100°F during the year. The lowest point reached during the last year was —2°, February 24th, and the highest 89°, May 10th. The lowest point in nineteen years, was —20°, January 30th, 1873; and the highest 95°, July 4th, 1872,—a range of 112°. The lowest yearly range was 84°, in 1877, and the highest 113°, in 1873.

SKY.

The face of the sky the last month, in 93 observations, gave 30 fair, 16 cloudy, 18 overcast, 6 rainy, and 3 snowy,—a percentage of 53.8 fair, while the average fair in nineteen December has been just 50, with extremes of 40.9 in 1878, and 75.3 in 1877. Only two Decembers have been more fair than the present, though several have been nearly the same.

The mornings of the 11th and 19th were noted foggy. The last half of the month was generally fine and warm,—more like autumn or spring than winter. "What remarkable weather for the season," was a frequent observation. On the morning of the 27th, at about 3 o'clock, a beautiful aurora was noticed in the northeast, resembling, however, more the break of day than the ordinary northern lights, as it was a steady light, destitute of streamers, extending four or five points in the horizon, and rising 25° to 30° upward, and gradually shading off into the blue sky. It continued for an hour or more.

It will be seen by the table below that the entire year has been less fair, and, consequently, more cloudy, than usual, and that this cloudiness extended through the year, except the three winter months. Two of these months—January and December—were remarkably warm, and nearly destitute of snow.

PRECIPITATION.

The amount of precipitation the past month, including about 8 inches of snow melted, was 1.77 inches, while the average amount during the last twenty-one Decembers has been 3.66, with extremes of 73 in 1875, and 7.89 in 1881. The precipitation came in small quantities, principally on nine different days, well distributed. The first snow of the season fell on the 30th—only about half an inch. On the 11th about 4 inches fell, giving two days of very imperfect sleighing. On the 19th the snow had entirely disappeared, and so continues until the present. The ground has much of the time been so free from frost, that plowing and other farm work need not be hindered.

The amount of precipitation the last year has been 57.32 inches, while the average yearly amount for twenty-one years has been 47.11, with the remarkable extremes of only 32.26 inches in 1883, and 64.40 in 1888,—a range of 32.14 inches. The amount of the present year has been exceeded but twice in twenty-one years—In 1878 and 1883. The amount of snowfall the past year has been remarkably small, only 17.49 inches, and this fell entirely on the first three and last months of the year.

PRESSURE.

The average pressure the last month was 30.068 inches, with extremes of 29.30 on the 26th, and 30.73 on the 31st,—a range of 1.45 inches. The average for the last sixteen Decembers has been 29.859 inches, with extremes of 29.84 in 1876, and 30.073 in 1879,—a range of 269 inches.

The average of the daily variations was 8.86 inches, giving an average daily movement of .286 inch, while this average the last sixteen Decembers has been .263, with extremes of .190 and .329. The largest daily movements were .33 on the 25th, and .52 on the 11th, downward, and .50 on the 27th and 30th, upward; on four other days the movements were .42 to .46, showing large barometric waves. The month closed with a very high barometer, 30.73, the highest point, with one exception, in sixteen years. December 1, 1877, it being 30.90. The lowest point reached during this period was 28.70, in November, 1873,—a range of 2.10 inches. The mercury has fallen below 29 inches but five times in sixteen years.

The average yearly pressure in sixteen years has been 29.948 inches, with extremes of 29.83 in 1880, and 29.98 in 1879,—a range of .102 inch. The average daily movement in the sixteen years has been .184 inch, with extremes of .156 in 1877, and .211 in 1887.

ASTRONOMICAL PHENOMENA FOR FEBRUARY, 1890.

MERCURY is a morning star throughout the month, and is far enough away from the sun to be seen during most of the latter half of the month. It attains greatest western elongation on February 23, and is then nearly 27° west of the sun; but, as it is at the same time nearly 10° south, it rises only about an hour and a quarter before the sun. Venus passes superior conjunction with the sun on February 18, and changes from a morning to an evening star. It will remain an evening star for a little more than nine months, or until December 3, when it passes inferior conjunction and becomes a morning star. During the last half of the month it will be too near the sun to be easily seen, and at the end of the month it will be only 10° distant. Mars is getting into better position for observation. It is in quadrature with the sun on February 9, and rises a little before 1 A.M. on February 1, and just after midnight on February 28. It is moving eastward in the constellations Libra and Scorpio, and at the end of the month is only about 2° west of Beta Scorpii. This distance will be still smaller in March, as the planet passes within 8° of the star. The actual distance in miles of the planet from the earth is rapidly diminishing. On February 1 it is 134,000,000; on February 28 it is 89,000,000. At its nearest approach (on June 4) the distance will be about 8,000,000—only about one-third of what it is on February 1. Jupiter is now morning star, and rises about an hour before the sun on February 1 and about an hour and three-quarters before on February 28. It is moving eastward from the constellation Sagittarius into Capricorn. Saturn is in the constellation Leo, and is in good position for observation. It is in opposition with the sun on February 18, and rises at 6:30 A.M. on February 1. At the end of the month it rises before sunset. During the month it moves westward about 2° toward the first magnitude star Regulus (Alpha Leonis), and at the end of the
month is about 2° east of the star. Uranus is in the constellation Virgo and is moving slowly westward. Neptune is in the constellation Taurus, and is in quadrature with the sun on the morning of February 20.

The Constellations.—The positions given for 10 P. M. February 1, 9 P. M. February 15, and 8 P. M. February 28. Gemini is near the zenith, the principal stars, Castor and Pollux, being a little south and east. Canis Minor, with the first magnitude star Procyon, is on the meridian to the south; and below it is the 2nd magnitude star with Surius, the brightest of the fixed stars. Cancer is just east of Gemini, and Leo is about halfway from the eastern horizon to the zenith, while Virgo is just rising in the east. Ursa Major is high up in the northeast, and Bootes is below it on the horizon. Ursa Minor and Draco lie principally to the east and below the pole star. Cassiopeia is in the northwest, about the same altitude as the pole star, just west of the zenith is Auriga; below this and a little to the north of west is Perseus; and Andromeda is near the horizon, below Perseus. Taurus, with the groups of Pleiades and Hyades, is a little south of west, and below it are Ariës and Pisces. Orion is about halfway between Taurus and the southern meridian, the principal stars being at a little lower altitude than those of Taurus.

M. LAKE FOREST, ILL., Jan. 1, 1890.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

G. R. A., Missouri.—If water is cooled it contracts till a temperature of 39.2° is reached, and then expands to the freezing point. Now if the resultant ice is cooled, does it contract, or continue to expand?

Answer.—After water is once frozen, the ice acts like any other solid body, and contracts as the temperature diminishes.

G. B. D., Cassville.—How can sulphur be detected in spring water?

Answer.—A regular analysis is the only means of detecting small amounts, but the odor of sulphur will probably indicate its presence; for which it occurs—the best test for any appreciable quantity. This gas has a very offensive odor, similar to that of rotten eggs, which adds a few drops of solution of acetate of lead, and note if a dark discolouration or precipitate is produced, indicating the presence of sulphur, which should be made at the spring, as the gas rapidly escapes from the water when exposed to the air.

A. P. H., Maine.—Next to the diamond, what is the purest form of carbon?

Answer.—A diamond made lamplblack is almost chemically pure carbon, containing only a small quantity of hydrocarbon compounds.

G. D. N., Atalanta.—Can you give a formula of chemicals to be dissolved in water, and kept in bottles, for the purpose of extinguishing fires?

Answer.—Common water is the best of all substances for extinguishing fire, and the addition of chemicals adds very little to its efficiency. You can use common salt and rain water, but they will not be of much use.

D. L. P., Boston.—Hydrogen gas is occasionally formed in steam and hot water radiators, from the decomposition of water by the heat and inflammable gas, which was blown out of the air-valve of your radiator, was doubtless due to that cause.

B. J. C., Chicago.—Hydrogen gas has been liquefied, but it requires a pressure of 10,000 pounds to the square inch, and a temperature of 220° below zero.

Answer.—It is best and safest to use the gas in a cooker, as it is not explosive. When the gas is ignited, it burns with a blue flame, and is not explosive.

WARTS.

This most comprehensive work furnishes to students and practitioners of medicine a clear and complete idea of the rise and fall of diseases in English, French, German, and Italian medical literature. Including the Latin medical terminology. The editors have had the collaboration of the most celebrated specialists, and the result has been the most complete work of the kind ever published, and one that will be of the greatest service to all persons concerned with the medical arts. It gives the current tables of food values, expectation of life, weights and measures, and many others, add to the value of the work.


This slim volume, written in a clear, dry style, gives directions for the determination of many of the rarer elements, as well as those which have a commercial value. In drawing the line between "assaying" and "analysis," the authors have always given the benefit of the doubt, thus adding to the completeness and value of the work.


It is an elaborate, comprehensive work, containing various popular lectures and discussions before the Brooklyn Ethical Association. It is a systematic, concise, and comprehensive presentation in popular form of the laws and theories of evolution, and a careful summary of all that should be read by all interested in the subject, whether from a biological, sociological, or philosophical standpoint.

A. S. Barnes & Co., of New York and Chicago, publish a revised edition of Wood's Lessons in the Street Life of Our Cities, edited by Fr. Oliver R. Willis. ($1.00.) Dr. Wood's works on botany have always ranked with the best, and the present edition, fully revised and brought down to date, will be found a valuable textbook for classes, and also suited for botanical amateurs taking up the study by themselves.

P. Blackston, Son & Co., Philadelphia, announce Osborn's Massage and Swedish Movements, Deacon on Mental Diseases, and Humphrey's Manual for Nurses. They will also continue to publish the Ophthalmic Review, under the new editorship of Dr. Edward Jackson, of Philadelphia, assisted by a large number of eminent English and American ophthalmologists.

HERBACEOUS GRAFTING.—Annuals, or herbaceous plants, belonging to the same genus or natural family, says the American Agriculturist, will adhere and grow on each other as readily as do woody plants. Thus, a cannaflower will grow on a calla, a potato on a potato, or rice on rice. The garden cucumber will grow on the wild vines of the same family which are sometimes used for covering arbors. And these grow to an extraordinary length, while the garden cucumber seldom exceeds six or eight feet. This knowledge of grafting annuals may be utilized and made profitable, especially when the potato is forced to ripen seed by engraffing or grafting on the cucumber. Cucumbers may be grown on a high trellis, or around the upper-story windows of any building, by training one of the wild cucumber vines—either Sicyos angulatus, the single-seeded or star cucumber vine, or the Echinocystis or wild balsam apple, either of which grows fifty or sixty feet in a single season—up to the desired height. This is easily done by sowing cucumber seeds in the media, varieties in a flower pot, and, when the plant is six or eight inches high, joining it to one of these wild vines when it has reached the desired height. Merely scraping the bark of each and tying them firmly together with any soft material is sufficient. They will unite in about ten or twelve days, or sooner, and produce fruits at a height to which the garden cucumber never attain.

LITERARY NOTES.


It seems highly proper to devote a few moments to the consideration of these exceedingly common, decidedly ugly, and very obstinate, growths; and they more especially appeal for pathological and surgical consideration, since the various methods of treatment suggested by housewives and others, do not often effect a cure. Our correspondents have not hesitated to call attention to the offending growths, or, by appearing to remove them, establish a suitable nidus for the growth of superlum in the minds of the credulous; while in not a few instances means are employed for their removal which, while accomplishing this end, produce scars quite as unsightly as the warts themselves.

Various methods of treating warts are common, technically speaking, verruca, are papillary ex crescences of the true skin, due to hypertrophy and elongation of its papilie, together with hypertrophy of the epidermis, or scar skin. They occur on nearly all parts of the body, though the fingers and the hands are their favorite seats. When the papillae are prominent and their dermal covering so arranged as to render them distinct to the naked eye, the wart presents a slight or lobulated appearance and is known as the name of 'seed-wart,' or verruca lolaosa. The cause of these growths is unknown. A warty state of the skin is often produced in those who continually expose their hands to irritating fluids, or hot surfaces, or even to long continued friction, but this condition of the skin so plainly caused by one's occupation gives no clue whatsoever to the cause of the spontaneous involution and disappearance, as mysteriously as they came. These are the warts which yield so readily to the ridiculous methods of treatment which have originated in superstition and ignorance. That "charms" acting through the mind have no effect upon the ex crescences, we are not prepared to say. Carpenter, believing that they did thus in some instances produce their disappearance, and cited a case in one of his physiological works; and although we have met with persons who have told us that their warts disappeared in a week, after they had counted them and buried in the garden as many pieces of meat as there were warts, and others who were relieved of their warts by touching each one with a piece of brown paper which they afterwards threw over their left shoulder at sunset, we have also met with infinitely more with whom all charms have failed, and we are inclined to be quite as skeptical as Dr. John Mason Good, who in his Study of Medicine says, "they (warts) often disappear spontaneously, and hence are sometimes supposed to be charmed away.

What, then, are the means by which these growths can be destroyed? These are the liguere, the incisions, and the cautery. Of these methods, the first two are probably the best known, but are not to be recommended in most cases. The application of a liguere can only be effected when the wart is predubculated, and the slow tightening of the loop is at the best a painful process, while warts thus removed are quite apt to return. However, if the pedicle is narrow, and especially if the growth be upon the face or neck, it may be advisable to attempt its destruction by means of a disk liguere.
The removal of warts by excision with some sharp instrument, as a razor or bistoury, was formerly much practised, and is still the method of treatment employed by a few. It is, however, not usually to be advised, even though it may appear on the face of things to be a rational plan of treatment. The wound produced by the sharp instrument employed for the excision, usually heals at once without producing any degenera-
tion of the roots of the papillae and deeper struc-
tures, and these by continuing to enlarge and elongate, in not a few instances soon elevate their heads quite as high above the surface of the skin as they were previous to excision. Although the vital-
ity of these excisions is usually not very great, 
still considerable hemorrhage may be caused by thus cutting the enlarged vessels of the papillae. We would, however, recommend excision of peduncu-
lated warts, occurring upon the eyelids and other portions of the face, and the excision should be thus performed: Traction should be made upon the growth with a pair of forceps applied to its free extremity, and it is then snipped off as low as possible with a pair of curved scissors. For these warts this treatment is usually quick, thorough, and causes but momentary pain.

Warts can be destroyed by caustics, and although 
this is the plan of treatment most universally re-
commended, and is, in fact, quite efficacious, still it has serious disadvantages and can in no way com-
pete with a form of treatment yet to be described. The application of caustics is often attended with much pain, their action is exceedingly slow, they discolor the tissues to which they are applied, and, what is of more consequence, they not only destroy the wart, but when applied in sufficient strength and amount to accomplish this end, they also invade and destroy the surrounding tissues, thus producing a wound which in healing almost invariably leaves an extensive scar. If, however, the treatment by caustics is adopted, let them be properly applied. Pare down the wart with a sharp knife to the level of the surrounding skin and then apply some strong caustic,—as the nitrate of silver stick, or nitric, muriatic, or glacial acetic acid,—repeating the appli-
cation daily until the wart is destroyed. Care should be taken not to apply the caustic to the nor-
mal tissues.

These growths may also be destroyed by the gal-
van-o-cautery, or even the actual cautery, but in the experience of the writer, by far the best way of re-
moving all ordinary warts is by means of the der-
mal curette, or "sharp spoon." A rather large sized instrument should be employed. Its edge should be forced deeply around the base of the wart, which usually comes away with the production of but little pain and scarcely any bleeding, leaving a clean ulcer, which soon heals over, so as to form a smooth and uniform surface. By this means a large number of warts can be removed at one sitting. This is a favorite method of most dermatologists, and we could easily cite numerous cases which have been under our own personal observation to prove its efficacy. After the use of the curette, the result-
ing ulcers may be touched with the lunar cautery stick, or otherwise stimulated, but this will usually be unnecessary, as the curette itself usually produces sufficient irritation to the roots of the over-nourished papillae to cause their entire absorption. In detail of the dermal curette, these growths may well be removed by means of a stout pair of dressing forceps—such as is to be found in every complete sur-
geon's pocket-case. The wart is firmly grasped from above with the forceps, and twisted from its base. The therapeutic treatment of the common wart is so uncertain that we may dismiss it without further consideration. Dr. Verco reports a case in which a severe crop of these growths disappeared

rapidly during a sea voyage, but we can quote nu-
merosus cases in which they have persisted under similar circumstances. J. H. E.

A SIMPLE WATER STILL.

BY EPHRAIM CUTTER, M. D.

When one lifts the cover of a dinner pot or wash-
boiler, the amount of hot water that will drip from 
the cover is horizontally visible. Now this water is con-
DENSED STEAM.

The idea struck the writer, why not utilize this 
for procuring pure water for drinking use in places 
where the natural water is not potable, i.e., alkaline 
or salt.

Acting on this hint I made a sketch of a device 
to do this for a patient who went to live at Malad 
City, Idaho, where the water was alkaline, three 
years ago. I tested it at home on the kitchen range 
and it worked well. It was also tested with success 
in London, at 115 New Bond street.

DESCRIPTION OF THE STILL.

(A) Does away with the worm. (B) With the 
condensing water. (C) Condenses by air which as 
fast as heated passes off. (D) A reservoir of 
tinned iron, 1839 inches, with tight top, which fits 
into a kettle.

At the bottom is soldered a flange of tin flaring 
upwards. At B is a tube to lead off the water 
that condenses inside and runs down the sides.

The drops of distilled water are arrested during 
their fall through the air to receptacle, and becomes 
palatable, unlike ordinary distilled water, which 
goes from the still into the receptacle without con-
 tact with the atmosphere.

Fig. 1. One eighteenth actual size—is a section 
of the apparatus made in London to show the prin-
ciple. A B B' is a cylinder 0.9 inches in diameter, 
and 18 inches high, covered with a conical tight 
cap. D is kettle—any common pot or kettle will 
answer. E is a handle. F F' is a flange to fit 
the kettle or pot as seen in any cover to a dinner 
pan. C C' is another flange like F F', turned upside 
down, so that water condensed on the inside of 
A B B', and running down, may collect and run 
into a receptacle, H. The use is clear. Put water 
bad as it may be in the camp kettle D. Set on 
stage, roof, or fire, so that when A B B' is put on 
the kettle the tube B G may come over the recep-
tacle II. Then have a gentle fire so that steam will 
not issue from G. Pure distilled water will soon 
drip from G, which will be wholesome to drink.

NEW POINTS OF THIS APPARATUS.

1. It does away with a worm and cold water for 
condenser. It is found that there is a current of air
from all sides cooling the condenser. A B B', enough 
to give with this apparatus five pints in ten hours.

2. The distilled water of the chemist is known 
to be brackish, but this is due to the distillate being 
discharged in closed, or comparatively closed, ves-
ses. In the present case the water in drops falls 
through the air, and this presents a large surface to 
the atmosphere, with the practical result of an 
erated water like that of a spring.

3. The material should be tin-iron,—not 
zinc, which distills zinc oxide,—or may be of 
enamelled ware, glass, porcelain, crockery, clay 
pottery, etc. 

4. Variations.—Take a dinner pot, remove cover 
and fit a tin cylinder to cover eighteen inches 
long; at the other end put flanges and tube as above, 
and this will also do the work. The apparatus may 
be made collapsible, like the collapsible drinking 
cup. Liquids of a less boiling-point that water can 
also be distilled with this device, for example, 
alcohol.

Water produced by this process will be pure and 
clear as crystal. The importance of purified water 
is great. The late Consul General of Japan in the 
United States, Mr. S. K. Takahashi, told me that 
when cholera in Japan carried off thousands, none 
the Chinese died of it. He thought this immu-
nity was due to their drinking-water always being 
boiled and filtered. The highest medical official 
of the British army told me that when he had rain-
water, boiled and filtered, his health did not suffer, 
while ordinary water would make him feel unwell.

1130 Broadway, New York.

CHLORIDE OF AMMONIUM IN WINTER 
COUGH.

DR. WILLIAM MURRELL, of London, possesses 
high scientific attainments combined with a rare 
talent for getting up a new cough remedy every 
year. Terebene, apomorphia, syrup of tar, have all 
been recommended as marvels of therapeutic utility. 
For the coming winter, Dr. Murrell proposes to 
give us chloride of ammonium inhalations. This 
is not a new thing, but it is served in a little different 
style. Dr. Murrell, however, does not depend 
entirely on his wits, for he usually employs the 
chloride of ammonium vapors as a vehicle for 
using terebene, sandal-oil, or some other balsamic 
compound.

We rejoice to see that Dr. Murrell possesses not 
only an organ and observant mind, but that he 
has a sense of humor which adds much to the 
interest of his clinical notes. In illustration of 
the value of the ammonium inhaler, he cites the 
following case:

"N. B.—a general, retired. Is deaf. Has 
been deaf for years. Was in the artillery. Says all 
gunners are deaf, so that they never hear anything 
not good of themselves. Has strange noises in his 
ears. Dislikes any noise in a room, especially 
rattle of knives and forks at dinner. Prefers dining 
in the open air, and takes to it kindly. Chloride of 
ammonium used first alone and then with piloc. 
Purchased one for himself, and at end of month 
writes to say it has done him much good."

This is a report of a case full of practical sugges-
tiveness.

The following note is almost equally valuable :
"Miss A. W.—singer, contralto, often loses her voice, especially when she has an engagement. Cough and vocal cords healthy. Thinks symptoms partly due to nervousness. Voice uncertain, and apt to give impression of being wrong with an upper C. Uses the chloride of ammonia inhaled, and takes phytolacca assiduously for a couple of days before singing. Maintains that it does her good. Impossible to contradict a lady, so treatment continued."

We trust that Dr. Murrell's poliomyelitis had its therapeutic reward. The inhalations of ammonium should be taken once or twice daily, for half an hour at a time.—*N. Y. Medical Record.*

[Specialy Compiled for *Popular Science News.*]

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY W. S. WELLS, M. D.

Every surgeon knows how difficult it is in certain cases to get a broken bone to heal by bony union. The ends may be pegged and hammered and sutured indifferently without success. In the case of the radius there are oftentimes special difficulties, since resection—the last resource of the surgeon—leaves a gap between the end of the radius, which is shorter than the ulna beside it, and so it is almost impossible to bring the bared ends of the fractured parts into apposition and to keep them there. Even if a piece be cut out of the unfractured ulna, so that inequality in the length of the two bones is removed, a satisfactory result cannot always be obtained. In the *Loudon Lancet,* Professor McGill reports this case: A man, twenty years of age, had fractured both bones so that the ends of the radius protruded through the wound on the radial side of the forearm. The ulna healed quickly and well, but the radius remained ununited, although the ends had been refreshed and wired three months after the accident. Some eight months afterward he came to the hospital. He had a scar over the wound, and the ends of the radius were quite movable, the usefulness of forearm and hand being much impaired. An Esmarch's bandage was applied, and an incision was made in the line of the old scar. The ends of the bones showed no signs of union, but were ready for bony union. They were covered by a thin membrane-like peristomeum. When this had been fixed away, an interval of three-quarters of an inch was left between the fragments. This interval was filled with thirteen pieces of bone, each about one-sixth of an inch in length, chiselled from the femur of a freshly-killed rabbit. The bones were not wired. The skin wound was tightly stitched, without drainage, with catgut. A dressing was applied by means of sallaglyced wool and bandages, and the forearm was placed on an interior splint. There was no suppuration and very little discharge. The patient left the hospital in six weeks, with the bone firmly united. Three months later, the injured arm was as useful as the other. Is it not possible that this method used by Professor McGill might be of advantage in the treatment of old ununited fractures in other parts? It is possible that a more vigorous action might be set up, by presence of the implanted healthy bone, than would naturally occur in the fragments of a fractured long-bone in a person of feeble constitution.

M. Perrier, chief surgeon, and M. Patené, chief pharmacist of the Hospital Lariboisière (*Paris Med.*), have employed salol as a surgical dressing instead of lodoform, and have found that it gives a real impulse to the work of cicatrization, without causing any disagreeable sensation.

Thus in the case of a man suffering from an extravasation of urine, with gangrene of the parts, lodoform was used as a dressing for about six weeks without marked improvement, but as soon as salol was substituted healing took place rapidly.

Excellent results, much superior to those of lodoform, have been accomplished with salol in a great variety of surgical cases, viz.: Ulcers, epithelnomatous, mammary fistula and abscesses, abscess of the antrum of Highmore, abscesses at the anus, vestations at the vulva, caries of the sternum and the femur, etc.

Both agree that even laymen prefer it greatly to lodoform for two reasons, viz., its agreeable odor and its moderate price.

One great point dwelt upon them is its absolute harmlessness as far as toxic effects are concerned, which latter form a source of danger when sublimate, lodoform, phenol, etc., are used, while the antiseptic action of salol is deemed by them to be equally valuable.

A new diagnostic sign of abscess of the antrum was brought forward by Dr. T. Hereny, of Warsaw, at the Congress of Otolaryngology, held at Paris during September. The patient is placed in a dark room and his mouth lit up with a small electric lamp, placed above the tongue. Two bright red spots will then appear before the lower eyelids. If the cavities are filled up with pus, or occupied by a tumor, these red spots will not appear, but, as soon as the pus escapes or the cavity is washed out, the spots again become visible.—*Medical and Surgical Reporter.*

Borthwick recommends sulphonial for night sweats. In the majority of cases the sweating ceases after the administration of half a gramme (1/2 grain) of salol. He is of the opinion that the inhibitory action of sulphonal on the secretion of sweat is not inferior to that of atropine. Its action is so lasting that during the second night (without sulphonal) perspiration was less profuse than before the Institution of the treatment.—*Jour. de Med. de Paris.*

Sahlé and Nencki, in a discussion before the Medical Society of Berne, recommended the use of salol in cases of diabetes, on account of the carabolic acid it contained. Dr. Mundel, Milwaukee, has used salol in three cases of diabetes during the past year, and found at the expiration of that time that the sugar in the urine had entirely disappeared. Dr. Mundel prescribed 0.5 Gm. (1/2 to 2 grains) four times daily.

Dr. William Perry Watson, from observation of thirty cases of enuresis, feels justified in saying that in sulphate of atropine we have a remedy which, when given to its full physiological effects, is unequalled in our materia medica.—*Medical Bulletin.*

A French physician relates a case in which a boy of fourteen suffered from persistent bleeding after the extraction of a molar tooth. Perchloride of iron was without effect, and so much blood was lost that syncope was induced. On recovery, the hemorrhage again broke out, and perchloride of iron was once more tried, but vainly. The cavity was then plugged with two or three pledgets of lint steeped in solution of antipyrine. The bleeding at once permanently ceased. It was noticed that while the perchloride caused severe pain, the antipyrine was not objected to. It is suggested, not improbably, that the antipyretic action of this and similar drugs may possibly be due to the fact that they diminish the blood-supply by their irriugent effect on the blood-vessels.—*Öhlo Journal of Dental Science.*

Cholewa recommends for the treatment of furunculosis of the external meatus, a twenty-per cent. solution of oil of menthol, introduced into the meatus by means of firmly twisted rolls of cotton, which by their size exert a gentle pressure upon the inflamed surface. The action of the remedy is not only antiphlogistic and analgesic, but, above all, antibacterial. The staphylococcus aureus, which, according to the investigations of Garre and others, causes the formation of furunculus, does not develop in nutritive substance which has been slightly impregnated with solution of menthol oil (0.5 of menthol: 9.999.5 aqua.) As soon as the coccus comes in direct contract with the solution, it dies quickly; even the vapor of menthol is sufficient.—*Centralblatt f. d. Med. Wissen.*

The following formula is suggested in *La Clinique* with the view of facilitating the removal of accumulations of wax in the external auditory meatus: R. Acid. borici, gr. Iv. Glycerini, f. 15 s. Aque dest., f. 15 s.

This should be warmed and instilled into the ear, leaving it there for a quarter of an hour, and repeating the process for a day or two. The result is to soften the plugs and make their removal comparatively easy by means of the syringe.

Dr. Geo. H. Powers, San Francisco, Calif., writes: In reading an article on "Death from Chloriform," I notice the absence of the one antidote on which I most rely, namely, nitrite of amyl. I always keep it ready for use in my office, and carry it with me when I use chloriform elsewhere, and find it of great value, in cases where chloriform does not act so kindly, in restoring the heart's functions. In the exceptional cases when cocaine causes faintness and collapse, a few inhalations of nitrite of amyl quickly restore a normal condition.—*N. E. Medical Journal.*

Dr. Konostein, (Medical Press), while giving directions in his clinic for the uses and prescribing of spectacles, said that green grass, as a protection against strong rays was worse than useless, and did more harm to a sensitive eye than good, as it allowed the yellow rays to be transmitted, and unnecessarily irritated the eye. Against strong rays the blue or smoked glasses were the only real protection. The blue should be light, as a deep blue color produces a clear violet disk in the center of the lens, which apparently corresponds to the fovea centralis, and by a protracted use of dark-blue spectacles the patient may become annoyed by the mosaic work of the fundus of the eye appearing before him. The phenomenon seems to be connected with the pigmenting changes in the macula lutea.

Hitherto it has been deemed permissible to add soda bicarbonate to milk to assist in its preservation, but now the Council of Hygiene of the Selne has condemned the practice as one of danger. The transformation of milk-sugar into lactic acid, in milk so adulterated, gives rise to a lactate of soda which is purgative, and frequently a source of almost uncontrollable diarrhoea in infants. Conse- quently, Dr. H. M. gives this advice: "Soda shall no longer be permitted in milk, which is an aliment of the first order, and very often prescribed for invalids and children."

According to the *Pharmaceutical Record,* comparative examinations of many mouth-washes show that those containing thymol as the disinfecting agent of the mouth-cavity and teeth, are to be
PARASITICIDE Ointment.
Sessile lute of mercury, 16 grains. 
Vaseline. 1 ounce.—M.

This makes not only an excellent ointment against the parasitic skin diseases, but against eczema, pityriasis, and syphilitic vegetation.—L. UNION MEDICAL.

An excellent ointment for red hands (Phys. Exe.) is the following:
R. Lanolin, 100 gm. 
Paraffin (liquid), 25 gm. 
Vanillin, 0.01 gm. 
Ol. rose, ggt—J.

The Parisians apply a thin coating of this at bedtime.

A UNIQUE PRESCRIPTION.

A paper printed in Krausenbarg, Austria, on the occasion of the recent celebration of the centenary of Cardinal Haynald, relates the following story on the authority of one well acquainted with those who know the reverend gentleman and were familiar with the circumstances:

Haynald, Bishop of Siebenburg, stopped, on his return from a confirmation tour, at a small place named Torda, and, being detained a day longer than was expected, his secretary, Lonhart, found to his dismay that they had not enough money to pay the hotel bill. Now a bishop cannot very well run away without paying what he owes, nor does his sense of dignity permit him to plead even temporary pecuniary embarrassment. Still, the bishop managed to avoid either dilemma. He sent a waiter to the apothecary of the place, a Mr. Gabriel, with whom His Grace was acquainted, with the following recipe, which has since been preserved by the several successive proprietors of the establishment:

R. Nalum astrinuntum Nuxeo Duceano.
D. S.—For one day's use only.
Dr. Haynald.

The druggist's clerk, being somewhat rattled by the sudden interruption of his sleep, tried in vain to understand the nature of the prescription, and after fruitless consultation of his works of reference, weakened his employer, who, after reading the prescription, sent his clerk again to bed, and said he would himself prepare the prescription. He put 200 guilders in notes into a powder box, duly sealed, labelled, and inscribed, and sent it to the bishop, saying to the messenger that in case the powder should not be sufficient he would be glad to send a second dose. This, however, was not necessary, and the first dose, after "one day's use only," was returned with thanks.—Am. Druggist.

MEDICAL MISCELLANY.

Chinese Pills.—Chinese pills are said to be just the size of crab apples, and are coated with a semi-transparent sugary substance covered with flowers and glit letters. But it must take an unusual amount of moral courage in a Chinnaman to tackle a pill.

An extensively advertised "Microbe Killer" is said by the Western Druggist to be composed of 4 drachms of oil of vitriol, 1 drachm of muriatic acid, 1 ounce of red wine, and a gallon of water. The dangerous nature of this stuff is evident from the above formula.

The turnkey of the Peoria jail, according to the Medical World, has a cure for delirium tremens. He rubs the patient with capuscum; and in the enthusiasm and singleness of purpose with which the latter scratches himself he has no time to think of snakes. One day of this treatment is sufficient for any ordinary case.

New Use for Stale Bread.—A safe, sure, and certain cure for corns is said to be found in a poultice formed of stale bread soaked in strong vinegar. It should be applied at night on retiring. In the morning the soreness will be gone, and the corn can be picked out. Stale corns may require two or more applications.

The Tendency of the Times.—"Who is your family physician, Freddy?" asked Mrs. Hendrick's of the Brown boy. "We ain't got none," said the boy. "Pa's a homeopath, ma's an allopap, sister Jane is a Christian scientist, grandma and grandpa buy all the patent medicines going, uncle James believes in massage, and brother Bill is a horse doctor."

A NOVEL PLANT.—Miss Bacon (they have been discussing orchids) "And now, professor, I want you to tell me about the plant from which electricity is made."
Professor Hohenhuth (aghast) "What the?"
Miss Bacon: "You certainly must have heard of it. Father says its high cost prevents the general use of electric lighting—I mean the electric plant."

CIGARETTES.—Mr. Willis G. Tucker, in his report to the New York State Board of Health, on the result of his examination of various popular brands of cigarettes, says that careful analysis of tobacco and paper failed to reveal any poisonous ingredients, other than the tobacco itself, and that most cigarettes contain pure tobacco and good paper. The evils of cigarette smoking are due to the fact that cigarettes are cheap, convenient, and can be used in large and excessive quantities, that the smoke is usually inhaled, and that children and immature persons freely use them.

A BULL IN A CHEMIST'S SHOP.—Recently, says the Liverpool Courier, the inhabitants of the usually quiet suburb of Fairfield were treated to a sensation of a novel description. About one o'clock in the afternoon a herd of cattle were being driven from Liverpool to Stanley, via Prescott Road. By Elm Park a huge specimen of the bovine species bellowed, and evidently feeling unswell, rushed into the nearest chemist's shop—kept by Mr. R. Jones. Once inside the shop his bullish condition threatened a number of accidents, and the ring of Hengler's Circus, would have made a fortune for its owner, but which in the circumscribed arena of a druggist's establishment, although doubtless, somewhat entertaining to the other onlookers, was not quite appreciated by the proprietor of the shop. Having upset three tables, smashed about two hundred bottles containing eau de Cologne, paregoric, aniseed oil, spirits of niter, St. Jacob's Oil, and other ingredients, the bull rushed at another case which contained a number of drugs, amongst others a large bottle of aetic acid, and another of nitric acid. These he likewise knocked on the ground, upsetting the contents. Some of the nitric acid got on the bull's nose and feet, which caused him to bust a speedy retreat into the street, where a centrally he was captured by six men, and dragged off to Stanley cattle market.
**Familiar Science.**

**FIRE.**

What is fire? We fancy that few persons could answer, this question off-hand, although the phenomenon of combustion is perfectly familiar to everyone. The ancients considered fire to be one of the primitive elements, like the earth, air, and water,—all of which last we now know to be compound and not elementary substances,—and this idea of an elementary fiery principle survived under the names of phlogiston, caloric, etc., down to the time of Lavoisier, and was not entirely overthrown until after the beginning of the present century.

We have, in the preceding paragraph, spoken of fire as a phenomenon, and that is exactly what it is. Fire is not a substance; it is not even an immaterial force, like light or heat; but, as generally understood, is simply the sensible phenomena of light and heat resulting from an intense chemical reaction,—generally, but not always, a process of oxidation. We may dissolve a piece of zinc in sulphuric acid, by itself, or do the same when it forms a pole of a galvanic battery; or we may heat it until it bursts into flame. In all these cases the process is a similar one,—that of oxidation,—but fire accompanies the process only in the last. There the oxidation takes place so rapidly that the heat set free is not only sufficient to be detected by our nerves of sensation, but the resulting particles of zinc oxide are heated to such a degree that they become luminous. So if finely divided metallic iron is exposed to the air, it gradually absorbs oxygen and is converted into rust. But if the same iron is ignited with a match, it takes fire, becomes luminous, and is converted into a similar oxide, or rust. Just as much heat is set free in one case as in the other, the only difference being in the rapidity of its development, which determines whether or not it shall become evident to our senses. When hydrogen and oxygen gases are burned together, as in the oxyhydrogen blow-pipe, the resulting flame, although one of the hottest known to us, is almost invisible, and to the eye alone there is no appearance of fire; but introduce a piece of metal, or a lump of lime, or other refractory substance, and the brilliant luminous phenomena at once indicate the intensity of the chemical combination which is taking place.

Fire is not always dependent upon a process of oxidation. A mixture of iron filings and flowers of sulphur is readily ignited, forming ferrous sulphide; and sodium, potassium, copper, and some other metals readily burn in the vapor of boiling sulphur, giving rise to the same igneous manifestations as when they combine with oxygen. Nitrous oxide, or laughing-gas (N₂O), also supports combustion, although the reaction is one of true oxidation, the same as with pure oxygen or air.

A very important distinction must be drawn between fire and flame; the latter is merely an incidental manifestation of the former. Burning charcoal simply glows and wastes away; there are no combustible gases formed, and the chemical reaction takes place only on the surface of the coals. With wood, oil, wax, tallow, etc., the heat produced by the oxidation sets free from the un consumed portion, a large quantity of hydrocarbon gases, which take fire and burn at a distance from the original burning body, exactly as the gas which we burn in our houses is driven off by heating the coal at the distant gas-works. If we burn a piece of magnesium, flame is apparently present, but it is only the incandescent particles of oxide as they fly off into the air at a white heat. A similar artificial flame may be made from charcoal itself by finely pulverizing it, throwing the dust into the air, and igniting it. Serious explosions have occurred by dust igniting in this manner, but such phenomena are not, strictly speaking, true flames, which are only produced by the combustion of gases.

A word should be said in reference to electric lights, which are simply masses of carbon heated to an excessively high temperature. There is no true fire or oxidation about them, but a transformation of electrical energy into heat and light. There is an oxidizing process at the foundation, however, and the heat of the oxidizing carbon in the furnaces under the steam boilers which furnish the power to drive the dynamo machines, is just as truly transferred through the wires to the distant electric lights, as the water from the pond or stream is transferred through the pipes to the dwellings of the city. In one case it is the transference of energy, in the other that of matter.

The knowledge of fire is a distinctive attribute of mankind. No ape, however intelligent, has been found but what regards it with terror, and no race of men with, perhaps, one or two doubtful exceptions—but what enjoys its numerous benefits. It is hard to say how it was first brought to the knowledge of mankind. The Greeks considered it a direct gift from the gods; but, disregarding that belief, the lightning-stroke; the volcano, an accidental spark, from the striking of a stone, falling upon dry leaves, or even, as has been suggested, by a drop of gum exuding from a tree acting as a natural burning-glass,—any or all of these causes may have introduced this useful but dangerous servant to mankind. Once discovered, the knowledge seems to have been carefully preserved, and the art of producing fire has advanced through the fire-sticks and drills of the savage, to the flint and steel, and friction matches of later times, until in this modern age of electricity a touch of the finger is sufficient to produce an electric spark, which will instantly ignite the fires and gas-lights of the largest building, or, if desired, those of an entire city.
EXTRAORDINARY HAILSTONES.

On the 9th of June, 1867, there was a fall of hail at Bjeloi-Kliusche, a village lying to the southwest of Tiflis, in which the hailstones occurred in the remarkable crystalline forms shown in their natural size in the engraving, (first published in the London Nature.) The drawings were made by a Russian professor residing at Tiflis, but, for some reason, have only recently attracted the attention they deserve. They consist of a central nucleus, surrounded by large ice-crystals somewhat resembling those of quartz, and, like that mineral, belonging to the hexagonal or rhombohedral system of crystallization. It has been suspected that water is dimorphic, and sometimes crystallizes in the triclinic system, but the supposition has not as yet been confirmed.

The most remarkable point in connection with the hailstones, is the fact that, judging from our present knowledge, a very long time must have been occupied in their formation. As a general rule, the larger and more perfect a crystal, the more slowly it must be formed; and we cannot understand how so heavy a body as a hailstone can be supported in the air long enough for the crystallization to take place so perfectly. We must admit either that these stones were formed under the influence of natural forces or conditions still unknown to us, or that, in certain circumstances, aqueous vapor or water may be solidified into large crystals, with the rapidity with which we should naturally expect to occur in the sudden condensation of moisture in the upper air. The genesis of hail is still an unsolved meteorological problem, and presents so many difficulties that one scientist was driven to the theory that hailstones were of interplanetary origin, like meteors. This remarkable hypothesis, however, only brings up the still greater problem as to how the hailstones could enter and pass through the atmosphere without being instantly dissipated in vapor by the heat evolved, as shown by the extreme temperature to which the meteors themselves are raised in the passage. The actual cause and method of the formation of hailstones must be left for future students of meteorology to discover.

manufacturing the arms, etc., broken objects are often found which have been brought to the spot to be mended. Only, in order to diminish the risks of fire during the operation of smelting, an especial place outside the palafittes was reserved for this work. At Moerigen and at Auvernier Dr. Gross found all the apparatus of workshops in a space of a few square metres.

The discovery of the workshop foundries of the Lacustres is recent. Until this time it was believed that the elegant objects in bronze were imported; but gradually, as the archaeologists pursued their researches, Moerigen and Auvernier, then Estavayer, Cortaillod, and Careclettes, one after another, revealed the presence of the foundries on the palafittes. The moulds for the objects we see in the museums, of pins, bracelets, hammers, rings, pendants, lances, and knives, are found in these workshops; also the tools used for hammering the metal. The stations of the age of Bronze, unlike those of Stone, all existed at the same time. Hammering and smelting of metal belong to the same period, some objects being found which unite the two methods of workmanship.

With the introduction of bronze, palafittes ceased to exist in the eastern lakes; but in the west, the practice of building on the water continued into the beginning of the Iron Age. The number of stations, however, diminished. Proof is given in the Lake of Bienné of thirteen villages of the age of Stone to two of Bronze. The same comparison exists in the lakes of Morat and Neuchatel. But the stations of the age of Bronze are less numerous, are far more extensive than those of the Stone periods. They are constructed farther from the bank,—two or three hundred yards, instead of one to two hundred,—and occupy a large area. The piles are larger, better preserved, higher above the level of the soil, and cut into form—often square. Between these piles is a treasure trove of pottery, fine vases having been found entire.

The discovery of the first bit for a horse, at Moerigen in 1852, was a great event in the archeological world. At first its authenticity was doubted, but when the same station produced a bit made in one piece,—a true chef d'ceuvre of metalurgy,—further incredulity was impossible. At Cortaillod, in 1862, a very large bronze wheel was found. Archaeologists looked upon it as a symbolical object, considering it unlikely that a people dwelling on lakes would have use for chariots. However, as the Bonnae stations were further developed, the richest beds furnished skeletons of entire horses and more than twenty bits. The museum of Lauzanne has one of these bits—a particularly fine specimen—among its treasurers.

The moulds in which the various bronze objects were made are almost as interesting as the objects themselves. The majority are made of gray moulds stone. They are double, and have the pattern traced on each part. Some are found in clay, and a few of bronze. The swords and knives of bronze are not only elegant in shape, but are covered with graceful designs, all of which, however, are more or less geometric, for the Lacustres do not seem to have taken any ideas from the kingdom of Nature nor from the animal kingdom.

It is certain that they knew steel, since some of the arms are made of this metal, and they made use of it in engraving patterns on the hammered jewelry. Lead, almost unknown hitherto in a pure state, has been found at Auvergne, in the form of a granular mass weighing 1,700 grammes; while a large mass of tin is formed by a ring of bronze, and weighing 1,800 grammes (about four pounds), was discovered at the same spot. Hence it is proved that metals—copper and tin especially—were imported by the Lacustres, and used them for the manufacture of their bronze objects.

Among the curious articles that this period furnishes are tubes of bronze, which reminded an enigma to the savants until the discoveries on the Tene—the great station of the Iron Age—proved these tubes to be needle-cases, some being found there enclosing the needles. The rattle for babies, too, remind us that "there is nothing new under the sun;" they are made of a hollow bowl of bronze or clay, in which are bits of metal or stone, the
handles being of wood. Clasps for belts or heavy garments are massive, beautifully chased, and inconceivably expensive. Among the ornaments of this period—the ear-rings, bracelets, and pendants—are found in amber (brought, probably, from the shores of the Baltic), glass (blue, yellow, and white), and even in gold.

But, leaving the wealth of metal objects which catch the admiration and surprise at every moment, and our appreciation of the ingenuity and skill of the workman of this prehistoric race, let us pass to the ceramics and see what progress the potter of the Bronze period has made over his brothers of the preceding ages. It is evident that pottery has now approached a fine art. The shapes of the vases are so graceful and perfect that some of them can rival those of the Roman ceramics. Utensils, dishes, cups, and plates are all more or less flat at the bottom, while vases and goblets are sometimes round or conical, necessitating some kind of stand to place them in. A few specimens are supported by feet; others have one foot, enlarged at the base and hollow inside, always decorated with tastes, very fragile and easily broken. Triple vases are among the curious diversities of shape, being composed of three vases identically alike, joined by clay cylinders, perforated so that there is a communication between them. In certain tombs in Prussis (Laussitz) and in the ruins of Troy, analogous vases are found. Do we not find the same idea, too, in the baskets of the Japanese? Vases vary in size at this period, from the colossal, to the tiny things (apparently playthings for children) no larger than a nut.

The ornamentation of the pottery, as that of the bronze implements, is geometric—series of lines traced in different ways, or grouped with artistic skill. Triangles, concentric circles, wreaths jutting out or hollowed in the clay, are among the most beautiful of the designs. Here and there the cross is met with, especially on the bottom of certain little vases. The custom of coloring vases in yellow, red, or black, belongs only to the end of the Bronze Age, therefore specimens are very rare. The best of these was found at Moergestel. It has a form of large open dish, whose interior is covered with geometric designs, artistically colored in red and black. The pots employed for scrippling to rub the surface of the vases, but some pieces present such a polished exterior as could only be obtained by means of varnish. Moulds were used instead of the potter's wheel to shape the vases, and, in some cases, thin bands of metal, kept in place by resin, were bound around the outer edges for ornament.

The use of bronze, or using the kingdom of Nature as a model for ornamentation seems to have occurred to the Laucutres, they seem to have tried their hand at modelling. Little statuettes of pigs, moles, and ducks have appeared, the latter being very interesting, since instead of feathers, the artist has glued little pieces of tin to the clay. As all the palatines were destroyed by fire, it is not unusual to see several objects—bracelets, hatchets, and ladles—lying in a kind of combination though golded together by the heat to which they have been exposed.

In order to arrive at such a high degree of culture, which includes a technical knowledge very astonishing at this epoch when individual development was confronted with such great obstacles; it must be granted that the pre-historic race was well endowed, both as to intelligence and ingenuity. Nor were they lacking in surgical skill, one would premise, for a skull was found in Dr. Gross's presence, at nearly two metres depth of soil, which had a round opening in the occipital region of three inches in diameter, which by analogy is identical with the operation of modern days termed "trepanation." The practice of "trepanning" has already been proved in several places, though this is the first and only instance as yet discovered among the Laucutres. Dr. Prunieres, of Lyons, was the first to draw the attention of archaeologists to this point, in determining the numerous skulls bearing traces of this surgical operation. It is clear that the development of the tombs of the Lozere.* Dr. H. Waukel de Blansko (Moravia) has found a skull, presenting the resection of the greatest part of the occipital bone, in a tomb near Olmutz.

But the "beautiful Bronze Age" had its limit. It must have been a past age long before the men of iron weapons occupied the banks of the lake. History had not begun for us by the advent of the Romans when the last palatinate of the Bronze Age was destroyed; therefore we cannot know why the beautiful cities were thus desolated. It is almost too much to hope that further researches can throw light upon this disastrous close to an age of remarkable development.

*Doublet remains. — [Original in Popular Science News.]

EGYPTIAN LANGUAGE AND CHRONOLOGY—CHARACTERS OF EGYPTIAN INSRIPTIONS—THE ROSETTA STONE

By Joseph Wallace

The history of the development and decay of the Egyptian language has not yet been authentically established. Only four distinct graphic systems—Hieroglyphic, Hieratic, Demotic, and Coptic—can be safely confined within chronological limits. The time of the development of the old and full hieroglyphic writing is unknown. It was perfectly understood and freely used in the third and fourth dynasties, which would render it probable that the date of its discovery must be placed earlier than 3,000 B.C. There were thirty-one dynasties which reigned successively in Egypt, numbering upwards of three hundred kings. The total number of years between the reigns of Mene and Nectanebo II., (about 350 B.C.), the last king of the thirtieth dynasty, who was succeeded by a Persian, was 535 years. This succession, though the longest hitherto established anywhere in the world, is now, also, the best authenticated. It is based upon the lists of kings and their reigning years, and these lists are corroborated and elucidated by contemporary monuments up to the fourth dynasty, with only slight breaks in the chain. The era of Menes, according to Bunsen, was 3,643 B. C. Lepsius makes it 3,883; Brugsch, 4,453; and, according to a recent calculation, 5,004. The date of the hieroglyphs among Egyptians, although rather the first seventeen dynasties succeeded Menes were consecutive. It is maintained, however, by the latest writers, that the dynasties were, with some exceptions, consecutive, and that the kings enumerated reigned over all Egypt.

The use of hieroglyphic writing was not confined to the Seven Principal Cities of Egypt. We believe on the authority of the Greeks, but employed by all. Though shorter methods of writing were afterwards devised, the hieroglyphic or pictorial representations of the language continued in use for important state documents, inscriptions, and religious compositions. It was accompanied by transcriptions in demotic and Greek down to the Roman emperor Decius, and, if Lenormant's researches are correct, so late as the usurpation of the government of Egypt by Achilles, who was put to death by Dioctetian, A. D. 296. The spread of Christianity in Egypt caused a proscription of hieroglyphics, because they are considered as the symbols of idolatry.

The wants of a reading and writing nation led at an early period to the use of linear hieroglyphics in long documents, which subsequently developed into a cursive hand, called the hieratic.

"The great body of the Egyptian literature," says the learned oriental scholar, Rev. John Thein, "has reached us through this character, the reading of which has been resolutely resisted by the Egyptians, who have endeavored to assimilate it into its prototype hieroglyphics. It is not possible to fix the time of the first use of hieratic writing, but from the actual preservation of several hieratic papyri of the eleventh dynasty, presenting it as a perfectly distinct and well developed mode of writing, it is safe to conclude that it must have come in use earlier than 3,000 B. C."

The demotic denotes a rise of the vulgar tongue into literary use, which took place about the beginning of the seventh century B. C., when it was brought into fashion by the great social revolution in the reign of Psammetich. The oldest papyri found, which is now in the Turin museum, dates from the forty-fifth year of his reign, or 620 B.C. The demotic was used to transcribe the hieroglyphs and hieratic characters; it varied much in form from the latter; and, perhaps, is—through the translation from the obsolete and difficult demotic to the more intelligible coptic alphabet. Demotic words were occasionally transcribed in Greek letters, pure coptic occasionally in the demotic characters, and, again, demotic in Greek letters, with the sounds not found in Greek, preserving their vowel quality, which was not otherwise written. The coptic is the exclusive character of the Christian Egyptian literature, and marks the last development or final decay of the Egyptian language, which became almost extinct in the last century, and made way for the Arabic.

The learned men of the last century who gave their attention to Egyptian writings, naturally consulted the ancient Greek and Roman writers, and consequently were led astray. All the ancients agreed in speaking of the hieroglyphic system as hieroglyphic. They even gave the meaning of a few signs which are common in the inscriptions, and seemed to be well informed as to their interpretation. As the hieratic and demotic characters appeared more cursive and better suited to the transcription of long documents, they maintained that by means of them the same language was written in letters representing sounds. The writings of Kircher during the seventeenth century, De Guignes and Koch in the eighteenth, and, later, those of Zoega, were based on the opinions of the Greeks and Romans, and consequently failed to throw light on the language.

The Rosetta stone, discovered in 1799 which had the effect of changing the whole texture of the ancient speculations on the Egyptian hieroglyphic writings. A French engineer officer, M. Brossard, while throwing up earthworks at Rosetta (Busaid), discovered a large black slab of stone, somewhat mutilated, with an inscription in hieroglyphic, demotic, and in Greek. The victory of the English over the French in 1801 cost the French ambassador, Sir William Hamilton, who deposited it in the British Museum. By this accident, a text was discovered, which the Greek version stated was an inscription of divine honors to one of the Pharaohs, and that the hieroglyphic and demotic versions were transcriptions of the Greek text.

Although this was a very important aid to the Egyptologists, and a hopeful suggestion to a successful solution of those mysterious characters which defied the learned of all nations for many centuries,
the difficulty still remained of determining the value and sound of each character. It was observed that about the place corresponding to the name Ptolemy in the Greek version, there was in the hieroglyphic inscription an oval ring enclosing a group of characters. This ring suggested many ideas, but, on further researches, it was observed that a long series of sitting figures on the temple of Karnak had also such rings placed over them, apparently indicating their names or titles; therefore, it was conjectured that this ring was the sign which indicated the proper name.

Champlisson discovered that the Greek proper names on the Rosetta stone were arranged phonetically in the demotic version. These results were obtained by guessing that a group occurring in almost every line was the conjunction; that a group repeated twenty-nine times in the demotic version corresponded to king in Greek, when this word occurred about the same number of times; and for the words Alexander and Alexandria in the fourth and seventeenth lines of the Greek, this was the early close parenthesis in the second and tenth lines of the demotic.

The next difficulty was to determine the order in which the characters were written—which might be as in Hebrew from right to left, or as in modern systems from left to right. This point was soon settled by Champlisson. Mr. Banks brought a little obelisk, found by the Cape of Phœnix, which was inscribed with a dedication in Hebrew and Greek to Ptolemy and sister, Cleopatra. This inscription was copied by Caillían in 1816, and commented on by Lepronne and Champlisson in the French scientific journals in 1822. There was a ring identical with the ring for Ptolemy in the Rosetta stone, and another for Cleopatra. By a fortunate coincidence, these names were in the same order; and from this and other similar analogies, it was concluded that the inscriptions were in the same language, and Champlisson was in possession of eleven phonetic signs of the old Egyptian language. It now became plain that in this case the signs were not syllabic, but alphabetic. Applying them to monuments which had been supposed to be of the Roman period, it was shown that the outside storm which has been observed since that time, and attempting to decipher the royal rings upon them, Champlisson found an almost ample list of Roman emperors, each with his title, emperor, added; and this title became a clue to all similar inscriptions.

[Original in Popular Science News]

WHAT THE WINTER WOODS AFFORD.

BY PROF. W. WHITMAN BAILEY.

It might seem as if the student of Nature would find little to do in the depths of winter. He has, however, many occupations. In the first place, if he is a collector, there are all his summer stores to examine. Often, as he turns them over, he is led in imagination to the spot where he found them. Suppose it is a set of plants he is viewing. Each specimen will recall to him pleasant scenes and delightful companionship. The outside storm which has been long a voice for him: he is in the woods with his pets, breathing sweet perfume of leaves and flowers, listening to the merry birds, or chasing gilded butterflies. The memory of the noontide halt comes back to him; the little spring, half buried in moss and fringed with ferns, the over-arching birches, and the “chequered shade” in which he reclines.

But even now, cold as it may be, he who walks with his eyes open will see much in the forest that is worth possessing. The hazels, alders, and birches, the sweet-pine, poplars, willows, ironwood, hop-hornbeam, etc., have all winter seen their tassels. They are closely compacted now, each scale closing over the minute flowers, but at home we can coax out some of them in water. It is always a delight to see them evolve,—the light, pendulous, graceful “tages” of alder are an especial joy. It is a not unusual thing to see the silver-leaved maple (Acer argyrophyllum). There are more than one in the eastern woods, and is known at this season by its exfoliating bark, and the pendulous habit of the branches.

Crocuses and snow-drops sometimes shiver into bloom on sunny banks before the calendar mentions spring. It is not so astonishing after all. Do not the most delicate of plants embrace the feet of snow-drifts in the Alps? On the top of Mount Washing-ton, when the tourist is hugging his overcoat orshawl about him, the little Arenaria is fluttering its white blossoms in the gale. By the Lake of the Clouds, fed by icy streams, which one hears murmuring under the rocks beneath him, there grows a perfect garden of flowers. Moses and lilies we have ever with us, clothing the rocks, encrusting the trees, spattering the gravel-stones, or even perching in their branches. These are the precursors of higher life—living chapters, as it were, of that old history which antedates the coming of man. Trees, ferns, that tell of the Carboniferous period, do not, after all, inspire one so much with awe as these Paleozoic forms. Then, how beautiful they are!

Among mosses the student will find miniatures of palms and spruces. The Polypodiunm, indeed, will show us a little pine forest, or a further stretch of the imagination will convert the clump into an army of pygmy spear-men. Do the breezes, we wonder, sing in the tiny foliage that sad song that the sombre trees have learned from old Ocean?

There is no time so good as this for learning the actual shape of the trees—when they have, so to speak, left off their corsets. Look at the spike of that maple, the fountain-spray of that elm, or the dark silhouette of yonder rounded horse-chestnut. Break off a branch, tack it to a white wall, and sketch it. What a study of light, and shadow, and form! You will discover beauties of which you never dreamed. Open the buns, so neatly packed in tarpaulins and wool. Here are little leaves, or flowers even, that one feels to be a human pang at having revealed them prematurely.

Life is dormant about us; but, after all, it is life. The gray trees are no mere skeletons. Ere long their opening hands will beckon us to the woods.

BROWN UNIVERSITY, PROVIDENCE, R. I.

SCIENTIFIC BREVITIES.

AN ECONOMICAL BATTERY.—M. Jablückoff has furnished the Societe des Ingenieurs Civils with the models of a new primary battery consuming iron, which he fondly believes will supplant the dynamo. The battery is said to be interesting from a theoretical point of view, but M. Hospitalier, in a note to the “Bulletin” of the society, states that on the accuracy of the figures given by M. Jablückoff, who neglects to give the E. M. F. and consumption of the battery, though he states the cost to be two to three cents per horse-power per hour.

FRUIT BLOSSOMS.—A chief cause of unfruitfulness is the imperfection of the floral organs of many of our fruit trees. In this particular the Russian fruits are far superior to most of those of western Europe. Nothing gives a better idea of life in the country than the fact that they are mostly vigorously self-fertilizing, and bear full crops on solitary trees. Yellow Transparent, Tetofsky, Oldenburgh, Longfield, Antonovka, Switzer, Titus, Proflite Sweeting, St. Peter, Alexander, and many other Russian apples, are sure croppers for this reason, and large croppers, too. Russian crosses will greatly benefit all our tree fruits, by infusing their wonderful vigor into their progeny.

A VARIABLE STAR.—Professor Vogel, the German astronomer, has recently made an interesting demonstration of the existence of a companion to the big variable star Algol, from photographs of the star’s spectrum. Algol is brighter and thirteeen times as large as the earth, but suffers a partial eclipse at short and regular intervals, when it loses about five-sixths of its brilliancy, and falls from a star of the second magnitude to one of the fourth magnitude. Professor Vogel demonstrates by photographs of its spectra, what was before suspected, that Algol has a dark satellite, a hundred times as large as the earth, and moving at a speed of six miles per second, the interpolation of which between us and the big star perfectly accounts for its remarkable variations.

THE COST OF ATLANTIC RACING.—The recent breakdown of one set of the engines of the “City of New York” affords a startling illustration of the enormous cost at which the fast records of ocean racers are obtained. During a trip eastward, one of the crank pins of the port engines was broken, and the trip was continued at a reduced speed.

VEGETABLE HYBRIDS.—An agricultural exchange says: There is a class of hybrid vegetable plants, which in one season become almost worthless. We allude to the various vines. Farmers and gardeners do not, as a rule, exercise enough care in planting them. Take, for instance, the several varieties of squashes. They should be planted quite a distance apart. Last autumn, while attending a fair, we noticed an exhibit of squash marked Hubbard’s, which were yellow, showing that the squashes were small. The farmer labelled the squash in this way, as they had all the characteristics of that variety. Squashes should never be planted near pumpkins, watermelons near citrons, or cucumbers near muskmelons. If so planted, they will in one season become worthless hybrids. Too much care could not be exercised in this matter, and the farmer should give careful attention to planting, or the whole crop may be a loss.

DANGEROUS FUN.—Professor Cook, the chemistry professor of Harvard College, has a reputation for facetiousness, and his lectures are highly popular, though the attraction appears to partake somewhat of the fearlessness with which little children pay their first visit to Madame Tussaud’s Chamber of Horrors. One of his lectures, says the Toronto Mail, is devoted to dangerous explosives, and a stir always goes over the room when he picks up a bottle labelled nitro-glycerine. When he takes the bottle and holds it up, the yellow liquid stirring with the shaking of his hand, he always says something like this: “Now, gentlemen, it is commonly believed that if I were to drop this little bottle, we should all be blown to the skies (his hand trembles a little nervously over the bottle); but if this compound be pure,—perfectly pure, mind you,—I can light a match with perfect safety and thrust it down the neck of the bottle.” Here he feels for a match. “But,” he instantly adds, “I am free to confess that I have not enough confidence in its purity to try the experiment.” (Many sighs of relief.)
Practical Chemistry and the Arts.

ULTRAMARINE.

A beautiful blue mineral, known as lapis-lazuli, occurs rather sparingly, which has been used for many years in the manufacture of pigments for artists. Little preparation is needed, beyond finely grinding and separating it from the gangue, or rock in which it is found. Its magnificent blue color is all the more remarkable in that it contains neither copper, cobalt, nor any other metal forming colored salts, but is simply a silicate of aluminium and other bases, containing also a certain amount of sulphur, both as sulphates and sulphides, to which the color is probably due.

The great beauty of this ultramarine, as it was called, and also its scarcity and consequent high cost, early led to attempts to produce the compound artificially. Its composition was known from analysis, and from this an empirical formula was deduced, and a mixture of China clay, sodic sulphate and carbonate, coal, and sulphur was strongly heated in a closed crucible, the resulting mass proving to be a very good article of artificial ultramarine. This is one of the few cases where "the rule of thumb" gives results which would not have been anticipated from a theoretical consideration of the principals involved.

Artificial ultramarine was first prepared by Gsellin, in 1822; and in 1828 it was made at Lyons on a commercial scale. Since then the production has greatly increased, and enormous quantities are now annually produced, and from its cheapness it has largely replaced such pigments as smalt (cobalt), lapis, and Prussian blue. The process of manufacture varies in different factories, but is essentially that given above, where the constituents, as shown by analysis, are mixed together and ignited in closed crucibles. In one process, a green ultramarine is first obtained, which is roasted with access of air and additional sulphur to convert it into the blue variety; but the mixture is also made so as to form the blue variety at the first ignition. Artificial ultramarine is quite stable under ordinary conditions, but it is readily affected by even weak acids, which destroy the color. Natural lapis-lazuli is not affected in this way, showing that there is some chemical or molecular difference between them. A similar acid-proof variety is occasionally produced artificially in the furnaces, but the conditions governing its production are not known.

The chemical constitution of ultramarine, and the cause of its blue color, are not well understood. According to the experiments of Stein, it consists chiefly of a white mass, with which black sulphide of aluminium is intimately and molecularly incorporated, the blue color being due, not to chemical composition, but to the optical relations of the component substances. Green ultramarine contains less soda and more sulphur than the blue. The native ultramarine surpasses the artificial in beauty and softness of color, and is still used by artists, and for purposes where the artificial product is unsuitable.

A DEVICE FOR WRITING IN MOVING VEHICLES.

Under the phonetic name of Wrycezy, the London Industries describes an ingenious and useful, though very simple, invention, by which one can write in a carriage or on the cars without any disturbance from the motion, even when travelling over the roughest roads. The writing-desk, as shown in the engraving, consists of a light piece of wood, the lower part of which is attached to the arm by an elastic band. The upper part is supported by two cords (not elastic), which are attached to a point at some distance above the writer's head. By this arrangement, all movements of the vehicle, paper, and fingers are rendered synchronous, or occur at the same time and in the same direction.

Everyone who has tried to write on the cars knows what an exasperating and unsatisfactory operation it is, and this simple little device—which can be made by anyone, and carried in an ordinary hand-bag—will be of great service to those who have occasion to make many railroad journeys.

A NEW WAY OF PREPARING HYDROGEN is described by J. Hadermann as follows: A granulated alloy of tin and zinc, containing about 3 per cent. of the latter metal, is prepared by adding zinc to molten tin as long as it dissolves in the liquid metal. The product is recommended for the production of hydrogen. The pieces retain their shape and size after all the zinc is dissolved out by acid.

THE SCIENTIFIC KNOWLEDGE OF THE ANCIENT GREEKS AND ROMANS.

BY JOHN C. VOLFE, PH. D.

V. ASTRONOMY.

So much attention was given to this branch of science, and so much progress was made, that only a very brief survey of the field can be made in this article.

The Greeks began at very early times to observe the heavens, and to distinguish the heavenly bodies from one another. In the poems of Homer mention is made of the Pleiades, Hyades, Orion, Sirius, the Great Bear, and Arcturus. The morning and evening stars are spoken of, but their identity is not suspected. The earth is conceived to be a disc, around which flows the stream of Oceanus. Thales of Miletus, one of the "Seven Wise Men of Greece," who lived at the end of the seventh century before our era, looked on the heavens as a hollow sphere divided into five zones. He discovered the true causes of the phases of the moon, and of eclipses, and is said to have foretold an eclipse of the sun which occurred during the reign of Alyattes of Lydia, in the year 609. Anaximander, his great successor, held that the earth had the form of a cylinder, suspended in the middle of the universe, and that men dwelt on its base. It was surrounded by water, air, and fire in successive layers. This fire, shining through different openings, took the form of the sun, the moon, and the stars. The first to turn his attention to the planets was Anaximenes. He looked on them as flat-discs, supported by the air between the earth and the arch of heaven. Heraclides believed that the heavenly bodies were shaped like cups. When these were turned towards the earth, they caught its vapors, which took fire and reflected their flame. When they were turned from the earth, darkness ensued. By the time of Anaxagoras, who lived in the fifth century before our era, the spherical form of the earth was known. The first to elaborate a regular cosmic system was, apparently, Pythagoras, although it is difficult to distinguish his personal work from that of his successors. This system, as finally elaborated, was as follows: In the center was an ever-burning fire, not the same as the sun. Around it revolved the sun, the moon, the earth, the five planets (Saturn, Jupiter, Mars, Venus, and Mercury), and the sphere containing the fixed stars. There was assumed to be a counter-earth,—probably merely to make up the number ten,—which was distinct from the earth itself, but always moved parallel to it at a distance of 180°. Pythagoras defined the inclination of the courses of the planets and of the ecliptic. Aristarchus of Samos, in the fourth century B.C., first made the sun the center of the universe. Copernicus mentions three other Greeks as predecessors of his in this regard.

Aristotle wrote a work in four books on astronomy. He gives various proofs of the spherical shape of the earth, among others the circular shape of the edge of the earth's shadow in a partial eclipse of the moon. He also discusses comets and meteors, and the nature of the milky way, which he believed to be formed of myriad of small stars. Aratus, an Alexandrine astronomer of the same century, gave especial attention to the constellations, whose form and location in the heavens he describes in a didactic poem.

Many attempts were made to ascertain the size of the earth. The method of Eratosthenes was, perhaps, the most ingenious. He was informed that at Syene in upper Egypt, near the modern town of Assuan, deep wells were lighted to their bottoms at the time of the summer solstice, and...
that vertical objects cast no shadows. He observed the inclination of the sun in Alexandria (2), and got the distance from Syene to Alexandria (d) from the Egyptian tribute lists. He then calculated the circumference of the earth (a) from the proportion

\[ \frac{a}{b} = \frac{c}{d} \]

His result was 250,000 stadia. We do not know what stadium he used, but in any case the stadium is, roughly, an eighth of a mile; his result was a creditable one, considering the means he employed.

To discuss, even briefly, the discoveries and theories of Ptolemaus (Potlemy), would be to write a history of astronomy. The chronicle of the science for many centuries consists merely of comments on his work.

The Romans did but little in astronomy. That they were not keen observers is sufficiently shown by the fact that for nearly one hundred years they used a sun-dial brought from Catania in Sicily as a public time-piece, without noticing the errors due to the height of the gnomon, which was intended for a more southern latitude. Their most distinguished astronomer was Julius Caesar, whose reform of the calendar is too well known to be more than alluded to.

VI.—PHYSICAL GEOGRAPHY.

Intercourse with Egypt led the Greeks at an early period to speculations about the causes of the rising of the Nile. The great traveller and historian, Herodotus, mentions three views which were current in his time. Two, he says, are hardly worth mentioning; while the third (that it is caused by the melting of great quantities of snow) he objects to, on account of the heat of Libya, which would make the existence of snow impossible. The real explanation had its advocates in very early times. The alluvial formation of the Nile delta is also referred to by Herodotus.

Earthquakes, which have always been common in Greece, early became the objects of investigation. Anaximander thought them caused by riffs in the earth, the result of long droughts; while Anaxagoras believed that masses of air imprisoned in the earth and trying to force their way out, were the cause of these disturbances. Aristotle agrees with this latter theory. Aristotle also considers the question of the softness of the sea, which he thinks due to chemical changes wrought by the sun when the water is taken away. He believes it can be got rid of by filtration and boiling. Strabo first observed the fall in temperature as the elevation increases, and the fact that trees were confined to certain elevations as well as to certain latitudes.

Among the Romans, Seneca is the foremost writer on physical geography. In his "Naturalis historia" he discusses the erosive force of water, both mechanically and chemically. He observes that the spring tides are caused by the attraction of both sun and moon together. He defines volcanoes scientifically, distinguishing them from subterranean fires. He does not believe that the earth is a mass of fire within, but that there are collections of fire in different parts of its crust. On the subject of earthquakes he agrees with Anaxagoras and Aristotle, but considers the imprisoned force to be gas or vapor rather than air.

In the science of navigation little progress was made, since voyages were only along the coast. In the open sea "dead-reckoning" (by course and distance) was employed, the distance being merely inferred, while the course was got from the constellation. Lighthouses and beacons are of ancient date, and charts were employed at a comparatively early period.

VII.—MINERALOGY.

The industrious Pliny was the first to collect the results reached on this subject. He knew a great many varieties, although, of course, not the metals (like platinum, cobalt, nickel, etc.) which are got found in the Grecian and Italian mountains. He enumerated most of the signs by which mineralogists today distinguish different varieties—shape of crystals, cleavage, hardness, color, transparency, weight, lustre, and grain.

VIII.—BOTANY.

The Greeks were probably led to the study of this science by the Egyptians, who turned their attention to it at a very early date. They found a richly developed flora in their own country, although many forms of vegetation, associated in our minds with the name of Taurus, first found their way there from the East, in comparatively late times. The natural philosophers were too much taken up with the consideration of larger subjects to give much attention to the study of vegetable life, but the extensive use of plants for medicinal purposes must have led to a considerable knowledge of the subject. Aristotle wrote a "Theory of Plants," which seems, however, to be largely based on the analogous and contrasts between plants and animals. Theophrastus of Lesbos, in the fourth century before our era, wrote a work in nine books on botany, in which he considers the anatomy and physiology of plants, and their dependence on climate and cultivation. The Alexandrians confined themselves to the relation of botany to medicine, and the same is true of the Romans.

IX.—ZOOLOGY.

The knowledge of the ancient in this branch of science was by no means insignificant, and interest in it was kept up by the chase, and the popularity of fights between wild beasts in later Roman times. One writer, Aristotle, treats the subject so exhaustively that his successors did no more than comment on his work. He knew five hundred different varieties of animals, not all of which can be exactly identified at the present day. Much that is common now-a-days was unknown to him. He knew but four species of apes, and nothing at all about the man-monkeys. His knowledge of reptiles and their geographical distribution is very limited. Fishes, from gastronomic reasons, were better known. Of the lowest forms of animal life there was no knowledge at all in ancient times. Aristotle is said to have been furnished with material for study by his pupil, Alexander the Great, but he appears from his description never to have seen an elephant or an ostrich. He studied the internal structure of animals also, but was hampered in his investigations by the preconceived notion that the heart was the centre of the nervous system. We are unable to learn just how much he did know of this branch of the subject, as his special book on "The Anatomy of Animals" is known to us only by its title. Pliny gave four books of his "Natural History" to animals, but is in no way original. Allan describes some new varieties, especially of fishes.

SOLIDIFICATION OF NITRIC ACID.—To solidify anhydrous nitric acid, though still containing small quantities of nitrosic acid, there is required a temperature of 52° to 54° C., obtained by the evaporation of methyl chloride in a current of dry air. To obtain anhydrous nitric acid free from hyponitric acid, Fl. Birnans has operated similarly to Fritsche, but at a lower temperature. It forms a fine blue liquid, which was solidified only by the cold produced by a mixture of methyl chloride and carbonic acid in the flask under. This mixture, according to the experiments of MM. Carleis and Colardeau, lowers the temperature to 82° below zero.

The Out-Door World.

EDITED BY HARLAN H. BALLARD.

PRESIDENT OF THE AGASSIZ ASSOCIATION.

[50.0 ADDRESS, PITTSFIELD, MASS.]

It is pleasant to know that the new arrangement, by which the Agassiz Association has secured a department in this journal, and also one for the younger members in "Santa Claus," is proving popular. At a meeting of the New York Assembly of the A. A., a unanimous vote was passed endorsing the plan, and recommending all Chapters to appoint committees to solicit subscriptions from members and friends. This recommendation has been promptly accepted by a large number of Chapters, and a very gratifying addition has already been made to the readers of both these excellent magazines.

Mr. W. T. Demarest, President of the Manhattan Chapter, No. 20, of New York, one of our oldest and strongest branches, writes: "As President of the Manhattan Chapter, I wish to assure you that your plan has our hearty approval, and that we shall do all that in us lies to make it a success."

We wish every Chapter, and each member, to take a personal interest in "The Out-Door World," and feel, in a measure, responsible for it. Let each be "on the lookout" for interesting facts, particularly such as come under his own observation; and let him send us as promptly as possible an accurate statement of whatever he finds that is curious or new to him. Whenever you can add to your notes, pictures of the objects or phenomena described, it will greatly enhance their value. These pictures may be photographs, line-drawings in India-ink,—which are the best if well done,—or pencil sketches, from which our artist may catch the idea. It is a good plan to carry a note-book in the pocket, and thus be ready to jot down notes of what you see at the time you see it. Then, if you can send them to us the same day, so much the better.

Mr. Fred E. Keat, one of our wide-awake members, is engaged in a work which may well be undertaken by others, each in his own neighborhood. "I have in mind," he writes, "to make a set of photographs of our native trees, selecting as fine representatives of each as I can find." If this plan could be thoroughly carried out, and if to the photograph of the tree, were added photographs of details,—such as leaves, flowers, fruit, bark, grain of wood, insect visitors, attached nests, etc.,—a valuable contribution to science would result.

A word of special welcome must be spoken to Chapter 771, of Adelaide, Australia, and also to the two Russian Chapters.
POPULAR SCIENCE NEWS.

Vol. XXIV. No. 3.

516. Shargorod, Podolisk, Russia. Sasha Shepnoteff, Secretary; and 525. Savinstry, Polavia, Russia. Miss Julia Less cheerful, Secretary,—and to 752. of Tuskegee, Alabama. Of the first, the President is Mr. W. Cattan Grasby, a member of the Royal Society of Australia. Mr. Grasby has been at the head of a Field-Club of Young Naturalists in Australia for some time—a club quite similar in its plan and objects to our Association. He has lately made a tour of the United States, partly in order to study our methods of scientific and industrial education, and he soon heard of the Agassiz Association. It appealed to him at once, because it reminded him of his own society in Australia, and so he made many inquiries about it, paid your President a most delightful visit, and, as he made us good by, he said: "You may enroll our Field-Club as a Chapter of your Association. Put us down to start with at a hundred members. After I get back we shall soon send a larger list. We are your first branch in Australia, and we will do our best to be an honor to the Association." The two Chapters that come to us from the far interior of Russia, are the first ever formed in that great empire, and they are desirous of corresponding with some of our American Chapters, with a view to exchanging specimens, and becoming acquainted with American thought. The last Chapter is established in connection with that well-known and most interesting college at Tuskegee, which has the sympathy and good will of all who know its history.

REPTS FROM OUR CHAPTERS OF THE NINTH CENTURY, 801-900.

It is quite impossible to print all the excellent reports which come to us from our active Chapters. We therefore shall select, hereafter, those which reach us most promptly, and which contain most matter of general interest. While, therefore, it will be no reflection upon any Chapter, if its report should be crowded out, it may be considered a special recommendation whenever a report is crowded in!—

866. Morristown, N. J. [A].—Our Chapter has offered a prize to the member who shall hand in the best note-book of personal observations. In July, nine of our members went into camp at Lake Hopatcong, N. J. This lake is about nine miles long and two and a half wide. We had a delightful and novel time. During the year we have held twenty-five meetings, and have gained four new members.—Ridley Watts, 48 Hill Street, Cor. Sec.

881. Synck, N. Y. [A].—Number of meetings held during the year, nineteen. 'The subject for one evening was: "Cotton." We had specimens of the plant in its various stages of development, also the raw and manufactured products of the same. At another meeting, the habits and appearance of many of the fresh-water inuscrCrab were described, and illustrated by drawings made directly from nature. A talk on corals interested another evening, and beautiful specimens were shown. Again, we listened to a lecture on the "Geological Evidence of Evolution," illustrated by drawings. Other subjects have been: "The History of the Ophelik," and "A Practical Lesson on the Crab," with the help of specimens brought by Dr. W. E. Hensoldt of Columbia College, kindly gave us a most interesting lecture on "Star-Fish, Eelworms, and Sea-Urchins;" and Mr. Lilley, for many years a resident of Japan, spoke to us on the "Education and Life of the Japanese." We devoted one evening to a microscopic exhibition. These are, of course, only a few of the topics that have engaged our attention, but there is no lack of general interest in our work. Besides all special topics, each member is expected to bring a specimen concerning which he either gives or asks information. The new year brings us an addition to our membership, and all promises well.—Emma Partridge, Sec.

833. Fall River, Mass., [C]. (Massachusetts Archaeological Chapter.)—Our membership is composed of amateur archaeologists of Massachusetts. We began on the first of May, with five members, and have gained one. We were organized just before the long summer vacation, and are therefore not yet able to do much work. We shall be glad to correspond with all who are interested in archaeology.—Lynward French, Box 45, Fall River, Mass.

834. Peru, Indiana. [B].—Each of our members has been studying some branch of natural science, both by reading and by personal observation. One member, for example, has been studying plants,—visiting certain marked plants once a week, noting the progress of their development, and making careful sketches and notes; another has made a collection of seeds of the plants in this region.—J. E. Walter, Sec.

835. Boston, Mass., [H].—Although our time for study is limited, our interest does not flag. Last winter we took Professor Crosby's course in mineralogy, and this year we are attending his lectures.—Abbie F. Brown, Sec.

856. New York, N. Y., [W].—We have now eleven members. We have held meetings every two weeks. A botanizing excursion to Fordham Swamp was one of the pleasantest events of the year. We are now studying mineralogy.—Florence L. Jackson, Sec.

857. Elizabeth, N. J. [C].—Since last report, we have changed our Chapter room from our Secretary's home to a room in one of our grammar schools, where we have better accommodations, and the use of the larger class-rooms for open meetings. By thus meeting in a more public place, we hope to gain a firmer foothold, and to interest more people in the work of the A. A. The number of active members remains the same, but we have added several honorary list among them the principals of three of our schools. In April, two Chaussia Circles joined us in one of our meetings, where we compared work and exchanged fraternal greetings; and in May, the State Assembly met with us. We have been represented in all the meetings of the "Hill and Dale Club," and many observations have been made and specimens gained in this way. In the chapter room, cabinets have been built, and now contain—besides those yet to be determined and classified,—127 mineralogical specimens, 50 kinds of wood, and, in the herbarium, 153 mounted specimens. The various steps of the process of refining crude petroleum are represented by sixteen samples. These show the process required to make not only one kind of refined oil, but the way in which the process is varied in order to make oils for different purposes. Crude petroleum, as it comes from the Bradford oil-wells, embraces in its composition all the varied products in the form of lubricating oils, wax, or illuminating oils. The difference between the distillating crude oil is very

859. Providence, R. I., [E].—We have worked up the fossil Carboniferous flora of our State pretty thoroughly, and have a fine collection, with duplicates to dispose of. We have also added many species to the Carboniferous fauna of the State, including several insects and crustacean.—Russell W. Knight, 100 Broadway, Pres.; F. V. Gorham, 105 Knight Street, Sec.

860. Grand Rapids, Mich., [C].—For the past year, our Chapter has been exceptionally busy. During that time, we have added to our collection, 125 species of Michigan birds, including 332 specimens; about 30 new kinds of insects; some minerals, and 21 new species of birds' eggs. We have made many interesting discoveries and observations, one of which was the finding of a nest and the young of the Ruby-Crowned Kinglet, which had never been observed before in the United States.—T. Gilbert White, Sec.

861. Bedford, N. Y. [A].—For several months there have been only irregular meetings of our society, during which a few geological specimens
and fossils have been exhibited, and various plants shown and named. A collection of our native grasses, by Miss D. Marbie, has advanced to forty varieties. Our herbarium contains thirty-two specimens. Our President gave us an interesting lecture on geology, and a friend gave us an illustrated lecture on the use of the blow-pipe in minerology. The society was broken up by the removal of the Secretaries and four fine ladies, and reorganized on November 6 on a different basis. Our members are now all adults, and we hope to do some more serious work.—Mrs. Lea Luquer, Sec.

887, Grinnell, Iowa, [A].—During the year, our Chapter has gained six active members. Two members spent the summer travelling in this State and Nebraska and South Dakota. They sent home very interesting accounts of their travels, and many fine specimens. The members at home have been busy with the work of the Chapter. In the spring they found five birds never seen here before, and found the nests of four not before known to breed here. Several new and rare species of butterflies were collected. Six members attended the Sixth Convention of the Iowa Chapters, at Oskaloosa, in August. Our Chapter was awarded first honor for work done. We have divided our work into departments, each department being given to two or more members. We are still working for the government under the departments of bird migration and forestry.—Lynds Jones, Sec., Box 1766, Grinnell, Iowa.

891, Schenectady, N. Y., [B].—We have gained three new members during the year. The preparation of note-books is now in progress, the member having the best to be exempted from all Chapter duties for six months. Our meetings, in which the greatest interest is taken, are held twice a month in the Union School Building.—S. Frances Winans, 159 Lafayette Street, Sec.

A CONVOCATIONAL invitation is extended to all our readers to join the Agassiz Association. Blanks for application will be furnished on request. "Address all communications for this department to Harlan H. Ballard, President of the Agassiz Association, Pittsfield, Mass.

[Written for "The Out-Door World."]

PHOTOGRAPHY.

THE CAMERA ABOUND.

BY ELLERSLIE WALLACE, M. D.

The first steps on German soil made by the amateur traveler, or "el-wanderer," as they picturesquely call him, cannot offer anything very remarkable for the camera. Bernehaven, the port of Bremen, is a dull seaport town, and almost the only objects of interest are the docks and yards of the North German Lloyd Steamship Company. These, however, will repay a visit to those interested in marine matters. Subjects for the camera might be found here, but not the characteristic and beautiful ones of other cities and towns. A ride of about seventeen miles by rail brings us to Bremen, and here we immediately find ourselves in a city thoroughly European in character. The guide-books give short historical sketches of these old and famous towns, which should by no means be neglected, and this reading will at once make clear how and why the old city, the Contrescarpe, planted with fine old trees, came to take the place of the old city walls of the middle ages.

Those who stay at Hillmann's Hotel on the Contrescarpe, will find themselves well and centrally situated for excursions about the town, both in the old and the new quarters, and will also enjoy the great treat of occasionally hearing the fine military band play. The musicians are under strict army discipline, and are frequently ordered out to the Contrescarpe to play on Sundays in the forenoon, and sometimes, also, on week days, quite early in the morning. I was awakened about seven in the morning by the sound of my first night's rest in the Fatherland, by this incomparable band, consisting entirely of wind instruments. Although greatly fatigued from the previous day, the interruption to my sleep was a most welcome one. These open-air concerts have for years been a feature of German life, and of those of our young friends—and older ones, too, for that matter—who are musically inclined, will find them well worth their attendance.

A short walk through the quaint, narrow streets brings us to the Rathhaus Platz. This is a very picturesque place; the Cathedral is at one end, and the curious old Rathhaus, or State House, at the side, with a colossal statue just in front, that adds not a little to the picturesque, old-world, and thoroughly German appearance of the square. A very interesting view of this fine old building may be taken from the steps of the Rathaus, in the form of a sort of raised stoop in front of the shops; and another one from the extreme left-hand side of the Cathedral, opposite the Exchange. This will give the end of the Rathaus, with the principal facade nicely foreshortened, and a glimpse down the street leading from the square to the Church of St. Peter in the adjoining city. The tower of which makes a pretty bit of distant in the picture. If the front of the Rathaus is attempted, it should be done before noon, and care taken to choose a time when there is no market being held in the square. The farmers put up umbrellas, and have heaps of stuff of all sorts littering up the pavement, and it makes a very poor foreground for such a fine specimen of ancient German architecture. Permission from the town authorities could doubtless be obtained to make views of the great hall on the second floor of the building. However this may be, the visitor should by no means neglect to visit the cellar of the building. The Bremen Rathskeller is famous for its giant wine casks, second in antiquity and capacity only to the great one at Heidelberg. The cellar is used as a restaurant, and the great casks are shown on payment of a small sum.—Plates A and B.

The Cathedral is a rather plain structure, compared to many of the continental churches, but it has an imposing appearance on the square; and a visit to the crypt, where the air is so dry that bodies are said to keep indefinitely without decomposition, will repay the curious.

The country around Bremen has numerous features in common with Holland, although the ground does not lie quite so low. To put a photographic meaning to this expression, let me say that there is absolutely nothing to take, save here and there a thatched barn with its cross-timbers, and an occasional windmill. These windmills, however, are frequently very picturesque, and some of the larger ones quite imposing. A good specimen will be found at the edge of the town, near a windmill. These mills, even when quiet, are picturesque objects; and a nice, sharp negative, with the expressions on the faces of the workers, would make a well-drawn picture, a matter of the arms, relieving their delicate wood-work, will be a very pretty addition to the stock of negatives.

My route led me from Bremen to Dresden, via Leipzig. Those who may follow in this track will find much to interest them in a city like Leipzig, in an historical point of view, and some fine modern buildings to photograph. The new Book Exchange makes a very fine picture, and there are numerous private houses that are beautiful enough to devote a plate or two to. There are but few ancient buildings of any interest here.

In Dresden, there are plenty of subjects. The Russian Church is a beautiful specimen of its class, and makes a very effective photograph, as I can say from my own experience. The various churches, also, are picturesque, and may be conveniently photographed, owing to there being plenty of space around them. None but those who have experienced the difficulties of getting good photographic views of buildings when obliged to work "close-on," as it is technically termed, can fully appreciate the value of these open spaces.

A few days' work in Dresden, and I was obliged to leave for the charming old town of Nuremberg, of which I will speak in my next.

PRACTICAL PHOTOGRAPHIC POINTS.

SULPHITE OF SODA IN DEVELOPING.—Having found on analysis that numerous samples of sulphite of soda, sold as chemically pure, contained carbonate of soda, I have worked with a specially prepared sample, absolutely free from carbonate. One hundred c. c. of a 25 per cent. solution of this salt, with 1 1/2 grams of Pyro, added, developed the plates very well, but slowly, indeed, than the commercial salt, or than a bath to which carbonate of soda had been added; by allowing time, the required density is obtained. The fog appearing on under-exposed and under-developed plates is not seen when using this developer. Plates exposed in the worst possible light have been left soaking in this developer for from eight to nine hours without veiling or frizzling. The solution may be used repeatedly, and in well-corked bottles will keep for a long time. I have kept a bath for five months in which eight to ten plates had been developed; there was hardly any discoloration, and it worked as well as a fresh solution. After many trials, I have come to the conclusion that the above conditions are the best, and that carbonate of soda should only be added when the development proceeds too slowly.—Plates 14, 16 Annals of the French Academy of Science.

We have frequently in these columns deplored the use of ruby light in the developing-room, on account of the strain upon the eyesight. Every now and then we find ourselves supported in this view by the experience of some operator of ability, or even of world-wide fame. An article in the Archiv, describing the studio of Scharwachter, in Berlin, says: "In the dark-rooms the work is not done by ruby light, but by a combination of green, orange, and opal glass, which admits a light almost white. It not only saves the eyes, but makes it easier to observe and control the development."

Those of our readers who are old-fashioned enough to possess a rolling-press for prints, will be pleased to know that it has been recommended as a specially valuable form of physical exercise by high medical authorities. They declare that there is no class of machines, in the use of which an equal amount of bodily exercise can be expended in a given time without over-fatigue, to compare with the exercise derived from the rolling and pressing of the various parts of the arm, relieving their delicate wood-work, will be a very pretty addition to the stock of negatives. Our President has demonstrated in a city like Leipzig, in a historical point of view, and some fine modern buildings to photograph. The new Book Exchange makes a very fine picture, and there are numerous private houses that are beautiful enough to devote a plate or two to. There are but few ancient buildings of any interest here.

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A few days' work in Dresden, and I was obliged to leave for the charming old town of Nuremberg, of which I will speak in my next.
It is with deep regret that we announce the death of Dr. S. F. Landrey, at Logansport, Indiana, on the 25th of January last. Dr. Landrey was a valued contributor to the *Science News* for several years, and our business relations with him led to a full appreciation of his noble character and high scientific attainments. Dr. Landrey was fifty-six years of age, and his death was caused by consumption.

The Medical Summary, which, under the successful editorship of Dr. Wells, has been a feature of the *Science News* for the past three years, will, for the present, be conducted by Dr. C. E. Washburne, of New York City. Dr. Wells has been obliged to resign the work, owing to the pressure of other engagements; but we have no doubt that it will continue to be of as much interest and value as formerly to the large number of physicians among our readers.

The disbandment of the American Psychical Society is a matter to be greatly regretted by all persons interested in scientific progress. There is no class of phenomena more worthy of systematic study than those mysterious occurrences which it has been the province of the society to investigate. We understand that the principal cause of its dissolution was a lack of interest and financial support, and it is to be hoped that sufficient encouragement may soon be given to lead to the re-establishment of a society which, at the least, has rescued an important class of natural phenomena from the hands of religious fanatics and peripatetic charlatans. Although the society has no longer an independent existence, some of the members will continue to carry on its work as an auxiliary to the original British organization.

A sad accident is reported from Bloomington, Illinois, where a retort in which oxygen gas was being generated, exploded in the midst of a class of students, destroying the eyesight of the instructor, and seriously injuring a large number of pupils. No particulars are given, and we are at a loss to account for the cause of so violent an explosion, unless the binoxide of manganese used in the experiment was adulterated with charcoal or coal-dust, as has occasionally happened. These substances, when mixed with chloride of potash, would form a violently explosive mixture, and the greatest care should be taken to obtain only pure materials for this, as well as all other chemical experiments. No punishment would be too severe for the person who would knowingly sell this murderous mixture for such a purpose.

Speaking of adulteration, a correspondent sends us some specimens of an ingenious fraud in the shape of artificial coffee-beans, apparently consisting of burnt flour, made into a paste, with some albuminous substance to prevent their entire disappearance in boiling water. A few genuine coffee-beans are mixed with them to give a flavor to the beverage, and the total cost of the mixture is said to be three cents a pound. Although the artificial berries closely resemble the genuine ones, a careful examination of the interior, in comparison with a genuine berry, will show the difference at once; and this is, perhaps, the easiest way to detect the fraud, where more complete tests are not available.

The dairymen of this State are making frantic efforts during the present session of the Legislature to have a bill passed prohibiting the artificial coloring of oleomargarine, and thus preventing its sale in free competition with genuine butter. As there is not the slightest objection to the use of oleomargarine as food, and as at least nine-tenths of all the butter sold in the State owes its yellow hue to artificial coloring-matter, there seems to be a good deal of assurance in this demand of a limited class of producers for "protection." The whole history of oleomargarine legislation is a curious and most unpleasant example of the success with which State authority may be invoked to interfere with private industries and the natural laws of supply and demand.

A meteorite fell at Nigieni, in Russia, on the 9th of June last, which was remarkable in containing about five per cent. of organic matter, in the shape of a yellow substance readily combustible and soluble in alcohol, closely resembling resin. It also contained two per cent. of an inorganic body which is, apparently, a metallic salt of a new element allied to tellurium, although it has not been fully investigated. The presence of organic matter in this celestial visitor is certainly an extraordinary occurrence, and must be held to indicate either the previous existence of living organisms on these bodies, or else as seems more probable—that under certain conditions, such as we may suppose to prevail in the interior of the earth, carbon and hydrogen may unite to form organic substances. The bearing of this theory upon the formation of petroleum and natural gas is evident, and whatever may have been the genesis of this meteoric resin, the discovery is of the highest importance.

Dr. Phipson, of London, has published a paper in which he attempts to prove that the difference between the various elements is not in the atoms themselves, but in the space between the atoms, to which he gives the old-fashioned name of phlogiston. He claims that each element is composed of a system of atoms—all alike in size, weight, and form. This theory, although, of course, unprovable with our present knowledge, is of interest as showing the tendency among chemists, at present, to refer all the different elements to one primitive form of matter. A theory, however, which apparently confers the properties of matter upon space is rather an incomprehensible one, and not likely to meet with general acceptance.

H. O. Tumeliez has calculated the mechanical equivalent of the force of a ray of light, and comes to the conclusion that, under certain standard conditions, the light received through the pupil of the eye in each second of time, represents a quantity of work which would require 1 year and 89 days to raise the temperature of a gramme of water 1° Cent. This amount, it may be noted, is so infinitesimally small as to be quite beneath the bounds of human comprehension.

In continuing his researches upon the atomic weights of oxygen and hydrogen, Professor Cooke has determined the specific gravity of hydrogen by direct weighing of a glass balloon filled with the gas. A new feature of the process is the determination of the weight of the empty globe, by first weighing it when filled with carbonic dioxide, and afterwards determining the weight of this gas by the well-known methods of organic analysis. The new determination confirms the former atomic weights of oxygen obtained by Professor Cooke and Lord Rayleigh by other methods, the average value of Lord Rayleigh's determinations being 15.881, of Professor Cooke's first determination by chemical methods being 15.882, and by his last experiments 15.891. Although the atomic weight of oxygen is undoubtedly below 16, Professor Cooke considers it best, for various reasons, to assume it to be the whole number, and leave the value of hydrogen to vary, as our increasing knowledge may indicate. Professor Cooke's original paper, which is published in the *American Journal of Science*, is of great interest as an illustration of the refinements and precautions required in modern scientific investigations.

At this season of the year a good deal is heard of the injurious nature of the "burned air" which is given off from the furnaces used in heating our houses. It is impossible to "burn" air, and there is no chemical change whatever caused in it by being heated in a furnace. If the furnace is gas-tight, and does not heat the air to too high a
temperature, it is a perfectly safe and healthful means of warming buildings. The disadvantages of a furnace are due to other causes than from its "burning" the air. It is also a mistaken idea that steam heat is moister than any other kind. Air heated by passing over a radiator is in exactly the same condition as when heated by a furnace, and the only possible way in which it could be moistened would be by the escape of steam from a leaky valve, which, however, is by no means an uncommon occurrence in many of the radiators in use.

PRE-HISTORIC ROCK INSCRIPTIONS IN SWEDEN.

No part of Europe has given richer returns to the student of archaeology than the countries of Norway, Sweden, Denmark, and, perhaps, Finland, generally grouped together under the name of Scandinavia. From the very earliest times they seem to have been occupied by a large and energetic population, and the numerous deposits of weapons, implements, and utensils,—whether of stone, bronze, or iron,—show a perfection and beauty exceeded or scarcely equalled by those of no other pre-historic races.

The advanced state of the early civilization indicated in the Scandinavian countries, tends to confirm the doubtful theory that the great Aryan immigration started from this region; or that more preposterous assertion, that the north polar regions were the true cradle of the human race, and were, in former times, blessed with a temperate climate and a luxurious vegetation. No scientist of any reputation, however, supports this wild idea, and the best authorities consider that the use of bronze and other metals was introduced into the Scandinavian countries from other parts of Europe, and did not originate with the ancient inhabitants, no matter to what perfection they afterwards brought the foreign arts.

M. Victor Rydberg has recently been studying the curious rock inscriptions which are quite abundant in Sweden. We reproduce two engravings of these cuttings, one (Fig. 1) showing a ledge near Bohuslan covered with representations of boats filled with men, and the other (Fig. 2) showing the details of a similar rock sculpture in the parish of Brastad. The age of these sculptures is still in doubt, but the best authorities, including the Marquis of Nadaillac,—from whose description in La Nature we reproduce the accompanying engravings,—agree in referring them to the age of Bronze, which came to a close not later than 1500 B.C. This age is particularly indicated by the wheel-shaped solar emblems, shown in Fig. 2, and the absence of the svastika, or sacred symbol of the Aryans, which was not introduced into Sweden until after the commencement of the age of Iron.

The objects represented in the Swedish rock sculptures are very numerous. The ancient boats, with high bow and ornamented stern, are very common, and were probably the models after which the later ships of the Vikings were constructed. Many animals are represented, including oxen, foxes, dogs, various birds, and reindeer attached to a sledge. Human figures, are common, and generally represented as naked, but sometimes clothed in a long robe descending to the feet. Certain of these figures are apparently represented with tails, but this is undoubtedly an unskillful attempt of the ancient sculptor to represent the extremity of the arm.

At Tanum a certain number of men are represented as walking in Indian file, and deprived of their arms. These are supposed to represent captives in war, submitted to a cruel mutilation; or, more probably, it is only another indication of the sculptor’s lack of skill. Other inscriptions closely resemble those of the North American Indians, and suggest the question of a possible ancient emigration to this country. Many religious symbols have been noted, such as wheels, crosses, and cupules, or cup-shaped depressions, doubtless connected with ancient religious rites. To this day, in certain parts of Sweden, the peasants deposit in these cupules offerings for the souls of their departed children, which are supposed to be wandering in space, waiting for an opportunity to enter once more into a human body.

The future study of these inscriptions, which M. Rydberg has so successfully begun, will undoubtedly greatly increase our knowledge of those interesting pre-historic times of which so many relics have come down to us, but of which we really know so little. All our historical records are but of yesterday, and, we cannot doubt that, lack of the races of which we have a direct knowledge, the earth has been inhabited for many thousands of years by successive generations of men, who have left scarcely any more traces of their existence than the leaves of the trees in their annual growth and decay.

BRIEF STUDIES IN BIOLOGY.

BY PROF. JAMES H. STOLLER.

II.

THE HYDRA.

As a subject for our second study, we may take the little animal found everywhere in ponds attached to the eves of water plants, called the hydra (Hydra viridula or Hydra ferox). This animal, which is a sort of classic in zoology,—having been famous since 1744, when Trembley, the Swiss naturalist, did his curious experiments upon it,—is a representative of the second great division of the animal kingdom, viz.: the Coelenterata.

The general form and aspect of the hydra, as seen under a low power of the microscope, is shown in the accompanying figure (page 43.) It is seen that the body consists of a trunk-like part, attached at its base, and of six or eight radiating arms, or tentacles, at the free end. (The bud-hydra connected with the trunk will be referred to below.) The mouth is situated at the free end, and opens into the body-cavity, which is simply the hollow of the trunk. The body-cavity is also the stomach, and it is from
the fact that the digestive cavity is thus one and the same with the cavity of the body that the group of animals which the hydra typifies receives its name, the word Cockleburra meaning hidden stomach.

Thus the bodily structure of the hydra is exceedingly simple. While in all higher animals, from worms to mammals, there is a digestive tract, or alimentary canal, separate from the general cavity of the body, in the hydra a single cavity suffices. Food taken in at the mouth moves about freely in this cavity, undergoing digestion the while. Should any inordinate matter be swallowed with the food, it must be passed out of the body by the same opening that it entered, that is, through the mouth. Moreover, in this simple, suck-like animal there are no internal organs at all, the work of food-digestion being performed by the action of the cells that compose the walls of the body, and the circulation of the fluid product of digestion (blood) being effected by the general movements of the body.

Having thus noticed the general features of the hydra, we may now pass to a more detailed examination. By the use of the microscope it can be seen that the body is made up of two layers of cells—an outer layer, or ectoderm, and an inner layer, or endoderm. If the cells of the two layers be examined and compared, they will be found to differ somewhat. While—like all unmodified living cells—they consist of minute bits of protoplasm, each having a nucleus, those of the ectoderm have a different form, and, as experiments show, possess different active powers, from those of the endoderm. If a few ectodermal cells be isolated and examined under high magnification, they will be found to be unknown when their former ends into long processes. In the living animal these processes lie between the two layers, and extend longitudinally. Now, to understand their use, let us observe what happens when a hydra, extended at full length and swaying its body to and fro in the water, is lightly touched by a needle. The body—a quarter of an inch in length when extended—is quickly contracted into a small rounded mass. The little creature thus possesses the power of contracting its body to a wonderful degree, and it has been found that it is the processes of the ectodermal cells in which this power of contractility lies. What we learn, then, is that these processes have the same function that belongs to muscle-tissue in the higher animals.

And, as the endodermal cells are not provided with these processes, we see that the latter differ from the former both in form and in physiological properties. We may now examine the endodermal cells. They are of an irregularly spherical form, and have scattered over their whole surface a great number of granules of a green color. It is the possession of cells containing this green coloring substance that makes the hydra almost unique among animals: for this green matter is chlorophyll, the same substance that gives to plants their characteristic color. Now, in plants, chlorophyll has a very important function: it enables the plant to utilize the sunlight in the making of starch and sugar, of which the animal body is supplied by carbonic acid and ammonium. The interesting question thus arises, whether chlorophyll serves the same use in the hydra. This point has not been finally determined. It is known that the hydra, like other animals, seizes and feeds upon organic bodies as food, but whether it is also able to derive food-matter from inorganic compounds, by means of the chlorophyll-granules, is not yet known.

But what is certainly known in regard to the endodermal cells is, that they are brought into contact with the organic compounds swallowed as food by the hydra,—since these cells line the stomach-cavity,—and seem to digest them. At any rate, the food-matter, consisting chiefly of minute animals, is gradually absorbed by the living cells, and the life of the hydra, as an animal, is preserved. And here we may point out a biological principle of fundamental interest. Any living body, plant or animal, is an aggregate of cells, and the life of the body is the tota life of the cells. It is understood, of course, that we are here speaking of life as sinuity, not as consciousness. The principle is, that life, considered as that state of the body which is opposed to death, is the product of the united life of the component cells.

The biology of the hydra is especially interesting in regard to the ways in which the function of reproduction is effected. We do not commonly think of one animal being derived from another by a process of building, just as one branch of a tree grows out from another. Yet this is one of the ways in which new generations of hydram are produced. The cut shows a young hydra, formed by this process of budding, still attached to the parent animal. During the time when they are thus connected, the body-cavities of the two are continuous, so that food swallowed by either is available for the nourishment of both. Sometimes, the bud-hydra will itself give rise to another, so that three generations of hydrams will exist in one body. After a time, the buds detach themselves from the parent and begin an independent career.

Reproduction by budding occurs only during the summer. At the approach of cold weather another process takes place, whereby the hydra perpetuates its kind. A small protrusion appears upon the trunk, just below the tentacles, and a second, larger, protrusion has been observed in summer. This has been found out that these parts are sexual organs; that in the former, male cells are developed, and in the latter, an ovum, or female cell. The male cells eventually escape from their covering, and, by means of vibrating, hair-like processes (called cilia), swim through the water to the ovary, or sack containing the ovum; then, penetrating the wall of the ovary, they are fertilized; the ovum by them thus capricious to develop into a new hydra. But this does not take place until the next spring, the fertilized ovum remaining at the bottom of the pond during the winter.

Let us notice that one method of reproduction shown by the hydra is non-sexual, and the other a true sexual one; also that these take place alternately. The same is true of many of the lower organisms, both plant and animal, and the whole process is spoken of as an alternation of generations.

The manner in which the ovum develops into a full-grown hydra in various stages, as follows: The cell divides into two: these grow and dividing again, give rise to four; the process continuing, eight, sixteen, etc., are successively produced. The aggregate of cells thus formed is a rounded, mulberry-like mass, and the embryo hydra is then said to be in the morula stage. A little later, the cells arrange themselves into two layers, thus passing into an elongated (little stomach) stage. These two layers are, respectively, the ectoderm and endoderm. The cells composing them, at first pretty much alike, soon take on the distinctive characters (noted above) of these two layers in the fully developed animal. That is to say, the cells become differentiated into layers, or tissues, having definite and characteristic properties. Meanwhile, about an opening (the mouth) in the wall of the gastrula, the tentacles grow out, and development is complete—a new hydra has been formed.

Now the development, or embryology, of all animals is, in its earliest stages, substantially like that of the hydra. All begin as a single cell, and pass through the morula and gastrula stages; and in all, the cells gradually arrange themselves into two layers, as in the case of the hydra. In the case of an animal of high organization, there is no muscle, bone, nerve, or other distinct tissue; but, gradually, the undifferentiated cells fall into groups, take on distinctive characters, and thus build up the complex body. These are the fundamental facts of embryology.

Union College, Schenectady, N. Y.

[Original in Popular Science News.]

AN ANCIENT INDIAN VILLAGE SITE.

BY WARREN K. MOOREHEAD.

For several centuries there flourished in certain spots throughout the fertile Ohio Valley, large and small towns inhabited by aborigines, who gained their subsistence by hunting, fishing, and limited agricultural pursuits. Many of these villages occupied the same locality year after year; some of them might have retained their position at the present day but for the settling of the country by the whites. Those who study the ancient Indian, and who have become expert in field searches, can readily distinguish the spots occupied by these towns by the refuse—such as broken pottery, flint and stone implements, burned rock, etc.—that thickly strews the surface. Often these objects have lain exposed to atmospheric agencies for so many years that they present the appearance of the natural surface rock in color.

The Indian towns were most numerous in the State of Ohio, for it is in her river valleys that we find field after field covered with diversified forms of Indian mounds. These have been found in all parts of Ohio. The valley of the Little Miami River, for a distance of seventy miles, was occupied by quite a numerous people. At Old Town, in Green County, we find the first large village site, at the forks of the river, where it is swelled to a considerable size by the influx of Cesar's Creek. From this point to its junction with the Ohio River above Cincinnati, town sites are not at all rare.

At the station on the Little Miami Railroad named Fort Ancient (in honor of a large pre-historic earthwork upon the hills above), the largest Indian town found in the entire valley was once situated. The railroad runs parallel with the river for some distance, and is two hundred yards east. Extending between the base of the hills and the river, for a distance of half a mile, and having a breadth of
three hundred yards, is this Indian camp. The refuse is thickest between the railroad and the river. There seems to have been but little occupancy east of the track. This peculiarity can be easily accounted for, because the Indians always choose to have their wigwams located as near the bank of the stream as possible; hence the greater number crowd to the river front. The presence of so many persons would cause a heavy deposit of wigwam refuse.

There is nothing upon the surface in the river bottoms at Fort Ancient. The deposits range from two to five feet in depth, with layers of loam alternating, and thus indicating occupancy at three distinct periods. When our survey located at Fort Ancient, in July of last year, we began prospecting in various portions of the meadows lining the river by sifting small excavations here and there. The river at this place has banks from twelve to fifteen feet in height. It has cut into the rich, soft soil, and is rapidly wearing down the east bank. In its encroachments upon the farms it washed out considerable pottery and animal bones. Those who first learned of this informed me, and I went to the spot, and found, that I can perform the opinion that there was a cemetery some feet below the present surface. The subsequent examination of the place proved that a few persons had been interred, but that the site was occupied more as a town than as a burial spot.

The first few holes sunk struck one of the most populous portions of the village. As soon as the deposit is made, brooks which could not be in various directions, and extended for several hundred feet; thus a great portion of the town was laid bare. At a depth of two feet from the surface, a third layer of ashes was found intermixed with burnt rock, pottery, fragments, and broken animal bones. This deposit was made by the last village, and cannot be very old. The deposit of sand and loam above is due to the encroachments of the river, which overflows its banks every few years, and leaves in one place heavy layers of mud, while in another it may erode and transport the soil to some distant point. The pottery and bones found at a depth of two feet from the surface do not look old as those occurring further down. nor are the bones in as decayed condition, but are quite well preserved. The fact that the bones found on the later village occupation is plain, while nearly all that found in the earlier epochs is decorated and of a superior finish.

Four feet from the surface a uniform layer of relics occurs. In this many shells of the freshwater mussel and the backs of the land tortoise are found. There is little or no burnt rock, the pottery very common, and not a few Flint knives, broken arrow-heads, and useless celts may be gathered from every excavation. The village that deposited the layer must have occupied this region several hundred years ago. In spots the accumulation of ashes is several feet in thickness; it is in these ash-pits that we find many bones of birds, fish, and beasts. Some of these have been split lengthwise to extract the marrow, broken into hundreds of splintered bones (nearly always bones of the extremities) of deer and bear, we ascertain that the natives considered the marrow a very great delicacy. In estimating the age of the second village, a number of things must be carefully considered. It was occupied when the country was quite heavily wooded, a consideration which would account for the decayed vegetable matter. The river has been subject to sudden rise and fall, to spring floods and summer droughts, since the country has been cleared. Before the timber was destroyed, the channel held an even stage of water the year round.

Of course, the winter floods came and caused high water for a time, but the stage was more even—there were no extremes. The meadows along the banks were in many places vast swamps; the creeks and tributaries were clogged by fallen trees and brush; the river itself was retarded in its course by piles of drift. The thick woods that lined each bank were disturbed in places by the current cutting into the bank and running out into the stream and checked the rapid flow of the water. Old settlers have told me that in 1810 to 1820, when they first visited the Miami Valley, the country was heavily timbered, that swamps lined the river margin, and that sudden floods were of rare occurrence. All this being taken into consideration, we can readily see how much longer it would take the soil to accumulate between the second and third epochs than between the third and the present surface of the meadow.

Below the second village site there is one foot of black soil which contains nothing whatever. Below it, or five feet from the surface, lies the heaviest deposit of all three—the one made by the first aborigines who occupied the site. This layer varies in thickness, but it is the most artistically decorated pottery I ever saw. (The pottery is fragmentary.) The bones of the following birds, fish, reptiles, and animals have been found and identified: Turkey, quail, hawk, duck, owl, ge, cat-fish, turtle, bear, deer, elk, wolf, rabbit, raccoon, squirrel, ground-hog, musk-rat. Many mussel shells were found which have been perforated in the center. The fingers thrust through this perforation would render the manipulation of the large shell easy, and thus they were used as scrapers, cutters, and dippers. Some of these shells were 4½ by 7 inches. Ashes have a wonderful preserving power; therefore the most minute bones, and even the scales of fish, were almost as perfect as the day they were thrown down, although centuries may have elapsed since these bones and scales were a part of live animals and fishes. In some places we found bone awls and perforators, made from the bones of the turkey and deer, and having very sharp points. These were undoubtedly used as needles by the squaws in the manufacture of hunting shirts, leggins, mocassins, etc.

It was the custom of some of the tribes of America, to perform burial ceremonies, burying children underneath the wigwam in which they died, or at the edge of the village. No doubt this custom was practised here, for in the course of the excavations the skeletons of three children were found, accompanied by small ornaments of bone and shell. These skeletons were poorly preserved, being but eighteen to twenty inches below the present surface in two instances, and three feet and half deep in other cases. The bodies were walled in with large, flat, water-worn slabs of limestone, transported from the river bed near by. The stones were placed on edge at the head and feet and on each side of the body. One large one served as a covering to the rude tomb. I think these infant burials were made by the inhabitants of the third village, as the lower layer here and a half deep in these cases have been disturbed. The reason that the skeletons are so much decayed is because they are not surrounded by ashes, as are the other deposits, and because the floods fill the tombs with water, causing rapid decomposition of the bones.

*SMITHSONIAN INSTITUTION, WASHINGTON, D. C.*

**Chemical names for streets have been adopted for a certain Australian town.** Argent, Beryl, Cobalt, Kaolin, Iodide, Oxide, Bromide, and Sulphide are favorites. It is significant that along the latter are situated churches and recreation grounds.

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**METEOROLOGY FOR JANUARY, 1850.**

<table>
<thead>
<tr>
<th>Average Thermometer</th>
<th>Lowest</th>
<th>Highest</th>
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<tbody>
<tr>
<td>At P. M.</td>
<td>1.6°</td>
<td>11.0°</td>
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<tr>
<td>At S. P. M.</td>
<td>1.9°</td>
<td>12.3°</td>
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<tr>
<td>Daily</td>
<td>1.7°</td>
<td>11.8°</td>
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<tr>
<td>Weekly</td>
<td>1.5°</td>
<td>11.4°</td>
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<tr>
<td>Monthly</td>
<td>1.5°</td>
<td>11.3°</td>
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<tr>
<td>Second Average</td>
<td>2.5°</td>
<td>11.2°</td>
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We have another remarkably warm January to report, exceeded only twice in twenty years, namely, last year (see above), and in 1880, when the temperature averaged 3°. The lowest point reached the present January was 10° above zero, on the 27th, and the highest 64° on the 24th. The 10th was the coldest day, with an average of 13°, and the 2nd was the warmest, with a mean of 57°. The 20th was the next warmest, at 56°, and the 31st the next coldest, at 17°. The first week averaged 45.5°—so near mid-winter! In the twenty-one observations the mercury went below the freezing-point only five times, and the extremes were 22° and 64°. The 10th had the least range of any day, being only 3°, and the 23rd the widest—30° in fourteen hours, of which 20° occurred in seven hours, and an average rise of nearly 4° per day. There were only nine days when the mercury stood below the freezing-point at P. M. Such warm and changeable weather in mid-winter was unfavorable for health, and "la grippe" prevailed, with a number of deaths from this now memorable disease.

**SKY.**

The face of the sky, in 93 observations, gave 43 fair, 16 cloudy, 21 overcast, 8 rainy, and 5 snowy,—a percentage of 46.2 fair. The average for the last twenty Januaries has been 57.2 fair, with extremes of 40° in 1884, and 61° in 1878 and 1888. January has been less fair than the present only three times in the last twenty years. The morning of the 13th was foggy, and the 22d and 28th were clear and cold. Only a few days could be called fine.

**PRECIPITATION.**

The amount of rainfall in the last month, including 4.5 inches of snow, amounted to 34.2 inches, while the average for the last twenty-two Januaries has been 48.53, with extremes of 10.9 in 1871, and 8.85 in 1889. The "Signal Service" at Boston reports this to be the driest January in twenty years, while my record gives seven drier than the present, illustrating how different localities may vary in this respect, though not very far distant from each other. The small amount of snow, 23.4 on four different days, between the 10th and 27th, and soon disappeared, leaving the ground usually bare and often muddy. Only two days of imperfect sleighing thus far, and the prospect for a good ice crop is now quite unfavorable.

**PRESSURE.**

The average pressure the past month was 30.11 inches, with extremes of 29.44 on the 8th, and 30.75 on the 1st—a range of 1.31 inches. This is the highest average for January on my record, and has been exceeded but twice in all the months of the year. The average pressure for January in seventeen years has been 29.924 inches, with extremes of 29.80 in 1879, and 30.11 in 1870,—a range of 0.31 inches. The sum of the daily variations the last month was 11.39 inches, giving a mean daily movement of 0.35 inch—the largest, with three exceptions, in seventeen years. This average in January has been 30.21, with extremes of .156 and
The sun crosses the equator and spring begins on March 20, at about 10:30 A.M. Mercury is a morning star. Venus passed west elongation on February 23. It is at the beginning of the month about 20° south of the sun, but is about 25° west, and so can be seen for a few days in the morning twilight, low down in the southeastern sky. By the end of the month it will be very near the sun, and will pass superior conjunction on the morning of April 9. Venus passed superior conjunction and became an evening star on February 28. The planet is farthest from the earth during March and so telescopic observers from the north are able to see it from about 100,000,000 miles to 75,000,000 during the month. Jupiter is a morning star, rising at about 4:30 A.M. at the beginning of the month, and at about 3 A.M. at the end. It is in the constellation Capricornus, and is moving eastward and a little northward, having passed its greatest southern point during the past year. Saturn passed opposition with the sun on February 18, and is in good position for observation, being on the meridian at about 11 P.M. on March 1, and two hours earlier on March 31. It is quite near the first magnitude star Regulus. During the month it moves slowly westward, and at the end is less than 1° 30' north of the star, between Regulus and Eta Leonis, the star and the edge of the blade with the handle of the sickle. Uranus is in the constellation Virgo, about 5° east of Spica (Alpha Virginis), and is moving westward slowly. It will come to opposition with the sun in April. Neptune is in Taurus, between the Pleiades and Hyades.

The Constellations—The positions given are for the altitude of the northern part of the United States, and for 10 P.M. on March 1, 9 P.M. on March 16, and 8 P.M. on March 31. Cancer is not far from the zenith, a little to the south. Leo lies east of Cancer, and Virgo lies below Leo, reaching to the horizon on the east. Between these constellations and the southern meridian are Hydra and one or two other constellations. On the northeast are Ursa Major, well up toward the zenith, and Boötes. Between the bear and Ursa Minor lies the east and the pole star, while Cepheus is just below it. Andromeda is just setting in the northwest, and Cassiopeia lies between it and the pole star. Perseus is above Andromeda, and Auriga above and to the south of Perseus. Gemini is west of the zenith, high up; and Taurus is low down in the west, just above Ariés, which is setting. Libra is between the east and the west. Libra is the Optus of Taurus, a little lower down. Canis Minor is about 1° away from the zenith to the southwest, and Canis Major is below, between Orion and the southern horizon.

Lake Forest, Ill., Feb. 3, 1890.

D. W. NICKAT.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

G. F. W., Boston.—In a recent number of the Science News [Jan., 1890, page 6] it is stated that Nero used a corner lens as an aid to his near-sightedness. Was this an eccentricity on the part of that amicable monarch?

Answer.—There is evidently some mistake about the matter, but as the parties concerned are now beyond the reach of an interview, we do not think the question can be settled. Perhaps Nero was really far-sighted, as the ancients would not readily distinguish between the two defects in vision.

C. H. C., Va.—Is there any kind of ink which will fade away in a short time after being used?

Answer.—We know of no ink which would become absolutely invisible and beyond power of restoration; but it is said that iodine of starch, blackened by the action of a thin starch paste, possesses those properties to some extent. We have had no practical experience with it, however, and do not know whether it will do what is claimed for it.

J. K., New Hampshire.—How can I grind raw bones so as to dissolve them in sulphuric acid for the purpose of making an artificial fertilizer?

Answer.—Raw bone can only be ground in what is called an agate mortar, which is absolutely non-reactive to use. You had best burn the bones till they can be ground in an ordinary plaster mill, although in so doing you will lose a goodly proportion of the mineral properties of the food. You must, however, not expect the bone-ash to dress the soil as the acid. The chemical reaction between the bone and acid takes place without forming a complete solution. See Dr. Nichols' "Barn Floor Lecture," which we can mail for ten cents.

G. H. T., New York.—Which is the proper form of the name of the metal occurring in clay, Aluminum or Aluminium?

Answer.—Both words are correct and used by good authorities. We prefer the form aluminium, as the termination in, is analogous to that of most of the other elements, the form aluminium is, perhaps, more generally used in works on chemistry.

P. R. D., Fla.—What is the exact length of a pendulum oscillating in one second of time?

Answer.—Owing to the varying force of gravity at different points on the earth's surface, this length varies somewhat. It has, however, been determined, which made show that at the level of the sea, at the equator (St. Thomas), the length is 95.0297 inches; at London, 39.1583 inches; and at Spitbergen, 39.2169 inches.

LITERARY NOTES.


This instructive book is intended for the better information of miners, over-men, under-lookers, deputies, and freemen, and those of them who intend to become managers of collieries. The book has an extensive public and practical field—a hard-working coal miner of Lancashire, who had risen by sheer natural ability and force of character to a position of influence and control, has written it, in order, to issue the work, chiefly as a hand-book for the use of operatives and laborers in coal mines. From the outset the book has had a marked success, and has been accepted and highly valued by the working miners, as a treatise peculiarly adapted for a treatise of this kind. Its simple and exact methods of statement, its quaint and at times picturesque language, its popularization of scientific purpose, and the transparent honesty and unquestionable manliness and straightforwardness of its author, all help to give the book a character of its own.


The practice of massage has rapidly come into favor of late years, as a remedial agent, and, in many classes of affections, has been used with signal success. The Swedish Movements, which are only a modification, have been in use among the Swedish peasants for many years. Dr. Ostrom, in this book, brings down in detail, with all the care and accuracy which are his特性, the subject, which clearly explains the methods of performing the different manipulations, and the various movements in which they may be used, with reference to give relief. Numerous wood-cuts illustrate the work, and add greatly to the clear comprehension of the text.


A competent French psychologist has characterized the monograph of M. Ribot upon the psychology of attention as the most remarkable production of the philosophical press of France for the year of 1889. M. Ribot, who, in his own country, may be regarded as the inaugurator of modern psychological research, now occupies the chair of comparative and educational psychology at the College de France, and is the editor of the foremost philosophical review of the continent, the Revue Philosophique. Every book, therefore, that treats the subject of color is of timely interest. The training of the eye is acknowledged to be as important as that of the hand and of the mind. Every book, therefore, that treats the subject of color is of timely interest. The training of the eye is acknowledged to be as important as that of the hand and of the mind. Every book, therefore, that treats the subject of color is of timely interest. The training of the eye is acknowledged to be as important as that of the hand and of the mind. Every book, therefore, that treats the subject of color is of timely interest. The training of the eye is acknowledged to be as important as that of the hand and of the mind. Every book, therefore, that treats the subject of color is of timely interest.
SLEEP.

The condition in which we pass at least one-third of our lives is certainly one of the highest importance and interest, and it is, even with our present knowledge, not devoid of a certain amount of mystery. We know that in sleep the amount of blood circulating in the brain is considerably diminished, and it is, undoubtedly, the time when the waste of the nervous system is repaired, and a store of vital force—whatever that may be—handed over for the labors of the ensuing day.

The profound influence which the state of slumber has upon the human system, is evident to anyone who has ever passed one or more nights without the presence of “tired Nature’s sweet restorer;” and the feeling of strength, vigor, and well-being with which one awakens after a period of sound, dreamless sleep, shows that the restorative influence extends to every part of the body. The need of sleep is an imperative one, and, in many cases, is almost irresistible. Instances are on record of soldiers sleeping on horse-back, or even in the midst of a battle, and many a sentry has been sentenced to death for sleeping at his post, who was in no way to blame for his neglect of duty, but was simply overcome by a demand of Nature which he was unable to resist, even at the peril of his life. Similar instances are known of railroad engineers and steamboat pilots sleeping when on duty, with the knowledge that the lives of many others, as well as their own, depended upon their wakefulness.

The proper amount of sleep required by anyone is an individual peculiarity, and no general rule can be given. The new-born infant sleeps nearly all the time, but the periods of wakefulness soon grow longer, through childhood and youth, until the full-grown adult devotes a minimum time to the recuperation of his bodily energies, while in old age the need of more time for sleep is again felt. The feelings are the best guide in this respect, and if one awakes completely refreshed after six hours of slumber, that amount is doubtless sufficient for his bodily needs, while another person may require nine or ten hours of each day to restore the balance of vital profit and loss. Nothing, however, can be worse than to regularly deprive one’s self of needed sleep, in order to have more time for work or pleasure. This is like expending one’s capital instead of the interest, and although the final result may be postponed, it can only end in physiological bankruptcy.

The time of sleep is of no particular consequence, and is largely a matter of habit. The darkness and quiet of night naturally lead to repose, but large numbers of people must, necessarily, reverse the usual practice and devote the daylight hours to slumber. Neither is there any particular hygienic virtue in early rising. The familiar old couplet is only true in a very general sense; and there are a great many cases where a man would be healthier, wealthier, and wiser if he delayed the time of his rising to an hour consistent with his own feelings and inclinations.

Dreams, undoubtedly, occur during disturbed sleep, or during the interval between sleeping and waking, and—although it is not easy to prove this—it is more than probable that a sound sleep is a dreamless one. Unusual mental anxiety or excitement, or a disturbed state of the bodily organs, such as an overloaded stomach, may cause a certain activity of the mental processes, which will become manifest in dreams. The sudden awakening of a sleeper will often cause a dream in the brief interval before full consciousness is attained. Dreams more often relate to recent and important occurrences in our daily life; but, on the contrary, the most trivial incident, forgotten for many years, may be, as it were, stored up somewhere in the brain, to be afterward revived in a dream, with all the accompanying circumstances.

The literature and curiosities of sleep and dreams is, however, very extensive, and it would be impossible to refer to even a fractional part of the observed phenomena. A simple falling asleep, if it were not so common, would be a most wonderful and even alarming occurrence. Although the vital processes of a sleeper go on as usual, yet the mental life, the self-consciousness is suspended, and the sleeper is practically dead to this world, or else wandering in another and stranger world—that of dreamland. A dreamer may be said to be in two places at once, and, if, from any cause, he should not awake, but continue to dream on indefinitely, it would be hard to say why he would not be living just as true and real a life as the one which he knew in his waking hours. Hamlet’s chief argument against suicide was that “in that sleep of death who knows what dreams may come?” and Bryant, in his poem Thanatopsis, speaks of welcoming the approach of death,

"Like one that wraps the drapery of his couch
About him, and lies down to pleasant dreams."

It is a noble, and perhaps the most logical conception we can form of the great and inevitable change that must come to us all, to consider it as but the awakening from the dream of our present life into a higher state of existence, with a comprehension of the laws governing the universe and our individual being, which shall lead us to look back upon the experiences of our present life as we now vaguely remember the visions of a disturbed slumber, and with as little regret that they have forever passed away.
drugs are among those most frequently employed—and, when occasion warrants it, in large doses. The chief objection to antipyrin is the scarlatiniform eruption it is liable to produce when given in large doses especially in the case of young girls. Second to antipyrin (and inferior to it only because of its insolubility) is placed methyl acetanilid, or exalgine. It is more active than antipyrin and causes no eruption. The ordinary dose—four grains two or three times daily—may be increased to twenty grains in obstinate cases. Insoluble in water, it is to be given in alcoholic solution. The following formula was suggested:

R. Exalgine, 2.90 grams.
Essence of peppermint, 10 grams.
Linden water, 120 grams.
Syrop of orange flowers, 30 grams.
M. One tablespoonful, (four grains), morning and night.

The remedy has a wide range of applicability. It is said to afford relief whatever might have been the cause of the pain. In three cases of cardinalgia, with anginous seizures, the speaker had observed its beneficial action, and Gaudiman, in neuralgia, had known it to fail but three times in thirty-two cases.

Pheenacetic, to which he accords third place, is sparingly soluble, and but slightly toxic. It is of special value in the neuroses of the hysterical. It is best given in capsules—the dose being about seven grains once or twice a day.

Acetanilid he placed last, not because of deficiency in power to relieve pain, but on account of the alarming cyanosis it sometimes produces. The remedy, however, was often employed for months without causing more than a passing—and harmless—discoloration of the skin and mucous membrane.

The close interdependence of different parts of the body, and the folly of any "specialism" in medicine which ignores that interdependence, is well shown by cases of obstinate cough reported by Dr. A. C. Palmer (North Carolina Medical Journal). One case was that of a patient, forty-five years old, suffering from an almost continuous cough with little or no expectoration. After careful examination of the chest and larynx, accident led to an examination of the ears, where there was found decided inflammation, with hyperaesthesia of the drum membrane so intense that a touch or even a draught of air was sufficient to bring on a characteristically paroxysmal cough of the cough. All other treatment was now discontinued, attention being directed solely to relieving the condition of the ears. Under treatment of this local affection of a comparatively distant and obscurely-related part of the body, the cough entirely disappeared. Afterwards two other cases suffering from disagreeable and obstinate cough came under Dr. Palmer's care. In one of these cases repeated consultations had been held for some supposed lung trouble, a real want of strength being finally proved to be the ears, which were affected by eczema of the external auditory canal, with inflammation extending down to the drum.

Dr. Lindenborn, physician to the Municipal Hospital, Frankfort-on-the-Main, claims for dithiocarbamate of soda, a new antihemorrhagic with which he has been experimenting, the following advantages over ordinary salt of soda: It has a powerful action; the requisite dose is smaller; it has no bad effect on the stomach, heart, or great vessels; it does not cause collapse nor rhinorrhea in the ears. Conceding that further experimentation with this agent is desirable, "it suffices for him to have drawn the attention of the profession to a preparation which may, he confidently hopes, be of avail in the often long and tedious treatment of some rheumatic affections."

Hueppe, who has been testing the same substance as a disinfectant and aseptic, pronounces it much superior to sulfolate of soda.

Dithiocarbamate of soda is an isomeric substance consisting of two molecules of salicylic acid bound to two molecules of sulphur.

Dr. Kolinsky calls attention (Grenn's Archive) to some undesirable effects produced by naphthalin, which has been coming into considerable use lately in the treatment of diarrhoea. It is said to cause small extraverzations in the choroid and in the ciliary body of the eye, which are followed—if the naphthalin is continued—by ephineum and white patches in the retina, and finally by a cloudiness in the lens, and crystals in the vitreous humor. These effects Dr. Kolinsky explains by attributing to naphthalin the property of producing nutritive changes in the blood which occasion degeneration of the blood vessels. The eye being a highly vascular organ, is easily affected by this vitiated state of the blood.

M. Clemens (Journal de Medicine de Bordeaux) reports good results in the treatment of ingrrowing toe-nails, by the employment of tin-foil, such as is used for enveloping chocolate and other food products. A single or double sheet of the tin-foil is introduced between the nail and the ulcerated tissues beneath, by the aid of an instrument with a thin blade. The tin-foil is kept in place by wax, which is moulded over the parts. M. Clemens attributes the beneficial effects to the chemical, rather than the mechanical action of the tin-foil.

CONTAGIOUSNESS OF TUBERCULOSIS.—Dr. Lendet of Paris, according to the Paris correspondent of the Journal of the American Medical Association, states that in the families he has known personally and attended for the last twenty-five years, out of 112 widowers and widows, whose marital companions had succumbed to phthisis, seven only were affected by tuberculosis. He therefore concludes that contagion, even between married couples, is extremely rare.

A Paris pharmacist, says the Medical Record, was recently called upon to dispense a mixture containing sixty grains of antipyrin and seventy-five grains of chloral in half an ounce of water. An oily precipitate was immediately thrown down, resembling neither antipyrin nor chloral in taste, but suggesting that of coriander seed. A mixture of antipyrin and quinine is also incompatible, both substances being at once precipitated from the solution.

According to Dr. Edw. N. Whittier, of Boston, (New Remedies), a comparison of antipyrin and acetanilid shows the following points of difference:

**ANTIPYRIN.**

Acetanilid

Action more rapid, Generally more prolonged more transitory, and powerful.

More diaphoretic. More diuretic.

Depressing after effects. Stimulating.


Dangerously toxic. Rarely toxic.

Large dose. Small dose.

Expensive. Cheap.

These results, though not uniform, are, in his opinion, sufficiently so to cause, in general, a preference for acetanilid in febrile cases.

**REGULATED DIET.—According to The Medical Brief.** (N. Y., Feb., 1890), Dr. Flini says: "I have never known a dyspeptic to recover vigorous health who undertook to live after a strictly regulated diet, and I have never known an instance of a healthy person living according to a dietary system which did not become a dyspeptic."

For nocturnal incontinence of urine, a combination of bromide of potassium and tincture of bellarmona is recommended (Therapeutische Monatsschrift) as superior to either of these agents alone. Ten grains of the bromide, together with ten to twenty drops of the tincture of belladonna should be taken before retiring.

**ANNODALIN,** a new substitute for iodide, is a preparation made by the action of iodine upon an alkaline solution of thymol. It is of a red color, and, on exposure to light or in the presence of moisture, liberates iodine.

A CHICAGO boy, suffering from paralysis, was treated (Times and Register) by laying bare the spinal column and removing a clot of blood which had collected there.

**STAMMERERS,** says the Times and Register, are advised to keep silent for ten days, then to speak in whispers only for ten days more, and finally to return to the ordinary voice gradually.

**A MAN arrested in New York City for supposed intoxication, was found to be suffering from a peculiar and obscure brain trouble. He is unable to keep awake, and seems to be in a fair way to sleep himself to death.**—Times and Register.

**MASSAGE was a fine art with the Chinese about the time Moses was perfecting his plans for the exodus from Egypt.**—Times and Register.

The Supreme Court of New Hampshire has decided that the law of that State, requiring a license for the practice of medicine, surgery, and dentistry, is unconstitutional.

**BACTERIA, BACILLI, MICROCOCCI, AND MICROBES.**

Webster thinks microbes of not sufficient importance to receive mention in his ponderous lexicon, but in this belief he is poorly supported by scientists of today. We cannot blame the compilers of this work for shirking the task of definition, for the query "what are bacteria, microbes, etc.?” would elicit the greatest variety of answers, according to the authorities consulted.

We confess to being sadly at sea when questioned regarding the differences or shades of difference in the meaning of the several terms taken as a text. It is therefore pardonable to quote a few of the more interesting statements contained within a paper by Mr. F. D. Davis before the Chemists' Assistants' Association, in London. By the freedom with which he uses the terms, it would seem that microbes, bacteria, and bacilli are the same, and though enthusiasts may apply subtle and hair-splitting differences, the unfinites are not thereby concerned.

Mr. Davis describes bacteria as being slender little rods, about one-thousandth inch long, and about one-twenty-thousandth inch in diameter. Though in form the bacteria closely resemble one another, in their manner of motion there is a vast difference, which has led to their classification as Vibrioons, having a wave-like motion, Oscillatoria, oscillating motion, etc. Just previous to the period of multiplying, the bacteria becomes quiescent,
and shortly afterwards encysted, forming upon itself an external gelatinous wall, which entirely encloses the original bacteria or protoplasm. The protoplasmic mass then divides into numberless granules, which increase in size, and eventually burst the gelatinous wall and become free, each in turn commencing to go through the phenomena of multiplication, which would probably continue to the end of time.

Micrococci are bacteria of another shape, mostly round or elliptical, multiplying by simple division. There are two principal divisions into Micrococci zyngens and M. pathogenae, besides two lesser subdivisions into the chromogenic or color-makers, and the septic micrococci. Some (the aerobes) require free oxygen, illustrated by the top yeast in the manufactory of bakers; others (the anaerobes) do not, as in bottom yeast.

Bacteria exist in all departments of life. The saltpetre beds of India and Peru are produced by aerobic bacteria, which reduce the organic matter of the soil to nitrates, which latter then combine with potash or soda. The greenish matter in a succumbing weed is the product of a chromogenic micrococcus. Any bacteria appear to be harmless, such as Leptothrix buccalis, always present in the saliva. Others are harmless in the saliva and digestive canal, but immediately produce disease if they gain access to the blood through ruptured membranes. Some bacteria assist materially in the processes of digestion, converting albumo-"nids into peptides. The bacillus of contagious diseases may be found in the body after death. Small-pox, typhoid, and the like, each has its characteristic bacillus. In some diseases they occur in the blood, in others in the liver or kidneys. It is, however, still an open question whether the bacteria or their secrections are the immediate cause of the disease, though many are inclined to think these latter, the poisons, are really the cause of many diseases.—Pharmacogn. Era.

PATOLHICAL INFERIORITY OF THE LEFT SIDE OF THE HUMAN BODY.

When a unilateral lesion attacks any of the double organs of the human body, the left organ is more frequently affected than the right. Thus, obliterating arteritis attacks the left Sylvian artery, tuberculous infestation occurs in the left apex, pneumonia in the left lung; calculus nephritis, or cyst of the kidney, attacks the left kidney; ovaritis and cysts of the ovaries are observed in the left ovary; orchitis affects the left testicle, etc. M. Henry Duchenne tries to explain this fact by the greater activity of the right side of the body and the relative passive condition of the left side, which contains the heart. The mechanical activity of the right side determines nutritive activity. The mechanical passivity of the left side produces a kind of physiological meagreness, pathological predisposition. Dr. Duchenne considers that the law of atavism may also explain the physiological inferiority of the left side of the body, for in ancient times, when hand-to-hand fights were always occurring, the activity of the right side of the body was constantly called into play.—Medical Recorder.

THE DEADLY COLD BED.

It trustworthy statistics could be had of the number of persons who die every year, or become permanently diseased, from sleeping in damp or cold beds, they would probably be astonishing and appalling. It is a peril that constantly besets travelling men, and if they are wise they will invariably insist on having their beds-aired and dried, even at the risk of causing much trouble to their landlords. But the peril resides in the home, and the cold "spare-room" has slain its thousands of hapless guests, and will go on with its slaughter till people learn wisdom. Not only the guest, but the family often suffer the penalty of sleeping in cold rooms, and chilling their bodies at a time when they need all their bodily heat, by getting between cold sheets. Even in warm, summer weather, a cold bed is deadly work. It is rated less peril, and the neglect to provide dry rooms and beds has in it the elements of murder and suicide.—Good Housekeeping.

MEDICAL MISCELLANY.

Professor Stowell urges medical students to dissect cats, as a means of studying the arrangement of muscles of the spine.


STERILIZED LINT.—M. Regnier renders lint sterile by heating it to a temperature of 120° C. (248° F.). He has tested the antiseptic value of lint thus prepared in dressings applied after operations of various kinds, with good results. At the recent surgical congress he stated that he considered sterilized lint equal to antiseptic dressings.

HUNYADI JANOS.—There recently died in Buda-Pesth, Andreas Saxlehner, the discoverer and proprietor of the well-known Hunyadi janes water. He was a cloth dealer and a Hungarian patriot, and a warm friend of Kossuth. In 1851 a cloth dealer from the country, chatting with Saxlehner in his shop, told the latter that he had upon his own land no fewer than ten places on which an oddly tasting and smelling water bubbled up, which neither man nor beast could drink. Saxlehner visited the far-famed fountain accompanied by Dr. Molnar, the analyst. The visit and analysis resulted in the purchase of the farm. Twenty years later the poor weaver's son had become the richest trader in Hungary, and had developed Hungarian industry and commerce in a direction and to a degree of which Kossuth never dreamed. He named the water "Hunyadi Janos," after his darling hero, John Hunyadi, the victor over the Turks.

FEES IN NEW YORK.—The professional fees in New York City are not so extravagant as they are generally believed to be. The general practitioner averages from two to five dollars per visit, according to the pecuniary condition of the patient. The average fee for visit to the wealthy is five dollars. The office consultation of an expert or general consultant is, as a rule, ten to twenty-dollar rates for the first visit, and five to ten dollars for succeeding ones. The fee for a consultation visit varies with the reputation of the consultant and the ability of the patient, from ten to twenty-five dollars. Visits out of town are usually from ten to twenty dollars per hour of absence from home, plus the travelling expenses and regular consulting fee of twenty-five dollars. Surgeon operations are rated according to character, time, and skill, range from one hundred up into the thousands. The operation fee is charged for as extra of that for time when away from home. Night calls are twice the amount of day services, whether ordinary or consulting visits. Notwithstanding these accepted rules, there are not a few cases with higher fees—in fact, name their own price and get it. On the other hand, there are many younger men in the profession who are content to average a dollar a head for every patient they see, whether in their office or on the top floor of a six-story tenement in the rear.
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Familiar Science.

THE MAGIC CASH BOX.

A curious little toy is illustrated in La Nature, called the Magic Cash Box. Viewed from the front through the glass forming one of its sides (A), it appears to be simply an empty box, covered on the interior with white cloth or paper. Now, if a coin is dropped into it through the slit in the top, it immediately vanishes, the box is apparently as empty as before, and the question printed at the back, "Ou est passe la monnaie? (Where has the money gone?) becomes a very pertinent one.

The mystery is solved by removing the back of the box (B) and examining the interior. We then find that the box is not really empty, but contains two mirrors, placed together at an angle of 45°, with the apex of the angle facing the front of the box. These mirrors reflect the sides of the box, and produce the illusion that one is looking directly at the back, when, in reality, it is the reflection of the sides that we see, and the money dropped into the box is concealed in the space behind the mirrors.

This ingenious toy can easily be made by anyone with two pieces of looking-glass cut to the proper size. Care must be taken to have the cloth or paper covering the inside of the box perfectly white and clean, with no marks or figures to be reflected. The mirrors must be placed at an angle of exactly 45°, and the edge where they come together is concealed by a narrow strip of card bearing the legend noted above.

LEAF MOSAICS.

By Fred'k Ledyard Sargent.

Since the time when the illustrious Dr. Priestley, a little over a hundred years ago, discovered that the green parts of plants have the power of making the air around them fit for animals to breathe, the attention of the curious in such matters has been repeatedly directed to the study of how the leafy shoots perform their work. It was early seen that sunlight is necessary to enable the leaves to drink in the carbon-laden particles from the air, and liberate from their confinement the atoms of oxygen; and, after a while, it came to be understood that the purpose of this subtle activity was the making of nourishment for the plant. Once arrived at the conception of foliage leaves as so many food-mills run by sunbeam-power, the great variety of form and arrangement, and the many peculiarities of behavior exhibited by leaves, acquired a new interest from the hope thus given that an explanation of their queer ways might now be found by the use of this new key.

One of the most brilliant results of the studies in this direction was the discovery that the arrangement of leaves on upright stems is governed by curious mathematical laws, according to which the place of origin of each leaf and the angle between successive leaves is fixed with remarkable precision.
To fully discuss these laws would require many pages, but for our present purpose it will be enough to point out that the various sorts of leaf arrangement on vertical axes are approximations—often extremely close—to that method which mathematicians have found to be theoretically best for securing to each leaf the utmost exposure to sunlight, and, at the same time, having it shade the others as little as possible. Thus, on stems having the leaves opposite, the successive pairs cross at right angles, and so each leaf has a clear space above it and also one below. In other cases, the leaves are arranged spirally around the stem, like the steps of a winding stair-case, and always with a nice adjustment of distance, angle, size, and proportions of leaf.

Fig. 4. Sycamore Maple. (Kerner.)

Besides these more common instances of leaves situated in higher and lower planes, there not infrequently occur occasions when it is of advantage to a plant to have all its leaves—or, at least, all the leaves of a branch—spread out at nearly the same level. Then the best possible disposition of the leaf-blades becomes a sort of mosaic, in which all the available space is completely filled, and without overlapping. Almost any wood or country roadside will afford examples of leaf-groupings which meet these conditions in ways as beautiful as they are interesting, and if a person is on the lookout for them, he will have many delightful surprises.

In situations where the soil is poor, and where, consequently, as much of the ground as a plant can get is none too much for its needs, we find leaves disposed in flat rosettes, (like that shown in Fig 1), which effectually exclude all rivals from the area they cover. Plantains, dandelions, mulleins, and saxifrage afford other familiar examples. But, in the power to exclude other plants from the soil it occupies, we have no weed which equals one which southern farmers call “the king devil.” Not content with poor soil, it encroaches upon cultivated fields with such rapidity that, in a single season, acres will be covered with an almost continuous mat of the outspread leaves.

Fig. 5. English Ivy. (Kerner.)

Similar in many ways to these rosettes on land, are those made at the surface of ponds and streams by clusters of floating leaves, borne on more or less elongated foot-stalks which come from a submerged stem. The water-starwort (Fig. 2) is a pretty little plant of this description, and abounds during the spring and summer.

Finally, in shady woods we find a third form of rosette (Fig. 3), consisting of a circle of leaves placed at the top of a short, upright stem, and so rather suggestive of a parasol. Since the theoretically best form for the leaves composing a rosette is a sector of greater or less width, according to the number of leaves, it is interesting to notice how nearly sector-shaped many of the rosette leaves actually are.

In the case of trees and shrubs, a mosaic-like arrangement of the leaves becomes of advantage on those branches which take a horizontal direction, and, if these happen to grow in a shady situation, it becomes all the more important for the leaves to be so disposed that they may utilize to the utmost what little light they can get. A moment's consideration will show that this little piece of engineering, which leaves have so often to perform, is by no means so simple as might appear at first sight. To start with, all the leaves on a plant have fundamentally the same arrangement, and, most commonly, this is such as was described above for vertical stems. Hence, to bring into one mosaic-like cluster a number of leaves which tend to point away from the axis in all directions, a variety of expedients must be resorted to; and even when they are brought to lie in one plane, there remains the necessity of adjusting them to each other with considerable nicety.

Thus in the maple (Fig. 4) we have a case in which the leaves arise in pairs, crossing each other as before described. Consequently, to make the blades horizontal on a lateral branch, certain of the leaf-stalks have to twist through half a turn, while others are forced to bend through 90°. But, besides this, there is a lengthening of some of the stalks, by which means the blades are carried out of shadow, while other stalks are correspondingly shorter than the average, so that they will shade only the stem. Finally, it should be noticed how well the size of each leaf is adapted to the place it occupies, and how admirably the peculiar angular shape allows them to fit together.

This fitting together of angular shapes is, however, accomplished even better by the English ivy (Fig. 5), and the result, as will be seen, is an especially fine mosaic. The hazels, blueberry-bushes, and the elm (Fig. 6), especially when growing in the shade, exhibit the effects of similar twistings and bendings, and show also the filling of small spaces with small leaves. In the Chinese honeysuckle such small leaves make their appearance on the older parts of a shoot—a single pair at the base of each leaf—after the first leaves have attained their growth, and are thus actually intercalated to fill up, as well as may be, the remaining spaces. This introduction of small leaves into a mosaic is well exhibited also in the belladonna (1), and in a somewhat different way in certain species of selaginella (2, Fig. 7).

Climbing plants, like this honeysuckle and the ivy, and others which grow closely appressed to the upright face of rocks, walls, or tree-trunks, differ, as a rule, from the other plants we have described, in having their leaves vertical instead of horizontal, and plenty of cases may be found of leaves grouped in planes more or less oblique; but in every instance it will be seen that only one side of the leaves is well illuminated, and this is clearly the essential condition for the formation of a leaf mosaic.

A CURIOUS MENTAL TRAIT.—A correspondent of the German Anthropological Society tells of his meeting a farmer by the name of Lowendorf, who had a peculiar habit of writing “Austug” for “August,” his Christian name. Some years later he was inspecting a school, and heard a little girl read “jeneb” for “luben,” “naded” for “nalez,” and the like. Upon inquiring, he found that her name was Lowendorf, and that she was a daughter of his former friend, the farmer, now dead. This defect was noticeable in the speech and writing of both father and daughter. It appeared in the father as the result of a fall that occurred some time before the birth of his daughter.
THE PROTO-HELvetes, OR LAKE-DWELLERS OF SWITZERLAND.

BY ADA M. TROTTER.

PART III.

THE HELvetes on the Tene.*—THE AGE OF IRON.

The numerous and important discoveries of archaeologists during the last thirty years have thrown a new light on the times preceding the Roman invasion in Gaul and Helvetia. The first researches were made on the Tleman, near Berne, in an island formed by the Aar, in 1849-50. A hundred swords, wheels, a door of chariots and chariot-wheels, Gaulish and Roman money, with numerous other objects like those later found on the Tene, rewarded these investigations. Archaeologists pursuing researches in Alesia (Alise Sainte-Reine), where Gaul and Roman met for the last time, found light arms which had been buried for nineteen centuries, furnishing precious specimens for study.

After the discoveries of M. Fred Keller, at Melien, Prof. Desor and Coll. Schwab began to seek for antiquities in the lake of Western Switzerland. At the extremity of Lake Neuchâtel, near the spot where the new canal of the Thuelle is by Port to Bruff, below Nidau, even to Zurich and along the Limmattal.

The researches organized by MM. Schwab and Desor were carried on at the spot where the water was only from 60 to 80 centimetres in depth, and where the gravel-bed was not so deep as elsewhere. Here they found an ancient habitation—a station almost full of objects in iron, unique then, which made a great sensation in the archaeological circle, and bore afar amongst savants the distinguishing title of Tene, (iron tennis), shallow water. Still, the depth of the water and the layers of mud and gravel on either side, limited the researches to the few metres above the bottom; this field was left by the workers, apparently exhausted. When, however, the correction of the waters of the Jura, with the construction of the canals communicating with the rivers, lowered the level of the lakes, laying bare the archaeological treasures of the Brolo and Thuelle, the portion which had already yielded such rich rewards on the Tene was left dry, and here Prof. Vouga began his new investigations.

These researches on the Tene have furnished the most numerous and best preserved objects of the Iron Age; hence archaeologists have termed this period when the use of iron was general, the "Epoch of the Tene." It is supposed to be more recent than that of Hallstadt, where iron existed at the same time with bronze. These recent discoveries on the Tene confirm the assertions to be found in the writings of ancient authors, Latin and Greek, as to the manner of life, utensils, and the arms of the Gauls. The "Helvetes," they tell us, "made part of the large Celtic, or Gauls race, extending from the Carpathian Mountains to the Atlantic Ocean." Proof of this assertion may be found in the towns of Western and Central Europe, even to the Carpathian range and the Vexia, where objects are found similar to those of the Tene. At some time, B.C., however, the Gauls, pressed by the Suebi (Germans), occupied only the country west of the Rhine. The time of their splendor was past, and they were weakened by intestine warfare. The advance of the Romans to the south of their territory, and the frequent incursions of the Germans to the east, rendered them at length desperate, and they decided to emigrate en masse, to pass the Jura and establish themselves in Gaul. "Before their departure," says Caesar, "they had burned their twelve towns and four hundred villages." So far the ancient writers carry us. Now let us return to the revelations of the Tene.

Prof. Vouga began his researches near a bridge, or long passage on piles, and, in addition to several Gaulish habitations, found traces of a Roman station. Among the houses was one which had a second floor in place. This floor was formed of two beams, 15 metres in length,—one of oak, the other of pine,—20 centimetres thick, square and well jointed. The walls had fallen one upon another in the lake, but it was found that each was formed of three beams of pine wood. The cross-beams were there also, and some treillis-work, whose interstices were filled with large pebbles. The building was covered with gravel, and was probably built with a view to further research, but it was impossible to penetrate the gravel-bed to the bottom of the river. Vestiges of five habitations were discovered within an area of 180 metres, while from the neighborhood, from a bed of mud three metres thick, quantities of objects in iron were drawn,—swords, lances, hatchets, razors, chisels, an entire wheel, chariots, and a broken deformed wheel and harness.

Then below other layers of mud, sand, and gravel, the searchers came upon a meele of bones of men, horses, oxen, and other animals, with utensils of wood, and fragments of large vases, unhappily destroyed. Near this spot, three complete skeletons were discovered, one of which had a cord tied around the neck. By the first habitation, the bank of the Thuelle is covered with gravel for a distance of three metres deep. The Roman remains are found in the middle of this gravel-bed, in the form of tiles, fragments of pottery, nails, etc., about a metre above the objects belonging to the Helvetes.

The Helvetes worked in iron and bronze with great skill. Their arms, swords with scabbards in iron and bronze, lances, arrow-heads, javelins, horse-bits, etc., show great perfection. The hand of the artist also is visible in the tools of this age, and furnished him with materials for the production of art in iron and bronze. The scabbard adapts itself exactly to the sword. It is formed of two blades of sheet-iron, or very thin bronze, of which one laps over the other, and is more or less ornamented. Most of the swords are rounded, but a few have been pointed. They are pliant, but not always well tempered, as the Romans found to be the case, according to Polybius. The fact that so many of the swords and knives appear to be new, has given rise to the supposition that these habitations on the Tene were storehouses, or shops, always kept well supplied, so that the Helvetes could retire to their fastnesses on the pile dwellings when pursued by the enemy.

Among other interesting objects, we find two hand-saws, such as are used by gardeners of the present age; also in some cases containing iron needles, and several iron and bronze keys, with circles and rings of iron. But none of these kettles were furnished with handles; the latter came in with the Romans. There are but few remains of pottery to be found in this epoch of the Tene. The one whole vase is in the museum at Neuchâtel. The fragments of broken ones are not well made, being rough inside, black, and polished on the exterior. A few objects in glass, beads (white and blue), part of a bracelet in blue glass, money, and ornaments in gold, are sometimes found. The stations on the Tene must have been very ancient, as there are no signs of coats of mail, casques, belts, or chains of bronze. The money

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PUPULAR SCIENCE NEWS.

[Origin in Popular Science News.]

* Les Helvetes a la Tene, by Prof. Vouga.
found seems to date from 200 B.C. Still, some of the establishments must have been of prior date, but the researches have not been complete enough to prove, or even approximate to correctness on this point. But the archaeologists seem to be of the opinion that the Tene was not a station such as those of the Stone or Bronze Ages, known as habitations where people lived in security against wild beasts. It is evident that they were attacked here and defeated by their enemies, who carried off everything of value in gold and silver that they could find. We read in Roman history that such was the custom of the conquerors; that Marcus, "having defeated the Cimbres, chose from the trophies the most beautiful arms, and burned the rest." The unfortunate Helvetes left on the marsh or in the river, their bodies, their treasures,—everything, in fact, that the victors did not care to carry with them. The waters at flood tide swept these bodies and objects to the bottom of the Thielle, and there covered them with successive layers of turf, sand, gravel, and mud.

Such is the conjecture of the archaeologists, to whose labors we owe the fine collections in the museums, which give us the opportunity of judging for ourselves of the skill and ingenuity of this war-like race of the great Iron Age—the "Epoch of the Tene."

Scientific Brevities.

A Dublin Trader announces on his billheads that, in consequence of the inaccuracy of chemical analysis, he has ignored such tests in favor of a sworn magisterial declaration regarding the quality of his goods.

Another Mine of Mercury is announced as having been discovered in the Transvaal, at a place called Witkoppies, near Malamane. The yield of quicksilver shows that the ore is rich, though the mine at present is only fifty yards square.

Electricity in the Dairy.—An interesting application of electricity to the dairy industry has been recently made in Italy. The Count of Assati, whose bouses are in the shape of a tower, has connected his dairy plant with an electric motor of twelve horse-power. This machine drives a Danish separator and a Danish churn of the capacity of 400 litres of cream, churning being conducted at the rate of 120 to 160 revolutions per minute, the butter being brought in from thirty to thirty-five minutes, in fine grains, which, it is now recognized, enables the maker to produce the finest article. A pump is also worked in the dairy.

A New Roofing Material.—A new roofing material is mentioned in the German papers, in the shape of a sort of metallic slate, somewhat similar to those used among us, but enamelled so as to be proof against moisture or acid vapors. Metallic slates of tin and galvanized iron have long been used in Germany, and galvanizing has been pronounced by the highest scientific authority there, to be the best protection against rust that has yet been applied to iron, but it is acknowledged that the heading necessary to form the locking joints of the metallic tiles is apt to throw off the protecting covering, leaving the iron exposed to corrosion. In order to provide against the bad effects of this, the new plates are made of sheet-iron, stamped into shape in the usual manner, and are then dipped into an enamel paint, which, when heated, forms a continuous coating, unaffected by acids or alkalies. It is too soon to say how long a roof laid with such a material will last, but it promises to be of considerable value.

Practical Chemistry and the Arts.

Aerial Navigation.

It may safely be said that the navigation of the air is a practical impossibility, and that no balloon, air-ship, or other means of conveyance which can be propelled through the air in a definite direction, under the control of the operator, will ever be constructed. But, as, this method of travel is confidently predicted by many as a development of the near future,—and even now announcements of the discovery of a means of navigating the air appear more or less frequently,—a consideration of some of the theoretical principles involved may be of interest.

It is evident that a practicable air-ship must contain within itself the power to make it rise in the air, as in the case of a bird. No balloon could ever possibly be forced through the air against a wind of any velocity. The immense surface presented to the action of the wind, would require a force to overcome it far beyond any that we could produce; and, even if it could be accomplished, it would only result in its immediate destruction by tearing the necessarily light and fragile material of the balloon into fragments. It would be as easy to drive a balloon at a high rate of speed underneath the ocean itself, as to make any headway against a wind of only moderate violence.

It is a necessity, therefore, of a practicable air-ship that it must contain within itself not only the power to move it through the air, but to sustain it at the required height. A bird does this, it is true; but the body of a bird has a very small weight in proportion to the force developed by its organism. It is like a motor which has only to move itself. But we have no artificial motor which can begin to compare in efficiency with the natural one possessed by the bird; and, besides, an air-ship must not only raise and move itself,—and the weight of all our artificial motors is very great in proportion to the power they exert,—but it must also carry the weight of passengers, baggage, supplies, and many other things, all of which increase the power necessary to raise them to an immense degree. Theoretically, an air-ship is possible, but a calculation of the force necessary to lift into the air even the lightest and most efficient form of steam engine known to us, will show that it is far beyond any power that it can develop, to say nothing of the addition of passengers or freight, and the driving of the whole through the air against the ever prevailing winds. The storage battery has been suggested as a feasible means of supplying this power, but the storage battery is even less efficient in proportion to its weight than the steam engine, to say nothing of the practical difficulties in the way of recharging it with energy.

As far as we can now foresee, the railroad will always remain our best means of locomotion. Undoubtedly immense improvements will be made in our present system, as regards safety, comfort, speed, and economy; and, although the traveller of a hundred years hence may, very likely, look back upon our limited expressions as something only fit for emigrants, yet we are inclined to believe that the fundamental type of the railroad will always persist, and that as long as the human race remains upon the earth it must confine itself in its movements to the surface of the land and water.

[Original in Popular Science News.]

Aluminum.

By George L. Burdett.

One of the most abundant elements on earth—in fact, the most abundant metal—is aluminum. It occurs in combination with oxygen and silicon, and is the principal basic radical in many minerals, such as slate, felsspar, and mica. It occurs in clay, marl, and in different soils; also in sapphires, rubies, and emeralds. In all, about one-twelfth of the earth is aluminum.

Many aluminum salts had been known from early times, and had been utilized in different ways, but the pure metal had not been known. It was first obtained by Wohler, in the form of steel gray powder, but afterwards in malleable globules. Others have obtained it by heating metallic sodium with chloride or fluoride of aluminum, or with a double chloride or fluoride of aluminum and sodium.

The pure metal (Al, 27) is bluish-white, with a bright metallic lustre. Its low specific gravity (2.65) is its most remarkable property. It is ductile, malleable, and tenacious, and may be rolled into sheets or drawn into fine wire. It melts at about 660°. It conducts heat better than silver, and electricity better than iron. It is permanent in air, and is only attacked by water, forming hydrated oxides in octahedrons on cooling. When melted in a crucible, it does not oxidize, and so it may be cast. When dropped or struck, it gives a clear, musical note, but is too Sonorous for bells. Neither concentrated nor dilute nitric acid acts upon it, but it is readily attacked by both concentrated and dilute hydrochloric acid.

The uses of aluminum are, at present, comparatively few, owing to its cost and the difficulty with which it is prepared. It is used chiefly on philosophical instruments where permanence, lightness, and rigidity are needed. For the same reason, it is beginning to replace copper in making scale-beams for delicate balances, being only about one-fourth as heavy, but equal in rigidity, and about the same rigidity. Small weights are also made of it. Owing to its permanence, it is used sometimes for cap-stones. The cap-stone of the Washington Monument is of aluminum, and is said to be the largest piece in existence.

Aluminum forms a number of interesting compounds. It readily unites with copper, silver, and iron to form alloys. It may be melted with lead, but it is immiscible with tin; however, and no combination will take place. The alloy with copper is a golden yellow, and takes a high polish. It is much used as jewelry, being the best imitation of gold. Aluminum treated with soda hydrate gives the rough, frosty surface lately so popular on jewelry. Messrs. Bell manufacture a yellow alloy containing ten per cent. of aluminum, which they call aluminum bronze. It
is very hard and tenacious, and is used to some extent in gas-fixtures.

Aluminoxide ($\text{Al}_2\text{O}_3$) is white when pure, but when colored with oxides of iron and manganese, it is known as emery, and is used in the manufacture and grinding of cuttery.

Aluminate hydrate ($\text{Al}_2\text{H}_4\text{O}_5$) is used to form lakes in dyeing. It acts sometimes as a base, and sometimes as an acid, and is thus interesting, because it fulfils Mendeleef's prediction.

Alum ($\text{K}_2\text{Al}_2\text{SO}_4\cdot 24\text{H}_2\text{O}$) is an important compound, formed by adding potassium sulphate to a boiling solution of aluminate sulphate, and crystallizing the alum from hot water. When pure, it crystallizes in white octahedrons, and so its purity may always be told by its crystallization. It is used extensively as a mordant in dyeing.

Uranomarine is an aluminium compound. Its blue color is due to the way in which its constituents are arranged, and not to those which it contains. It is a common blue pigment.

Clay, as has been before stated, contains aluminium. All pottery, earthen-ware, china, porcelain, etc., are made of clay. The clay is shaped by various processes, baked, burned, and milled. Aluminium, therefore, occurs in all pottery, etc.

Although the compounds of aluminium are so widely distributed, the pure metal is comparatively rare. Many so-called cheap processes for making the metal have been discovered during the past fifteen years, but none have succeeded. Aluminium was formerly obtained entirely from the Aluminium Society of Paris, who make it from clay. Before the Franco-Prussian war, it was said that England and Germany could manufacture it, but during the siege of Paris none appeared. At that time no process was able to compete with that of the Society, who furnished aluminium at $1.25 per ounce troy. In 1882, about one ton of the metal was used in this country. In 1884, a Philadelphia chemist discovered a process, in which he substituted sodium vapor for the soda carbonate of the other processes. A better quality of metal was obtained, and many thousand ounces have been manufactured.

The Cowles brothers have tried reducing aluminium in an electric furnace. This is a sort of crucible, through which passes an electric current, flowing through a substance offering great resistance, and developing great heat. This fuses the mixture of charcoal and aluminium compound in the crucible, but it is very difficult to get the aluminium at this high temperature. A new process of reduction has lately been discovered, by which, it is said, aluminium may be put on the market at $2.00 per pound, with the possibility of a much lower price. If this process is successful, the uses of aluminium will increase rapidly in a short time.

Aluminium, being a fine conductor of electricity, a non-rusting, non-tarnishing metal, harder and much lighter than iron, must eventually replace iron. But, of course, the change will be gradual. Just as there has been a Bronze Age and an Iron Age, so there may be an Aluminium Age. Or, in other words, it will begin to be manufactured at a price which will make it useful in the arts.

The old-fashioned way of doing things is often lost sight of, and, when seen for the first time, is of great interest at the present day. To persons accustomed to large manufacturing enterprises, with special machinery for turning out certain articles very fast and cheaply, the hand-made article of an hundred years ago is curious and interesting.

In many sections of the country, far away from cities and railroads, some of these old-time articles are still made in the original way. A visit to a "jug factory" in one of our interior counties will show an example of a primitive process still in active operation in a number of places. Many of our young people have probably not had an opportunity of seeing how a jug is made. The writer remembers as a boy the apparent mystery as to how they were made, and was told that they were constructed by plastering clay over a coil of rope, and the rope afterwards removed by uncouling and withdrawing the same through the mouth of the jug. Such a method would, of course, be impracticable.

The maker of pottery at one of these rude factories is usually a small farmer, who devotes his spare time to the business. Since he uses his own material, employs no help, but does everything with his own hands, he cares nothing for strikes, freight rates, or labor agitators. His wage is good for so much per gallon in the vicinity or the neighboring country towns, where it is taken for sale on his own wagon.

The potter sits astride a rough bench, and generally uses an old, worn-out saddle to make the seat more comfortable. In front of him is a shallow box, with a horizontal wheel or disc in the center, carried by an upright shaft having a similar, but heavier, wheel below and near the floor. He causes the wheel to revolve rapidly by means of a remarkably simple foot-power arrangement, the heavy wheel at the bottom serving to keep up a steady movement. The foot-power is a short stick or rod, pivoted by a peg at one end, and suspended at the right height by a short piece of chain. The crank in the upright shaft is connected to the oscillating rod by a piece of wood. By a gentle side-swing of his left foot, the operator produces the necessary rotary movement of his wheel.

Having previously tempered his clay and separated it into proper portions for a jug of a certain size, he takes one of the lumps and places it on the center of the revolving wheel, and proceeds to give it shape and form. It is a curious sight to watch the plastic material grow into symmetrical shapes under the simple manipulations of the potter's fingers, sometimes assisted by simple tools of wood or bone.

He first inserts one or two fingers of one hand into the center of the mass, and uses his other to press on the outside. This produces a hole in the clay, which now assumes the shape of a thick ring, and is made thinner and drawn upwards, to form the side walls of the jug, by simply raising both hands at once, drawing the clay up between them. The article now has the form of a wide-mouthed jar or cylinder, and may be finished as such by a few touches of a tool around the brim. To make it into a jug, the upper rim of the jar is turned inward with the handle in the form of a dome. To do this, the potter turns the wheel with one finger inside and a tool on the outside. The handle is shaped separately and attached by pressing the ends down on the moist body. At the bottom the jug is still stuck fast to the wheel, but is readily detached by drawing a fine wire under it.

After being properly dried, the pottery is baked in a long arch of brick-work, having a chimney at one end. Wood is used for fuel, and, at the proper time, common salt is thrown in, to produce a glaze on the surface of the ware. Some skill and experience is necessary to conduct the firing properly, or the ware may be ruined. Though often ungraceful in shape, this pottery is in common use in most places where the distance from large factories makes freight rates very high on such goods.

STATE TELEPHONY.

It is not yet known what action the Postmaster-General will take with regard to the telephone companies during the next six months. The companies work under a license from the Postmaster-General, who, at the end of June next, can give notice to the companies that the government intends to take over by purchase, the telephone service of the country. According to the draft license under which the companies carry on their business, the government may purchase the telephone systems at the end of this year by giving six months' notice, and it is very probable that this will be done, in view of the amalgamation which recently took place between two or three of the companies. Should the State take over this industry it is to be hoped that we may be saved the inconvenience which has occurred in France since the French government took over the telephones a few months ago. There everything is topsy-turvy, and communication between subscribers to the Exchange is exceedingly difficult, and sometimes impossible, owing principally to the inattention of the government employees. Another great annoyance is the fact that many of the subscribers-except those having the instruments in their dwellings—are run up very early every morning by the employees, in order to see whether the transmitters are in working order. The Italian government, too, proposes to purchase the native telephones. We trust that we in England may be spared the vexations of the French subscribers, as telephone communication is already carried on under sufficiently great difficulties.—Mechanical World (Englland.)

LABORATORY NOTES.

ACTION OF Glycerine upon Vulcanized Rubber.—M. Morellet states that vulcanized rubber dipped suddenly into boiling glycerine takes the characters of non-vulcanized rubber, i.e., that its parts can readily be joined and that it dissolves in the usual solvents of coumouchon. The glycerine must be boiling at the time of first contact.

MUSICAL FLAMPS.—The well-known experiment of making sounds by holding a tube over a jet of burning gas (usually hydrogen) is often omitted in chemistry classes because no suitable tubing is at hand. A fact noted by Mr. T. B. Smith is that a bottle will serve in place of a tube. A "philosopher's candle," properly burning, will yield a fine sound if capped by a wide-mouthed bottle, as a quinine bottle or large test-tube.
A NEW MEMBER OF THE A. A. COUNCIL.

It always gives us encouragement to receive offers of assistance from gentlemen of scientific prominence. It is with peculiar pleasure, therefore, that we present to our Chapters the following generous offer from Dr. Austin P. Nichols, the senior editor of the *Popular Science News*:

**HAYERVILL, MASS., MARCH 1, 1890.**

**DEAR MR. BALLARD:** I shall be most happy to correspond against members of the Agassiz Association, and answer questions on the subjects of chemistry and physics, as far as it is in my power to do so.

*Very truly yours,*

*Austin P. Nichols.*

**CHAPTER ADDRESSES, NEW AND REVISED.**

Between last July, when the *Swiss Cross*—which for two years and a half had represented our Association—was suspended, and January 1st of this year, when it was revived in connection with *Santa Claus,* a large number of new Chapters were admitted to the A. A., whose names and addresses all our friends will wish to see. We therefore give the list in full:

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<th>No.</th>
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**THE WORLD'S FAIR IN 1892.**

**SHALL THE AGASSIZ ASSOCIATION EXHIBIT?**

It is moved and seconded that the Agassiz Association make an exhibit of its work at the coming celebration of the discovery of America by Columbus. The motion is as follows:

At the eighth-third regular meeting of Chapter 421, East Providence Centre, R. L., it was unanimously resolved to make a motion that the Agassiz Association exhibit at the World's Fair of 1892.—Joseph Bridgham, Sec.

This motion has been seconded by Chapter 949 (Z), New York, N. Y., and it is now .
before the Association for discussion. It will, of course, involve a great deal of labor and no little expense; but, if the Chapters would enter into the scheme with enthusiasm, we could make an exhibit that would command attention. The collections of all our Chapters, if ranged side by side, would not only occupy a large space, but would fairly represent the varied and abundant natural products of America. Photographs of our local societies, of their rooms, apparatus, libraries, and of local scenery should be added. There would be a place for all the publications that have been issued by Chapters or individuals connected in any way with the A. A. Geological and botanical charts and maps, sketches, note-books, and manuscript papers should be added. These, together with our charters, badges of all the various styles, banners, and other emblems, would form a collection not unworthy a place even in so imposing an exposition as will be that of 1892.

Mr. Uriah L. Hertz, President of our Audubon Chapter in Kent, Washington, writes: "I should like to see our society represented in some attractive manner at the coming World's Fair. A small, unique pavilion—built by subscription—with the collections, maps, etc., would be appropriate, I think. I will subscribe, for one."

Now I shall not undertake to rival one of the great New York papers, by offering large prizes for the greatest number of the brightest ideas with regard to a possible representation of our Association in 1892, but I hope to hear from every Chapter that feels an interest in this matter, either pro or con. Say particularly whether your Chapter would contribute its share toward making such an exhibit worthy of the Association, and whether it would subscribe toward the necessary expenses. Suggestions of ways and means of making an interesting and attractive display will be especially welcome. 

THE ISAAC LEA MEMORIAL CHAPTER OF CONCHOLOGY.

The Isaac Lea Chapter of the A. A. is one of our so-called "Corresponding Chapters"—that is, it is composed, not of members united by their residence in a common town, but of those who, though scattered throughout the whole country, are united by a common interest in conchology. The President of the Isaac Lea Chapter is Professor Josiah Keep, of Mills College, California. Professor Keep is well known among scientific men, and is the author of "West Coast Shells," and "Common Sea-Shells of California." Under date of Jan. 17, Professor Keep writes: "I was surprised to receive notice, a few days since, that I had been elected President of the Isaac Lea Chapter of the A. A. I will accept the office, and will endeavor to perform its duties faithfully. I have long taken the Popular Science News, and am pleased to see that you are to have a department in that excellent paper. I desire to increase the interest in conchology among the members of the Association."

We congratulate the Chapter that it has secured so able and kindly a gentleman for its leader. Was there ever before so good an opportunity for young and old to make themselves familiar with the beautiful and curious shells that lie scattered along their paths, and under the waters of the brooks and ponds in their vicinity? No one is so young, so isolated, or so humble, that he will not be welcomed to this earnest circle of shell-hunters; and there are in it men able and willing to give freely and only too gladly, all the information anyone may need about whatever specimens he may find. The membership of the Isaac Lea Chapter ought to double in a month. All are invited to join it.

ORIGIONAL OBSERVATIONS BY MEMBERS OF THE AGASSIZ ASSOCIATION.

259. A Double Ranunculus Traced by a Stream of Water. —I found last spring a double-flowered specimen of Ranunculus, growing in the moist ground by the railroad. The species seemed to be closely allied to R. repens, as shown by the foliage and manner of growth. The flowers were perfectly double, all the stamens and pistils being changed to petals. This fact led me to the conclusion that the plant had escaped from cultivation, as I have not heard of an instance in which flowers have become perfectly double naturally. So I set myself to find out, if possible, how it had escaped, and from where. There is a small stream which runs by the place where the plant was found. Thinking some root-stalks might have been detached and brought down by this stream, I followed it up some distance to a place where it runs along the roadside. Here I found another specimen of the plant, and in a doorway near by were others of the same kind, which had evidently been cultivated. I considered this satisfactory evidence that the plant had escaped from cultivation. There is a specimen of a similar plant in the New York State herbarium. It came from the central part of the State. Prof. Peck, State botanist, says that it is the only specimen he ever saw. He came out to the place and collected specimens of it, and he has since written me that he compared it with the true R. repens, and that he considers it a cultivated form of that species.—Cornelius L. Shear, (member of Gray Memorial Botanical Chapter), Union Church, N. Y.

260. Remarkable Insect Intelligence. —We happened to witness a curious fight between a wasp and a black-faced horning-bee. We had noticed dead bees lying on the ground beneath their holes, which were in the side of a wooden building, but had not before known what killed them. The wasp was metallic black and blue. It was busy at one of the bee-holes. Near by was an asparagus-bed, full of bushy and dry old plants. On looking closely, we saw that the wasp was holding a piece of one of the branches of an asparagus-plant, and was trying to pry the bee out of his hole. The bee had his body at the entrance of the hole, the sting pointing outward, and was buzzing angrily. The wasp held his weapon firmly with his mouth, supporting it by his legs. About a quarter of an inch of the twig projected in front of him. Suddenly he dropped his stick, but immediately flew to the asparagus-bed and went to cut a branch. Next he flew up the bee-hole. He lit on a bush, and cut a branch off near the main stem, and then cut off the opposite end. He then had a little lance about an inch in length, and a little larger round than a pin's head. Then he charged the bee again, and began prying as before. The wasp dropped his stick again, but, not at all discouraged, cut himself another, and this he did several times. At last he succeeded in getting a piece of the bee, and stood his lance straight up in it. I did not see him after that, but suppose he killed the bee. I have heard it said that animals do not make use of "tools," but this observation seems to show that they can add to their means of offense when their natural powers are not sufficient. Connecting the dead bees with what we saw, there is reason to conclude that the wasp was killing the bees and taking their stores for his own purpises.—George M. Brooke.

[The foregoing account seemed to us so unusual, that a letter was written, asking the corroboration of the second witness implied in the word "we." The answer is appended.—EDITOR.]

Dean Sei: You may accept without hesitation the report made by my son of the encounter of a wasp with a bee. I was present and witnessed the occurrence. The circumstances were as above described, and the wasp, which I have already mentioned, from which the wasp cut his staves, was not more than six feet from the bee's hole, and we were about midway. The wasp was so successful in his attack that I supposed not to notice our presence, and we were thus enabled to approach very near him while engaged with the bee, as well as to cutting and trimming the slender tips of the dry asparagus-stems. His aggressive manner, his checkered and blue body, and his attitude instantly suggested the idea of a knight in armor facing, lance in hand, the stronghold of an enemy. This incident occurred in the latter part of the summer of 1897; the exact date was not noted. We kept a bright lookout last summer, hoping for a repetition, but were disappointed.

Respectfully yours,

John M. Brooke.

Professor of Physics, Virginia Military Institute.

REPORTS FROM OUR CHAPTERS.

A BRIEF GLANCE AT A FEW OF THE GOOD WORKERS.

259. Onconta, N. Y., [A].—Our Chapter has been organized five years, and during that time we have analyzed and identified three hundred and fourteen phanerogamous plants, twenty-one ferns, seven or eight sedges and grasses, and four or five lycopodiurns. This list includes scarcely any cultivated plants, and, with very few exceptions, all were found within easy walking distance of our homes. We think we have quite a fair knowledge of our native flora. Our little wild garden has been a great assistance in our studies. Frequently we find young plants with which we are unacquainted, and transplant them to our garden, where we can observe their growth, blossoms, and fruit. But it would have been impossible to have visited them in the woods at exactly the right time for analyzing. The situation of our plot is unfavorable, being too dry and not shady enough. For this reason, many of the prettiest plants die, and, as the worthless ones are pulled up, our garden never presents a very showy appearance. A few days ago I overheard a farmer, who was looking at it, say, in a very emphatic and somewhat disgusted tone, "Well, that don't amount to much!" I suppose he could not see much that had been looked valuable, but if he could have seen the knowledge we have gained from that little bit of earth, he would have concluded that there was much more there than could be seen. We find the plot has many advantages, and it cannot be too strongly recommended. We were greatly interested in two articles about "Many
On March 2, 1859, we held our third annual exhibit-
ion, which was largely attended. It is surpris-
ing to find, at the end of the year, how many names our
"Visitors' Book" contains. In April 1859, a course of
lectures was given by Professor Freeman. LL. D.,
under the auspices of the Chapter, on
Oke, Pompeii, and Naples. These were beauti-
fully illustrated by colored lantern-slides, prepared
for the occasion. The proceeds of the lectures en-
abled us to enlarge our cabinets and pay other
expenses. At present we have a surplus of $22 In
the treasury. Our library is in a flourishing condi-
tion, and contains sixty-two bound and eighty-five
unbound volumes. The collections have been
greatly increased during the year. The minerals
have been arranged and catalogued by Mr. G.
Stanton, and our collection of New York City
minerals has become of such value that our rooms
are visited by local collectors for the purpose
of seeing our rare specimens. Several hundred insects
have been donated, as well as a number of plants,
especially cryptograms. A number of excursions
have been made to points in the vicinity, and sev-
eral splendid collecting-grounds found. Within
a short time we hope to issue a report of our work,
upon which we are now busily engaged. Several
persons have joined us as corresponding members,
and we should like to hear from more.—Heinrich
Iles, Columbia College, Cor. Sec.

PUBLISHER SCIENCE NEWS.

[April, 1890.]

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Reports from the Fifth Century (Chapters
401-500) should reach the President by May 1.

All are invited to join the Agassiz Asso-
ciation, either as corresponding members or
by forming Chapters. Local societies of
kindred aims are especially invited to unite
with us. No surrender of present name,
purpose, methods, or independence is
required. Application blank sent on request.
Address, Harlan H. Ballard, President A. A.,
Pittsfield, Mass.

[Written for "The Out-Door World."]

ALASKAN BURIAL.

BY JAMES T. WILDE, M. D.,
Of the Agassiz Association.

For a number of days in last July, I was in the
vicinity of Point Hope, Alaska, and made frequent
visits to the village of Tigara, and the neighboring
cemetery, which is one of the largest on the Arctic
coast. It is situated on the village of
between the village. Here the Inuitas place their dead—not
in graves, but upon platforms, raised, perhaps, four
feet from the ground on four rude posts. In
the older cemeteries these posts are the ribs of whales,
but in the newer portions woodef support are used.
Upon these platforms the bodies lie flat on their
backs, with their heads toward the east. I was care-
ful at first not to let the natives see me disturbing
their dead, but I soon found that they did not mind
it; at least, they made no expression of disapproval.

The heavy winter gales play sad havoc with the
burials. Whatever they can and do not bury, they
place the bones about in every direction. By digging care-
fully in the loose sand between the whale-bone
uprights that marked the location of an old plat-
form, I found quantities of flint and bone arrow-
heads, slate knives, bone adzes, and various pieces
of broken bows, sleds, and snow-shoes but in the
more recent ground were found pieces of guns,
bullets, steel knives, and the like, for the whalers
have taught the Eskimo the use of modern imple-
ments. Near one of the old posts I found fragments
of a coarse black pottery, evidently portions of a
good-sized bowl, of considerable interest to me, for
I did not find any pottery among the natives at the
village. They used metal utensils, obtained from the
whalers in exchange for whale-bone, furs, and
ivory.

A party of us landed one day just in time to wit-
ness the ending of a funeral ceremony. The body
—that of a woman—had already been wrapped in
skin blankets, and placed in an open box supported
above the ground. At the head was a party consisting of the mother, three other women,
a man, and several children. The mother was sit-
ting on the ground beside a small fire, smoking
while the others were arranging some garments
As we approached, one of the women gathered up
the remaining clothes of the dead, and, tearing
them into strips, scattered them about on the
ground. When this was done, the old man took a
black stone and made a mark on the ground behind
the mother, who had moved a little way from the
fire. Then, handing the stone to the next, she, too,
took a mark and so with each one, the old woman,
moving a little each time, until a circle was com-
pleted. Inside this circle the mother knelt, and,
muttering something, dropped the stone down
inside her outer garment, or parka; and in succes-
sion each of the others—even to the little children,
some of whom had to be held while the
stone was dropped inside their parkas for them.
The old man gathered up an armful of articles,
and, placing some in the box near the head of the
dead, took his place at the head of the line that had
been formed, and in single file they marched around the
foot of the platform, back to the village.

In a good many cases, I found small strips of
fresh whale-blubber, or muktuk, placed at the head
of the dead, on three small, flat stones, arranged
to form a triangle, with the apex toward the
head. All articles left with the dead are first broken or
torn. Bows, arrows, and sleds are broken so as to
make them useless, and all clothing and blankets
are torn to pieces. The natives will not use articles
found upon a corpse, believing they will bring them
bad luck.

At the villages of Noo-wook, at Point Barrow, and
Guldfish-wik, at Cape Smyth, the natives dispose of
the dead in a somewhat different manner. They
are wrapped in their skin blankets as before, but,
instead of being placed on frames, they are dragged
a short distance from the village, where, with pegs
driven through their clothing, they are securely
fastened on top of the ground, and, like the others,
with their heads toward the north. Formerly, how-
ever, when the whalers came, they buried their dead under the
ground; and a little way behind the old signal-
station, the ground is dotted over with numerous
small mounds, from which may be recovered various
relics of the past.

According to Brown and Morris, the molecular
weight of soluble starch is 32,400.
The present winter, although of unexampled mildness on shore, has been noteworthy among seamen for the terrible storms which have swept over the North Atlantic Ocean. Few steamers sailing between the United States and Europe have made their passages without suffering more or less damage from wind and waves. A correspondent, referring to this subject, asks how so much damage can be done by a wave if, as is generally held, it has no progressive motion as a mass of water. It is true that any given particle of water in an ocean wave has merely a vertical, or up and down motion, and that it is only the motion of the water that progresses, and not the water itself; but the fact is that the damage is done by the breaking up of the crest of a wave, at the proper moment to allow the mass of water composing it to sweep over the vessel with almost irresistible force. A similar occurrence may be observed at the sea-shore at any time, when the waves may be seen rolling quietly in toward the shore, and giving little indication of the energy stored up in them till they strike the rocks or the beach, when the crest rolls over, and the whole mass of water breaks up and is precipitated forward with great force. This tendency of waves to break up can be prevented by spreading oil upon the water. The effect is almost magical, and many vessels have been saved from pounding by its use. It is estimated that a film of oil 1/200,000 of an inch in thickness will prevent this "combining" tendency of the waves, and transform them into smooth, long swells, over which the vessel rides in safety.

Another eccentricity of this remarkable season was a thunder-storm which occurred on the evening of February 18th. A thunder-storm in winter, during a period of warm weather, is not uncommon in this vicinity, but it is very unusual during the ordinary winter weather, when the ground covered with snow, and a temperature near zero. The storm was brief, but violent. The lightning struck the wires of the electric street-railroad in Cambridge, and passed to the ground through a car, doing no harm, but badly frightening the passengers. Take it all together, we doubt if even the traditional "oldest inhabitant" can remember a season equal to the winter which has just passed.

A few months ago, a man convicted of a most atrocious crime was pardoned from the Massachusetts State Prison, for no apparent reasons except that he promised to be good, and had enough money to interest outsiders to work for his release. He had scarcely been at liberty six weeks before he murdered his own brother in cold blood, in order that he might inherit some of his property. This sad affair ought to be a lesson both to those crack-brained philanthropists who waste so much sympathy upon their unfortunate friends, the criminals, and for those State officials who weakly consent to the liberation of such beasts in human form, to again commence their warfare upon society. The crime for which this man was first convicted was well worthy of death, and the least that the public can demand of their legislative servants is, that such crimes shall be made unpardonable, except upon proof of innocence.

The story, related in another column, of the fight between a wasp and a bee, is certainly a most remarkable one, although well authenticated. That a wasp should have sufficient intelligence to make and use an artificial weapon to aid him in the combat, is most surprising, and shows a higher mental capacity than that possessed by some men. The great development of the intellectual faculties in certain insects, like wasps and bees, is a fact very difficult of explanation, and it is only an evasion of the difficulty to call it "instinct." Although the faculty of instinct does exist, in the human race as well as in animals, yet it is often impossible to distinguish it from reason, as in the case referred to above.

Mr. C. A. Stephens, of Norway Lake, Maine, offers three cash prizes of $175, $125, and $100 for the best three comparative demonstrations, as to the causes of failing nutrition in aging organisms, by means of microscopic slides, of the blood capillaries in young and in aged tissues, canine or human. Circumlas giving full particulars will be sent on application.

SOME ASSUMPTIONS OF SCIENCE.

It is not going too far to say that the modern sciences of chemistry and physics are based upon theories which have never been proved to be true, but are, possibly, or even probably, unprovable. The two fundamental conceptions regarding matter and energy—the atoms and the ether—are assumptions, pure and simple, and the only justification we have for assuming their existence is the very strong one that they perfectly explain all the observed phenomena, and, even further, that by reasoning from them as a basis, we can predict what phenomena will occur under previously untried conditions, and have our prediction fulfilled when the proposed conditions are obtained. Take, for a single instance, the theory of atoms. It is a fact of common observation.
that all bodies, but especially gases, vary in volume or size under varying conditions of temperature and pressure. Now the human mind can form only two possible conceptions of matter—that it is perfectly continuous, or it is discontinuous. If a cubic inch of air, for instance, or the mercury in a thermometer, were perfectly continuous, or one solid lump of matter, so to speak, we cannot conceive of any way in which its volume could change; but we know that it does change, and we are therefore driven almost inevitably to the belief that matter is made up of separate particles (or atoms), separated from each other by empty spaces, like a swarm of gnats, to use a rough illustration. The atomic weights and other chemical phenomena are hardly explainable upon any other theory than the mutual attractions of excessively minute but perfectly definite and immeasurable masses of matter.

But are the spaces between the atoms empty? Here we meet with another difficulty, for we know that energy, in the forms of light, heat, electricity, etc., not only passes readily through matter, but also across the interstellar spaces, where, for various reasons, we cannot admit the presence of matter in the forms familiarly known to us. We cannot conceive of energy or force traversing an absolute vacuum. The very existence of energy seems to be conditioned by the presence of matter. We are, therefore, driven to another assumption—that of the ether, which is supposed to be an extremely subtle form of matter, as much lighter than common gases, as these exceed solids and liquids in tenuity, which not only fills the interstellar spaces of the entire universe, but the interatomic (or, more properly, the intermolecular) spaces of all forms of matter itself. But, if the ether is matter, and if it is not it has no existence, —then it must be constituted very differently from other forms of matter with which we are acquainted, and possess a combination of qualities—such as low density and high elasticity—which are not possessed by any other form of matter of which we have knowledge.

We have no actual and definite knowledge as to how matter is constituted, how energy is transmitted, or what light, heat, electricity, chemical affinity, etc., really are, and we are hardly able to thoroughly differentiate matter and energy themselves. Certain scientists have considered them nearly identical, holding that atoms are but centers of attractive force, or of vortices in the ether, like the rings of smoke blown from the chimney of a locomotive. We think that scarcely a single scientist of repute would claim to absolutely believe in the existence of either atoms or the ether. They simply stand as expressions by which observed phenomena can be formulated, or, as illustrated by Professor Cooke, they are but the scaffolding of an uncompleted building, to be removed when our system of the philosophy of Nature is complete, but in the present condition of knowledge serving a useful if not indispensable purpose.

The more we search into the mysteries of Nature, the more incomprehensible we find them, and the more clearly we perceive the limitations of our present knowledge. It sometimes seems as if we must reason from a psychological standpoint, and refer natural phenomena to a subjective basis. But this is merely a fanciful speculation; the course of knowledge is ever onward, and we have no occasion for discouragement. We have but little doubt that in time many, if not all, of the problems of Nature will be solved, and shown to have a material and objective existence; and it is not impossible that we may obtain a comprehension of the true nature of vital force, or life itself, which we cannot but consider as the key to all those other mysteries which now perplex that manifestation of our being which we call the mind, or soul.

[Original in Popular Science News]

THE MINERAL WEALTH OF NEW MEXICO

BY M. J. GORTON

The mineral wealth of New Mexico has been known—until tradition asserts, has been partially developed—for more than three centuries. But the general exploration and real general development of the mineral resources of the Territory only commenced less than nine years ago. It was not until geological and mineralogical surveys had been achieved and reported to the national government, and the coming of the means of transportation had become an assured fact, that the development began satisfactorily.

The resources of the Territory consist not only of its mines of precious metals, but likewise of nickel, copper, lead, manganese (sulphate and carbonate), iron, and cobalt; also mica, salt, gypsum, soda, arsenic, alum, coal, borax, tellurium, lime, sulphur, plumbeous, mineral paints, silicates, many precious stones and gems,—topaz, rubies or garnets, amethyst, emerald, sapphire, olivine, chalcedony, obsidian, smoky quartz, opal, agates,—besides, of course, rich mines of gold and silver. The mining districts found in the different ranges of mountains are prospectively rich, and in importance dwarf all other interests.

The Organ Mountains lie about eighteen miles east of the Rio Grande. Several mines are in operation in this district, and we were driven to some hurried examination. Every claim has a heavy iron capping, and carries both gold and silver. The Jarrillas district, known as the Silver Hills, is due east from Sheridan's ranch, twenty miles. Here an old civilization has left positive signs of having sunk shafts and wrought out the precious metals; and the dumps of unused ore, thought unworthy the labor necessary for carrying away and piling long distances to be sold, is now found to yield a good profit under more modern methods and with improved means of transportation. The great trouble is lack of water.

There are irrigating methods—sinking artesian wells, digging trenches, and securing the rainfall—which will revolutionize and develop the enormous mineral wealth of the Jarrillas district, if enough water is secured to use for washing purposes.

There are reports of the vivid possibilities of the Soccorro and Rincon districts. A rapid investigation showed the existence of wealth-producing ores. The greater part of the wealth has been denuded by electric and atmospheric agencies of the long ago. The country where lie the sources of the tributaries, in the wet season, of the Rio del Norte, takes the character of savage grandeur in its sterile rocks and bold elevations. Broad beds of gravel and sand lie between the cliffs of sandstone, which is combined with other minerals—sandstone, petroleum, and gypsum—more or less. In many places it bears evidence of having undergone a roasting, the residuum filling the surrounding cavities. The combinations of quartz and feldspar, that in different localities bear mineral-producing lodes, from the dome rocks of the clearly defined leads that penetrate the mountain, extend from the mountain peaks to the plain, and the water is secured to use for washing purposes.
taken, and, when evening came with its grateful coolness, the country erstwhile so desolate, dreary, and forbidding, was found to have developed into an enchanted region. The test to this wonderful find proved its value, and the region which was an epitome of devastation appeared now by hope of golden treasures, swelled away to a fairy gleam of great opportunities. The purchase price duly paid, the three Mexicans established the legal claim to excellent plants, which, it is true, cost much to develop, the scarcity of water ever rendering any effort difficult.

Reduction works of the best construction in connection infinitely increased now in operation. Sulphur, alum, coal, copper, lead, and nickel are shipped from various points in paying quantities. A good merchantable article of mica, produced in large quantities from the mica mines at Petaca, is being shipped to an eastern market. A Chicago company owns the mine, and the sheets—which are cut into sizes varying from two inches and a half by four, to twelve by twenty, inches—are shipped at the Tres Piedras station in the cast in marketable condition for the retail trade.

Water and capital are the necessary adjuncts to a good trade and much prosperity in developing the mineral wealth of New Mexico.

[Special Correspondence of Popular Science News.]

PARIS LETTER.

One of the scientific events of the last few days is the appearance of a new paper, published by G. Masson, and edited by MM. Cartailhac, Hany, and Topinard. This paper is a review of exceedingly good exterior appearance, which is published every two months, and bears the name L'Anthropologie. It is destined to take the place and function of three other reviews, which now disappear, only to assume a new plumage and combine their forces in one effort. The Materiometrums l'Histoire de l'Homme, the Revue d'Anthropologie, and the Revue d'Ethnographie are things of the past: their individual existence has disappeared; they live anew under a new form—L'Anthropologie. We will not complain. The writers of the three periodicals remain devoted to the fourth, and this last one assumes a strong and varied and interesting character, in the eyes of most readers. Among the papers published in the first number, just issued, (No. 1. January-February, 1890), the principal ones are: A paper by Topinard, on the skull of Charlotte Corday, who murdered Marat; one by O. Montellus, on the Bronze Age in Egypt, with many illustrations; and one by S. Reinach, on the tomb of Vaphio. This tomb, discovered in Greece, belongs to the mycenian period of the pre-historical age of Greece, and is of great interest, as it certainly will give new documents on times concerning which but little is yet known. As to Charlotte Corday's skull, M. Topinard, the pupil of Froc, and one of the most able anthropologists, concludes by saying that it is a handsome and very regular head, without defects, and shows a certain resemblance very similar to that of the average Parisian woman, in which the principal defect is a rather low forehead. At all events, there is nothing very criminal in it, and neither Lombrici nor any other of the Italian school of criminalists, would venture to say that it is a criminal's skull.

It has often been questioned by microbiologists whether pathogenic microbe is not the ordinary and offensive ones which are well known to all, and which, for some reason or other, have acquired dangerous character which endow them with the power of creating disease, while, under ordinary circumstances, they exert no appreciable bad influence.

MM. Roedel and Rousse believe that they have shown that the typhoid-fever bacillus is no other than <i>Bacillus coli communis</i>, a bacillus which is extraordinarily found in the intestines, toward their distal portion, and which is quite innocuous. Their experiments seem to show that between both types operation. Hence these observations show that both are intimately related, and that the typhoid-fever bacillus is a degenerate and weakened form of the <i>B. coli communis</i>. The degeneracy seems to be produced by the influence of the spleen, and it is supposed by the authors that the <i>B. coli communis</i> becomes the typhoid-fever bacillus when it has been brought to the spleen, where various agencies operate upon it and bring it to a state where it becomes simultaneously degenerate and harmful to the organism. It must, however, be not believed that the degeneracy usually originates in this manner. MM. Roedel and Rousse think that, as the <i>Bacillus coli communis</i> is Innocuous so long as it remains in the intestines, but becomes dangerous after having been expelled with the fecal matters, the degeneracy occurs outside the organism and is not a result of degeneration of the bacillus remains among the matters expelled. If true, this fact shows not only typhoidical matters, but all, without exception, are liable to pollute the water, and to render it poisonous and able to confer typhoid-fever, when drank by persons who are in a condition rendering the outbreak of the fever—that is, the multiplication and growth of the pathous bacillus—low. If things go on, I wonder who will dare to eat or drink, or touch anything, considering the number of dangers "deshert to," owing to the presence of those unannounced and highly unbidden guests that our body, our food, our drink, and all things generally swarmed with of late! MM. Roedel and Rousse's interesting paper has been published in the proceedings of the <i>Societe de Biologists</i>, an old established and very hard-working society of naturalists and physiologists, whose only inconstancy is to be too little known abroad by biological workers.

Biologists will be much interested in M. E. Young's <i>Propos Scientific</i>, a rather short book, published by Reinwald, in which the author, formerly assist- ant of Carl Vogt in the Geneva University, has abstracted his original contributions to Biology, and moved on to give a general survey of the subject, by various physical and chemical media on the development and growth of some organisms (frog's eggs, principally). At the present time, and especially in America, where the study of the influence of environment on organisms is the aim of a great number of naturalists,—of the neo-lamarckian school, as it is commonly called,—such researches are of great use, and call for a large public of readers. Large is perhaps an euphemism; but it is clear that while in England pure Darwinism remains unattacked, in France and America biologists are considering that natural selection does not give all it pretends to give, and that some reason for variation must exist. If it exists, it can be discovered through observation or experiment, and might become known. Hence this work is directed towards the research for causes of variation in the influence of media or environment. If one considers how much influence the variations of media do exert on the biology of microbes, surely the influence of media on higher organisms may be very great.

The bacillus of typhoid are a good thing, but, like all good things, must be taken with discretion, and will not do to take much of them. Oxygen also is a good thing, but if you take too much of it, it becomes a poison, as Paul Best has shown. There is marked tendency in France to develop out-door games and exercise. But, in order to avoid the evil effects of excessive exercise, or of exercise taken under unfavorable circumstances, some care must be taken. M. Lagrange, himself a great admirer of athletics, and a man who has given a good deal of time to the practical study of the subject, brought out some time ago a book on the physiology of exercise, of which we have said a word. Now he publishes a volume on the Hygiene of Exercise, for children and young people. It is a good book, and contains many good hints as to how, and how much, exercise must be used in order to yield good and beneficial results, and to avoid the many dangerous effects which follow when athletics are indis- criminatingly practiced. In a second volume the author is to deal with the also very important subject of exercise for adult persons.

To electricians and geologists I must give the names of the two following works: 1) Hospitalier: <i>Trades Elementaire de l'Energie Electrique</i> (2 vols. in Svo.), a very good volume of matters but little known; and, Dupont: <i>Letters sur le Cougo</i>, in which the geology of a part of Africa is well studied.

PARIS, Feb. 24, 1890.

[Specialy Observed for Popular Science News.]

METEOROLOGY FOR FEBRUARY, 1890.

WITH REVIEW OF THE WINTER.

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Another remarkable month and winter. The lowest point reached by the mercury the last month was 2° above zero, on the 22d, and this, indeed, is the lowest point during the entire winter. The next lowest were 7° and 9°. This is the only winter in twenty years which has not been reached at the hours of observation. The highest point during the month was 58°, on the 5th. The 21st was the coldest day, with a mean of 10°, and the 9th was the warmest day, with a mean of 47°. The entire month was the warmest February during the last twenty years, being 6° above the average, and nearly 1° above that of 1889.

The entire winter has been equally remarkable for high temperature. December and February of the present winter were the warmest on my record, and January had but two slight exceptions of higher temperature. Hence this result. The cold waves have been few, generally very short, and not severe, ending in a warm spell, spoiling our entire ice harvest in this region.

sky.

The face of the sky, in 84 observations, gave 33 fair, 13 cloudy, 28 overcast, 5 rainy, and 5 snowy,—a percentage of 39.3 full. The average fair for the last twenty Februarys has been 36.9, with extremes of 39 per cent. in 1883 (the only instance less fair than the present February), and 74° in 1877. Several days were noted "fine," others "spring-like," and two or three mornings foggy—that on the 9th continuing all day, rendering it quite dark.

The percentage of fair weather the last winter was 46.6, while the average for the last twenty winters has been 54, with extremes of 38.1 in 1884, and 67 in 1878. Only two winters have been more cloudy than the present in twenty years.
The amount of precipitation the last month, including 3.6 inches of melted snow, was only 9.07 inches, while the average for the last twenty-two winters has been 13.30, with extremes of 6.83 in 1887, and 22.52 in 1886. Only four winters in twenty-two years have had less precipitation than the present. We had only two days imperfect sleighing in December and four in January—six in all. The snows disappeared suddenly, under the unusual high temperature, and ice was unmade almost as fast as it was made.

The average pressure the past month was 30.042 inches, with extremes of 29.42 on the 5th, and 30.54 on the 2d,—a range of 1.12 inch. The average for the last seventeen Februarys was 29.974, with extremes of 29.834 in 1885, and 30.134 in 1876. The sum of the daily variations was 8.98 inches, giving an average daily movement of .321 inch. This average in seventeen Februarys has been .292, with extremes of .162 and .418. On six days the movements ranged from .51 to .86—a very active, as well as high barometer.

The average pressure the present winter was 30.074, while for the average for the past seventeen winters has been only 29.960 inches.

WINDS.
The average direction of the wind the past month was W. 35° 19' N., while the average of the last twenty-one Februarys has been W. 27° 29' N., with extremes of W. 60° 57' N. in 1870, and W. 5° 5' N. in 1875,—a range of 60° 2', or nearly six points of the compass.

The average direction of the wind the past winter was W. 29° 52' N., and the last twenty-one winters W. 21° 20' N. Hence the winds the past winter have been 8° 32' more northerly than usual; yet the remarkably warm winter. Other causes besides the winds modify the temperature.

COMPARATIVE METEOROLOGY OF NEW ENGLAND FOR JANUARY, 1890.

The table of comparative meteorology inserted above is collected from the Bulletin of the New England Meteorological Society for January, 1890. It gives a condensed view of each of the New England States, and of all combined, in regard to temperature and precipitation, with that of Natick appended.

The table needs but little explanation. The first column under "No." gives the number of reports from observers in each State; that under precipitation, the number of states. The other columns explain themselves, except against New England, where the "mean" is obtained from the sum of all the reports divided by the number of reports.

By the Bulletin, the highest monthly mean in New England was 37.9°, at Block Island, R. I.; the lowest 16.0°, at Fairfield, Me. The highest observation was 69.0°, at Olneyville, R. I.; and the lowest 73°, at Orono, Me.—giving the range for January, 1890, in New England at 92°. The extremes at Natick were 10° and 64°,—a range of 54°. The average temperature of January for twenty-five stations in New England, having records for more than ten years, is 23.7°; that of Natick for twenty years is 24.28°.

The mean precipitation of thirty-four stations in New England, having records for more than ten years, is 4.01 inches; at Natick, in twenty-two years, showing a large deficiency in precipitation throughout New England during January, 1890. The largest amount was 4.66 inches, at West Milan, N. H.; and the least 1.26 inches, at Shelton, Conn.

NATICK, March 5, 1890.

[Specially Compiled for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR APRIL, 1890.

MERCURY is a morning star at the beginning of the month, but is too near the sun to be easily seen. It passes superior conjunction and becomes an evening star on the morning of April 9, and by the end of the month is well out toward eastern elongation, which it reaches on May 6. During the last few days of April, and for some time in May, it is in pretty good position for observation, setting about an hour and a half after the sun. It is seven or eight degrees north of the sun, and may be seen in the twilight soon after sunset, near the horizon, a little north of west. Venus is also an evening star, and is getting far enough from the sun to be easily seen. Venus and Mercury are very near together at the end of the month. Mercury will be about three degrees above Venus as they set on April 30. Mars rises at about 13 P. M. on April 1, and at about 9 P. M. on April 30. It is in the constellation Scorpius, and moves eastward until April 22, when it begins to retrograde, the whole motion being only about three degrees daily. Mars is not north or the bright star of the constellation—the first magnitude red star Antares (Alpha Scorpii). The planet is approaching the earth, and on April 30 its distance is about 55,000,000 miles—a diminution of about 20,000,000 miles during the month. It will be in opposition with the sun on May 27, but will not reach the nearest approach to the earth until June 5. On the morning of April 9 there will be a very brilliant conjunction of Mars to the sun, which will be an occultation in some places, but not in the eastern part of the United States. Jupiter is in the constellation Capricornus, and rises at about 2 A. M. on April 1, and at about 11 P. M. on April 30. It comes to quadrature with the sun on the morning of May 1. During April it moves about four degrees east and north among the stars. Saturn is in fine position for observation, being on the meridian at about 9 P. M. at the beginning of the month, and a little less than two hours earlier at the end. It is in the constellation Leo, and in that part of the constellation known as the Sickle. It will be interesting to see whether it will set before the first bright star Regulus (Alpha Leonis), at the end of the handle of the Sickle, during this and the following months. At the beginning of April it is about three diameters of the moon north of Regulus, and not far from a line between it and Eta Leonis, the smallest star at the junction of blade and handle. During the month it moves west and north a little more than one degree. On April 28 it is about 3° south of a line drawn from the moon toward the handle.

The Constellations.—The positions given hold good for latitudes not more than degrees different from 40° north, and for 10 P. M. on April 1, 5 P. M. April 15, and 9 P. M. April 30. Leo Minor, a small constellation with no very bright stars, is in the zenith. Leo is just south of it, the principal group (the Sickle) having just passed the meridian. Hydra is between Leo and Virgo, and is in the southeast, about halfway from horizon to meridian. Libra is just rising below Virgo. Gogul from the zenith toward the east, we first see Coma Berenices, and Canes Venatici; below these, Boötes, then Corona Borealis. Hercules has just risen, a little north of the east point. Lyra and Cygnus are on the horizon, just north of Hercules. Draco and Ursa Minor are east of the pole star. Ursa Major lies between the zenith and pole star, the pointers being very near the meridian. Cassiopeia is below and a little west of the pole star, and Perseus is west of the latter, at about the same altitude. Auriga is a little higher and farther west. Taurus is on the northwest horizon; above it follow Gemini and Cancer, just west of Leo. Orion is setting in the west, and Canis Major is in the southwest. Canis Minor is above and between the last two.

LITERARY NOTES.

The second volume of the magnificent Century Dictionary, including the letter J, is now ready. We have already referred to this work at length, and can only repeat that it is indispensable to every one desiring a complete knowledge of the English language. The Century Co., New York, publishers.


This is an exceedingly practical work, and contains all material of a medical matter, selected from Dr. Potter's experience in his extensive private practice. The use, dosage, and medicinal effect of the various medicinal substances are very clearly and thoroughly described; and the list of diseases, with the remedies appropriate to each, amount of dose, etc., will be found a very useful document. The book is also arranged in a manner followed by a catalogue of drugs, but is a complete digest of modern therapeutics, and as such will prove of the greatest use to its possessor.

The same firm have also published a New German-English Medical Dictionary, by Frederick Treves, F. R. C. S., and Mr. Hugo Lang; a Manual of the Præcepts of Medicine, by Frederick Taylor, M. D.; and a Text-book on Obstetrics, by Dr. F. Wickeck, M. D., translated by Prof. Edgar F. Smith of the University of New York.
THE RELATION OF CHEMISTRY TO MEDICINE.

While medicine is one of the oldest of sciences, as is shown by the trepanned skulls found among the relics of the pre-historic races of Europe, chemistry is one of the youngest; and although the alchemists, in their fanciful search after impossibilities, stumbled upon many valuable discoveries, and recorded observations which afterwards proved to be of great importance, yet not until the time of Lavoisier can there be said to have been any real system of chemical philosophy, and the science of chemistry, as now accepted, is almost entirely a growth of the present century.

Coincidentally with the advance of chemical knowledge, the science of materia medica began to be founded upon a more rational basis, and the disgusting and useless mixtures with which the doctors of the preceding centuries had afflicted their doubly unfortunate patients, began to give way to the substances, both organic and inorganic, prepared by the chemists, of which the composition was accurately known, and the therapeutic action invariable—except so far as limited by individual peculiarities of constitution. Like all good things, the new remedies were subject to many abuses. The powerful action of mercurial compounds, still invaluable in many cases, led, at first, to a wholesale use of them for all manner of diseases; and the injury which they sometimes caused has brought about not only a general popular horror of all mercurial compounds, but one which has included all the inorganic, or "mineral" remedies,—a prejudice which is fully understood and taken advantage of by the quacks, who advertise their "purely vegetable" cure-alls, regardless of the fact that some of the most dangerous and deadly poisons known belong to the class of organic substances.

Among the remedies which the physician owes to the chemist, are the invaluable quinine, morphia, strychnia, caffeine, and a large number of other alkaloids; the bromides, the iodides, chloral hydrate, the various acids and salts of phosphorous, the salts of iron, and, perhaps the most valuable of all, the anaesthetics—ether, chloroform, and nitrous oxide. The modern practice of antisepsic surgery would have been impossible if the chemist had not first produced the germ-destroying substances, such as corrosive sublimate, carbolic acid, permanganate of potash, thymol, and others of a list which is increasing in length daily. Many—perhaps the majority—of these compounds were accidentally or purposely prepared by investigators who were interested only in their chemical relations, and had no thought whatever of the medicinal value which they afterwards proved to possess, and which, in fact, would have been impossible to foresee or predict.

This fact is well illustrated by the substance now extensively used in medicine known as antifebrin or acetanilid, \( C_6 H_5 NO \). This body has been known for a long time, and some fifteen years ago we prepared a small quantity of it, as an intermediate product in the synthesis of an organic compound of theoretical interest only. This was probably the first specimen ever prepared in this country, although, of course, it was previously well known to chemists; but it was not until many years afterwards that its remarkable antipyretic action was discovered, and it is now to be found in every drug store.

As to the more lately discovered remedies which have been introduced to the medical profession by the chemist,—such as somnial, urethan, salol, sodium, phenacetine, exalgine, antipyrine, and numerous others,—it may be said that, while they all doubtless have more or less value, much observation and experiment will be necessary to determine their exact therapeutical action. This can in no way be predicted from their chemical composition, and the use of any new remedy must be more or less empirical, until its medicinal qualities are fully understood. Take calomel and corrosive sublimate, for instance: chemically they are almost identical, but while one is extensively used as a medicat, the other is one of the most powerful poisons known; and there are numerous organic compounds, which, although they give identical results when analyzed, yet in their physical and medicinal properties are as widely different as it is possible for any two substances to be.

The increasing attention paid to the study of chemistry in medical schools is, therefore, a tendency in the right direction. Although, as has been said above, the therapeutic action of a substance is not dependent upon its chemical composition, yet it is of the utmost importance that the physician should, to some extent, a chemist. If there were no other reason, it would be necessary to prevent the prescribing of incompatible substances in the same mixture. The prescription-phials of most druggists, if they could be examined, would show ludicrous instances of the lack of chemical knowledge by physicians of high standing. But, aside from this, the tendency is to discard the old-fashioned bulky drugs, and use instead their active principles which the chemist separates out and condenses in compact form; he is also constantly making and offering to the profession new combinations of the four elements which may make up the endless list of organic compounds. Although there may be an occasional relapse to medieval agents,—as in the recent pyrotechnic announcement of Dr. Brown-Sequard,—yet it is the chemist who is to discover our future remedies, and the physician with the most thorough knowledge of chemistry who is to apply them intelligently and use them successfully.

[Original in Popular Science News.]

A TALK BY JOHN WESLEY: LONDON, A. D. 1747.

BY EMELIE TRACY Y. SVETT.


Such is the title page of a curious volume that lies open before me—a volume that was an oracle in the family of my grandfather's father. Medical science has marched ahead since then; surgery has outstripped the record of its grandfather and even of its father. And yet, when we are honest with ourselves in occasional moments, how helpless we still find ourselves in the event of sickness and death, and how many times even the best medical men can only grope after the truth. I am going to let this article do its own talking. The resurrected spirit of this healer of the eighteenth century will give you a few readings from his own published works.

ENTER MR. JOHN WESLEY.

He sits upon the platform, eyes the spectated medics that fill the auditorium, polishes off his ungainly glasses with a bald bandana handkerchief at least a yard square, takes a pinch of snuff and a sip of sweetened water, and begins to speak as follows:

Dear beloved brethren: When man came first out of the hands of the great Creator, clothed in body as well as in soul with immortality and incorruption, there was no place for physic, or the art of healing. As he knew no sin, so he knew no pain or sickness or bodily disorder. The habitation wherein the angelick mind—the divine particula—abode, although originally formed out of the dust of the earth, was liable to no decay. It had no seeds of corruption or dissolution within itself. And there was nothing without to injure it: heaven and earth and all the hosts of them were mild, benign, and friendly to human nature. The entire creation was at peace with man, so long as man was at peace with his Creator. So that well might the morning stars sing together, and all the sons of God shout for joy.

But since man rebelled against the Sovereign of heaven and earth, how entirely the scene changed. The incorruptible frame has put on corruption; the mortal has put on mortality. The seeds of weakness and pain, sickness and death, are now lodged in our inmost substance, whence a thousand disorders continually spring, even without the aid of external violence. And how is the number of these increased by everything around us? The heavens, the earth, and all things contained therein, conspire to punish the rebels against their Creator. The sun and moon shed unhealsome influences from above; the earth exhales poisonous fumes from beneath; the beasts of the field, the birds of the air, the fishes of the sea, are in a state of hostility; the air itself, that surrounds us on every side, is replete with the shafts of death; yes, the food we eat, daily says the foundation of the life which cannot be sustained without it. So has the Lord of all secured the execution of his decree: "Dust thou art, and unto dust thou shalt return."
'Tis probable physiology, as well as religion, was in the first ages chiefly traditional, every father delivering down to his sons what he himself in like manner received concerning the manner of healing, both outward hurts, with the diseases incident to each climate, and the medicines which were of the greatest efficacy for the cure of each disorder. 'Tis certain this is the method wherein the art of healing propagated among the ancients to this day. Their diseases are exceedingly few; nor do they often occur, by reason of their continual exercise and (till of late, universal) temperance. But if any are sick, or bit by a serpent, or torn by a wild beast, the fathers immediately tell their children what to apply. And 'tis rare that the patient suffers long, those medicines being quick, as well as, generally, ineffable.

Thus far physiology was wholly founded on experiment. The _European_, as well as the _American_, said to his neighbor: "Are you sick? Drink the juice of this herb, and your sickness will be at an end." "Are you in a burning heat? Leap into that river, and then sweat till you are well." "Has the snake bitten you? Chew and apply that root, and the pain will cease at once." Thus we see, men, having a little experience, joined with common sense and common humanity, cured both themselves and their neighbors of most of the distempers, to which every nation was subject. But, in process of time, men of a philosophical turn were not satisfied with this. They began to enquire how they might account for these things. How is it, they asked, that medicines wrought such effects? They examined the human body in all its parts. They explored the several kinds of animal and mineral as well as vegetable substances. And hence the whole order of physiology which was obtained to that time, came generally to be inverted. As theories increased, simple medicines were more and more disregarded and disused. Till, in the course of years, the greater part of them were forgotten—at least in the polite nations. In the room of these, abundance of new ones were introduced by reasoning, speculative men; and those more and more difficult to be applied, as being more remote from common observation. Hence, rules for the application of these, and medical books were immediately multiplied; till, at length, physic became an abstruse science, quite out of the reach of ordinary men.

Physicians began to be had in admiration, as persons who were something more than human. And profit attended their employ as well as honour; so that they had now two weighty reasons for keeping the bulk of mankind at a distance, that they might not pry into the mysteries of the profession. To this end, they increased those difficulties by design, which began in a manner by accident. They filled their writings with abundance of technical terms, utterly unintelligible to plain men.

As to the manner of using the medicines herein set down, I should advise, as soon as you know your distempers, (which is very easy, unless in a complication of disorders, and then you would do well to apply to a physician that fears God): First, use the first of the remedies for that disease which occurs in the ensuing collection, (unless some other of the like nature be worse, or have been, and then it may do as well.) Secondly, after a competent time, if it takes no effect, use the second, the third, and so on. (I have purposely set down, in most cases, several remedies for each disorder; not only because all are not equally easy to be procured at all times and in all places, but likewise because the medicine which cures one man will not always cure another of the same distemper,—nor will it cure the same man at all times.) Thirdly, observe all the time the greatest exactness in your regimen, or manner of living.

Abstain from all mixt or high season’d food. Use plain diet, easy of digestion, and this so sparingly as you can, consistent with ease and strength. Drink only water, if it agrees with your stomach; if not, good, clear, small beer. Use as much exercise daily in the open air as you can without weariness. Sup at six or seven on the lightest food; go to bed early, and rise betimes. Above all, add to this that you are labor lost in that old-fasioned medicine, Prayer. And have faith in God, who "killeth and maketh alive, who bringeth down to the grave and bringeth up." A FEW Plain Rules.

Tender people should have those who lie with them, or are much about them, sound, sweet, and healthy.

Water is the wholsomest of all drinks; quickens the appetite and strengthens the digestion most. Strong, and more especially spirituous liquors, are a certain though slow poison.

Experience shows, there is very seldom any danger in leaving them off all at once. Strong liquors do not prevent the miscarriages of a surfeit, nor carry it off so safely as water.

Malt liquors (except clear, small beer, of a due age) are exceedingly hurtful to persons who have tender nerves.

A due degree of exercise is indispensably necessary to health and long life. We may strengthen any weak part of the body by constant exercise. Thus the lungs may be strengthened by loud speaking, or walking up an easy ascent; the digestion and the nerves, by riding; the arms and hands, by strongly rubbing them daily.

The studious ought to have stated times for exercise, at least two or three hours a day; the one half of this before dinner, the other half before going to bed.

They should frequently shave, and frequently wash their feet.

Those who read or write much, should learn to do it standing; otherwise it will impair their health.

The fewer clothes anyone uses, by day or night, the harder will he be.

Obstructed perspiration (vaguely called catching cold) is one great source of diseases. Whenever there appears the least sign of this, let it be removed by gentle sweats.

The passions have a greater influence on health than most people are aware of.

All violent and sudden passions dispose to or actually throw people into acute diseases.

The slow and lasting passions, such as grief and hopeless love, bring on chronic diseases.

Till the passion which caused the disease is calmd, medicine is applied in vain.

The love of God, as it is the sovereign remedy of all miseries, so in particular it effectually prevents all the bodily disorders the passions introduce, by keeping the passions themselves within bounds. And by the unspeakable joy and perfect calm, serenity, and tranquillity it gives the mind, it becomes the most powerful of all the means of health and long life.

A COLLECTION OF RECEIPTS FOR CURING COMMON DISEASES.

For an Ague.—Go into the cold bath just before the Cold Fit. Or, apply sliced Roots of Water Lilies;—tried. Or, eat a Lemon, Rind and all.

A Tertian Ague. (An Ague which returns every other Day.)—Apply to each Wrist a Plaster of Trench and soot. Or, Bathe twice or thrice a Week at least; till you have bathed nine or ten Times.

The Apoplexy.—To prevent, use the Cold Bath, and drink only Water. Or, put a Handful of Salt into a Pint of cold Water, and, if possible, pour it down the Throat of the Patient. He will immediately come to himself. So will one who seems dead by a Fall. Or, fill the Mouth with Salt.

The Asthma.—Take a Pint of cold Water every Night as you lie down in Bed. Or, drink Sea Water every Morning. Or, dry and powder a Toad. Mix five small Flints; and take one every Hour till the Convulsions cease.

Bleeding at the Nose.—Hold a red-hot Poker under the Nose. Or, in a violent Case, go into a Pond or River;—tried.

Blister on the Feet.—When occasioned by walking, are cured by drawing a Needle full of Worsed thro’ them. Cily it off at both ends, and leave it stroyed the Skin.

Children.—To prevent the Rickets. Tenderness, and Weakness, dip them in cold Water every Morning, till they are eight or nine Months old; afterwards their Hands and Feet. Or, let them go bare-footed and bare-headed, till they are three or four years old at least.

Cold.—Drink a Pint of cold Water;—tried. Or, a Cup of warm Water;—tried.

A Consumption.—Cold Bathing has cured many deep Consumptions;—tried. Or, every Morning cut up a little Turf or fresh Earth, and lying down, breathe into the Hole for a Quarter of an Hour. Or, in the last Stage, take the Milk of an healthy woman daily;—tried by my Father. So long as the tickling Cough continues, chew well and swallow a Mouthful or two of a Biscuit or Crust of Bread. If you cannot swallow it, spit it out. This will always shorten the Fit, and would often prevent a Consumption.

An Invertebrate Cough.—Wash the Head in cold Water every Morning. Or, use the cold Bath; it seldom fails.

The Cran.—Tie your Garter smooth and tight under your Knee at going to Bed; I never knew this to fail. Or, be electrified tho’ the Part which uses to be affected. This sometimes prevents it for a Month; sometimes a Twelvemonth. Or, stretch out the Limb. Inhumbly. Or, hold a Roll of Brimstone in your Hand.

Deafness.—Be electrified through the Ear. Or, use the cold Bath. Or, put a little Salt into the Ear. Or, saltpetre.

Drouzen.—Rub the Trunk of the Body all over with Salt. It frequently recovers them that seem dead.

A Blood-shot Eye.—Blow in white Sugar-candy, finely powdered.

Dull Sight.—Drop in two or three Drops of Juice of rotten Apples often.

A Fever.—Drink a Pint and half of cold Water, lying down in Bed; I never knew it to do Hurt. Or, smear the Wrists, or six Inches long, with warm Trench, and cover it with Brown Paper. Or, apply Trench Plasters to the Soles of the Feet, changing them every twelve Hours. Or, in a high Fever attended with a Delirium, plunge into cold Water, which is aware Remedy in the beginning of any Fever. Or, apply warm Lamb’s Lungs to the throat for some time.

To destroy Fleas or Bugs.—Cover the Floor with the Leaves of the Alder, gathered while the Dew hangs upon them. Adhering to these they are killed therебy.

Gout in the Foot or Hand.—Apply a raw, lean Beef-steake. Change it once in twelve Hours till cured. The very Matter of the Gout is surely destroyed by a steady use of Mynsch’s Elixir of Vioirit.

The Head-ach.—Rub the Head for a Quarter of an Hour;—tried. Or, be electrified;—tried. Or,
apply to each Temple the thin yellow Rind of a Lemon, newly pared off. Or, keep your Feet in warm Water a Quarter of an Hour before you go to Bed, for two or three Weeks;—tried. Or, wear tender Hemp-leaves under the Feet, changing them daily. Or, order a Tea-kettle of cold Water to be poured on your Head every Morning in a slender Stream.

The Heart-burning.—Drink a Pint of cold Water. Or, chew five or six Pepper-corns; a little; then swallow the fluid from the Fennel or Parsley, and swallow your Spittle. Or, a Teaspoonful of Crab’s Eyes, ground to an Impalpable Powder.

Hypochondriac and Hysterical Disorders.—Use cold Bathing. Or, take an Ounce of Quick-silver every Morning.

Iliac Passion.—Hold a Live Puppy constantly on the Belly. Or, Ounce by Ounce, a Pound or a Pint of a Medley of Quick-silver.

The Itch.—Steep an Hour in a Quart of Water, mixed with half an Ounce of powder'd Brimstone. Dry it slowly and wear it five or six days.

Old Age.—Take Tar-water Morning and Evening;—tried. Or, be Electrified daily.

The Plague.—Cold Water alone, drink daily, has cured it. Or, a Draught of Brine as soon as seized; wear jasper as other Drinks for some Hours. Pleurisy.—Take half a Dram of Soot. Or, of Dejection of Nettles. Or, a Glass of Tar-water.

To restore the Strength after a Rheumatism.—Make a strong Broth of Cow-heids and wash the Parts with it warm twice a Day.

Ring-worms.—Appy rotten Apples. Or, apply Garlic pounded Or, rub them with Oil of Paper. Scabies.—Live on Turnips for a Month. Or, take Tar-water Morning and Evening for three Months. Or, a Decoction of great Water-dock. Or, use as a common Drink, Water made very sweet with Treacle.

A Broken Shin.—Bind a dry Oak-leaf upon it.

To cure the Tooth-ache.—Be Electrified through the Teeth. Wash the Mouth with cold Water every Morning, and rinse them after every Meal. Rub the Teeth often with Tobacco-ashes. Or, apply to the aching Tooth an artificial Magnet. Or, rub the Cheek a Quarter of an Hour. Or, put a Clove of Garlic into the Ear. Or, keep the Feet in warm Water, and rub them well with Bran, just before Bed-time;—tried. Note: There is no such thing as Worms in the Teeth. Children’s using Coral is always useless, often hurtful. The constant use of Tooth-picks is a bad Practice. Constant Smaking of Tobacco destroys many good Sets of Teeth.

To prevent the Bite of a Viper.—Rub the Hands with the Juice of Radishes.

Worms.—Take Filings of Tin and red Corr, of each an equal Quantity. Pound them together in a very fine Powder, of which one Dram made into a Balsam, with Camphor, of the Tops of Sea-weed, it to be taken twice a Day.

J. JOHN WESLEY, amongst the plaudits of an appreciative nineteenth century audience, who regard the speaker as a sort of Mark Twain or a Bill Nye. And yet, incredulous reader, John Wesley was a man much revered in 1744 and thereabouts for the cleverness of compiling a book of simple cures for common sicknesses. It is but just in me to tell you that many of the remedies suggested were truly beneficial—simple herbs entering largely into their composition, and I have only quoted those cures that seemed utterly absurd according to my 1889 ideas.

So we will close the well-thumbed volume once more, and, laying it away with some other relics, we will lift up our hearts in devout gratitude that we have progressed a little in the treatment of diseases. It may be all illusion, but it is a happy one, and we will believe in it.

[Specially Compiled for Popular Science News.]

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY C. E. WASHBURN, M. D.

Operation Under Hypnotism.—Dr. Edward L. Wood, resident surgeon, St. Barnabas Hospital, Minneapolis, Minn., relates (Medical Record) a very interesting case of the successful performance of a severe, protracted, and painful operation, in which hypnotism was the sole means used to effect anaesthesia. The operator was Dr. Hugo Toll, of Minneapolis. The patient, a young Scandinavian, aged fourteen years, was suffering from osteomyelitis of the upper third of the humerus. There were three fistular openings: one into the axilla, one above the insertion of the deltoid, and a third above and back of the second. The adjacent soft parts were considerably swollen and quite painful, and motion at the shoulder and elbow joints was considerably impaired. In order to bring the patient under better hypnotism, two operations were performed during the three days prior to the operation. On the morning of the operation, he was hypnotized in bed and led to the operating table. The fistulae were first explored, scraped out, and washed out; then the bone was laid bare by an incision four inches long; and an opening three inches in length by a quarter of an inch in width was made, with a chisel, to the mediastinal canal. The bone-chiselling was rendered the more difficult by the presence of osteo-sclerosis into the two fistulae which did not connect with the incision, drainage-tubes were inserted, and the recent wound was packed with iodoloma gauze. The operation, which, from the first, was performed under thorough antiseptic precautions, was greatly facilitated by the patient himself, who, although in a thoroughly cataleptic condition, was nevertheless able to turn from side to side, sit up, or otherwise to shift his position, in accordance with the directions given him by the operator. At 9 a. m. He was led back to his bed, and told that at 12 o’clock he might have something to eat. The attendants were cautioned not to disturb him meanwhile. He was perfectly quiet till the time mentioned, but, on the arrival of that hour—sharp, he sat up in bed, and stretching his well arm, said: Dr. Toll said I could have something to eat at 12 o’clock.’

‘Amputation above the elbow,’ says the writer, (a witness and assistant), ‘would certainly not have been more painful than this operation; yet the hypnic condition was preserved through it all, with a loss to the operator of not more than a few minutes. There have been a number of minor operations done with the patient in a cataleptic condition, but, to me, this case was a revelation, as I think it will be to many of my fellow practitioners, throwing, as it does, a flood of light upon what it is possible to do with a favorable subject.’

The Hour at Which Death is Most Apt to Occur.—Dr. John Francis Burns, senior assistant, Charity Hospital House Staff, New York City, in an interesting article on this subject, (New York Medical Journal), states that the opinion prevalent among physicians, as also among laymen, that death occurs oftener during the small hours of the morning than at other periods of the twenty-four hours,—as a reading found by medical books and medical teachers,—is not borne out by the records either of the Charity Hospital or of the New York Board of Health. For the past ten years, of the total number of deaths in cases in the large hospital referred to,—one of the largest on the continent,—there have been sixty-six more deaths during the period from 1 to 6 P. M. than during the corresponding hours of the early morning; furthermore, there have been twenty-seven more during the day (6 A. M. to 6 P. M.) than during the night. Such, in brief, is the showing from more than four thousand cases. Despite the fact that in a hospital there are other reasons than the alleged low vitality which, seemingly, would tend to increase the liability to deaths at night,—as, for instance, the vibration of the atmosphere of the wards during the night hours, when all the patients are, of necessity, in their respective wards, and when proper ventilation is most apt to be neglected. Of the deaths from acute contagious diseases, for two years, reported to the New York Board of Health,—numbering 16,609,—one hundred and sixty-nine more occurred during the day than at night, and the hour at which the most deaths were reported to have taken place was 11 A. M. From the fifteen thousand cases tabulated by Dr. Burns, taken both from hospital and private practice,—the tables showing the deaths for each hour of the twenty-four hours,—it would appear that death occurs with equal frequency during the day, at any special predilection for any particular hour. The conclusions drawn by Dr. Burns are: 1. That the belief that more deaths take place during the early morning hours is erroneous. 2. If stimulants are to be pushed at those hours, the practice must be justified on some other ground than the prevalent but unwarranted opinion. 3. That human vitality in disease is not regulated by the same influences or subject to the same laws that obtain in health, the normal relation observable in health between the mental and physical states being altered.

Dr. J. L. Napier, of Blenheim, S. C., reports (Transactions of the South Carolina Medical Association for 1888), several cases of epilepsy and other convulsive disorders, which were treated by him with marked benefit by the use of Solanum Caro-

linense, or ‘horse-nettle.’ During the summer of 1887 he had read of this agent, and had heard of its use among the negroes for fits and epilepsy. Determining to test its efficacy, he employed it in the case of a woman who had had epilepsy most of her life, and who, during her menstrual periods, was generally in an epileptic condition. The various remedies for epilepsy were first tried, without relief. Horse-nettle, steeped in whiskey, was then given her—a tablespoonful three times a day. This treatment was continued for months. Three days after the use of the remedy was begun, she was threatened with a seizure, but did not have it, nor has she had one since she had a single convulsion. He had also used it in other cases with marked benefit. In two cases there had been no return of the convulsions. Another case was that of a dwarfed, deformed child, a victim to epilepsy all its life. The bad effects of the disease had been heightened by a course of typhoid fever, from which the child had never entirely recovered. Subsequent to the fever, the epileptic attacks were more severe and occurred almost continually during eight hours. The bromides had been used, but they had had no effect at all. This most unpromising case was put upon the tincture of horse-nettle, which entirely stopped the convulsions. In the case of a pregnant woman with convulsions due to albuminuria, he had used the remedy with marked benefit, as also in the case of a woman suffering from hysterical seizures during her catamenia.

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Dr. K. Paskoff strongly recommends (Moscow Therapeutic Weekly) the dressing of recent wounds with a thick layer of ashes, prepared ex tempero by the burning of cotton or linen stuff. The ashes form, with the blood, a protecting scurf, beneath which the wound heals very rapidly. Lesions presenting a dirty appearance should be thoroughly cleansed with boric lotion before the ashes are applied. Of twenty-eight cases of cuts, cuts, bruises, etc., treated thus by Dr. Paskoff, twenty-six healed promptly without any trace of suppuration. This simple, cheap, and convenient method, Dr. Paskoff states, has been practised from time immemorial by the Russian peasantry.

Dr. Laurent, of Rouen, (Le Progres Medical), considers boiled milk less healthy for young infants than milk which has not been boiled. Although boiling destroys microbes, it also destroys constituent cuts of the milk which act as ferments and render it more digestible, especially in the case of young babies. Hence, stomach and intestinal troubles follow the use of boiled milk in such cases. Dr. Laurent considers it preferable to use milk which has not been boiled, to ascertain that it is of good quality, and to watch the state of health of the cows. Thus, in his opinion, may a great deal of infantile tuberculosis be prevented.

A Novelty in Skin-grafting.—At a recent meeting of the Edinburgh Medico-Chirurgical Society, Mr. A. Miles showed an interesting and successful case of skin-grafting. In a ten-year-old boy who had been afflicted with an extensive ulcer of the leg, the result of a burn. The special interest in the case arises from the fact that the skin used was taken from a young greyhound. The grafts were made in strips six inches long and an inch broad. In six weeks the entire ulcer was closed over, and, at the time the lad was brought before the society,—three months subsequent to operation,—he had a healthy, useful limb.

Coriolis on the Contagousness of Tuberculosis.—This eminent authority, in the course of some remarks under this disputed question (Coriolis Medicale), said that tuberculosis was entirely unknown in Tierra del Fuego previous to English immigration thither. A missionary's wife, who had pulmonary tuberculosis, opened a school for young natives with a view to expediting their advance in civilization and their conversion to Christianity. The founding of this school by this tuberculous teacher was followed by an epidemic of tuberculosis, in the course of which the population was decimated.

M. H. Secretan recommends (Revue Medicale de la Suisse Romande) that in cases of stenosis of the esophagus, in which it is proposed to employ dilatation by bougies, the patient be directed to drink a quantity of oil just before the operation is begun. The passage of the bougie is facilitated by this mode of procedure in a much greater degree than by the oiling of the instrument. Moreover, the operation is rendered not merely much easier, but far less painful. [It is inferred that the oiling of the oil is not intended to do away with the oiling of the instrument as well.]

According to the Medical Times, nothing so quickly restores tone to exhausted nerves, and strength to a weary body as a bath containing an ounce of aque ammonis to each gallon of water. It makes the flesh firm and smooth as marble, and renders the body pure and free from all odors.

It is said that consumption and other lung troubles will be checked by a residence on the Channel Islands, the only complaint not benefited by the climate being rheumatism.—Cincinnati Luezet Clinic.

It is a fallacy to suppose that the cravings of a patient are mere whims, which should be denied. The stomach often needs, craves, and digests articles not found in any dietary.

According to Dr. F. A. Evans, of Tell City, Ind., fifteen minims of the fluid extract of saw palmetto will abort an attack of migraine.

Prof. Bartholow calls attention to the fact that valerianic acid does not represent the active principle of valerian; therefore the valerianates cannot be expected to produce the action of valerian.

Another practical point to which Prof. Bartholow directs attention is that the irritability and crying of young children is due many times, not to hunger, but simply to intestinal flatus. Instead of using opiates, or soothing syrups, which are generally opioid in disguise, the professor advises the following:

R. Mistura asaetrida, 31. Soda bromid, Grs. iii—v. M.

This is a single dose for a child from one to four months old.

Andrew Twaddles, who died on Christmas day, near Moro, Ohio, was the last member of a family of nine children, all of whom were born blind.

MEDICAL MEMORANDA.

When you have a cold do not know how to cure it. All your friends know how, and they tell you; but that does not affect the cold.

Watery Solutions are difficult to mix with vaso-line, but the Extrait de Pharmacie says this difficulty can be overcome by means of a Little castor oil.

Salol in Burns.—Gratzjez recommends a mixture of from two to three parts of salol with fifty parts of starch as an application to inflamed and painful surfaces, bruises, burns, and painful skin diseases of all kinds. The relief is said to be great and very prompt. The remedy is simply dusted on the surface.

A Child Born with the Measles.—Dr. Lowri, of Hamburg, reports a case where a mother gave birth to a child while suffering from measles, it being the second day of the eruption. The child when born showed the beginning of a measles rash, and subsequently developed the disease in its typical form.

Pithitis in High Altitudes in Switzerland.—From a report by Dr. L. Schrotter on the distribution of pithitis in Switzerland, it would seem that the inhabitants even of high altitudes are not so exposed to pithitis as we are perhaps wont to suppose. The tables of deaths for the eleven years 1876-1886 show that pithitis is endemic in every part of Switzerland, not a single district (Bezirk) being free from it. On the whole, the deaths from this cause are fewer in the high than in the low-lying districts, but it cannot be said that the mortality from this cause is inversely proportionate to the altitude. Wherever there is a large industrial population, the pithitis mortality is considerable. Industrial populations always suffer much more than agricultural populations where the altitude is the same.

The necessary effort for aerial disinfection is recognized by all sanitarians. To carry out such treatment properly and wherever required has been a difficult problem; but the Sherman "King" vaporizer claims to have solved it. This device consists of an iron vessel, provided with a tightly-fitting lid that can be held down with a screw, including a porous cup. A small aperture closed by a screw valve is arranged on the side of the case about half way up the base. A volatile disinfecting fluid is used to saturate the porous cup. The liquid that has been selected is a coal tar product characterized by the presence of phenol and cresol. This is of wide reputation as a disinfectant. In short, it supplies a means for delivering constantly volatile disinfectants, and at the same time for regulating the supply of disinfectant vapor for two months. For further particulars the reader is referred to the advertisement in this number.
Familiar Science.  

SIMPLE SCIENTIFIC EXPERIMENTS.  

ELECTRICITY.

The illustration shows an amusing and instructive experiment in electric fishing, in which a pencil serves for a rod, a piece of thread for a line, and a bent pin for a hook, while the bait is composed of a small lump of sealing-wax, which is melted around the head of the pin, as shown in the lower corner of the engraving. The fish should be about an inch long, and cut from thin tissue paper. If, before exhibiting the experiment, the wax is briskly rubbed with a piece of wooden cloth, sufficient electrical excitation will be produced to cause the fish to "bite" very readily, and remain attached to the hook for quite a while. It is hardly necessary to say that the "bait" should always be presented to the head of the miniature fish; otherwise, the unusual phenomenon of a fish biting with its tail might be illustrated.

MAGNETISM.

Take a pair of iron tongs and a knife, and, holding them as shown in the engraving, rub the knife-blade briskly with the end of the tongs, taking care to rub only in one direction—towards the point of the knife. When the point is reached, the tongs must be lifted back towards the handle, and the motion repeated. The knife should be occasionally turned over, so that the friction may be applied to both sides. In about a minute the knife-blade will be found to be magnetic, and capable of supporting a needle or steel pen, and the magnetism is quite permanent. The point of the blade corresponds to the north pole of the magnet. The cause of this phenomenon is not quite clear, and it is worthy of further investigation.

OPTICS.

Take a piece of cardboard or opaque paper, and pierce a small, clean-cut hole through it, about the diameter of the head of a large pin. The proper size is easily found in one or two trials. On holding the opening before the eye and looking through it, the first effect noticed will be that the depth of focus of the eye is greatly improved. Objects can be placed very near to the eye and seen plainly, while, if viewed in the usual way, they would be very indistinct. At the same time, distant objects can be seen with perfect clearness, and the effect of the minute opening placed before the eye is exactly the same as when a photographer puts a small diaphragm, or "stop," in front of his objective: greater depth of focus and clearness of definition, but a loss of illuminating power.

A more curious experiment may be shown by holding the card between the eye and a strong light—a lamp-shade, for instance, or a window-curtain through which the light is shining. Then hold a pin between the eye and the hole in the card, as shown in Fig. 3. The head of the pin will be quite visible, but reversed, as shown in the small illustration. The cause of this appearance is explained in the accompanying diagrams of the eye (Fig. 4), where 1 represents the experiment under ordinary conditions: the rays of light from the pin are refracted by the lenses of the eye so that they cross each other, giving a reversed image on the retina. In fact, we really see everything upside down, and it is probably only on account of long experience that we perceive objects in their natural position, just as the photographer soon forgets that the images formed on the ground glass of his camera are reversed, but selects his points.
of view and poses its sitters without thinking of the inverted position in which they appear. In 2, however, the conditions are changed. The illuminated opening in the card acts as an independent source of light, and casts the shadow of the pin directly upon the retina; the head of the pin being smaller than the pupil of the eye, and being held so close to it that the shadow is cast directly upon the retina, without the usual reversal of the image, which, therefore, appears to our mind as upside down, whereas it is really in an upright position. This automatic correction by the eye or brain of the images thrown upon the retina is a curious fact, and cannot be said to be fully understood, although the explanation given above is probably the correct one.

Fig. 4.

This experiment may be varied in several ways. By looking, or "squinting," at the opening through the half-closed lids, the reversed shadow of the eyelashes will be perceived, and, by moving the card quickly before the eye, so that the opening describes a small circle, the field of vision will appear filled with a network of dark lines, which are the images of the capillary blood-vessels of the retina. As this last experiment is not always successful, it should not be persisted in, on account of the strain it imposes upon the eyes.

The illustrations accompanying this article are reproduced from *La Nature*.

[Original in Popular Science News.]

**HOW OLD IS THE WORLD?**

BY JOSEPH WALLACE.

The chronology of the birth of the terrestrial globe has always been a profound and difficult problem to solve. Some attempts, however, have been made to arouse the learned to a more liberal spirit of inquiry; the theologians had kept within what they considered probable bounds, and were not disposed to change the established chronology until science could offer them a theory free from doubts and speculations.

Eusebius, in the beginning of the fourth century, though far from grasping the whole extent of the difficulty, questions the limited knowledge of the people in regard to the chronology of the world. Almost all of the chroniclers prior to the present century have considered the epoch of the creation of the world to be that of man, because they believed that the one was separated from the other only by an interval of six days of twenty-four hours each. Some brighter minds, however, avoided confounding the two great events. St. Gregory of Nazianze supposed an indefinite period between the creation of the world and the formation of the first man. Gennad of Marseille expressed in his *Dogmes Ecclésiastiques* his belief that after the creation of heaven, earth, and water, the heavenly hosts could see the manifestations of God's power through the long spaces of time which should pass yet before the days of creation.

Although many of the early Christian theologians and philosophers were little disposed to raise objections against the authority of the Bible, yet they felt themselves embarrassed by the short duration of time which passed between the deluge of Noah and the period assigned to the creation of the world. Still they could not accept the fabulous stories adduced by ancient writers, who mentioned mythological traditions of Trigands, Cenaturs, etc., before the creation of the human race. Still among these traditions there is a source of evidence pointing back to a period of antiquity too remote to be reconciled with the short chronology of Usher and Petrie. Of course it is now the almost universal accord of Christian theologians that long periods of time must have elapsed prior to sacred history.

In 1659 the learned Jesuit, P. Poreon, wrote: "The antiquity of the times is a good deal greater than one believes today." He defended this conclusion against the attacks of Martinay and Leguain with great learning and skill, though at that early day it was conflicting with the general opinion of the fathers and early Christian philosophers and scientists, who counted about 4,000 years until the coming of the Messiah. This chronology was based on the historic records of the Chaldeans, Egyptians, and Chineses, though differing from the actual Hebrew text.

Thirty-two years after, another eminent Jesuit, P. Tournemine, spoke in the same sense: "The Jewish chronology appeared to me always too short and little in agreement with certain monuments of history, especially what concerns the epoch which followed the deluge. It takes off from the chronologists several necessary centuries for the agreement of the profane history with the sacred history." When one perceives in the seventeenth and eighteenth centuries that the common chronology, placing the origin of the world in the year 4004 B. C., was too circumscribed for the developing knowledge of the times, he beholds it still more in our own days—when the natural sciences have cleared away many of the doubts, errors, and mysteries of the past, and show the sublime beauty, grandeur, and perfection of God's works. They carry us beyond the time when there was no sun, no moon, no stars to shed light on a new-made world. Verily, there is some truth in the words:

"More things are wrought . . .
Than this world dreams of."

Science is the great light which enables us to see countless beauties in the visible creation where before we could only see with the dim organs of the senses. Still, science has its legitimate sphere, and must not enter the domain of theology and dogmatize. Its proofs must support its conclusions; and not only must its proofs support its conclusions, but in its terminology it must maintain exactness of definition. One does not ask himself today, like Pezon and Tournemine, whether we should not substitute the chronology of the Septuagint to the more short one of the Hebrew and Vulgate. The longest is too short to satisfy the just demands of the geologist; and yet there is, at times, a recklessness about some geologists who demand improvable periods of time. A thousand years is to the geologist the same as a day is to the historian or journalist.

And while we are willing to concede thousands—yea, millions—of years to them, we expect at the same time that geology will be in harmony with other natural sciences.

There is one point in the issue between natural science and revelation, which, if viewed in proper light, will harmonize both, for there cannot be any conflict between them, if one understands the other. First, we are to distinguish between the antiquity of the world and the age of man, because these are two different things altogether in their relation to Scripture—the earth having been created a long time before the first man. Thus we see that Scripture does not teach us anything about the epoch when the universe was formed, nor does it appear to contain a theory of creation. It asserts creation, providence, and fatherhood, but how matter was created, and how after its creation the divine agency stands in producing new forms of life and beauty, Genesis does not declare.

The views expressed by those advanced minds in past centuries have been confirmed by the development of geology. It is no more a question of doubt about our planet being very ancient. The more accredited systems on the formation of our globe require almost countless periods of time, but for the present we content ourselves to the scrutiny of geology and its most certain conclusions. Half a century ago, when the science of geology was in its infancy, a cry of alarm was heard throughout Europe, that the new science was an attack on Genesis. The learned were soon able to reconcile these misgivings, and now it is largely a Christian science.

Our ideas as to the method in which the strata took place in the early formation of the earth may differ, but as to the estimate of time we must all agree to long periods. Geologists are unanimous, with a few unimportant exceptions, in saying that a very long time must have elapsed before all the strata, many of which are in places several thousand feet thick, attained their present form. G. Bischof calculates the duration of time for the formation of the earth at three hundred and eighty million years, and Palfy thinks it likely that the solidifying of the earth's crust took no less than twenty millions of years, and not more than four hundred millions of years. The time which elapsed between the beginning of the Carboniferous Age—which constitutes only one of the divisions of the Paleozoic period—and the recent period, is supposed by Arago to have been three hundred and thirteen thousand six hundred years. G. Bischof estimates it at one million three hundred thousand in one passage, and in another says it may have been nine million years.

Owing to the want of space, we can adduce only one illustration in this article to show what a "long period" means. In order to form the Saarbruck coal beds, which are four hundred feet thick, a mountain of wood two thousand four hundred feet high would have been needed, supposing them to have been formed of vegetable matter. Now we know that our forests hardly produce a layer of wood two inches thick in a hundred years; therefore, a mass of wood such as we mentioned would require at least one thousand years to grow and a corresponding length of time to form into coal. This calculation is based on present accretions of vegetable and earth matter in formations of the coal measure. It is very probable that the primeval flora grew much quicker than it does.
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at present, owing to greater heat and moisture during the Carboniferous Age; but the intermediate strata in which the coal is imbedded must also be taken into account. We have heard from the Egyptian priests that the mud beds of the Nile which formed below Memphis, hardly increased a yard in a hundred years. Recent investigations have shown that the increase is only from three to four inches. Now as the bed of the coal-late slate is one of the finest mud deposits known, the deposit of this stratum seems to require periods of time which are about five times greater.

In the great coal-pits of Wales, for example, they find in a depth of nearly eleven thousand feet, from fifty to one hundred distinct beds of coal, the one surmounting the other, and intermingled with layers of clay several feet thick. Now every one of these beds represents an old forest, which had to grow, vegetate, and perish in the place; or, at least, an enormous and various mass of floating wood must have been transported from a distance by the action of the courses of the water and deposited at the mouth of rivers or lakes. During these successive submersions, the gigantic Ichthyosaurs, as also their marine companions, sported in the waters which rolled over the plains and mountains, and, when they had subsided, the monsters were buried in the deep clay of the counties of Oxford, Warwick, and Dorset.

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THE WELLINGS OF THE INDIANS OF NEW MEXICO.

BY MRS. M. J. GORTON.

The Lehuas, or the Leguas, a tribe of Indians dwelling in New Mexico, are so manifestly—from the easily-compared authentic descriptions of the early Spanish explorers, Cordovaño (1540-41), Francisco Sanchez Charnusado (1580), Espejo (1583), and Gaspar Castano de Sosa (1590)—the same people who now dwell in the pueblo, or communal houses, that a visit was planned to the cave and cliff dwellings beyond the Rio Grande, where their forfathers dwelt.

A visit to these singular people who inhabit the pueblo, or community houses, was so full of interest, the strangeness of the idea of the queer four-story domiciles entered from the roof of the upper story, and showing the idea of the caves in the cliffs, modeled on the protective idea of a long bygone age, suggested an unusual amount of useful knowledge in the evolution of such houses from the cave home in the cliffs. So we visited the caves in the cliffs.

Jaded, travel-worn, and utterly weary from crossing the long stretches of the desert land which lie far to the north and east,—sandy, dry, arid, and cheerless wastes, stretching on and on to an ever-receding horizon. The greens of the grayish-brown shades into browns, with no green or living thing to relieve the general aridness; under a flat, opaque sky, in which a copper, fiery orb swang slowly, mercilessly above us, pressing downward with a pitiless glare that fell with a heavy, aching, oppressive weight, ever increasing; the only sign of life, now and then a skulking coyote or the cactus hound, which has been tracked down, down into the valley of the Rio Grande.

Beyond the Rio Grande, the deep, gulch-like canons of the Sierra del Valle open out towards Santa Clara. The scenery here is very striking; the whole masses of mountains seem to have been lifted up from 6,000 to 8,000 feet, not in one continuous chain, as the Las Vegas range, but in independent, broken masses, and these have been so scarified and furrowed by the action of electric forces and by the elements as to leave myriads of sharp ridges and peaks, separated by declivities, almost unapproachable canons, cut to the depth of 2,000 to 3,000 feet; and the tuffs of which their sides are formed have been dug out innumerable caves, with an ingenuity and pains-taking care that seems incredible when the tools are taken into consideration. These artificial caves are many of them of small size, but the grouping and the connecting pathways show that the inhabitants lived on the communal plan, and each group represents a different family.

As the caves are often dug out one above the other, each group of caves represents a pueblo itself, and imitating, as far as practicable, the system of the many-storied communal village. Other ruins are found on top of the mesas and at the base of the canon, which indicate the many-storied pueblo, such as are occupied at the present time by the Pueblos, the Lehuas, and by the Sun Indians.

These ancient cave habitations, which, from the nature of the rock and also from the peculiarity of the locality, were of easier construction, and also more easily defended against the encroachments of depredators, than houses, still exhibit many traces of their human occupants. The pottery fragments show considerable advancement in the use of pottery of the same kind of finish and the same color as the vessels now found in earthenware fragments of broken pottery resembling the quaint vessels sold by the Indians of the present day. Indeed, when on our return, at the mouth of the deep canon, where it opens down to the river, several of the natives, clothed in the striped Navajo blankets and buckskin leggings and moccasins, with their heavy black elf-locks tied back with a strip of red blanket and cast-off rag of civilization, and with the sad, immobile features of this doomed race, approached and offered for sale the usual collection of black obsidian and coarse-baked earthenware, and amidst the very common lot in the collection was an image intended to represent an owl, of a much higher type of earthenware finish, exactly resembling a piece of broken pottery of the same kind of finish and the same color in which I held in my hand, and which, from its appearance, seemed centuries old.

The ruins of the pueblo villages, of which there are quite a number, were also visited. The ruin of Valverde, near Golden, is quite distinct in its characteristics of the communal plan. A chain of four handsome ancient villages, some of them quite large, extends from west to east, along the southern "Cresto." These are the "Pueblo Largo," "Pueblo Colorado," "Pueblo de She," and "Pueblo Blanco." Of the Lehuas pueblos, Santa Clara (Capo) San Ildefonso (Ojo-que) stands on a site about one mile from the Bo-ve of 1598.

The community houses of the Pueblo Indians of today are of the same construction, formed upon the same plan as can be ascertained by comparison of the ruins, as those of three centuries ago. They are three, four, and sometimes five stories high, are built of adobes, have port-holes for windows, and are entered from the roof. Ladders are placed on the ground, and the ascent of the low one-storied room is made; then crossing this dirt sun-baked flat, roof, another story is made, and the same—up and up and up—until it is reached on the roof of the upper story. Poles or logs are placed upon the walls of the sun-dried bricks, these are covered with hay and leaves, and on this the mud is plastered, which makes a roof that, in a high, dry climate, answers every purpose. The houses are very cool in summer, and said to be warm in winter. Thither all the necessaries for life are stored. The lands on which the maize, beans, and other produce is raised are in the valley some distance away, and the crops are all irrigated.

The small cattle are also pastured far away, so that life, even at the primitive stage of a Pueblo Indian, is of severe trial.

New Mexico is rich in archaeological treasures; the mesas, hills, the edges of the plains, and the cliffs and caves, are covered with the ruins of prehistoric cities, towns, and villages, the inhabitants of which lived their day and sank into oblivion, ages ago.

It is very little difference in the culture of the inhabitants of New Mexico today and of those whom Antonio De Espejo found and described three centuries ago. In his journal he says: "From Couches, situated on the western border of Texas, (probably centering around where the river of the same name discharges into the Rio Grande), they followed their journey for the space of fifteen days without meeting any people, all that while passing through woods and groves of pine trees (pinon) bearing such fruits as those of Castle. At the end whereof, having travelled, to their judgment, four score leagues, they came into a small hamlet or village (pueblos at or near Paso del Norte or San Elizario) of a few people, in whose poor cottages, covered with straw, they found many deer-skins, as well dressed as those of Flandres, with great store of excellent white salt. They gave them good entertainment for the space of two days, while they remained there, after which they bare them company about twelve leagues, into certain great towns, always travelling by the river called the Rio Del Norte, above said, until they came into the country called by them New Mexico." The account of Captain Espejo, which is to be found in excellent preservation, and the successive steps from such life as was to be found in the cliff dwellings to the industrial methods of the ancient Egyptians, are awakened from the sleep of centuries by the on-rush of the locomotive and the mighty, onward, irresistible awakening to modern civilization and modern houses.

[Original in Popular Science News.]

THE DODDER.

BY S. E. KENNEDY.

An interesting plant, common in this locality, is the Cuscuta Gracervis, or, as it is usually called, the dodder. It belongs to the order convolvulaceae, and is the only order of the group. Although there are several species of the genus, this is said to be the only one found in New England.

Its general appearance is that of a snarl of orange-colored twine. There is not a particle of green anywhere about it. It is usually found twining about some coarse weed, as the nettle, cleavers, etc., and I have found it wound in interminable coils around the stalks of coarse grass. It is also often found on the willows. Some of these parasites are restricted to a particular species of plants for support, and that their seeds germinate only when in contact with the stem or root of the species upon which they are destined to live; but the Cuscuta does not show such preference, as I have myself seen it upon several different kinds of plants in no wise related. Gray says that parasites are found only upon those plants whose elaborate juces furnish propitious nourishment.
This curious vine possesses one well-known characteristic of its relative, the morning-glory,—that of twining from right to left, or against the sun. In trying to remove a specimen from a stalk of eupatorium, I found the bark broken, and only succeeded in removing the vine by breaking it in tiny pieces. If one will take the trouble to examine the under surface, at the place where it adheres most closely to its support, he will discover by what means it is enabled to cling so tightly. Where it comes in contact with the bark, are developed minute papillae, which remind one of the tiny feet of some creeping thing, and suggest the curious fancy that the tenacity with which it clings is prompted by instinct. This arrangement is not wholly for support, it seems, but by thus insinuating itself into the outer bark of the plant, it is enabled to draw from it its juices. At any other place along its entire length it may easily be uncouled.

As it steals its nourishment from that to which it clings, it has no need of digestive apparatus, therefore leaves are wanting, but in which it bears deeply-fringed oval scales. The tiny white flowers, produced late in summer, are the only deviation from the prevailing color of the plant. These are gathered together in a cymose cluster at a distance of ten or twelve inches apart. The tiny corolla is bell-shaped, five-parted, with a tube somewhat longer than the calyx lobes, which are ovoid and spreading. The stamens are united with curiously fringed scales. The dead corolla remains upon the ovary, which is two-celled and four-ovuled. The spirally-coiled embryo germinates in the soil, but, upon rising from the ground, the root withers, and it becomes entirely parasitic. One specimen had the remains of a tiny thread-like root still adhering to it, though the germinating portion of the plant was at least twelve inches from the ground, clinging for dear life to a species of eupatorium known as trumpet-weed.

MOOSE VALLEY, R. I.

THE PEARL.

By ANNA HINRICHS.

The pearl, like the calm, pure moon, ever fascinates the eye. In its charming modesty it resembles the violet, and occupies the same place among gems that this simple flower holds among gorgeous florae. Little wonder that its rare beauty entices thousands of bold divers to brave the perils of the deep. They seek it at the risk of fatal encounter with shark and swordfish; in defiance of the deadly embrace of the polyp. True, the diver does not make his perilous plunge solely because of his admiration for this matchless "daughter of the deep;" his fundamental motive is the love of gold with which his labor is rewarded. Certainly, the poor diver is ambitious because of necessity, for the most robust of constitutions cannot endure the hardships of diving for more than—at the utmost—one year. The pearlless gem is obtained at the expense of many human lives.

The most extensive pearl fisheries are conducted along the coasts of the Persian Gulf, Ceylon, and Japan. Every shell does not contain this treasure, and hundreds shatter the eager expectations of hidden wealth. But to the diver, misfortunes, likewise blessings, never come singly; for if he finds one pearl in a ton of shell, he may in all probability find many more of various size and forms. In color they range from deepest black to pure white, frequently yellowish, and rarely delicate rose-pink.

The pearl is "beauty unadorned," requiring no artificial aid—no mechanical art—to cut and polish. Its most peculiar form is the so-called "Barock." This form is highly fantastic, disclosing sometimes the grotesque features of a "king's fool," again, the distorted figure of a dwarf, a comical elf, and so forth. Pearls of this character are mounted on pedestals richly embellished with gold and silver, and pleasure the eye as curious bric-a-brac or paper-weights.

The real "mission" of the pearl, however, is to enrapture man in the capacity of a most gratifying jewel. Indeed, it receives more homage than either the diamond or the ruby. Years ago, it was custom-ary for jewelers to mount pearls in the form of a metal tube, the usual arrangement of the garnet. Now, the preference is to use them as settings; and its shimmering white appears most effective from the bed of glistening gold. In this way they are used on bracelets, necklaces, brooches, pins, ear-rings, and rings.

In its modest splendor, the pearl can maintain its own beside any gem. Even the brilliant rays of the diamond cannot depreciate its beauty. Its quiet charm kindly heightens the liquid green of the emerald, enhances the deep-blue light of the sapphire, and deepens the glimmering red of the ruby. While its unpretentious dignity lends grace to the most costly of gems, it does not scorn to aid the common stones. As graciously it casts its soft radiance over garnet, amethyst, lopaz, or turquiose.

A Good Preventive for the Inroads of Ants is a Stripe of Cardolized Petroleum, about half an inch in width, drawn about the places frequented.

The loss to manure by exposure, especially by leaching, in tests by the Cornell University, has reached as high as 42 per cent. The moral is, keep manure under shelter, or draw it upon the land at this season.

PARIS consumes, on an average, 300,000 litres (quarts) of milk per day. In summer this quantity falls to 210,000 litres, and the difference is used in making cream and fresh cheese. Four-fifths of this milk is furnished by milk companies, which gather it from as far as 60 or even 100 miles from Paris.

A cold storage company's circular says that if celery is packaged in small boxes, placed in total darkness, and submitted to a certain low temperature for thirty to sixty days, it will not only be beautifully white but will not have the usual natural blemishes and have the delicate flavor and fine appearance of the choicest fresh celery.

Novel Training of Grapes.—A grape-grower in Bristol County, Massachusetts, has adopted a plan which, though it may not be new, is certainly interesting. He sets stout posts at suitable intervals, with smaller ones between wherever there is a vine, and upon these stretch two strong wires at a proper distance apart, the lower one being placed far enough from the ground to allow passage for the vine to pass freely underneath. By the use of high step-ladders the fruit can be readily harvested and the vines trimmed or handled at will. A similar method has been in use among the Italians since the time of the ancient Romans, at least.

The Pleasures of a Deer Forest.—A correspondent of an English society paper enumerates the pleasures of being the tenant of a Highland deer forest. He explains that the place costs him £1,000 a year in addition to the cost of end of small sums, which he grew tired of noting, and the pleasures which he obtained in return for this outlay were of the following character: "For a couple of hours at a time I have walked with the waters of a running stream well over my boots. A suit of clothes has been done for in a day's wear. Twice or thrice I have sunk up to my chest in a moss. Once I fell over a precipice. Once when crossing a loch I fell overboard, and was not fished out till I was nearly drowned. On another occasion I was fired at by one of my own gillies, who said he mistook me for a 'beastie,' of what kind I do not know, but I fancy I had rather a narrow escape. Per contra, I have on five occasions brought down a good stag."

A Novel Railroad Tariff.—Hungary has led the way in a railway experiment of very great interest. The whole country for railway purposes was divided into zones, and within each zone the railway fares for any distance travelled are equal. Short journeys and their frequency are intended to compensate for the expenses of long journeys. The results are said to be astonishingly successful. There has been an increase of seventy per cent. in the number of passengers and fifteen per cent. in the receipts. No additional expense has been incurred, either in laying rails, buying engines, or increasing the number of officials. This system is practically the application of the post-office stamp principle to given times of railway service.
GELATINE AND ITS USES.

In various animal tissues, such as the skin, bones, intestines, etc., is found an interesting group of organic compounds, very closely resembling each other, and which, when treated with boiling water, are transformed into the well-known and exceedingly useful substance gelatine, which is the same as ordinary glue, differing from it only in purity. The most characteristic property of gelatine is that of solidifying, or gelatinizing, when solutions containing it are cooled below 68°. A solution in water containing only one per cent. of gelatine, will form the characteristic "jelly" when cooled.

Common glue is prepared from the trimmings of hides, and the refuse of slaughter-houses and tanneries. The skins are cleaned and steeped in lime water, and afterwards exposed to the air for some days. They are then boiled in water, and the resulting liquid run off and allowed to settle, after which it is left to cool and gelatinize in shallow boxes. The resulting cakes of soft glue are then dried on nets in large buildings, provided with movable blinds, so that the air can freely circulate through them in pleasant weather, while during storms the glue can be protected from the weather. This process of drying requires great care, as a rise in the temperature may cause the partially dried glue to liquefy, making a "mess" which requires much labor to clear up, to say nothing of the loss or damage to the stock. It was formerly supposed that glue could only be dried at temperatures above the freezing-point, but it was accidentally discovered in this country, that frozen glue was of equally good quality, and the manufacture is now carried on all the year round.

Cooking-gelatine is practically made by the same process, but much greater care is taken in selecting the stock, and the utmost cleanliness is necessary in all the processes. It forms a healthful and attractive article of diet, but its nutritive value is not very great.

By long continued boiling, gelatine loses its gelatinizing power. The same result is obtained by adding nitric or acetic acid to its solution. The ordinary liquid glues are made in this way, and a very good article may be extemporaneously prepared by throwing some pieces of glue into a bottle of vinegar, and shaking occasionally until it is dissolved. When chlorine gas is passed through a solution of gelatine, it unites directly with it, precipitating an insoluble substance, and forming a very peculiar looking solid froth. Gelatine also unites with tannin to form an insoluble compound. This reaction is the basis of the tanning process by which raw hides are converted into leather. A minor application of this reaction is found in the use of fish-skin for settling coffee. The tannin of the coffee and the gelatine of the fish-skin unite, forming a solid, tenacious mass, which mechanically encloses the impurities suspended in the coffee, in the same way as the coagulating albumen of the white of an egg, often used for the same purpose. When gelatine is placed in cold water, it softens and swells, but does not dissolve. On heating the water, however, it dissolves immediately. If some bichromate of potash is added to the gelatine, it still remains soluble if kept in the dark, but, if exposed to the sunlight, a chemical change—probably an oxidation—takes place, and it becomes perfectly insoluble, even in boiling water. This property is of the greatest value and importance, as it is the basis of all the modern processes of photo-engraving, which have enabled us to make exact reproductions of the most celebrated works of art at a nominal cost. The ordinary kind of gelatine is also indispensable in the manufacture of photographers' dry plates, which are coated with an emulsion of gelatine and finely-divided sensitive salts of silver, and, after drying, will retain their sensitiveness for years without change. The collodion-coated plates formerly in use became worthless in a very short time after being prepared.

The minor uses of gelatine are innumerable. When combined with glycerine, it forms a soft, elastic mass, which is used for printers' ink-rollers, electrotypew moulds, and for taking casts of irregularly shaped objects. The surface of this compound readily absorbs the ailine dyes, and this property is taken advantage of in the heliotype copying paper which consists mainly of a shallow tray filled with this composition. Characters written on paper with ailine ink are transferred to the surface by simple pressure, and a large number of copies may be taken in the same way, as the gelatine readily yields sufficient of the color to fresh sheets of paper, when pressed upon it, to give a clear reproduction.

Some fruits contain gelatinous principles known as pectic and pecticous acids, but they are entirely different substances from the true gelatine. It is these substances which render it possible to prepare fruit jellies, but they have much less gelatinizing power than the animal product. The cheap manufactured fruit jellies are frequently found to consist of animal gelatine, properly flavored, and to be entirely free from the pectose compound which should legitimately be present.

THE TWO FORMS OF PHOSPHORUS.

Phosphorus is an element dear to the heart of every amateur chemist, its remarkable inflammability and its ready adaptability to explosive and pyrotechnical effects giving it an attractiveness to the youthful experimenter, which is not justified when the great danger accompanying its use is taken into account. Some time ago, one of our readers wrote us an amusing account of his early experiments, in which he made up a mixture of phosphorus and chloride of potash into "torpedoes," and placed them in his pocket for safe keeping and to avoid the observation of the teacher. As might be expected, however, the treacherous compound soon made itself evident in the most unmistakable manner, and nothing but that special Providence which is said to watch over boys and intoxicated persons prevented serious results.

Phosphorus is one of the most active chemical elements we are acquainted with, being exceeded only by fluorine. It rushes into combination with other elements, especially oxygen, on the smallest provocation. A temperature of 112° F. is sufficient to cause it to burst into flame, while, even at ordinary temperatures, when exposed to the air, a slow oxidation takes place, causing it to glow and emit luminous vapors. The slightest friction will raise its temperature to the igniting point, while if it is mixed with substances rich in oxygen,—like nitrate or chlorate of potash, or peroxide of lead,—a slight concussion causes the oxidation to take place with explosive violence. It is also excessively poisonous, when taken into the system, and even a burn from ignited phosphorus produces a most painful sore, and one very slow in healing.

Like many other elements, however, phosphorus exists in an allotropie form, known as red, or amorphous phosphorus. Although this is chemically identical with the ordinary variety, its physical characteristics are very different. When ordinary phosphorus is heated in a vacuum, or in a gas in which it cannot burn, to a temperature of about 450° F. for a considerable length of time, it becomes converted into a red, infusible substance, which has a much higher specific gravity than the ordinary variety (2.14 as compared with 1.83), and is insolable in the usual solvents of phosphorus. It cannot be ignited by friction, and, in fact, is unflammable until a temperature of 500° F. is reached, when it changes back into ordinary phosphorus. When mixed and rubbed with dry bichromate of potash, it does not explode, and when mixed with nitrate of potash it will not explode by friction, but if ignited burns off quietly. It cannot resist, however, the influence of chlorate of potash or peroxide of lead, but, when mixed with these substances, explodes more or less violently by heat and friction. It is also, apparently, non-poisonous. Amorphous phosphorus is extensively used in the composition of the surfaces for igniting safety matches. The matches are tipped with an inflammable composition containing chlorate of potash, which, when rubbed upon the
amorphous phosphorus, unites with it at once and ignites.

The existence of allotropic, or different varieties of the same element, is a chemical mystery which has never been fully accounted for. It is a strong argument in favor of the compound nature of the elements, or, at least, an indication that the molecules of the elements are composed of atoms, and have a more or less complicated structure, like the well-known isomeric hydrocarbons, which show similar phenomena. We have also some reason to believe that many other elements may show allotropic modifications, in their compounds, at least, although they have not yet been distinguished in their free condition.

TO DETECT METALLIC SILVER IN THE PRESENCE OF LEAD.

As silver and lead very commonly occur in nature combined together in the same mineral substances, a more easy, rapid, and correct method for the detection of the former in the presence of the latter than any of those generally adopted in practice has been given by M. Marey. The apparatus proves to be as practicable as it is claimed, it will undoubtedly be of great value and importance to both science and art.

A RECENT INVENTION IN PHOTOGRAPHY.

Since the invention of the rapid dry plates which have made instantaneous photography a possibility, many attempts have been made to fix the successive positions taken by men and animals in their natural movements, and with much success. The best of these photographs have been taken by Mr. Muybridge of San Francisco, who placed a number of cameras side by side, so arranged that the exposure was made by the man, horse, or other animal itself, as it moved past them. The results obtained were very remarkable, the attitudes caught by the sensitive plate being so extraordinary and apparently unnatural that, without the unimpeachable evidence afforded by the photographs, one would have been justified in saying that they were entirely the result of the artist’s imagination.

M. Marey, of France, has recently invented an apparatus by which, with a single camera, as many as fifty successive exposures of a moving object may be taken in a single second. Instead of glass plates, he uses a sensitive film, which is rolled from one cylinder to another, stopping in the focus of the objective just long enough to receive the image, and then passing on to give place to the next one. The particulars of the mechanism are not given in La Nature, from which we copy the engraving, but the results as shown by it are very fine, and indicate a remarkable amount of mechanical skill and ingenuity. The figures represent the positions taken by a horse and rider as they moved past the camera, commencing at the upper right-hand corner, and following each line from right to left, in a reverse direction to the lines of a printed page. If M. Marey’s apparatus proves to be as practicable as it is claimed, it will undoubtedly be of great value and importance to both science and art.


IN THE MATTER OF RAILWAYS, Japan appears to be going ahead tolerably fast. Considerably over 1,000 miles are already in operation, while an equal quantity are under construction or surveyed, and will be open within a year or two from now. The projected railways exceed 700 miles in length, with a capital exceeding £6,000,000 sterling.

SCALE IN BORELLS.—It is estimated that the presence of 1/16 inch of scale causes a loss of 13 per cent. of fuel; 1/4 of inch, 38 per cent; and 1/2 of an inch of scale, 60 per cent. The Railway Master Mechanics’ Association of the United States estimates that the loss of fuel, extra repairs, etc., due to incrustation, amounts to an average of $750 for every locomotive in the Western and Middle States.

INCINERABLE TEXTILES.—There are many substances which have the property of rendering the fabrics to which they are applied incinernable, but they usually spoil them, either by changing the color or stiffening them to such a degree that they cannot be used. An easy and safe way of protecting curtains and mosquito nets against fire is said to be by steeping them in a solution of phosphoric of ammonia obtained by mixing 1/2 a liter of water (1 pint) with 100 grammes (about 3 ounces) of phosphoric of ammonia. In this way the color and texture remain unaltered.

NEW INSULATING COMPOUND.—A new insulating compound which finds favor among manufacturers of electrical instruments and machinery in France consists of one part of greek pitch and two parts of burnt plaster by weight, the latter being pure gyspum raised to a high temperature and plunged in water. The mixture, when hot, is a paste, and can be applied by a brush or cast in moulds. It is amber-colored, and can be turned and polished. Its advantage is said to be endurance of great heat and moisture without injury to its insulating properties.

ELECTRICAL DOORS.—An admirable arrangement, looking to the quick and safe emptying of the house, has been adopted in the Tremont Theatre in Boston. At any time, by simply touching a button in any one of the eight handy places in different parts of the theatre, seventeen sets of folding doors, leading to as many exits, open simultaneously, actuated by electrical apparatus. The expense of the improvements is said to have been considerable, but it is safe to say that the public will appreciate the advantage of being able to take their pleasure without any dread of fire and panic.
The Out-Door World.

EDITED BY HARLAN H. BALLARD,
President of the Agassiz Association.
[P. O. ADDRESS, PITTSFIELD, MASS.]

A SUCCESSFUL A. A. CONVERSION.

SCORES OF ENTHUSIASTIC DELEGATES HOLD A THREE DAYS' MEETING.

On February 27th and 28th, and March 1st, a very enjoyable Convention of those Chapters of the Agassiz Association which are within a hundred miles of New York City, was held here, under the auspices of the New York City and the New Jersey State Assemblies.

On Thursday the regular quarterly meeting of the New York City Assembly was held at the Friends' Seminary, Rutherford place and Sixteenth street, and this was followed by a meeting of the Convention Committee.

On Friday, at 2:15 P. M., the delegates assembled by invitation at the College for the Training of Teachers, where they first attended an interesting lesson in science, given by Prof. J. F. Woodhull to a grammar class. After they were conducted through the scientific and manual training departments of the college; and at 4 o'clock all gathered in the lecture room, where the Convention proper was opened by the President of the Agassiz Association, who spoke on the advantages of a thorough scientific training, and explained how such a training could be secured by means of the aid afforded by the Association. This address was followed by one on "The Relation of Science to the New Education," by Prof. Walter L. Hervey, Dean of the Faculty of the New York College for the Training of Teachers; after which Prof. Woodhull interested the audience for half an hour by a delightful talk on "Some Simple Experiments in Natural Science," which he performed at the same time, in the most dextrous and graceful manner, by way of illustration.

In the evening there was a remarkable exhibition at the rooms of Chapter 999 (2), of New York, No. 49 W. Twentieth street. This Chapter is composed almost wholly of boys and young men between the ages of twelve and sixteen, and the collections they have made, classified, and labeled are equally a credit to themselves and an honor to the society. The walls were covered with specimens of preserved plants, some of them of great rarity, and one or two never known in the localities where they were found until the bright eyes of the Agassiz boys discovered them. In one corner was a large collection of beautiful butterflies and moths, while in the center of the room was a really wonderful collection of the minerals of New York City, some of which were first discovered there by members of this Chapter. Fine specimens of crystals of garnet attracted special attention. One room was devoted to a microscopic exhibition. The large cabinets, with tier after tier of drawers, were made by the boys' own hands. The rooms were crowded during the evening by an admiring throng of visitors, among whom ladies and gentlemen fairly outnumbered boys and girls. After the visitors had departed, a camera was produced, and one of the boys took a flashlight photograph of the attractive rooms.

We take the following account of the last day of the Convention from the New York Times of March 2:

The annual Convention of the Agassiz Association yesterday was the high point of the week. A number of newly-arrived delegates reported in the morning, among whom were T. H. Porter and E. S. Evans, of Somersford, Conn.; David N. U. MacMillan; Dr. M. D. Hussy of Orange, N. J.; S. E. Breed, J. Young, and W. M. Folk, of Cornwall-on-Hudson; S. Willard Bridgham, and A. B. Scudder, N. J. After the report of the President of the Philadelphia Assembly, and J. S. Taylor, Secretary, Miss L. Fauks, of the Elizabeth Hill and Dale Club, and S. E. Barnes, of Orange, N. J., the session was held in the geological rooms of the College of New Jersey.

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Mr. F. H. MacCracken of the university delivered the opening prayer, and the reports of the various Assemblies followed. The report of the New Jersey Assembly was read by J. L. Inman, of Luzerne, Pa.; the report of the Rhode Island Assembly was presented by S. Willard Bridgham, of Providence; and that of the Australian, by Prof. John Shalcross; the New York City Assembly by Dr. C. H. Bushong, of the Massachusetts Assembly by Prof. W. F. Leet, President of the Association; the Hill and Dale Club, composed of members of suburban Chapters, by Miss L. Fauks, of Elizabeth, N. J. Reports were also made by members of the American Association for the Advancement of Science, by the Agassiz Chapters of the Australian Royal Society, the Russian Agassiz Chapters, the Chapters among the colored people of Alabama, and in the Indian school at Hampton, Va. President Ballard also described the founding of the first Agassiz organization in his country, and showed how the work had increased and multiplied, until today the Association contains 1,000 Chapters and 17,000 members.

President Seth Low of Columbia delivered the address of welcome, extending to the Association the courtesies of the college. He said that the New York City Assembly had been the subject of extended comment, and developed facts of which few are aware. Datolete, "the pride of Bergen Hill," was shown side by side with the Indian school in Iceland, and the magnificence of the fauna of the Hudson Valley. Hoboken and New Rochelle produce immense serpentine outcroppings. The cuttings of the Pennsylvania and Erie roads reveal deposits of yellow zeolites and calcites. In the vicinity of Prospect Park forty distinct minerals are known.

The afternoon session concluded with an address by Prof. C. H. A. Bjerggaard, of the Asltor Library, on "Why We Study Nature." This was in the nature of a historical and critical study of the development of the study of natural history among children.

At the evening session, Prof. A. S. Bickmore delivered a lecture on "British Columbia and Alaska," illustrated by stereopticon views.

The success which has attended this Convention has awakened much enthusiasm in the local Agassiz Chapters, and the President of the National Convention of Prof. Kunz said it was decided to hold a seaside assembly on the New Jersey coast during the summer.

[NOTE.—The Times reporter is wrong in his statement of Prof. Newberry's discussion of the "chronology of the Bible." He took especial pains to say that the dates which appear in our English Bibles are not Biblical, but merely the addition of Archbishop Usher, and that therefore the Bible is in no way responsible for them. Prof. Newberry did not discuss the chronology of the Bible at all.—ED.]
given to accuracy, neatness, and beauty of style, but the main idea is to award the prize to the person showing the most originality and scientific ability in his methods of observation, and in the results secured. The observations may be made in any field, according to individual preference, whether botany, mineralogy, entomology, or any other department of natural science. All observations must be original and new—that is, made after reading this announcement. There are four months in which to use your eyes and brains, and in that time many interesting things should be discovered. Correspondence on this subject should be addressed to the President of the Agassiz Association, at Pittsfield.

EXCHANGE NOTICE.

MAMMALS and FISHES of the Pacific States, Lists exchanged.—M. Burton Williamson, University P. O., Los Angeles Co., Cal.

A COURSE IN BOTANY.

Mr. Alex. Wight, of Framingham, Mass., is now ready to receive applications for his Agassiz Association lessons in botany. He furnishes prepared specimens with lesson leaflets, and corrects all exercises carefully. Further details may be given next month, but all interested—and all are invited to be interested—should address Mr. Wight at once.

THE GRAY MEMORIAL BOTANICAL CHAPTER.

It gives us great pleasure to present the following most encouraging report from Chapter 2, and to congratulate the Chapter upon its growth and excellent work:

Gray Memorial Botanical Chapter of the

Agassiz Association.


This Chapter was organized in December, 1887, with ten members. Its objects and methods have been given from time to time in the Swiss Cross. During the past year it has grown steadily, and now numbers forty-three members, living in twenty States and Territories. Seven of the members occupy chairs of science in various colleges. Of the remainder, many are students or teachers, but a considerable number are occupied with secular affairs, and make the study of botany their favorite recreation. Phanerogamic botany has, of course, received the most attention from the Chapter, each member of which is required to write a report each quarter. As the members are so varied in age, and as many of their reports have been illustrated by pen and ink sketches, they have been very interesting, some being worthy of publication. At present, one member is studying the ferns of central Maryland; the President is especially interested in seed; two members are studying fungi; another, the algae of the South Californian coast; another,lichens. One member studied moss last summer under Prof. Barnes, of Madison, Wis. Much of the work has been the study and comparison of local floras, which has already resulted in many rare "finds." A serious obstacle to the prosperity of the Chapter has been the irregularity of receiving reports in some of the divisions, some valuable ones having been lost through carelessness. To remedy this and to make permanent the results of our studies, at the same time largely assisting to increase the esprit de corps, it has been thought advisable to publish the best reports in a semi-annual—perhaps quarterly—bulletin, which we hope to introduce to the botanically-inclined members of the Agassiz Association before long. Plans are being made to increase the membership and largely extend the usefulness of the Chapter during the present year. I shall be pleased to send a copy of the constitution, or to answer any questions concerning the Chapter, to those who will enclose a two-cent stamp for reply.

G. H. Hicks, Pres.
Lock Box 766, Owosso, Mich.

[Written for "The Out-Door World."]

A PAIR OF COLORADO ROBINS.

BY RUTH H. SPRAY.

Of the Agassiz Association.

WHETHER or not it is true, as has been said, that our American robin follows civilization, I do know that when we first came to this Colorado valley, in the spring of '87, we were charmed in vain for the robin's note. Three years later, we were gladdened one spring morning by the unmistakable song that carried us back to our childhood days in the old orchard at home. Since then they have never failed us, and are becoming more plentiful. However, right here at our home we have never seen but one pair in a season, although we can have no evidence that it is the same pair, and they never build in one tree twice. I think we prize them most for their music; but last spring our robins showed so much confidence in us, in a time when they were in great adversity, that I want to tell it to the readers of "The Out-Door World."

Our house stands in a grove of pine pine—a low, wide-branching evergreen, very suitable for nest-building, and many varieties of birds make their homes with us. We knew from their movements as to where the robins had built, but we had never located the tree. One day a hired man was set at trimming some of the trees in the enclosure not far away from the house. My husband had charged him to watch carefully for birds' nests, and especially not to touch a tree in which he might find a robin's home. But, when I walked out in the afternoon, to give the man directions about the work, he pointed to a nest upon the ground, and said "he was sorry, but he forgot to look for a nest in that tree until he saw the bird fly away as the limb fell to the ground." All but two of the eggs were broken. We saw the mother robin perched on a tree some distance away. We saw our birds after that, sitting or hopping about among the trees a little. They seemed to be debating the same question. By-and-by they appeared to be working.

But one day we missed them wholly. On a limb of one of the trees was their partly-made nest, but the birds themselves were nowhere to be seen. They had evidently abandoned their newly-begun home, and whither had they gone? The season for nesting was not very far advanced, and we supposed they had given it up. But in a few days they were seen among the trees very close to the opposite side of the house. They were hopping about in a lively manner, and seemed as cheerful and happy as if no evil had come near. We were happy to see them such, and left them alone.

We waited a few days longer; then my husband, from a step-ladder, proclamed that there were already two eggs in the nest. The mother bird soon came back, and we knew that they had fully settled on their new home.

Their first attempt at rebuilding their home was on a projecting limb, similar in position to the one the axe had felled to the ground. Who can doubt that, after beginning this, they reasoned that it might be cut off. The final choice was in a fork of the main trunk of a tree; and we like to think that, in choosing this tree so near to our very door, they believed we would protect them from the merciless axe and its careless wielder.

SALIDA, COLORADO.

[Written for "The Out-Door World."]

THE SPRING PRELUDE.

By Prof. W. W. Bailey,
Of the Agassiz Associates, Council.

NATURE is pretty much the same year after year. We ourselves only forget the events of past seasons. A carefully-kept day will reflect many fallacies in regard to weather, the coming of birds, or the opening of flowers. So much for observation. Now for the application. A few days ago, cold and sceptical after an ungenerous March and an unpromising April, the writer strolled into the woods. To his surprise, although he had never been astounded, he heard the hylas—as they call it. The final choice was in the marshes. And what is there like that? A cheerful sound, so pure, confident, and happy! "Here we are!" the little fellows say. "Nothing can keep us back. We have an engagement to meet the song sparrows, the blue-birds, and the robins. Surely you would not have us delay!" And—yes—there is the song sparrow's note, refuting the silly statement that American birds cannot sing. What do you expect of them—a Greek chorus or a German opera? Oh, perhaps, we don't know what singing is!

There are the black-birds, too—those jolly muggumps,—holding a convention and voting supplies. But, most spring-like of all signs, are the hazels and alders in full, swinging tassel and golden leaf. In the prairie, now we burst into praise, sometimes singing back, and then in ours, but always in a strain triumphant and glad, the burden of which is that God is good.

What is it, we wonder, that produces this thrill of ecstasy at the sight of awakening Nature? In the winter we often grow sombre, and half believe that things don't pay. We are sure that corporations don't, or poorly, and that life is one of Mr. Marklin's "grinds," adjective and all. But in spring, with the sun shining, the sky blue, the birds caroling, and flowers blooming, we are optimistic to a degree. The last state, induced by Nature in her smiling mood, we take to be the natural and better frame of mind. That we may not lose the phantom of joy, henceforth, for some months, we live in the woods.

Many interesting reports and notes are crowding out this month to make room for the report of the New York Convention.

Reports of the Sixth Century (Chapters 501-600) should reach the President by June 1.

All are cordially invited to join the Agassiz Association, and all communications for this department should be addressed to Mr. Harlan H. Ballard, President A. A., Pittsfield, Mass.
POPULAR SCIENCE NEWS.

BOSTON, MAY 1, 1890.

AUSTIN P. NICHOLS, S.B., . . . . Editor.
WILLIAM J. BOLPE, LL.D., . Associate Editor.

In an interesting paper, recently published by Dr. D. G. Brinton, upon the origin of the Semitic races,—including the Syriacs, Assyrians, and Jews,—he takes the ground that the Asiatic Semites were immigrants, not directly from Europe, but along the southern or African shore of the Mediterranean, from some region near its western extremity; and, as the younger and more active students of Aryan ethnology have accepted the theory that the Arayan stock originated in Europe and appeared in Asia only as immigrants, therefore both the great divisions of the white sub-species of man originated on or near the North Atlantic coast of the eastern continent. Dr. Brinton claims that a proper translation of the first chapter of Genesis would indicate the belief of the Jews that the garden of Eden and the place of their origin was to the westward of Palestine, and offers many other strong arguments in support of his novel theory. Dr. Brinton's views are questioned by Prof. Morris Jastrow, who is inclined to favor the northeastern coast of Africa, in the vicinity of what is now Egypt, as the cradle of the Semitic race.

A word of caution should be given photographic amateurs in regard to the use of compound "flash-powders." These frequently contain such substances as chlorate of potash, picric acid, etc., which form highly explosive compounds when mixed with magnesium powder. Serious accidents have occurred from their use, and the best and safest way to obtain a flash-light, is to burn only pure magnesium powder in some one of the many excellent lamps constructed for that purpose. In addition to their safety, much better pictures can be obtained in this way. The eyes should be shielded as much as possible from the light, as the intensity and suddenness of the flash cannot but have a more or less injurious effect. The best results in photographing interiors and groups can usually be obtained by holding the lamp to one side of the camera, some distance above the floor, so as to throw the shadows downward.

It is a well-known fact that, in ancient times, the Phoenicians had numerous settlements on the southern coast of England. An interesting discovery has recently been made, in a little village in Devonshire, of some direct descendants of these ancient colonists. For many centuries a family by the name of Ballhatchet has resided on a farm known as Ballford, or Baal's Ford. The family name is evidently a corruption of Baal-Akhed. Imme-
A MAGIC SQUARE 5,400 YEARS OLD.

In a very ancient Chinese work, said to have been written in the reign of Fo-chi, 3500 B. C., the accompanying diagram occurs, under the title of Lo-chou. Although it evidently indicates some mathematical rule or formula, its exact significance has been the source of much speculation, and many theories, of more or less probability, have been advanced to explain its meaning.

It remained for M. Lucas, a contributor to La Nature, to suggest a simple and reasonable explanation of the figure, which is entirely confirmed by the figure itself. He claims it is simply a magic square, represented in the only way that it could be by a person ignorant of figures. It will be seen that, in whichever direction one counts the groups of spots and circles, whether horizontally, vertically, or diagonally, the total product will always be fifteen. The above figure, translated into Arabic numerals, would be written thus,

\[
\begin{array}{ccc}
4 & 9 & 2 \\
3 & 5 & 7 \\
8 & 1 & 6 \\
\end{array}
\]

and a simple inspection of the two diagrams will be sufficient to convince anyone that the mysterious Lo-chou has no hidden mystic, or even mathematical meaning, but is simply the attempt of some ancient student, ignorant of figures, to express that remarkable relation of figures to each other which, under the name of the magic square, is a familiar source of amusement to every schoolboy of the present day. It is certainly a very curious circumstance that this arrangement should have been known, not only at such an early period, but even before the invention of figures to express the numbers themselves.

Nickel, cobalt, iron, and several other metals, separate very rapidly from cold sulphocyanide solutions under the influence of a weak electric current, according to recent experiments by E. F. Smith and L. K. Frankel.

[Original in Popular Science News.]

BRIEF STUDIES IN BIOLOGY.

BY PROF. JAMES H. STOLLER.

III. THE EARTHWORM.

In the study of animals, after two or three have been carefully observed they should then be compared. It will, therefore, be helpful to recall that we have thus far studied a one-celled animal, the amoeba—representing the Protozoa, or first great division of the animal kingdom—and a many-celled animal, the hydra,—representing the second sub-kingdom, the Coelenterata. It will be remembered that in the hydra the cells are arranged in two layers, differing somewhat from each other in their properties,—that is, forming tissues,—and that the general form of the body is that of a sack, the cavity of which serves as a stomach. It will not be out of the way to conceive the hydra to be an aggregation of amebas in the form of a two-layered sack, for each cell in the hydra is like an ameba,—being a bit of nucleated protoplasm,—and nourishes itself and multiplies itself in just the same way.

Only the cells are associated so that, as a whole, they form an animal body, and, acting in correlation, produce movements, etc., which, as belonging to the cells in toto, we call the life-phenomena of the individual animal. Now this is the conception we should have of any animal body, no matter how high in organization it may be. Its ultimate structural and functional units are ameba-like cells; these are disposed in groups possessing some distinctive active power dependent on the correlated action of the constituent cells; these groups, or tissues, are organized into a body exhibiting in their joint action phenomena referred to the animal as an individual being.

We may now pass to a study of a representative of the third division of the animal kingdom, Vermes, taking for our purpose the common earthworm, more familiarly known as the "fish-worm," and scientifically as Lumbricus rotundus. The general features of the body, looked at from the outside, that is, from behind the tail-end, are: 1, elongated cylindrical form; 2, the bilateral symmetry, or two-sidedness of the body as a whole; 3, its segmented, or ringed structure; 4, the presence of a head-end and a tail-end (though poorly differentiated); and 5, a dorsal (back) and ventral (belly) aspect to the body.

Let it now be asked, What is the significance of these several bodily features of the earthworm? Are we able to give any explanation of them—that is to say, to show that they were produced by natural causes? As regards 1, 2, it is obvious at once that the form of the body is in adaptation to its manner of life—its habit of dwelling in burrows in the ground. And anyone who stops to think of the matter will see clearly that an adaptation to physical surroundings, or environment, is evinced in the case of every species of animals. Without understanding the origin of or the various stages of the earthworm over the hydra. The complete separation of the digestive tract from the general body-cavity is preserved in all animals, from the worms to mammals.

A faint red line may also be seen through the skin on the dorsal side of the body. This is a blood-vessel, and in a large worm it may readily be seen to pulsate. What occurs is simply the alternation of expansion and contraction of the vessel, by which the blood is drawn from behind and propelled forwards. This contractile portion of the blood-vessel is thus analogous to the heart of the higher animals.

The earthworm has a well-developed nervous system. It consists of a double chain of ganglia lying on the ventral side of the body, except the most anterior ganglion, which is on the dorsal side, in
the third or fourth segment of the head, and is connected with the first ventral ganglion by a nerve-collaring surrounding the gut. Anyone who will dissect an earthworm, rendering it inescapable by placing it in a closed jar containing a few drops of chloroform, can easily trace out the nervous system. It is an interesting question whether the dorsal ganglion should not be regarded as homologous to the brain of higher animals. It is seen that the earthworm has quite a high degree of organization. It possesses the same systems, or sets of organs or tissues, that the highest animals do. We will close our study by considering the functions of that one of these systems which most allies the earthworm with animals higher in the scale of life, viz., the nervous system.

If a worm lying quietly in its retreat be suddenly disturbed, as by smartly touching any part of its skin, it quickly moves away—scampering, as it were, into its burrow. This is an instance of physiological reflex action, and proves that the ganglia just referred to are nerve-centers. The stimulus applied to the skin manifests itself in muscular contractions, and there is no reason to doubt that the physiological process is the same as that by which physical contacts cause muscular actions in our own bodies—as when one draws away his hand from contact with a burning body.

The same experiment proves that the earthworm has the sense of touch. It has already been said that it has the sense of sight; this is proved by the fact that when a bright light is suddenly flashed upon the head-end of the body, the worm quickly hides away. As to the sense of hearing, there is no reason for thinking they possess it; all experiments go to show that they are quite deaf. But as to taste, the fact that they are somewhat faddics in their selection of food—preferring the tender and succulent roots of certain plants—seems to leave no doubt that they possess this sense. The indications are that they also possess a faint sense of smell.

Thus the earthworm has four of the five senses characteristic of the higher animals. And now a question of much interest arises. Has the worm not-only senses, but also sensations? Does it have feelings of touch, sight, etc.? The wigglings of the worm, when pierced by the sharp hook, would seem to indicate clearly that they are capable of pain. Yet it is impossible for us to know that they have sensations at all; the phenomena may be purely those of reflex action. All analogy, however, supports the affirmative view of this question. If we thus conclude that the earthworm has sensations, then, since sensations are states of consciousness, we must ascribe to this animal a low order of 

**UNION COLLEGE, SCHENECTADY, N. Y.**

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**[Specially Observed for Popular Science News.]

# METEOROLOGY FOR MARCH, 1850.

## TEMPERATURE.

<table>
<thead>
<tr>
<th>Average Thermometer</th>
<th>Lowest</th>
<th>Highest</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>At 2 a.m.</td>
<td>20°37'</td>
<td>39°</td>
<td>18°37'</td>
</tr>
<tr>
<td>At 7 a.m.</td>
<td>30°53'</td>
<td>51°</td>
<td>20°53'</td>
</tr>
<tr>
<td>At 12 m.</td>
<td>40°57'</td>
<td>61°</td>
<td>20°57'</td>
</tr>
<tr>
<td>White Month</td>
<td>30°55'</td>
<td>51°</td>
<td>20°55'</td>
</tr>
<tr>
<td>Average</td>
<td>39°45'</td>
<td>60°</td>
<td>20°45'</td>
</tr>
</tbody>
</table>

**Last 20 Months:**
- 20°37' (18°45' in 1834, 18°35' in 1838) + 1°23' (20°45' in 1834, 18°35' in 1838)

The lowest point reached by the thermometer last month, at the hours of observation, was 4°, on the 7th, and this was also the coldest day, with an average of 17°. The first week, omitting the first day, was remained 21°. The highest point was 60°, on the 13th, and this, with the 12th, were the warmest days, averaging very nearly the same temperature—53°. The entire month was less than one degree above the average of March for the last twenty years, as shown by the above table, and yet it was not below the average temperature of the entire last winter, which was 33°. (Reported by mistake, 37°.)

## SKY.

The face of the sky, in 93 observations, gave 49 fair, 6 cloudy, 19 overcast, 11 rainy, and 8 snowy,—a percentage of 52.7 fair. The average fair for the last twenty Marches has been only 50, with extremes of 33.3 in 1881, and 63.4 in 1883. A fog came on in the afternoon of the 14th, and lasted till evening.

## Precipitation.

This has been abundant the past month, both in the form of snow and rain. The amount, including 11.7 inches of melted snow, was 9.90 inches,—nearly equal to the amount of the entire past winter, 9.97 inches.

The average for the last twenty-two Marches has been 5.52 inches, with extremes of 1.16 in 1884, and 10.22 in 1877. Thus March continues without a rival as the banner month for the largest amount of precipitation. The amount of snowfall the past month was more than double that of the entire last winter. About 14 inches fell on the 24th and 26th. My snow-gage holds 12 inches, was over flowing on the morning of the 33d. Seven inches more fell on the 6th, and we had fine snowing for seven or eight days. Warm days and rain had removed all snow by the 14th. On the 15th 3 inches of snow fell, with more on the 20th, but it soon disappeared, and the ground remained bare most of the month. On the evening of the 22d there was a heavy shower, with thunder and sharp lightning, when 2.96 inches of rain fell, leaving a trace of snow in the morning. On three other occasions the amount of rain and melted snow varied from 1.30 to 1.55 inches. So much rain and snow, often mingled, gave plenty of slush and muddy travelling, with a raw atmosphere. Rain or snow fell at the hour of 19 observations.

## Pressure.

The average pressure the last month was 29.941 inches, with extremes of 29.44 on the 16th, and 30.40 on the 23rd,—a range of 0.96 inch. The average for the last seventeen Marches has been 29.885, with extremes of 29.639 in 1881, and 29.993 in 1882,—a range of .352 inch. The sum of the daily variations was 6.66 inches, giving a mean daily movement of .215 inch, while this average the last seventeen Marches has been .237, with extremes of .189 and .252. The largest daily movements were .45 on the 25th and .39 on the 23rd.

## Winds.

The average direction of the wind the past month was W. 32° 44' N., or nearly W. N. W., which was very nearly the average of the last twenty-one Marches, viz. W. 32° 51' N. The extremes were in W. 1° 32° N. in 1897, and E. 5° 30° N. in 1876,—a range of 5° 55', or full eight points of the compass.

## Comparative Meteorology of New England for February, 1850.

with that of the last winter; gathered from the Bulletin of the New England Meteorological Society. The table below may need some explanation. Under "No." is given first the number of reports from observers in each state to find the average or mean temperature of February and the extremes, as given on the same horizontal line; under this is the number of reports for the three winter months, combined, from which is found the mean temperature of the winter of 1859-90, with extremes of the highest and lowest winter month reported in each State. The same arrangement is continued under precipitation, as given in inches.

According to the above-named authority, I also learn that the average temperature of the winters in New England was 25.37°, as found by combining twenty-five years, having a record of more than ten years; while that of the last winter was 24.71°, an excess above the average of 5.4°. The average at Natick the last twenty years was 26.41°; that of last winter 33.9—an excess of 7.49°.

From the same source, I learn that the average precipitation of the winters in New England, having a similar record at over thirty stations, was 11.28 inches,—a deficiency of 1.39 inches. The average at Natick for twenty-two years is 15.30 inches,—a like deficiency of 3.53 inches.

By further examination of this table, we may learn that each of the six States, and so of all New England, had a higher temperature in the winter that of a very warm February; and, if we may judge by the temperature of the present March in Natick, the winter was warmer than an average March,—all showing that the temperature of the last winter was truly very remarkable.

It will be further seen that the precipitation was greatest in the more northern sections of New England, with a gradual decrease toward the southern.

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**[Specially Computed for Popular Science News.]**

# ASTRONOMICAL PHENOMENA FOR MAY, 1850.

Mercury is in fine position for observation during the first half of the month, when the best opportunity of the whole year will be afforded. It is a splendid star, and comes to greatest eastern elongation on the morning of May 6. At this time it is also several degrees north of the sun, and remains above the horizon for an hour and a half or more after sunset. It may probably be seen on any clear evening during the first half of the month, low down in the northwestern sky during the
twilight. During the latter half of the month it rapidly approaches the sun, and passes inferior conjunction at midnight on May 29. Venus is also an evening star, and is getting far enough away from the sun to be easily seen. During the first half of the month it is very near Mercury; at the beginning of the month about \( \gamma \) south and \( \beta \) west, or nearly vertically below as they are setting. Both are then moving eastward, but Venus is moving faster. Their divergent courses are accentuated during the third week of May, when Venus is 1° north of the bright, red, first magnitude star Antares (\( \alpha \) Scorpii), and during the month moves from a position \( \delta \) east of the star to \( \lambda \) west of it.

It comes to opposition on May 27, that is, the earth lies between it and the sun, but, on account of the eccentricity of its orbit, it does not attain its nearest approach to the earth until June 4, soon after midnight. Our distance from the planet is then about 45,000,000 miles. The next opposition, in 1892, will be much more favorable than this, as the earth will then be several million miles nearer the planet than it will be at this one, perihelion and opposition of the planet being much nearer. However, this opposition will be better than the average. Jupiter rises at about \( \gamma \) A.M. at the beginning of the month, and at about \( \lambda \) P.M. at the end. It is in the constellation Capricornus, and moves slowly eastward during the month until the last day, when it becomes stationary. Saturn is in good place for observation in the western sky during the evening. It crosses the meridian, about two-thirds of the way to the zenith, at about sunset on May 1, and two hours earlier on May 31. It is still in the constellation Leo, near its brightest star, Regulus (\( \alpha \) Leonis), a little to the north. It moves slowly eastward, less than \( \lambda \), during the month, and crosses the handle of the Sickle between Regulus and Eta Leonis. It is in quadrature with the sun on the morning of May 18. Uranus is in the constellation Virgo, and passes the meridian at about \( \gamma \) P.M. on May 1, and at about \( \lambda \) P.M. on May 31, about halfway from horizon to zenith. At the beginning of the month it is rather easy to see, but by the close of the month the bright star Spica (\( \alpha \) Virginis), and during the month moves about \( \lambda \) toward the star. Neptune is too near the sun to be seen, and is in conjunction on the morning of May 25.

The Constellations.—The positions given hold good for latitudes differing not many degrees from \( \gamma \) north, and for \( \lambda \) P.M. on May 1, \( \lambda \) P.M. on May 31. Unless otherwise stated, all the positions are in the zenith. To the south, on the meridian, are Coma Berenices, Virgo, and Corvus. A few of the most northerly stars of Centaurus are on the southern horizon. In the southeast is Libra, and below it, just rising, is Scorpius. Bootes is high up, east of the zenith, and below it are Hercules and Ophiuchus. Lyra and Cygnus are low down in the north, close to each other. The stars of Draco are above, about the same altitude as the pole star. Cassiopeia is on the north horizon. Perseus and Auriga are setting in the northwest. Ursa Major is high up, near the zenith, most of the stars being west of the meridian. Gemini is near the western horizon. Cancer and Leo follow, above, to the left. Canis Minor is below Cancer, near the southwest horizon.

**Correspondence.**

**Brief communications upon subjects of scientific interest will be welcomed from any quarter. The editors do not necessarily take all views and statements presented by their correspondents.**

**COCO, CACAO, AND COCA.**

**Editor of Popular Science News:**

The Druggist's Bulletin for January, 1890, contains an interesting review by Dr. H. Rusby of my article on "Coco, Cacao, and Coca," which appeared in the Popular Science News for September and October, 1889. As Dr. Rusby here takes occasion to give some notes upon the subject, based upon his own observations in South America, I have prepared the following summary of his remarks, believing that the readers of the News would be glad of a discussion of this subject from one so qualified to speak on these matters.

A proopos of the origin of the word "coco" he says: "And this reminds us that all through Central South America, where the Cocos nucifera is unknown, all kinds of large shell fruits, like the case of the Brazil nut and the monkey-pot, are called 'coco.' The savage tribes decorate their temples with these fruits, and refer to them also the name 'cocos' is applied. While it is probable that this term was introduced by the Spaniards, and applied by them to these native fruits because of their similarity to the true cocos, yet it is not impossible that the name is native. A strikingly similar word is 'coto,' applied to the large red howling monkey, because of the large spherical carilage in his throat, which gives him the appearance of having a goitre, or 'cote.' The same term is applied to the carilage itself."

Dr. Rusby calls attention to the fact that the cihocolate family contains also the kola-nut (Cola acuminata, R. Br.), which, although known to but few besides botanists and pharmacists in this country, "is to vast tribes of Africans as important, almost, as tobacco or coffee are to us, or certainly as the mate to the Paraguay, or the coca to the Bolivian." It may be of interest to add that this plant, whose seeds are so highly valued as a condiment by the native tribes of Guinea and their descendents in South America, contains a considerable quantity of the alkaloid theine. The reviewer continues: "Mr. Sargent's reference to the existence of his tree [cacao] in a wild state in the Amazon forest will, no doubt, induce a personal experience of the writer, when he was once lost for an entire day in a vast forest, whose smaller trees were mostly of this species. Quite a number of species of theobroma, we may mention, occur wild in Brazil, and one which we encountered produces white seeds. While on this subject, we will put in a plea for the correct pronunciation of this word, which is a very common mistake.

Dr. Rusby strongly dissents from the generally accepted view (adopted in my paper) that it is the alkaloids contained in cacao and cocoa which have chiefly recommended these plants to man. His conclusions, based upon a long study of the coca-plant, are to the effect that the Indian does not value the coca-leaf chiefly for its alkaloids, but for other volatile matters, for he burns the leaves which are not sufficiently fresh or well preserved, although their percentage of cacao may be very slightly or not at all reduced. We might also correct the statement that the leaves are packed as soon as dried. They ordinarily, if not invariably, lie for two or three days in the cocoa-house, in order to go through the process of 'swearing,' before it is considered safe to pack them."

Yours truly,

Fredk LeRoy Sargent.
Medicine and Pharmacy.

THE RATIONAL USE OF MEDICINE.

Nothing indicates more clearly the modern progress of medicine than the disappearance of the bulky and disagreeable boules, powders, draughts, and mixtures which the physicians of former times administered to their patients,—in many cases, with but little effect, except to put an additional burden upon an already wearied and overloaded stomach. The homoeopathic physicians have, at least, shown that excessive medication is unnecessary, and that no medication at all will result in an equal number of cures in a great majority of cases, while the present tendency of all schools of medicine is to limit their prescriptions, both in number and quantity, and place more reliance upon hygienic and sanitary precautions, combined with watchful and experienced nursing care.

The philosophy of prescribing what are popularly known as "medicines" is really a very simple matter. It is a well-known fact that certain substances, when taken into the system, produce certain physiological effects. Thus, opium and its alkaloids produce sleep, ipecac causes vomiting, quinine is found to have a remarkable power of controlling intermittent fevers, and so on through the list. There is really no difference between a medicine and a poison, except in the violence of its action; and, in fact, some of the most powerful poisons are found to be valuable medicinal agents when administered in minute doses. The scientific physician, therefore, will not attempt to "cure" a disease by any specific remedy, but will endeavor to fully understand the cause and nature of the abnormal physiological action which is taking place in the system of his patient. As the action of medicines is very variable in different persons, and under different conditions of the disease, the necessity of skillful medical attendance, and the folly of depending upon the various widely-advertised patent medicines, is evident.

To a certain extent, the healing art must be empirical. Not until we can comprehend the actual nature of the vital processes, can a truly scientific system of medicine be formulated; and it is very doubtful if we ever arrive at that point. But the conscientious physician, no matter to what school he belongs, will use whatever remedy he may consider best adapted to the particular case before him. The homoeopath has as perfect a right to adulterate a solution containing an infinitesimal fraction of a grain of common salt, in the belief that it will produce definite physiological effects, as the allopath has to administer a draught of "salts and senna." It is a matter of judgment and experience, and our issue with the homoeopath is not that his theories are unphilosophical, but that they are not borne out by practical experience.

So in the case of the practitioners of the less reputable systems of so-called medicine—the faith and mind healers, the magnetizers and mesmerists, and the compounders of the thousand and one absolute specifics for every disease, who monopolize so large a space in the advertising columns of the daily press. They are held to be unworthy of confidence, simply because the claims they make are not borne out by facts. Innumerable persons believe themselves to have been cured by these agencies, when, in fact, they have got well in spite of them, or because they were so utterly ineffective that they allowed the healing power of Nature to work unhindered.

The natural tendency of most diseases is to recovery, and nothing is more natural than to attribute the cure to the particular drug or treatment which has been administered. If a man is so constituted mentally as to really believe that a cancer, for instance, can be cured by faith or will power, there is nothing left to do but to leave him to enjoy his belief, until he is restored to sanity again.

No physician can afford to confine himself to any "system" as popularly understood. His own experience and that of his predecessors will show him what results may be expected from the various medicinal substances, and the highest skill of his art will lie in searching out the true cause of the abnormal condition of his patients, and, as far as it lies in his power, meeting these conditions with such remedies as may seem best fitted to aid Nature in causing the disturbed vital processes to operate with their accustomed regularity and precision.

NASAL CATARRH.

The term "catarrh," which was formerly much employed, has of late years fallen into much disuse in technical medicine, on account of the extreme vagueness of its meaning. It is a term derived from the Greek, and literally means "to flow down," and has always been rather the name of a symptom which characterizes various diseases than a term applied to any properly recognized and understood lesions. It thus happened that before the present method of examining the nasal passages had been introduced, all catarrh was accompanied by a discharge—either through the anterior nares or through the posterior nares—were classed under the general, vague, though convenient term, "catarrh." The cause of the discharge was not taken into account, and, regardless of whether it was due to the existence of nasal tumors, or to a foreign body in the passages, or caused by a defective, eroded, or ulcerated septum, or a projecting portion of bone,—the simple fact that there was a discharge gave the name, and the routine treatment by salves, snuffs, powders, and douches was blindly resorted to, without producing any good effects in the majority of cases; and hence it is that the cedette has gone forth that nasal catarrh is incurable. The conditions just enumerated require for their determination careful examination, and for their successful treatment the intervention of intra-nasal surgery; and, since it is impossible for patients to make microscopic examinations of their own nasal passages, and since the practice of intra-nasal surgery is usually without the ken of the general practitioner of medicine,—as it involves the use of expensive apparatus and a dexterity of manipulation possessed only by those who have had special training in this line of work,—in all cases where any of these conditions are suspected to exist, the patient should consult the physician at every opportunity and special study have acquired the right to denominate themselves specialists.

But a catarrh, or discharge from the nasal passages, may occur which is not dependent upon any of the causes already enumerated, but which is due to an inflammation of the mucous membrane of the nose, which inflammation is properly called rhinitis. In the early stages these cases are readily amenable to treatment, but when a succession of attacks of this benign form occurs and proper treatment is neglected, a chronic inflammation of the nasal mucous membrane is quite likely to be occasioned, the treatment of which is more difficult and tedious. In all cases of rhinitis, the patients will make the diagnosis of "catarrh," and will very often devise their own course of "treatment"; and hence it is highly proper that every physician should have a sufficient knowledge of the nature of the affection, and of the remedies which they employ, to cure their "catarrh," that they should, at least, be warned against the employment of means which are not only worthless in curing the disease, but which are capable of doing much injury to the delicately constructed nasal cavities.

An annoying discharge from the nasal passages is by no means an uncommon complaint, and the field is a rich one for the charlatan, and consequently the country is flooded with advertisements, pamphlets, and books relating to the cure of nasal catarrh. From these sources, patients are not infrequently led to believe that the simple catarrh from which they are suffering is a more ominous and perhaps malignant disease, and they invest in the "sure cures," "catarrh snuffs," and "nasal douches" which crowd the counters of every drug store, and which do vastly more harm than good—either by direct effect, or, being inert, by allowing time to effect structural changes in the nasal cavities. There is one method of treatment, very extensively employed by the laity, and even recommended to patients by a few practicing physicians, which is probably productive of more harm than all the other means employed for the cure of nasal catarrh, viz.: syringing the nasal passages by means of the nasal douche. A description of the nasal douche would be superfluous, as it is a comparatively well-known article, being found in almost every household cupboard. By means of this instrument large quantities of fluid—usually a strong saline solution, and sometimes a mixture of saline and neutral solutions—are forced into the nasal passages under considerable pressure. Now, in the first place, it is not possible for the nasal passages were not intended to be conduits for any fluid whatever, and although absolute cleanliness of the parts involved is an essential factor in the treatment of nasal catarrh, nevertheless, no nasal douche, nor any number of nasal douches, ever cured a single case of nasal catarrh. When we consider that the air passages are lined throughout by an exceedingly delicate mucous membrane, it is very easy to conceive that a strong saline solution passed over this delicate membrane under high pressure, can become an efficient factor in the propagation, if not in the causation, of catarrhal rhinitis, and I have met with cases in which I firmly believe that a nasal catarrh was excited by the use
The nasal douche. Such treatment is not medication—it is irrigation. It has been frequently shown that the long continued use of the nasal douche is quite certain to cause a thickly, benefited, enlarged, and supersensitive condition of the mucous membrane lining the nasal fossae, thus rendering the patient more liable to attacks of acute rhinitis when subjected to the slightest exciting causes—as, for example, to sudden changes of temperature. The greatest danger in the use of the nasal douche is the possibility of producing severe aural complications. If, from any cause, the fluid passed from the douche into the nares found entrance into the Eustachian tubes,—which open into the pharynx, and through which the mucous membrane of the nose is continuous with that of the ear,—an inflammation of the middle ear would be likely to supervene; and hence it is that most aurists have long condemned the use of the nasal douche. The use of this instrument should, therefore, be entirely abandoned, and although it may, apparently, ameliorate distressing symptoms for a time, by securing a certain amount of cleanliness, even these apparent good effects ultimately fail.

What then shall be done for the relief and cure of nasal catarrh? The treatment varies with the form of rhinitis with which we have to deal. Acute catarrhal rhinitis—otherwise known as "coryza," or "cold in the head"—is probably the most common form, and is quite easily dealt with. It is caused by the sudden cooling of any part of the body, as may be effected by getting the feet wet, or by a draught of cold air, or by the use of an unheated or unheated object. It may also be produced by inhaling irritating substances, and sometimes appears in the early part of an attack of acute infectious disease. The symptoms are pronounced: the mucous membrane becomes red, swollen, and covered with a mucous secretion, which discharges itself from the anterior and posterior nares; there is more or less difficulty in breathing through the nose, on account of partial or complete occlusion of the air passages, caused by irritation and swelling of the mucous membrane; sneezing occurs, and not infrequently seems to give temporary relief. The catarrhal symptoms are usually very annoying; there may be some febrile movement. A patient usually recovers from an ordinary attack of acute coryza in from four to six days. The treatment of simple catarrh is cold applications and sweating may cut short an attack, and to this end a full dose of Epsom or Rochelle salts should be administered, and warm drinks—such as hot lemonade—should be given. The inhalation of camphorated vapor will give great relief, diminishing the catarrh and restoring nasal breathing by reducing the congestion of the mucous membrane. It is accomplished thus:—Into a suitable vessel—a small tin pail answering very well—put a pint of boiling water, and add a teaspoonful or so of powdered camphor. Now, placing the head over the vessel and a short distance above it, incline both head and vessel in a piece of muslin or towel, and inhale the vapor through the nose. Continue the inhalation a few minutes, and repeat it again during the day. Exposure to draughts of air and changes of temperature is to be carefully avoided.

Chronic nasal catarrh (chronic rhinitis) is also a common complaint, and exists in four principal varieties, or stages: 1. simple, uncomplicated, chronic rhinitis; 2. hypertrophic rhinitis; 3. atrophic rhinitis; and 4. oszana, or ulcerative rhinitis. The treatment of all these forms, excepting the first, is not only tedious, but involves the employment of special procedures, and hence we may dismiss them with a word. A neglected uncomplicated chronic catarrh usually passes on to hypertrophy of the mucous membrane and submucous tissues, and becomes an example of the second type of chronic rhinitis. It may then progress through further structural changes, with dissolution of the parts involved, and is then known as atrophic rhinitis. Ozana is usually of specific origin, but may arise from long-existing chronic catarrh. It following the stage of atrophy in the regular order of succession. It is characterized by a septic discharge and an habitual, offensive odor from the nose.

Let us now briefly consider the remedial treatment of simple chronic rhinitis. The first step is thorough cleansing of the nasal passages. In most cases of simple rhinitis, the patient can accomplish this by blowing his nose, undaided by any form of artificial apparatus. But in the exceptional cases, where crusts have formed which cannot be thus dislodged, the nasal spray apparatus of LeFer (manufactured by the Davidson Rubber Company) is the best means we have to aid in the accomplishing of this effect. For home treatment, however, merely snuffing up small quantities of warm water, softened by the addition of a small quantity of borax, from the hand, into one nostril and then into the other,—the patient forcibly blowing it out,—will effectually cleanse the nose for comfort and breathing purposes, and will quite nicely prepare the way for subsequent medication. The spray apparatus consists of a proper solution sprayed through the posterior nares by means of the compressed air apparatus of the specialist. But a very fair substitute for this apparatus is to be found in the hand-bulb atomizer, (preferably the double bulb variety, in order that a continuous spray can be produced), by means of which a medicated spray can be thrown by the patient, through the anterior nares, and hence is to be supplied with a proper nozzle, or "rip," which shall fit sleety the anterior nasal orifice. The solution employed should be of a mild resolved or astrin gente nature, and, if the patient is to apply it himself, a solution of sulphate of zinc,—made by dissolving from five to ten grains of the powder in an ounce of pure water,—or a solution of trinic acid,—made in a similar manner,—will probably give the best results of these solutions, only a small quantity should be sprayed into the nasal cavities, once or twice a day, as the intention is to spray, and not to flood, the nasal membrane. Inhalations are not usually to be depended upon for the cure of chronic nasal catarrh, but there is one other treatment worth mentioning and which has a special value in this complaint, both for relieving the prominent symptoms and for aiding materially in the cure of the disease. It consists in adding to a pint of boiling water a mixture of ten drops of carbolic acid and forty drops of tincture of iodine, and inhaling the vapor in a manner already described. A change of air and locality often proves serviceable in these cases, and long stays in the elevated regions being the most favorable. The patient's diet should be simple and moderate, though nourishing, and stimulants should be avoided.

It should be well understood by patients, as well as physicians, that there is no royal road to the successful treatment of nasal catarrh, and yet the means herein described are not only simple and easy of preparation, but are effective in curing the condition to which they have been stated to apply.

J. H. E.

**Two New Antipyretics will soon burst upon an astonished world, so far as lengthiness of name is concerned, at any rate: acetylsalicylic acid and ethylenephenylhydrazine!**
rubber cup is provided with straps to fasten it in place, or be held in position by the hands. The cup for adults fits any adult face, (one is also made for children), and is made so nearly air-tight by slight pressure that the slight leakage does not interfere with perfect filling of the lungs. The brass tube contains two valves, which control automatically the inhaled and exhaled air, effecting the proper discharge of the latter, and securing a constant demand of about 1.5 litres per minute, (this is fresh for the former).

The bellows has an adjustment by means of which the volume of air forced at each stroke may be regulated at the outset for each patient, in accordance with the capacity of his lungs. The instrument once in place, all that is required of the operator is to work the bellows at the desired rate of speed, the respirator automatically doing the rest. When necessary, one person alone may successfully operate it. The instrument forces air into the lungs, whence, as soon as pressure on the bellows is discontinued, it is expired, as in natural respiration, by the resiliency of the chest walls, lungs, and diaphragm. As in the natural process, expiration is—so far contradictory a phrase permissible—a passive act.

The respirator is applicable, so the inventor claims, in all cases in which artificial respiration is indicated. As yet, he has had opportunity to test it in but three cases—all of them of opium poisoning. In these it exceeded his expectations, as also those of the physicians present who saw it used. The first case was that of a man, aged 30, who had taken seven or eight grains of morphine with suicidal intent. Three hours afterwards, the narcosis was so deep that he could not be aroused. Respiration, one, or less, per minute; pulse, 140; pupils contracted to 1 mm. in diameter, and soon after 1.5 mm., was given hypodermically. Five and a half hours after the morphine was taken, Dr. Vanderbilt arrived with his instrument. Pulse, 138 and weak; respiration, one; pupils partly dilated; skin moist and clammy; deep cyanosis. The respirator was applied, and respirations forced at the rate of twelve to fifteen per minute. For an hour there was no apparent change, but on resuming the use of the respirator, the cyanosis, expiration of that time, the extreme urgency of the symptoms began to abate. At the end of three hours, the improvement was so decided that Dr. Vanderbilt went home, leaving the case, however, in charge of a physician. The respirations were now thirteen, deep and regular; pulse, 120. The patient was thought to be getting sufficient air, and forced respiration was discontinued, nor was it necessary again to resort to it. The case terminated in recovery. No lung trouble supervened. Considerable air was forced into the stomach and bowels, but this soon disappeared without producing bad effects. The only untoward sequel was a partial deafness in one ear, which lasted ten days, attributed to the action of the air in the Eustachian tube. The expiration of that time, the extreme urgency of the symptoms began to abate. The patient was then sent home in a condition of health.

The second case—the worst of the three—was that of a child 20 months old, who had swallowed one and a quarter grains of morphine. The narcosis ensuing became so profound and persisted so long, that family physician, friends, and even parents gave up all hope, and at length protested against further “torture of the child” by continuing the use of the respirator. Permission was reluctantly accorded, however, to go on with its use for a “short time.” Fortunately, a very slight but perceptible change for the better occurred before the parents again interfered. Further improvement was not long delayed, and, in brief, the child was saved.

The third case—the least urgent of the three—also terminated favorably.

The use of the instrument need in no wise interfere with any efforts on the part of the patient to inflate his own lungs. On the contrary, such efforts may be greatly assisted, while, between these, one or more artificial respirations may be interpolated. The author thinks that all vessels, bathing resorts, life-saving stations, etc., should be supplied with some device like his. Instrument of small size is specially recommended for resuscitating asphyxiated newborn babes.

The question having been raised whether anything as powerful as a bellows may be used to effect artificial respiration without rupturing the lung tissue, Dr. Vanderbilt replies that Dr. Fdl’s cases have forever set this question at rest. If a bellows can be used for nearly twenty-four hours, forcing respiration through a fresh opening in the trachea, which must allow more or less blood to get into the lungs, and all without the slightest injury to the lungs, the greater elasticity of lung tissue should be borne in mind.

W.

[Specialty Compiled for Popular Science News.]

MONTHLY SUMMARY OF MEDICAL PROGRESS.

By C. E. Washburne, M. D.

Dr. Lawstra related the following case at a recent meeting of the National Academy of Mexico (Medicina Practica): A man about 33 years of age, while riding on horseback, received a stab in the abdomen. The knife penetrated the bladder, and through the rearing of his horse, was broken over the horse’s back, one of the places—ninety-three millimetres long—falling into the bladder, where it remained two years and a half. The wound gradually closed, but the fragment of the blade within the bladder set up a severe cystitis. From the time of the injury the patient was never able to stand quite erect—always bending the body slightly forward. The patient was ignorant that he could easily lie on his back, sleep, and he became greatly emaciated. Calculus having been diagnosed, lithotomy was attempted, but it was found impossible to crush the stone. Exploration was then made through an opening in the perineum, when the broken blade was discovered, placed like a bridge between the anterior and posterior walls of the bladder, directed downward and backwards, with its point facing posteriorly. It had become so immovably fixed in this position that it could not be removed through the perineum. supra-pubic cystotomy was then resorted to. The incision first made—ten centimetres in length—proved insufficient, and had to be enlarged. The trespassing knife-blade was at length removed, and also the pieces of a large stone. This had been of sufficient size to perforate the bladder just beyond the point of the knife from penetrating the posterior wall. The walls of the bladder were ulcerated and covered with Vegetations. After scraping the mucous membrane, the opening into the bladder was accurately sutured, drainage being provided for both above and below the pubis. "Healing was almost immediate, no untoward circumstance occurred, and the course of the case has been of the happiest."

One hardly knows, adds the London Medical Recorder, "which most to admire in this most extraordinary case—the skill of the surgeon, or the phenomenal endurance of the patient."

Championniers recently reported to the Academe de Medecine (Journal de Medecine) a case of trephining for cerebral haemorrhage, together with statistics of thirty such cases, all of which were non-traumatic in their origin. There had been no deaths and no untoward occurrences. The new case was that of a man, aged 53, who had had an attack of cerebral hemorrhage twenty months before. Right hemiplegia ensued, together with late contracture of the hand and epileptic seizures. The focus of disturbance in the brain was localized at the middle part of the precentral convolution. Cranio-metrical measurements were made, in accordance with the results of which trephining was performed. The remains of an old cerebral hemorrhage were found and removed. Antiseptic precautions were duly observed, and drainage was provided for. Time of operation, one hour and a quarter. The next day the contracture of the hand had ceased, and the hemiplegia showed marked improvement. Speech was more distinct, and the patient also showed greater intelligence. During four months he has had no return of the convulsions, from which, previous to the operation, he had suffered at least as often as once in two weeks.

Dr. Charles McBurney, of New York City, with the aid of Dr. William Allan Starr, the neurologist, of the same city, recently secured an excellent case of trephining. The patient, himself a physician, Dr. Clark, of Rochester, N. Y.,—received an injury of the head, through accident, last summer, which was followed by aphasia and by paralysis of the right side of the body. The paralysis was, after a time, partially recovered from, but, the aphasia continuing, he was brought to the Roosevelt Hospital, New York City, in January last. The seat of the lesion was already been located,—and correctly, as the sequel proved,—trephining was performed, and disclosed the presence of a clot, the removal of which resulted in complete relief of the paralysis, and in partial relief of the aphasia. Complete relief of the latter, also, the physicians confidently believe, will be the ultimate result of the operation.

Mr. McGill, of Leeds, reports (Lancet) a case of unniected fracture of the radius, in which he scraped the ends of bone, and filled the space left between about three-fourths of an inch—with small bits of bone from a young rabbit. Immediate union resulted. The patient was shown before the British Medical Association five months after the operation, "when the injured arm was as useful as the other."

Buttermilk as a Diuretic in Chronic Bright’s Disease.—Dr. Henry D. White, of Nutley, N. J., says (New York Medical Journal) that in treating chronic Bright’s disease, where the urine is scanty and highly-colored, it is often very difficult to find a diuretic that will act satisfactorily, for any length of time. A patient of his, 55 years old, weighing 350 pounds, the mother of eleven children, has had Bright’s disease five years. When he first saw her, about ten months ago, she was suffering from dyspnea, constipation, excessive edema of the legs, with small superficial ulcers, which caused intense pain. The urine was very small in quantity and of high color. Diuretics, laxatives, etc., were prescribed, with temporary relief; but nothing could be found in the way of a diuretic which did not speedily lose its efficacy. Treatment was continued, with little satisfaction to either patient or physician, for about four months, when, one day, the sufferer casually expressed a desire for some buttermilk. The doctor offered no objection, and the patient, in following the "indication" afforded by her own
craving, entered upon a course of treatment, the results of which were most astonishing to her phy-
icians. The next time he saw her was about a week after she began taking buttermilk. She then told
him that since she had been taking it she had passed large quantities of urine, of a healthy color.
"It is needless to say," writes Dr. White, "that I was surprised at the result, as I had never in my
reading seen any reference to its use." To satisfy himself as to the cause of the greatly increased in
the patient, the buttermilk was stopped for two days. The urine at once became scanty and high-colored;
while, on returning to the use of the buttermilk, the urine increased in amount and became of normal
color. Since that time the patient has taken no medline of any kind, and has almost lived on
buttermilk, never taking, however, more than two quarts a day. The urinoma has almost entirely subsided, the ulcers on the
legs have healed, and the patient said she had not felt so well for years. Dr. White disclaims any
attempt to explain the action of the buttermilk on the kidneys. "I merely give this," he remarks in
closing, "as an example of its use as a diuretic, when everything else had failed. Whether it will
have the same effect in every other case of chronic Bright's disease, I am not prepared to say, as I have
not had enough experience with it yet. At any rate, it seems worthy of a trial."

MIGUEL AND RUFF, after a long series of careful observations, (Therapeutic Gazette), recommend the
inhalaion of biniodide of mercury in pulmonary tuberculosis. Often after the first administration, they say, the cough is relieved, and the expectora-
ines—e'en in cases in which there are large cavities—becomes reduced in quantity and less offensive in
odor. Further administration, it is claimed, stops the night sweats, increases the bodily weight, and
improves the general condition. Their method is to dissolve one part each of biniodide of mercury and
iodide of potassium in a thousand parts of dis-
tilled water. The resulting solution is used in the
form of a spray, at first once a day, and afterwards
—when the patient has become accustomed to the treatment—twice daily. If too irritating, the
strength may be reduced, even one half; since it is claimed that this preparation of mercury is destruc-
tive to bacteria in proportion of one to forty thou-
sand. The treatment should be persisted in for long periods, if necessary; patients may be subjected to it a year or more without suffering any evil effects from it. "If we admit that phthisis is due to the
presence and growth of a bacillus, the use of such a bactericide would be indicated on theoretical
grounds, and, as the authors' experience seems to prove that its use may be persisted in without
danger to the patient, it is certainly worthy of a trial."

BROMOFORM IN WHOOPING-COUGH.—Dr. Stepp (Deutsche Medizinische Wochenschrift) claims to have
treated one hundred children with this remedy, with successful results in every instance. The bromoform
was given in a pure form, dropped into a teaspoon-
ful of water. Being of greater specific gravity than the water, it sank to the bottom, and the
mixture was easily swallowed. The dose for an infant three or four weeks old is one drop three or
times a day: older infants may be given two or
two drops three times a day; children between
two and four years old, or five drops three or
times daily; and so on up to children of seven
years, for whom the dose is six to seven drops.
The cough, Dr. Stepp reports, was at once relieved,
and cure was complete in from two to four weeks. No undesirable after-effects were observed. More
than two grammes of the liquid should not be pre-
scribed at one time, because of the readiness of the
bromoform to decompose. It should not be exposed to sunlight, which sets free the bromine.

SILICATE OF MAGNESIUM IN CHRONIC DIARRHOEA.—Dr. Speer has observed that a quantity of the
same, nphased from the use of silicate of magnesium suspended in milk. The dose is from half an ollce
an ounce and a half to the quart.

According to Dr. L. G. Doane, of New York City, a neat way of giving quinine is as follows:
R. Quinine. 1 grain
Chocolate. 1 scruple
Children, he says, will take quinine in this form,
and cry for more.

CHLORAL hydrate is said to be almost a specific
for quinsy, in its early stages. It is to be dissolved in
glycerine—three or four grains to the ounce—and
used as a gargle. It acts as an antiseptic, astringent,
and sedative.

Dr. MARELLI HARTWIG, of Buffalo, N. Y., pro-
poses a plan for raising the standard of the medical
profession in this country, which, he claims, is
more practicable, as well as more consistent with
the liberty of the citizens, than any heretofore ad-
crated. A separate class of practitioners should be
established by the State; "State physicians" they
might be called, unless some better designation be
suggested. This class should be open to all upon
passing an examination before a board appointed
by the Governor. Entrance to this class should be
a prerequisite to the holding of public medical
office, and to the appearing in courts as expert
witnesses. Other practitioners might exist, as now,
and the people enjoy the right to employ them, if
they choose, in preference. But the "State physi-
cians" ought soon to stand enough higher with the
people to make it almost a necessity for a medical
man, who would succeed, to gain entrance to the
more reputable class.

A PHILANTHROPIC Englishman, whose name has
not been published, but who is said to be the Duke
of Westminster, has recently given half a million
dollars to found a convalescent home for the poor
of London. Only those who are familiar with the
crowded state of most of the large hospitals for the
poorer classes in large cities are in a position to
appreciate what a useful adjunct to them such a
charity must be. Many a poor man, after recover-
ing from a serious illness, has had to give place, in
the hospital, to some more urgent case, before,
his own health was fully re-established, and has had to go forth, unfit for work, but unable
to live without work, only to suffer a relapse, which,
not being fatal, ends in confirmed invalidism. In many
of our American cities the establishment of such
an institution would be of greater benefit to the
working poor than an increase in the number of hospitals.

A GOOD SUBSTITUTE FOR MOTHER'S MILK.—Add
a pint of boiling water to a pint of pearl barley; allow it to cool, and then strain. Mix one-third of
a pint of this barley with a cup of milk and sugar. This is a mixture which will be found excellent for fresh, pure milk, and sweeten with a teaspoonful of milk sugar. At the end of two months it may be used in place
of milk sugar. A mixture will be produced which strongly resembles human milk in color, taste, and
consistence, and which has been extensively and
satisfactorily used as a substitute.—Medical Soc.

An infant recently born at Mason City, Iowa,
weighed at birth but one pound.

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Seth C. Bassett,
Manager.

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mailed in unregistered letters.

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Then support them at one end by a cork placed in a bottle, taking care to incline the wires a very little towards the cork. Then place the other end in the flame of a candle, as shown in the illustration, and in a few seconds the paraffine will begin to melt, and the resulting drop slowly move towards the bottle. It will be at once evident that the coating on the copper wire melts much faster than that on the iron, showing that the former is a better conductor of heat. The experiment may be varied by attaching a grain of shot, or any small object, to the wires by a bit of wax. If both are placed at the same distance from the candle-flame, the one attached to the wire which is the best conductor of heat will drop first. In this connection it may be mentioned that copper is almost the best conductor known, both of heat and electricity, being only exceeded by silver, in a very slight degree.

A frictional electrical machine can be easily extemporized in any well-regulated family by pressing the household cat into the service of science. Place the legs of a chair in four clean glass tumblers to insulate it; obtained without insulating the chair at all, but the results are more brilliant when this is done. The only drawback to this experiment is the total lack of scientific enthusiasm in the average cat, who is likely to object most strenuously, in the familiar feline manner, against a repetition of the development of electrical energy. The electricity thus produced is generated by the friction between the hand and the fur, and does not differ from that produced by any frictional electric machine. The organism of the cat plays no part in it, beyond furnishing a coating of dry and warm fur from which the mysterious form of energy may be produced by friction.

The accompanying illustrations are reproduced from La Nature.

THE EIFFEL METEOROLOGICAL OBSERVATORY.

One of the most unique meteorological stations in the world is that situated on the very summit of the Eiffel Tower in Paris, 983 feet above the ground, and 1,102 feet above the sea level. At the top of the tower is a small room, reserved for the use of M. Eiffel, the designer of the tower; and above this, situated on a platform only five feet in diameter, is a fine collection of meteorological instruments, both self-registering and for direct reading, to which access is obtained through the trap-door. In addition to the usual type of hygrometers, barometers, thermometers, rain-gauges, etc., a novel form of weather-vane is shown in the illustration at C, and at B an anemometer for measuring the force of vertical currents of air, as well as the ordinary horizontal form at A. A telephone contained in the box T gives direct communication with the lower world.

Although the observatory has been established but a short time, some very interesting results have been obtained. It is found that the average velocity of the wind is about three times as great at the summit of the tower as at a station in the city below which is about 60 feet above the ground. Another curious observation is that regarding the time of day when the maximum velocity of the wind occurs. In the city itself this occurs about 1 P.M., and at sunrise the velocity is the least; while at the summit of the tower the minimum force of the wind is observed between 9 and 10 A.M., rising to a maximum about 11 P.M. These observations
correspond with those observed at the mountain observatories of the Puy de Dome and Pic du Midi. A similar approximation to mountain stations is noticed in the temperature, which averages from two to three degrees lower at the summit than at the base. A "cold wave" has also been known to pass over the observatory which did not affect the temperature of the air in the city till a day or two later.

In the first publication of the theory, in the journal of the Linnean Society, July, 1858, the names of Darwin and Wallace stand side by side. To each had the formation of new species by means of the perpetuation by Nature of varieties best fitted to survive in the struggle for existence, come as an original thought. Into the mind of Darwin it had flashed, as far back as 1838, while patiently accumu-

ating and reflecting on all sorts of facts bearing on the transmutation of species—that "mystery of mysteries" to which his attention had been directed during his recent voyage in the Bengal. To Mr. Wallace it occurred quite as independently, twenty years later, and afar off among the animals and plants of the Malay Archipelago. But while the originality of the discovery belongs equally to Wallace and Darwin, as it was Darwin, through the twenty years of cogitation, investigation, experiment, and minute research, who was first able to command attention to the great principle, it became associated with his name alone, and for many years has been known as "Darwinism." If to the end of time it should not be so designated, it will not be the fault of Mr. Wallace, who, in his loyalty to the memory of his friend, entirely suppresses himself, and speaks throughout his volume as though the theory of natural selection belonged to Darwin, and to Darwin alone.

Darwinism, pure and simple, is the theme of Mr. Wallace's book, although, in the treatment of his subject, he by no means confines himself to an epitome of Darwin's work or to an exposition of Darwin's views. The years that have followed the publication of The Origin of Species have added immensely to our biological knowledge. Of the new facts thus brought out—many of which had been collected by Darwin for his own future use—Mr. Wallace avails himself largely, bringing some of them to bear critically on the later work of the great master himself. In a brief statement of what naturalists have meant by the word species, and their origin, Mr. Wallace takes the reader, as it were, behind the scenes, and shows him Nature in anything but the calm, orderly, and peaceful state that sentimentalists like to picture. He shows organized life multiply-

ing on all sides with fatal rapidity, and the few organisms that survive belong to the state of being one against another to secure the food and protection requisite to bring them to maturity. He points out the advantages possessed by those that are superior in the special qualities on which safety depends, and demonstrates the variety that may obtain in the nature and quantity of these qualities. That the reader should be convinced beyond doubt that Nature does select upon and perpetuate any variation that gives its owner an advantage in the struggle for existence, it is of the utmost importance to firmly establish the principle that animals and plants do constantly vary in the manner and to the amount requisite to afford material on which natural selection may work. Darwin, it will be remem-

bered, appealed, in his great work, in the main, to those facts, that he had with rare ingenuity, prepared diagrams which exhibit variation in important organs as they are actually found among the members of many existing species. Indeed, so impressive is Mr. Wallace that the reader receives the conviction that, had he but eyes to see it, he would discover, among the indi-

viduals of any species of animal or plant, as much variety in structure and habits as he finds among his human acquaintance.

When it is remembered, moreover, that all the offspring of any particular pair are subject to indi-

viduality, and that the few that survive to maturity are immensely outnumbered by the many that fall by the way, the number of variations produced in any large and widespread species is seen to be enormous, providing at all times some forms fitted to adapt themselves to a change in the natural conditions in which they were produced. Consequently, it is not difficult to follow Mr. Wal-

lace in his most interesting summary of the present state of opinion on such oft-repeated objections to Darwin's theory as, the supposed smallness of vari-

ations, the doubt as to the right variation occurring when required, the beginnings of important organs, useless or non-adaptive characters, the instability of non-adaptive characters, the swamping effects of intercrossing, and the effects of isolation. In an evenly interesting manner does he discuss the differences among distinct species, and the usual sterility of their hybrid offspring. But even in his hands, and though he treats it at length and in a remarkably forcible manner, the subject will require the very closest attention on the part of anyone who wishes to gain a clear comprehension of all the arguments involved.

The close correspondence that exists between the colors of animals as a whole and their general environment, has been made familiar of late by Mr. Wallace. The reader is, therefore, prepared to extend the principle of pro-

tective resemblances to the colors of many animals that appear glaringly conspicuous when removed from their native haunts. It is not, at first, so easy to see that visibility may, in some cases, be of greater service than concealment. Nevertheless, Mr. Wallace's illustrations leave no room to doubt that to many species, and to those that are more or less gregarious, it is of the utmost advan-

dage that they should possess marks which render them easily distinguishable to their kind; the white upturned tail of the rabbit, for instance, serving as a signal and guide to those behind in a panic-stricken race for the burrow. This class of colors and markings,<Model->

which seem splendidly illustrated by a colored illustration by Mr. Wallace to have had an exceedingly important and widespread influence in determining the diversities of animal coloration. It is not for recog-
nition by friends alone, however, that color seems to have been developed for the express purpose of rendering a species conspicuous. To animals that are inedible, or possessed of dangerous, offensive weapons, it is a saving of energy, and even of life, to carry outward and visible signs of their character. These "danger-flag" colors Mr. Wal-

lace shows to be especially displayed in the insect world, where, a wound inflicted by mistake bringing death as surely as if the victim were afterwards devoured by its assailing, there is great need of some means to make known to insectivores the species that it would be best for them to avoid. The associated phenomenon of "mimicry" is treated by Mr. Wallace in a truly fascinating manner, and illustrated by wood cuts that clearly display the remarkable resemblances whereby many weak, small, edible species share the immunity from danger enjoyed by other species that are much larger and much more formidable. The differences of color or of ornamental appendages in the two sexes is connected with some of the most disputed questions in natural history. Dar-

win, as is well known, imputed the origin of all the decorative crests and accessory plumes of birds, the crests and beards of monkeys and other mammals,
and the brilliant colors and patterns of male birds and butterflies, to a process that he called "sexual selection." Sexual selection, applied to the development of the exceptional strength, size, and activity of the male, together with the possession of special offensive and defensive weapons, is admitted by Mr. Wallace to be a real power in Nature. But he is unable to follow Darwin into the extension of it to include the direct action of female choice or preference. The display of plumes and crests and gorgeous color, in so far as it is the outward and visible sign of the vigor and male of the bird, is undoubtedly attractive to the female. It is going too far, Mr. Wallace says, to assume that aesthetic emotions and artistic tastes, strong enough to cause her to choose him on account of minute differences in the forms, colors, or patterns of their ornamentation. Moreover, it has been proved that among butterflies and moths, where the display of color and ornamentation in the male is very great, the female exercises no choice at all.

As a substitute for this theory of female choice, Mr. Wallace elaborates one for which he acknowledges his indebtedness to a posthumous work by Mr. Alfred Tylor. Of this, the underlying principle is, the general dependence of diversified coloration on structure; the tracts in which distinct developments of color appear being marked out by the chief divisions of the skeleton in vertebrates and by the segmentation in invertebrates. Furthermore, than this, colors are shown by Mr. Wallace to vary in brilliancy, according to the degree of muscular and nervous development of the part on which they appear, reaching among birds a marvellous degree of perfection on the frills and crests and jewelled shields of the tropical humming-birds; in the resplendent eyespots on the elongated tail-covers of the peacock; on the enormously expanded wing-flathers of the argus-phantas, and the magnificent shoulder plumes of the birds of paradise. Mr. Wallace would derive not only the color but the ornamental appendages themselves from an excess of strength, vitality, and growth-power, and to the same cause attribute their display at all periods of life. It is to be observed in this respect that this surplus of vital force is best able to express itself without injury. In the tropics are concentrated forms of life driven from temperate regions by glacial periods of extreme severity. Here the luxuriant vegetation affords abundant food and perennial shelter, and the course of development has been almost unbroken and unchecked from remote geological times. The tropics, therefore, are the paradise of the animal world, and, entering it with Mr. Wallace, we see in its gorgeous occupants a culmination of the marvel and mystery of animal color—for a marvel and mystery it must remain, even though each separate hue has been produced through the agency of natural selection.

THEORIES OF THE FORMATION OF THE EARTH

BY JOSEPH WALLACE.

The search after truth has many sources to draw from while making up evidence on the great antiquity of the world. True, he will meet some scientists with a smattering of science, who make extravagant demands for the formations and deposits, which can be accounted in more ways than one. Theories keep pace with the advancement of science; some, in their widest application, demand such long periods of time that natural science cannot grant them. Geology is also in an unsettled state on the time question, owing to the theory now rapidly gaining ground that the rocks were formed, not by mechanical force, but by chemical agency superadded. How does geology or natural science in its present state explain the origin of heaven, or even that of our globe?

Science is not positive on this question. All theories, Mr. Wallace acknowledges that all the hypothesis about the former history of the earth must be based upon its present condition—on the forces now at work, on the laws which now exist; that all hypothesis must be rejected which begins by assuming that formerly different laws of Nature were in force. Still, it cannot be denied the scientist the question: Have the causes which are now operating been sufficiently altered, with equal force and to the same extent? This suggestion is held by Sir Charles Lyell; others, however, say: May we assume that such causes have worked differently at different times—at primitive times more powerfully than they do at present? According to the first theory, the course of the earth's history would have been comparatively quiet; and according to the second, its development in ancient times would have been interrupted by great catastrophes, revolutions, and convulsions.

It is extremely arbitrary to assume that all geological phenomena have been brought about by causes similar to those which are at work in our days, and that those causes never possessed greater force than they have had since the present order of things was established. On the contrary, for the circumstances are not longer the same. We see the great series of Neptunian deposits divided off into a certain number of groups. This leads us to the thought of a series of sudden and violent catastrophes, each of one which was able to change the form of the seas and the course of the rivers over vast tracts, which were separated from one another by periods of comparative quiescence. (For the full text see Longhardt, Geology, II, page 70.)

Sir R. Murchison, speaking in 1865, (see Athenæum, September 16, 1865, page 376), says: "I adhere (in opposition to Ramsay, Jukes, and Gelke) to my long-cherished opinion as to the great intensity of power employed in the production of dislocation of the character of the crust. The Neptunist and the Huttonian maintain that such reasoning is quite inadequate to explain the manifest proofs of convulsive agency, which abound all over the crust of the earth. * * * I reject as an assumption which is variation with the number less proofs of Intense disturbance, that the mechanical disruptions of former periods and the overthrow of entire formations, as seen in the Alps and many mountain chains, can be accounted for by any length of existing causes."

These conflicting theories have established Convulsionists, or Catastrophists; Quietists, or Uniformitarians, as they are called; also Neptunists, and Plutonists, or Vulcanists; the latter denote another deeply rooted opposition of parties. The Uniformitarian hypothesis deals with three successive periods of geologic time: the first, when the earth was in a condition of gas, the second, which is the present condition, the third, a period of vast changes in the crust of the earth's surface and again destroyed whole species of fauna and flora, gradually ceased; the temperature finally sank so low that ice formed itself in different localities, and now the earth does not emit more heat than what it receives from the sun. Thus, in millions of years, the surface of the earth arrived at its present condition, and the interior is yet in an incipient fusion.

As to the length of time for the formation of the earth, G. Blichow says 335,000,000 years must have elapsed, and D'Arcy thinks it probable that the solidifying of the earth's crust took no less than 20,000,000 years, and the formation of the earth to its present state not more than 400,000,000 years. The thought alone of this immense number of years is enough to stagger and bewilder the most profound thinker.
Of course, all calculations on the antiquity of the earth are conjecture, still, some may be approximately true. M. Polisson, supposing the temperature of the globe was three thousand degrees at the moment when the solid crust began to form itself, has calculated about 188,000,000 years. But, if one admits that the original temperature was only fifteen hundred degrees, a temperature more than sufficient to melt all the known rocks,—the time elapsed from the beginning of the solidification to the present would not have been more than 27,000,000 years. Undoubtedly this is yet an enormous length of time in comparison to what has been generally assigned to it by the Hebrew or Septuagint texts of sacred history in time. Astronomy has revealed to us that the works of God have immensity in space; geology teaches us that they have immensity in time. It is thus that all science contributes to the glory of the Eternal Creator, whose power and wisdom they gloriously show forth.

[Original in Popular Science News.]

FOSTER'S FLAT.

BY H. J. SEYMOUR.

This is the name given to seventy-five or a hundred acres of land situated more than one-half a mile down the river from the Niagara whirpool. The river runs eastward at this place, and closely hugs the precipice on the American side, the canyon being wide enough to admit of the flat between the river and the precipice on the Canadian side.

Intent on exploring this place for the first time in my life, early in May, two years ago, I proceeded down the river from the falls. Looking over the precipice below the bridges at the comparatively narrow stream at the rapids, as it foams and dashes along, it is difficult to believe that a stream of that size is capable of draughting so large an area of the continent. The depth must be enormous and the rate of speed very great. As you arrive at the whirlpool, you will notice that a high and wooded bank obstructs the hurrying waters, and the precipice along which you are walking is lost to view in the shade of a wood. If we follow up this precipice into the woods, we find that ultimately it appears under the cliff, coming to view occasionally only in places where the brink has been laid bare by the flowing over it of small surface streams. These streams unite, and have excavated a deep gorge opening out into the whirlpool, in a direction opposite that of the waters of the river. The waters of the river swash upon the pebbly beach at the foot of this earthy obstruction like the waves on the shore of the ocean. Baffled in their direct course, they are thrown into the utmost confusion. In some parts of this large expanse of waters called the whirlpool, the surface is dimpled with vortices, alternately appearing and disappearing, and in other places it is boiling up from the bottom, and a continual whirl is going on in all parts of its surface. After making a circuit and returning around in this cul-de-sac, the waters find a comparatively narrow outlet, some sixteen rods or more up the stream on the eastern, or American side.

With the purpose of following down the bank of the river on the Canadian side, we are compelled to go down the steep and difficult descent made by the precipice, cross the outlet of the above-mentioned wooded gorge, proceeding along the stony beach at the foot of the exceedingly steep clay-bank that is scarred by extensive landslides, and up a still steeper ascent till we arrive at the top of the precipice on the other side of the old gorge. Proceeding up along beside the whirlpool a little way, to where the water finds its outlet, we find ourselves on the top of a high, angular cliff, called Thompson's Point. Gazing down stream we see the upper end of the before-mentioned flat. It appears like an obstruction partly damming the river. It is heavily wooded at the upper end, and, as I drew nearer, I saw that it was covered with huge, loose rocks,—many of them large enough to stand upon, and a few of the largest being the only remnants of the green, mossy forest that must have been here thirty or forty years ago. This forest, undisturbed by human interference, is, in these days, of itself worth going a long distance to see, especially in such a wild and rugged region as this.

Although it is impossible to draw any very elaborate or definite conclusions concerning the age of the Niagara canyon, to the one or two elements that might be taken into the account, that I will venture to suggest. One of these items for consideration is, that the time thus far consumed in excavating it may be divided into at least three periods:

First, the period during which the waters excavated the old gorge that has its outlet at St. David's, several miles west of Lewiston. This was previous to the time of the glacial deposits, during which this gorge was filled with drifts.

Second, the period during which Foster's Flat was the bottom of the river. Of course, the falls must have been much less in height than they now are, and we naturally infer that there must have been a vastly greater volume of water at that time than at present, from the fact that the canyon is so much wider than it is necessary for the passage of the waters at the present day. Given a less height of fall and a wider canyon, and a much larger stream is required to produce the amount of excavation that we see.

Third, a long period must have elapsed during which the waters have been excavating the hard rock so much lower than the surface of the flat. Foster's Flat, the old gorge, and the whirlpool, as well as the upper rapids, should be made by all tourists who wish to make the most of a trip to Niagara Falls.

NIAGARA FALLS CENTER, Ontario, March 24, 1890.

SCIENTIFIC BREVITIES.

For Preventing Rust, coal tar and asphalt are much used by manufacturers of iron goods. The articles are dipped while heated in a trough of melted tar and asphalt, mixed to make a tough coating. This process is, no doubt, one of the best substitutes for galvanizing.

An Italian journal describes a new pharo-light, which is said to be as powerful as the electric light, and the efficiency of which is not impaired by fog. A clock-work arrangement pours every thirty seconds ten centigrams of powdered magnesium into the flame of a round wick lamp, producing an extremely brilliant flash of light.

THE STATE OF TRANCE.—Prof. William James of Harvard, in his article on hypnotism, entitled "The Hexical State," in the March Scribner's, says: "I know a non-hysterical woman who, in her trances, knows facts which altogether transcend her possible normal consciousness—facts about the lives of people whom she never saw or heard of before. I am well aware of all the liabilities to which this statement exposes me, and I make it deliberately, having practically no doubt whatever of its truth. My own impression is that the trance condition is an immensely complex and fluctuating thing, into the understanding of which we have hardly begun to penetrate, and concerning which any very sweeping generalization is sure to be premature. A comparative study of trances and subconscious states is meanwhile of the most urgent importance for the comprehension of our nature."
Practical Chemistry and the Arts.

HINTS TO INTENDING AMATEUR PHOTOGRAPHERS.

Thanks to modern improvements, the fascinating art of photography can now be practiced by anyone, no previous knowledge of chemistry being required, and excellent outfits can be obtained at all prices, from five dollars upwards. A few hints to those intending to join the ranks of the "photograph fiends" may be of service.

We should advise the beginner to start in a small way, with comparatively cheap apparatus, and proceed step by step, buying additional apparatus as it may be found necessary. The amateur who attempts the first day he receives his camera to take a landscape view in the morning, an instantaneous picture after dinner, a portrait in the course of the afternoon, and a flash-light interior in the evening, will surely come to grief, and consider all amateur photography to be but vanity and vexation of spirit. Nothing is better to commence with than an architectural subject,—the amateur's residence, for instance,—and in a few trials, the first of which will undoubtedly be failures, he will gain an immense amount of information regarding time of exposure, management of the camera, use of the diaphragms, etc., which will be indispensable to his further progress.

Taking everything into consideration, we would recommend the 5x8 size of plate as the best to use. It is easy to handle, and gives a picture in which the details are large enough to be distinct, while prints of this size when mounted are of a convenient size to examine and not too large to lie around the house. Larger sizes are adapted to particular cases, while apparatus for taking smaller views only has the advantages of greater portability and slightly less cost.

An excellent 5x8 outfit can be obtained complete for about twenty-five dollars, and is recommended as the best to commence with. As one gains experience and interest in the art,—and the interest always increases at a very rapid rate,—better apparatus can be substituted, to any extent that one's purse will allow, and the old apparatus sold at a small discount to some other beginner. Of course the most important part of the apparatus is the objective, or lens, and a good one should be procured before anything else. A strictly first-class photographic objective for the above size will cost from twenty to fifty dollars, although the single view lenses sold with the cheaper outfits are often most excellent, and give very satisfactory results.

"Wide angle" lenses are indispensable for interiors and many out-of-door views in confined situations, but the rectilinear landscape lenses are the best, we think, on the whole, for such duties as the average amateur is likely to require of them.

A very common mistake of beginners is to stop the development too soon. When a properly exposed plate is placed in the developing solution, the image soon appears and is, apparently, perfect in all its details. The temptation is strong to remove it at once and wash off the developer; if this is done, the negative, after it is fixed, will be thin and lacking in detail, and, in fact, quite worthless. The development should be continued until the image nearly disappears, and the plate seems to be spoiled. But it is not, and an immersion in the fixing bath will bring out a brilliant negative of the necessary intensity to make good prints.

It is not worth while to experiment much with different developers. There is nothing much better than the ordinary pyrogallic acid and carbonate of soda, and the average amateur does not usually care to trouble himself about the refinements of the art. It is better to become accustomed to one solution and use it constantly, when uniform results will usually follow. The same principle will apply to plates. The leading brands are all about equally good, and there is nothing gained by constant change.

No instruction in photography can take the place of practical experience. There is a sort of "knack" in the various manipulations which can only be acquired by practice. The first attempts of the photographic amateur are pretty certain to be accompanied by much trouble and anxiety, and result after all in a dismal failure. If one does not forget to pull out the slide, remove the cap, or take two pictures on the same plate, he will do well, for there is as much nervousness accompanying the taking of the first picture as in landing the first trout or shooting the first deer. Practice will soon make perfect, however, and patience and perseverance will enable one to obtain photographs which will be things of beauty and joys forever—or, at least, until they attain what seems to be the ultimate destiny of all silver prints, and fade away into oblivion.

A CHINESE SEED-PLANTER.

The accompanying illustration of an implement for planting seed, so curiously similar in principle to those of modern times, is taken from a work on China by Guignes, published about 1808, and seems to indicate that the Chinese anticipated some of our supposed modern inventions in the line of agriculture, as well as gunpowder, the mariner's compass, and the use of movable types in printing, to which they modestly lay claim. It is composed of a box for holding the grains, mounted upon a frame of bamboo, the lower ends of which are provided with two small plowshares. The rear part of the box, or hopper, is pierced with two holes, through which the grain passes into the hollow bamboo rods forming the back of the framework, which conduct it to the furrows made in the ground by the plowshares. This primitive implement is dragged over the ground by two men, and, in spite of the clumsiness of its construction, it must be fairly effective; at least it enables the Celestial farmer to plant his seeds much quicker than by dropping them one by one from the hand. It is an interesting example of the state of the Chinese civilization, which seems to have developed up to a certain point and there become permanently arrested, while the western nations, continuing on, left them far behind. Whether their modern intercourse with more advanced nations will start them once more on a career of progress, remains to be seen; but the prospect is at least hopeful.

PRACTICAL RECIPES.

VARNISHING FRETWORK.—Use white, hard spirit-varnish; it requires no size. The application is to be made in a warm room. Or, fill in the grain of the wood with glue size, and varnish with brown, hard varnish.

PAPER or pasteboard may be rendered waterproof as follows: Mix four parts of slacked lime with three parts of skimmed milk, and add a little alum; then give the material two successive coatings of the mixture with a brush, and let it dry.

FILLING FOR NAIL-HOLES.—The following method of filling up old nail-holes in wood is not only simple, but is said to be effective. Take fine sawdust and mix into a thick paste with glue, pound it into the hole, and when dry it will make the wood as good as new. Often by frequent attachment of new leather to old bellows-frames, the wood becomes so perforated that there is no space to drive the nails, and, even if there was, the remaining holes would allow the air to escape. A treatment with glue and sawdust paste invariably does the work, while lead, putty, and other remedies always fail.

FOR CLEANING AND POLISHING BRASS.—An acid which seems to have a peculiar solvent action upon the oxides, etc., and yet leaves the metallic surface intact, is oleic, and, when combined with finely powdered Venetian red and cleaning fluids, leaves nothing to be desired. A good formula is: Venetian red, finely powdered, 3 Troy ounces; oil of turpentine, 12 fluid ounces; oleic acid, 1 fluid ounce; ammonia water, ½ fluid ounce; alcohol, 1 fluid ounce; oil of sassafras, 10 minims. Mix; shake on using. To clean brass, apply a rag, and clean off when dry with whiting or precipitated chalk.
The general outlook over the Chapters of the Agassiz Association is most gratifying and encouraging. All our courses of study are in full operation, and show full classes and abundant enthusiasm. The interest of our Chapters always increases as summer opens, and this year, in many cases, this interest verges upon excitement. The successful Conventions of the New York and Brooklyn Assemblies, the organization of the Rhode Island Assembly, the pleasant and promising start of the Corresponding Geological Chapter, the large accession of new Chapters, and the interest aroused among leading educators by means of the popular Science News, are all trustworthy signs of a quiet, but sure and healthful growth.

A CORRESPONDING GEOLOGICAL CHAPTER.

As we have before explained, we have in the Agassiz Association, besides Chapters of the ordinary sort,—which are local science clubs,—another kind, composed not of members brought together by the accident of neighborhood, but by the stronger bond of a kindred interest. These “Corresponding Chapters” are composed of members scattered, it may be, throughout the United States, but all engaged in studying the same branch of natural science. Reports have been published in this paper from the Gray Memorial Botanical Chapter, the Isaac Lea Memorial Chapter of Conchology, and the Corresponding Archeological Chapter. It now gives us pleasure to report the organization of the Corresponding Geological Chapter of the Agassiz Association, which, beginning February 20 with sixteen members, had increased by April 7 to twenty-four.

The plan of work and other details are clearly set forth in the constitution, which we give in full, not only to make more intelligible the precise nature and functions of a “Corresponding Chapter,” but also that it may serve as a model for future Chapters of a similar character. This Chapter desires us to extend a most cordial invitation to all—young or old, learned or learning—to unite with it in its fascinating work among the rocks; and all who are interested may address Mr. Amadeus W. Graub, General Secretary, 154 Maple Street, Buffalo, N. Y.

The present officers of this Chapter are an Executive Council, consisting of Franklin W. Barrows, President; Amadeus W. Graub, General Secretary; Frederick A. Vogt, Treasurer; George T. Wardwell, and Miss I. S. Deane, all of Buffalo; and four Division Secretaries, viz.: Mrs. E. F. Boyd, 118 Hyde Park Avenue, Hyde Park, Mass.; E. T. Liefeld, Ph. B., 52 Avon Street, New Haven, Ct.; H. W. Britcher, 707 West Street, Syracuse, N. Y., and Rev. J. M. Keck, A. M., Chardon, O.

The Constitution.

Article 1.—Name.
The Corresponding Geological Chapter of the Agassiz Association.

Article 2.—Object.
Mutual assistance in the study of geology, mineralogy, and paleontology by means of correspondence and the exchange of specimens.

Article 3.—Membership.
Any student of geology, or any of its branches, who gives suitable evidence of his ability, is eligible to membership, and, upon application to the President or General Secretary, becomes a member of this chapter and thereby of the Agassiz Association, by agreeing to the constitution and paying the annual fee. Members are recommended to purchase Three Kingdoms, the hand-book of the Agassiz Association.

Article 4.—Honorary Members.
A. Geologists of advanced standing are invited to become Honorary Members of the Chapter.
B. Honorary Members shall not be required to pay the annual fee, but their names and addresses will be recorded so as to enable the members to correspond with them of their choosing, and such communications will be forwarded to them by the corresponding Secretary.

Article 5.—Officers.
The elective officers of this Chapter shall be a President, General Secretary, Treasurer, and an Executive Council, elected in March of each year.

The President, who must be a teacher of geology, shall have general supervision of the Chapter, make an annual report of its operations (which shall be sent to each member), and perform such other duties as are hereinafter provided.

The Secretary shall keep a list of all members and their addresses; receive all communications theretofrom, and forward them as they may be desired.

The Treasurer shall keep charge of all moneys of the Chapter, pay them out only on an order signed by the President and General Secretary, and make an annual report of all receipts and disbursements.

The Executive Council shall be composed of the President, who shall be ex officio chairman, General Secretary, and three (3) members of the Chapter, who shall be elected by the General Secretary to control the Chapter, and to them all motions, petitions, and plans not conflicting with this constitution shall be referred for decision.

Article 4.—Dues.
The annual dues of this Chapter shall be one dollar ($1.00) per annum. Each member will be required to forward each quarter a paper in the field of geology, mineralogy, or paleontology, and such papers may be secured at the rate of five dollars ($5.00) per year.

Article 7.—Divisions.
A. The President shall arrange the Chapter into divisions of not more than ten (10) members, designated by the letters of the alphabet.
B. Each Division shall be under the immediate supervision of a Division Secretary, appointed by the President, with the consent of the Executive Council.

Article 8.—Reports of Members.
A. Each member shall report on the first of May, August, and November (terminology to be settled by the President, giving the result of his studies and personal researches in geology, mineralogy, or paleontology during the previous quarter).
B. The President shall, on the 10th of the month, or as soon as practicable, after having the report, forward it to the General Secretary, stating when they were received and forwarded each list of reports, and the division in which they belong.
C. These officers shall attach to the reports a list of its members, and such members of the member (themselves being numbered one), and circulate them in rotation. At the same time they shall send a postal-card to the General Secretary, stating when they were received and forwarded each list of reports, and the division in which they belong.
D. Each member shall record upon the register the date of receiving and forwarding the reports, keep a private memorandum of the same, and inform the Secretary of his division by postal-card when he received and forwarded the same.
E. No member shall keep this correspondence more than three (3) days.
F. The last member in each division shall send the report and register to the Secretary of the next division, who will again attach to them a register of his division, and forward the same to the General Secretary when he received them and forwarded them; and so on.

Article 9.—Exclusion.
Any member who shall be guilty of a flagrant misdemeanor shall be dealt with in the following manner: The Executive Council shall constitute a committee who shall have the power to expel the offending member, if he cannot show the charge false, unless the Chapter shall, of its own accord, contest against said expulsion. Provided, that in case any member of the Council be personally interested, his place on the committee shall be filled by the remainder of the Council.

Article 10.—Amendments.
This constitution may be amended at any time by a two-thirds vote of all the members in good standing.

Note.—Many of the ideas of this constitution are adopted from that of the Gray Memorial Botanical Chapter.

The Course in Mineralogy.

If the Agassiz Association had never accomplished anything besides what has been done during the past six months in Professor Gutenberg's course in mineralogy, all the efforts in its behalf would have been well rewarded. No fewer than five hundred voluntary students have taken this admirable course, which places actual specimens in the hands of each pupil, and requires of each personal experimental observation and independent thought. Under date of April 1, Professor Gutenberg writes: "Your kind notices concerning my course in mineralogy have had good results, especially the notice in the Popular Science News. The edition of five hundred pamphlets—each accompanied by a case of mineral specimens and simple instruments—is already exhausted. I had not intended to go beyond that number, for the work really takes more time than can well spare; but I have received lately letters which speak in so high terms of the course, and others expressing so great disappointment at its limitation, that I have resolved to issue another edition as soon as I shall have finished my work on the third grade, which will be by May 1. I am also much pleased with Santa Claus. The paper, so full of bright things, cannot fail to be of great interest to the children, and must exert a good influence. I only wish that more space than the two pages could be given to the Agassiz Association."
A WONDERFUL RECORD.

Six Able Men Graduate from a Single A. A. Chapter.

Chapter 46, of Walpole, Mass., is suffering temporarily from the dispersion of its leading members; but it is worth while to note the places to which these members have gone. The President left to become a teacher of science in the Taunton High School; the Vice President to become an instructor in chemistry in the Massachusetts Institute of Technology; the Secretary to assume the superintendence of the chemical factory of William H. Swift & Co., Boston; a fourth member is superintendent of the Walpole Chemical Company; the fifth is superintendent of schools in Westborough; and the sixth is a senior in the Institute of Technology. "By their fruits ye shall know them," may apply to societies as well as to individuals.

INFLUENCE OF THE AGASSIZ ASSOCIATION ON SCHOOL TEACHING.

No one, however young, who has once been led to study any natural science in the natural—and therefore right—manner, i.e., by means of his own senses and faculties, can ever be satisfied with that futile attempt at education known as rote-teaching. Probably no one who has been for six months a member of any live Chapter of the A. A. will ever sit contentedly before a teacher who undertakes to teach him natural history by the ear alone. The very spirit of our Association is a constant protest against mere book-work. The A. A. does not foster docility, but promotes intelligence. It is diametrically opposed to dogmatism of every sort. Gradgrinds who try to use Agassiz boys and girls as pitchers into which to pour a stale decotion of facts, will find that they have undertaken a difficult task. The following extract from a letter written by a bright schoolboy, whose name is, of course, not given, illustrates this forcibly, and is only a sample of hundreds which prove to our satisfaction that the methods of the A. A. lead to freedom and independence of thought.

"Mineralogy will be our principal study. I hope to get the greater part of the two higher classes of the school into our Chapter before we begin, as we shall take up a systematic course in mineralogy, of which I shall have charge. I shall also try to bring it about that natural history be given up in this school, for I know from myself that the hour now devoted to that is the one in which we all least interest. Thus, we had, for instance, the 'Monkey Tribe' as a topic. A chart was hung up containing pictures of the different species. Then the teacher either read all about the monkeys, or else wrote a long essay about them on the blackboard, which we then had to copy and learn by heart for the next lesson. This, you will see, is the way a boy becomes averse to this hour—always dreading it. Now, if this hour be given up during the school session, and taken every Friday evening among us boys, where there are no cerimonies to be gone through with before a question can be asked, and where we have only voluntary members, I will wager that each pupil, while he may know nothing of the book, will know all about the monkeys at the end of a month; while, by the present method, he knows at the end of a year almost as little, even of the book, as he knew at the beginning, and about the animals—nothing."

EXCHANGE NOTICES.

I will send eggs, minerals, fossils, snakes, or anything I can find in Southern California, in exchange for books on astronomy.—Geo. Hoyt, El Modena, Cala.

MINERALS, fossils, woods, Indian relics, and various papers, for minerals or stamps.—L. L. Lewis, Drawer 107, Copenhagen, N. Y.

CHAPTER ADDRESSES, NEW AND REVISED.

It gives us pleasure to record the accession of a number of new Chapters, in presenting the following addresses, we would suggest that our Chapters send to these new friends letters of welcome. They will all be very glad to receive suggestions regarding methods of Chapter work, the conduct of meetings, planning of excursions, etc.

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THE A. A. HILL AND DALE CLUB.

The "Hill and Dale Club" is composed of Chapters and members of the Agassiz Association living within a radius of fifty miles of Elizabeth, N. J. Its purpose is to lead its members on a systematic series of excursions to such points of interest as can be visited in a single day. Since March 29 the Club has visited Fort Lee, Belleville, Bergen Hill, Castle Point, Newark, O'Rourke's Quarry at Orange, and Farmingdale, all in New Jersey, and New Rochelle, Van Cortland, and Fordham, in New York.

The next excursion is set down for Saturday, June 7, when the Club will visit Metuchen, N. J., to investigate the clay-pits, and to make botanical researches, under the guidance of Rev. L. H. Lighthipe, President of the New Jersey Assembly. It is proposed to take the train on the Pennsylvania Railroad, for which New York passengers must leave the foot of Courtland street at 9:20 A. M. The fare for the round trip is $1.25.

On June 14, Mr. T. G. White will conduct the excursionists on a botanical and entomological trip to Richmond Hill, N. Y. The Club will meet at Long Island ferryhouse; foot of 34th street, at 10:30 A. M. Fare, 40 cents.

On June 21, under the care of Miss E. M. Waters, of the Plainfield Franklin School, and via the Central Railroad of New Jersey, (Liberty street, New York, 8.45 A. M.), an interesting botanical excursion will be made to Plainfield, N. J. Excursion fare, $1.00.

The last excursion of the month is to be on June 28. Destination, Paterson, N. J. This will be geological, and led by Mr. G. S. Stanton, via Delaware, Lackawanna & Western Railroad, Barclay street, 9.00 A. M. Fare, 70 cents.

To all of these excursions all members of the A. A. are cordially invited.

REPORTS OF CHAPTERS.

20. Fairfield, L., [A].—Along with the general prosperity of Iowa Chapters, we have not been neglected. During the summer we profited by the presence of two of our leading members, who had just completed their medical education, and were qualified to give us some very interesting lectures. They prepared and articulated the skeleton of a horse and presented it to the Chapter. I refer to Dr. J. Fred. Clarke, now resident physician in the Hospital of the City of Philadelphia, and Dr. C. C. Cottle, now practicing at Marshalltown, Iowa. We have also had with us, during a large part of the year, another of our charter members, John G. Spielman, C. E. We were well represented at the sixth annual Convention of the Iowa Assembly, where we won the second diploma. — Carrie Lamson,Pres. ; Buhla West, Sec.

27. "High School Naturalists," Pittsburgh, Pa., [A].—Our Chapter is divided into three sections—botanists, zoologists, and mineralogists. The botanists meet once a week, and have devoted their time thus far to mounting and arranging the plants in the "Naturalists" herbarium. Today they undertook their first collecting trip. The expectation of discovery was not so great as the occasion merits, but the impulse to see something green and to sniff the spring air. Some heathies, Virginia saxifrage, rue-anemone, white-grass, and, of course, dandelions and chicweed, were found in blossom. Woodpeckers and robins were seen. Rotten stumps yielded large black wood-beetles, different species of centipedes, cocoons, ants, spider-nets, beetle-larva, and other creatures. All were eager to collect anything that showed or promised life. Even an immense bumblebee was discovered, just rubbing his eyes and sleepily looking out into the world. Thus it was not a bad day, after all. The zoologists have each an animal or a group of animals assigned to them for study; they make their reports at the monthly meetings. The American Pearl Clam was one of the first representatives of the mollusks that appeared. Many different kinds and beautiful specimens of the shells (a species of unio) and pearls were exhibited. The mineralogists study Prof. Gutenberg's course. A committee is now busy preparing for a spring meeting of the society, to which all the members of the High School will be invited.—G. G.

29. Barton Chapter, Boston, Mass., [B].—We are still alive, and just as enthusiastic as ever. The year 1890 has been very prosperous. We have, at present, thirty-seven active members—eight more than at the time of our last report. We have held twenty-three meetings this year; the one which occurred on the 17th of June we made an all-day excursion to Waverly Oaks, a charming spot within a few miles of Boston. We voted that hereafter we would keep this day for our field day. In January we began a systematic course in botany, under the direction of Mr. J. H. Sears, of the Peabody Academy of Science, Salem, Mass. Papers were read by our members—for we were fortunate in having a number of botanists. Mr. Sears gave us three talks during the course. Our members living out of the city were not to be outdone. They met afternoons or evenings. We do not want to see this habit continued, as we do not seem to favor us, also, for wild flowers bloomed very early. This course finished with the last meeting before the summer vacation, June 24th. At this meeting it was decided to begin to work for future cabinets, so different members were chosen to take charge of different departments. We bid fair to have a fine herbarium, and good scientific collections of beetles, minerals, rocks, fossils, and shells. In the spring we started a set of "outing" for Saturdays and holidays. We sold season tickets at fifty cents to those who did not care to join the Chapter work, but wished the benefit of the outings. We always had some object in view—either geology, zoology, or botany. We had twenty-one outings in the course of the year, and have had great benefit in the wealth of material collected by this method. The benefit was the promotion of kindly feeling between the Chapter members. One of our most enjoyable days was spent at Fitchburg, Mass., on April 30, when Prof. E. A. Hartwell showed us the beauties of Rollstone and Pearl Hills, and Mr. F. A. Marble kindly gave us the use of the rooms of Chapter 48. We held no meetings during July, August, and September. The Chapter was dormant during these months, but we are now fully alive again. The rocks from Waterloo, N. Y., illustrating the Sallina, Chemung, and Hamilton groups. Moths and beetles were searched for with cyanide jars under electric lights. Two of our members hunted in that enchanted field for mineralogists in the vicinity of Paris, Me., and came home laden with pink and green tourmaline, albite, muscovite, lepidolite, quartz crystals, gneiss, and rose quartz, triphyllite, Cookeite, cicimolle, cassiterite, and beryl. Another member visited Nova Scotia, in the vicinity of Blomidon. Our first meeting in the fall was held on October 7, when the Chapter unanimously voted to take up the study of geology for the winter. We have laid out a course based somewhat on the plan of Master H. L. Clapp's, book, No. XV. in "Guides for Science Teaching," only our plan is very much more thorough, as that was meant for a class of children, while our Chapter is composed of adults. The first meeting was devoted to the chemical elements contained in minerals; the next meeting to physical properties, structure, hardness, etc.; the third to crystallography. Mr. George H. Barton, of the Massachusetts Institute of Technology, giving this talk, illustrating the subject fully with models.

We began our work. Specimens of different kinds of granite were given out, one to each member, with a card explaining "I plan for Study," for each to tell what he or she found in his or her specimen. Questions are always given, to show any different kind of minerals each found, and the general characteristics. At the next meeting each member reported. Then came a meeting devoted to quartz (all kinds) and feldspar (all kinds), showing the constituents of binary granite. We had papers on the uses as well as the kinds, to bring in the practical side. At our next meeting we have mica and other kinds of mica, to show the kinds of granite. Then we shall give out all the accessory minerals found in granite, to be studied just as the granite specimens were. Then will come the allied rocks of the more basic order—syenite, diorite, diabase, etc. Other rocks will be taken up in the same way, and we hope before next June we shall know something of the foundation beneath us. Questions are always given, to show the student the evening to be answered at the next meeting. If any Chapter thinks this plan helpful, we should be glad to pass it along; also our botany plan of last year. We have three members who are taking Prof. Gutenberg's course in mineralogy, two Prof. Cassedy's course in chemistry, and one Mr. Alex. Wight's course in botany. On Fast Day, April 4, we opened a very enjoyable and profitable day at the observatory on Blue Hill, Milton, Mass. Mr. H. L. Clayton explained very minutely and clearly the workings of the meteorological instruments used in taking observations at the observatory. We note in the observations recorded by the Chapter that hepatica was picked as early as March 27, and late as November 4, 1890. Flowers were picked in open air In Hyde Park on December 25. We have joined the Massachusetts Assembly, and hope to meet delegates from all the Massachusetts Chapters at the next General Convention.—Mrs. R. S. Beanam, Pres.; Ella F. Boyd, Cor. Sec.

FRICTION CAUSED BY ELECTRICITY.—A curious phenomenon attending the friction between two bodies, especially when one of the bodies is made up of ascending heavy granules, is alluded to by Joseph Welter in his article on "The Electric Railway" in the April Spectator. This phenomenon, which was probably first observed by Leo Daft, at his works in Greenville, N. J., in 1882, is, that, when the current passes from the car wheel to the track, it causes an increased friction or resist-
The Popular Science News.

BOSTON, JUNE 1, 1890.

AUSTIN P. NICHOLS, S.B., . . . . . Editor.
WILLIAM J. ROLFE, LL.B., . . Associate Editor.

It is with the deepest regret and a sense of personal loss that we announce to our readers the death of Dr. John Crowell, of Haverhill, Mass., after a long and painful illness resulting from heart trouble. Dr. Crowell was an old and valued contributor to the Popular Science News, and was one of the most respected members of the community, not only for his eminent skill and success in the practice of his profession, but for his artistic and literary attainments, upon which subjects he was a critic whose opinions were deservedly valued. Dr. Crowell was sixty-six years of age, and had practiced medicine in his native city of Haverhill for nearly forty years.

By what name the present age is likely to be known to our remote posterity, it would be rash to predict, so enormous is the development in various departments of art and industry; but, in comparison with preceding ages, it might, from our immediate point of view, be well designated as the "Engineering Age." Certainly the recent and the prospective achievements in this line throw far into the shade the most famous exploits of engineering in the past, even if we go no farther back than the middle of the present century. The Eiffel Tower doubled at one bound, as it were, the loftiest structures that man had reared; and most of them—like the Egyptian pyramids and the Strasburg spire—belonged to a period several centuries or many centuries distant, "in the dark backward and abyss of time." And now we are told that Eiffel and Edison propose to build a tower 1,500 feet high for the coming World's Fair at Chicago! The great bridges of our day are even more conspicuous illustrations of the audacity of modern engineers. The Brooklyn bridge, with its clear span of 1,595 to feet, was an amazing feat; and the Forth bridge, with its two cantilever spans of 1,700 feet each, now just completed, is, in some respects, far more stupendous. But the appetite for triumphs like these appears to grow with what it feeds upon, and the engineer seeks new and greater worlds to conquer. Plans have just been made for a railroad bridge across the Hudson at New York with a span of 2,550 feet, or more than half a mile; and it is quite probable that it will be built. Its extreme length, including anchorages, will be 6,300 feet, that of the Brooklyn bridge being 3,700; and the height of the towers supporting the cables is to be 500 feet, the Brooklyn ones being 272. The dimensions of some portions and the amount of material required will be immensely greater. The cables, for instance, will be 48 inches in diameter instead of 15 to 2, and the weight of iron and steel in the structure will be 50,000 tons instead of 6,750. The cost, exclusive of land damages, is estimated at sixteen millions of dollars, and the time required for construction at ten years. What bigger and bolder enterprises in bridge-making may be planned by the time this one is finished, who will venture to guess? It would seem that the possible limits of span are nearly reached here, and that the great bridges of the twentieth century can only be longer and costlier works of the same general character. Yet who knows?

The circulars of the various summer schools are flying through the land, thick as the leaves in Vallombrosa; and the number and scope of these institutions are still on the increase. Several of the colleges are following the example of Harvard in providing for this vacation study; and a new feature at Harvard—in addition to the schools for chemistry, physics, botany, geology, physical training, etc.—is the opening of summer courses in the Medical School. No less than thirty-eight distinct courses are described in the circular issued by the university authorities. They begin at various dates between June 2 and August 18, most of them about July 1, and end between July 7 and October 3. The length of the courses is from four to eight weeks, with lectures or lessons from two to six times weekly. Certificates of attendance are to be given to students who desire them. Summer schools in theology, or at least in Hebrew and New Testament Greek, have been held for some years. Whether there is a summer school of law we have not heard. The attendance at the old and well established schools increases from year to year, notwithstanding the multiplication of schools. At the Martha's Vineyard Summer Institute, for instance, the attendance last year was 350, the largest up to that time; and the Harvard courses were never so successful as last summer. It is evident that these vacation schools meet a widespread want; and we believe that, in the vast majority of cases, all that is sacrificed in playtime is gained by the teacher in the increased ease and comfort with which the work of the rest of the year can be done.

In these wicked and scientific days, when adulteration and sophistication are alleged to be as rife as dangerous germs and microbes, when nature and art seem to conspire to poison our food and drink and our peace of mind, we have found a medium of comfort in the conviction that the egg of the barnyard fowl was happily exempt from the intrusion of microscopical organisms, just as when boiled it was safe from the ordinary virossi-

A recent writer believes that he sees evidence of increasing progress in the adoption of the metric system in the industrial arts, both in Europe—in Spain, Austria, Turkey, England, and elsewhere—and on this side of the Atlantic, in Brazil and other South American countries. No doubt it is gradually commending itself to practical men, as it had already done to men of science; but the advance is, nevertheless, exceedingly slow. Among medical practitioners in this country, we are inclined to think that very little progress has been made in recent years. We know of more than one physician who, five or six years ago, had prescription-blanks printed in the metrical form, and used them for a considerable time, but finally gave them up because they were not popular with the druggists, and sometimes led to mistakes and confusion. A committee of the American Association for the Advancement of Science has recently issued an address to the professions of medicine and pharmacy, and to the medical and pharmaceutical colleges of this country and Canada, urging the adoption of the metric system in the forthcoming edition of the United States Pharmacopoeia; but a leading medical journal remarks: "It may
be expedient for the Pharmacopoeial committee to comply with this suggestion, but we warn them that, if they wish to escape general complaint, they must couple every metric expression with its equivalent according to the system now in use; no mere table of equivalents will be satisfactory." We have no doubt that this voices the general feeling of the medical profession. The time has not come for substituting the new system for the old in the Pharmacopoeia, but it is good policy to put the two side by side. This will gradually "educate" physicians and druggists to the merits of the metric system, and be a stepping-stone to its complete adoption in "the good time coming."

**SOME CURIOUS EFFECTS OF ATMOSPHERIC EROSION.**

In the Department of Arveiron, near the town of Montpellier-le-Vieux, in France, occur some remarkable geological formations illustrating the effect of erosion, and duplicating, on a small scale, the familiar formations of Colorado in this country.

These formations are described and illustrated in *La Nature* by M. Martel, who has explored this comparatively unknown region quite thoroughly. The surface rock is of limestone and dolomite, and the erosion is probably due more to the action of water and frost than to the mechanical action of wind-blown sand, which has carved out so many fantastic figures among the Rocky Mountains.

The natural bridge shown in Fig. 1 is about ten feet high and eighteen wide, with a minimum thickness of about two feet in the rock composing the arch overhead. A cart-path traversing the locality passes through the arch, thus saving a considerable distance.

In Fig. 2 a more extensive view of this savage region is given, showing the shapes into which the rock has been carved, which closely imitate the ruins of an ancient city. The resemblance is increased by the fact that many of the formations are pierced entirely through by natural agencies, thus imitating doors and windows. In the foreground stands a column, or natural obelisk, forty-five feet high; and the surrounding scenery is said to be of the wildest and most fantastic description. A natural dungeon is found at one place, and one mass of rock is pierced in two places so as to form an excellent figure of a camel. Numerous other columns, similar to the one shown in the engraving, also occur; and, from M. Martel's description, it would seem that the locality was well worthy the attention of geologists.

[Special Correspondence of Popular Science News.]

**PARIS LETTER.**

No very important scientific question is being at present discussed in our circles; even Brown-Sequard's experiments are somewhat neglected, and few persons choose to investigate the matter. Each one works in his department, and at present nothing startling has been recently started. It proves a good moment for the perusal of Renan's last book on the "Future of Science." This book was written in 1848, and various circumstances have delayed its appearance. It must be confessed that it is of more interest to the historian than to the scientist—the experimenter. However, it is, of course, very pleasantly written and largely thought, so that it is really a suggestive book. Darwinism is slowly getting on in France. Thirty years have now elapsed since the publication of *Origin*, and the clamours are somewhat abated. One cannot howl thirty years; and, in fact, if only a theory contains some truth, time ensures its acceptance, however badly it may have been received at first. But in France, queerly enough, the Darwinian ideas are gaining silently. Save two or three writers, who, in some papers, (*Revue Scientifique Internationale*) now and then make their readers cognizant of progress recently achieved in this department of science abroad (especially in England and the United States); and save some ultra-radical politicians, who think that Darwinism, materialism, and so forth, are the same thing, and who foolishly and ignorantly twaddle in theories they hardly understand and thoroughly misapply,—the young naturalists seem to keep their ideas to themselves. The reason is not a difficult one to find. The officials are not in favor of Darwinism, and it is better to keep aloof—in appearance—from the unwelcome doctrine. But, certainly, when some of them are no more, Darwinism will be flourishing. Darwinian books are being translated in French; Wallace's *Darwinism*, Romanée's *Mental Evolution in Man*, Geddes's *Evolution of Sex*, and others, will shortly come out, and stimulate the dispersal of Darwinian thought.

Amateur photography—to pass from philosophical grounds to very practical pursuits—thrives splendidly in France. The number of amateurs is gaining every day, as a result of the numerous and cheap instruments which have been devised for them, and they really do the thing well. Special reviews and books have proved necessary, in order to allow them to keep abreast with the progress of science, or art; for it must be noticed that they hate routine, and want the very latest methods and improvements. One of the best makers of photographic apparatus, M. Fleury Hermagis, has just written one of these books,—and a capital one it is,—under the title of *Travels des Ecrivains Photographiques*, which is especially offered to travelling amateurs, and contains sound advice on the technical part of the operations—the whole is described in the very minutest detail—and on the artistic side of the question. This is a very important part of the subject. Photographs are exact, of course; but they may be made artistic without any alteration of truth. This book, published by the Société des Éditions Scientifiques, meets with a great success, and, if your readers are also photographophiles, it would certainly prove interesting and useful to a great number.

The transactions of the 1880 international scientific meetings in Paris are appearing in turn. The last ones I have met with are those of the congress of hygiene, zoology, and colonial matters. It is a pity that the different transactions are published by so many different publishers. In different sizes, on different paper, and with different types. In 1878 all the transactions of the thirty-two or thirty-six scientific meetings were published by the same printer,—the state printing-office,—and this uniformity was very pleasant to the eye. There is a good deal of useless matter, if not rubbish, in the hygiene transactions. Hygienists have to hear their own voice; they are addicted to every-elegant language; they have literary pretensions. In scientific matters, clearness is the suitable literary quality. The zoological transactions are good, and contain much useful information and discussion. The two main documents are the report of M. Fischer on geographical distribution, and of M. R. Blanchard on zoological nomenclature. M. Fischer's task consisted mainly in calling the attention of the zoologists assembled in Paris to the points which present the most interest in the line of distribution, ancient and present; on the insular faunas, especially when the islands considered are far from all main land, and have, most likely, never been connected with it, (such as volcanic islands, of which the Hawaiian group wards a very interesting sample); on geographical connections—palæontological and actual—between Northern America and Northern Europe; on the extinct race of horses in the United States; on Wallace's line in the Malay Archipelago, etc. M. Fischer's report is a very able
document, which should be attentively read by all zoologists setting off for some distant scientific expedition, in order to learn which points—besides those they intend to study—are of general interest, and which call for facts and documents supplementary to those already obtained. Since Darwin's views have been made known, many points in natural history have acquired a leading interest, and those to which M. Fischer alludes are prominent among all for the theory of dispersion, variation, and natural selection. M. R. Blanchard's very elaborate report is also a very useful one. Unfortunately, the meeting was not able to discuss it thoroughly, and in 1872, at the next meeting, the discussion is to be resumed. Steps must be taken, by a common action of all zoologists of note and repute, to prevent some maniacs from constantly altering the names of the oldest known species, under the pretense that they are revising the group or family, as the case may be, and confusing all zoological notions. The example has, unfortunately, been set by a great authority—by Linnaeus, who renamed the whole monocotyledons. The tendency is now to do away with many of the names he has imposed, and to revert to the former ones, and it is fair the thing should be done.

Psychologists will be interested in reading a small work by Guay on the origin of the idea of time, and another by Tissot on dreams generally considered. Both of these books have been issued by Alcan in Paris, who has also published a work by Lombroso on criminal anthropology. Lombroso is the head of an Italian school of psychologists who hold that criminals belong to a definite abnormal anthropological type, and constitute a human variety. His ideas are but very respectfully accepted in France.

One more book I must signal on modern chemistry, by A. Trebaullen, on the comparison of the atomic theory with the equivalent notation. The author discusses freely the advantages and inconveniences of both systems, and concludes in favor of the atomic notation, as might well be expected.

II.

PARIS, April 22, 1890.

[Specialy Observed for Popular Science News.]

METEOROLOGY FOR APRIL, 1890.

Temperature.

<table>
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<th>Average Thermometer, Lowest.</th>
<th>Highest.</th>
<th>Range.</th>
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<tr>
<td>At 7 A. M.</td>
<td>41.2°</td>
<td>65°</td>
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<tr>
<td>At 12 m.</td>
<td>44.8°</td>
<td>67°</td>
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<tr>
<td>At 9 P.</td>
<td>43.6°</td>
<td>79°</td>
</tr>
<tr>
<td>Whole Month</td>
<td>44.5°</td>
<td>78°</td>
</tr>
<tr>
<td>Average</td>
<td>44.3°</td>
<td>78°</td>
</tr>
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</table>

The month has been warmer than usual, and remarkably fair for April. The lowest point reached by the mercury, at the hours of observation, was 36°, on the morning of the 2d and evening of the 5th. The highest was 72°, on the 23d. The first day was the coolest, with an average of 36.33°; the 2d was nearly the same. The 24th was the warmest day, averaging 63°. The 24th and 30th were also warmer than the mean of the last twenty Aprils, which give a range of 12.44°, as shown above. The lowest daily range was only 2°, on the 9th; the highest 24°, on the 6th. The excess of heat since January 1 has been 303°, a daily mean of 4.19°—a remarkable excess for the first third of the year.

SKY.

The face of the sky, in 90 observations, gave 63 fair, only 3 cloudy, 16 overcast, and 6 rainy,—a per-

Perc. 

The amount of precipitation the past month, including 2 inches of melted snow, which fell on the first morning, was 2.66 inches, while the average for the past twenty-two Aprils has been 3.87 inches, with extremes of 1.20 in 1889, and 8.30 in 1870. There was no trace of rain from the 10th to the 24th. The largest amount at one time was 0.05 inch, on the 27th; nearly the same amount fell on the 9th. The amount since January 1 has been 19.36 inches, which is a little above the mean (19.02) for those four months.

PRESSURE.

The average pressure the last month was 30.044 inches, with extremes of 29.53 on the 9th and 10th, and 30.38 on the 2d and 26th,—a range of 0.85 inch. The average for the last seventeen Aprils has been 29.974, with extremes of 29.725 in 1884, and 30.273 in 1877, for a range of 0.37 inches. The sum of the daily variations was 4.16 inches, giving an average daily movement of 0.023 inch. This average the last seventeen Aprils has been 0.18, with extremes of 0.39 and 2.39. The barometer has been unusually high for April, in harmony with the usual fair sky in such connection. The largest daily movements were 0.21 inch on the 4th and 5th, and 0.42 on the 9th and 27th.

WINDS.

The average direction of the wind the past month was W. 4° to N., or nearly N. W., which is a very near average of the last twenty-one Aprils, viz., W. 40° to N. The extremes have been E. 15° to N., in 1877, and W. 95° to E. 1885,—a range of 144° to 33° from a near N. to E. to W. by S., or nearly ten points of the compass.

In general, the present April has been distinguished for a fair sky and high pressure, for small precipitation and moderately high temperature, which, in connection with a remarkably warm winter, has given us a spring about one week earlier than the average for the last eleven years. That in 1886 is the only earlier than the present. Those in 1883, 1840, and 1839 were ten or twelve days later than the present.

COMPARATIVE METEOROLOGY OF NEW ENGLAND.

For March, 1890, gathered from the Bulletin of the New England Meteorological Society.

<table>
<thead>
<tr>
<th>Average</th>
<th>Rainfall</th>
<th>Pressure</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass.</td>
<td>10.14 inches.</td>
<td>The table will bear careful study.</td>
<td></td>
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NATICK, May 5, 1890.

Specially Computed from Popular Science News.

ASTRONOMICAL PHENOMENA FOR JUNE, 1890.

On the morning of June 3 there will be a lunar eclipse. The moon will approach very close to the shadow of the earth; but, owing to the uncertainty of the effect of the earth's atmosphere on the size of the shadow, it is doubtful whether the moon will be even partially eclipsed. The time of nearest approach is about 2 A. M., Eastern Standard time. There will be an anamalular eclipse of the sun on June 15, which will be invisible in the United States. The moon is so far from the earth relative to the sun, that its apparent diameter is less than that of the sun. The path of annularity begins in the Atlantic Ocean, a little north of the equator, runs through Northwestern Africa, the Mediterranean, and Asia, ending in Iran. The eclipse will be partial throughout Europe.

Mercury is a morning star throughout the month, and comes to greatest western elongation, 25°, on June 23. It will not be in very good position for observation, however, owing to the fact that it is south of the sun at the time, and it probably cannot be seen before sunrise. Venus is slowly increasing in distance from the sun, and is a very conspicuous object in the western sky soon after sunset. At the end of the month it sets about two hours after sunset. Mars is in fine position for observation. It passed opposition on May 27, and it makes its nearest approach to the earth on the night of June 4-5. It will then be about 45,000,000 miles distant.

At the most favorable oppositions of the planet, when it is in perihelion and the earth in aphelion, the distance may be less than 37,000,000 miles. It is on the meridian, at rather less than 30° altitude, about 11.30 P. M., on June 1, and at about 9 P. M. on June 30, and rises about four hours earlier. It is in the constellation Scorpius, and moves westward about 7° during the month. On June 12 it passes a little south of the second magnitude star Delta Scorpii, the distance being about 0.5000 of the diameter of the moon. Jupiter rises in the southern sky at about 11.30 P. M. on June 1, and at about 9 P. M. on June 30. It is in the constellation Capricornus, and moves westward about 10° during the month. Uranus is in the constellation Virgo, 20° north and 17° east of Spica (Alpha Virginis). Neptune is in Taurus, a morning star, and is very near the sun.
The Constellations.—The positions given hold good for latitudes differing not many degrees from $40^\circ$ north, and for 10 P.M. on June 1, 9 P.M. on June 15, and 8 P.M. on June 30. Bootes is in the zenith. Libra is on the southern meridian, about halfway up, and Scorpius is a little below and to the east of the zenith. Cepheus is a little below and to the right of the pole star, and Cassiopeia is near the horizon, a little east of north. Auriga is just setting, about 20° west of the north point. Ursa Major is in the northwest, high up. Gemini is setting, a little north of west; Cancer is a little above, to the left; Leo is above Cancer, and nearly due west. Virgo is in the southwest, about halfway up.

Lake Forest, Ill., May 3, 1890.

M.

Correspondence.

Brief communications upon subjects of scientific interest will be welcomed from any quarter. The editors do not necessarily share the views and judgments presented by their correspondents.

SAFETY IN PREPARING OXYGEN.

Editor of Popular Science News:

An editorial in the current number of the Popular Science News notices a disastrous accident that occurred while oxygen was being generated in a public school at Lexington, Illinois. As I am deeply interested in the subject of science teaching in public schools, I sincerely regret both the fact of such accidents and the publication of them, unaccompanied by a statement of such precautions as will help to prevent their recurrence.

During the past eight years, each one of more than one thousand students—mostly girls—has generated oxygen at least eight or ten times in our laboratory here, without a single explosion occurring. Therefore, I hope you may place in your valuable journal a brief account of how we avoid such accidents, in order that all may be encouraged in performing such simple school experiments as may serve to stimulate the minds of the young with facts that enrich intelligence and excite mental activity.

The explosions that occur while generating oxygen are usually attributed to chemical dust as an adhesion in the manganic oxide; but a far more common and danger source of danger consists in the fact that careless druggists sometimes sell "black antimony" (antimonic sulphide) for manganic oxide—the two resembling each other in being black and pulverulent. "Black antimony" and potassium chloride are constituents of some exceedingly powerful explosives, and any attempt to generate oxygen from such a mixture proves dangerous to the most unpracticed hand, known by personal experience.

In order to avoid the possibility of such accidents, a small quantity of the oxygen mixture should be heated in an open receptacle—a common tin teaspoon answers the purpose well. If either antimonic sulphide or charcoal be present in danger proportions, the mixture in question will explode violently; but without doing any harm to the materials for generating oxygen be thus tested before they are put upon the laboratory shelves, there need be no fear of such sad disasters as that at Lexington; for, with such precautions, generating oxygen is far less dangerous than the necessary daily experiment of lighting an ordinary "coal-oil" lamp. Very truly yours,

Geo. R. Kleberger.

State Normal School, San Jose, California, April 24, 1890.

[Note by the Editor.—Another cause of explosions in preparing oxygen gas, is from the delivery-tube becoming stopped up by particles of solid matter carried over mechanically. We have even known a slight reverse fuse from the heat of the escaping gas. The precaution of using large-sized delivery-tubes is obvious.]

"THE EVOLUTION CLUB" OF CHICAGO.

Editor of Popular Science News:

A few gentlemen in this city, believing that science can be advanced in a manner at once socia-ble and pleasant, recently issued a call for a meeting of scientific men to form a club with the above name. On the first evening there were forty-two present, and twenty more will attend the next meet-ting. The plan of the exercises is somewhat novel. We meet at one of our best hotels, the Tremont House, at 6 P.M., and at 6:30 P.M. sit down to an excellent dinner, after which short papers are read and addresses made until 9:30 P.M., when, without any parley, the president declares the meeting ad-journed. As our forefathers of fifteen hundred years, Americans manages all details. It appoints a new president for each meeting, selects the subject for considera-tion, and chooses one or two persons to lend in the discussion. The leaders are allowed fifteen minutes, but subsequent speakers only eight minutes. This insures condensed and terse statements, and, es-pecially with such comfort as a cigar can give to a man not tired with one hour's exercises from assuming a wearisome and monotonous character. The meetings are held every alternate Wednesday evening, and the expense is $1.00 for each dinner, and $1.00 per year to cover the cost of stationery and printing. The name of the club was chosen because it may with propriety include every subject of living interest at the present time, and because it is worth at least the choice of members. The society is not de-signed for direct missionary work. Indeed, it would seem cruel to inveigle a heathen into such a society, and then, fifty against one, maul him to mummy. The design is rather to so cultivate the members, by mutual aid, that one may overcome a thousand.

H. D. Garrison.

Chicago, Ill.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

SUBSCRIBER, Allegheny, Pa.—In dissolving potash in water, the temperature of the liquid nearly reaches the boiling-point. What is the cause of the heat?

Answer.—The caustic potash unites chemically with the water, and, as in all chemical reactions where atoms combine with each other, a definite amount of heat is generated.

B. S. T., Michigan.—What becomes of the energy of running water after it reaches the ocean?

Answer.—The energy radiated from the sun raises the water from the ocean to the higher levels of the land. A mass of water at any distance above the sea-level represents so much potential energy. As the water falls back to the ocean-level, it gives out this energy, which is finally converted into heat by friction, either directly, or by an intermediate trans-formation into work or power, as illustrated in every water-mill.

B. T. H., Kansas.—A travelling showman in this vicinity has been amusing his audiences by lighting cigars, gunpowder, etc., with an icicle. There is, currently derivation, and you perhaps can explain how it is done.

Answer.—It was undoubtedly accomplished by the aid of a small bit of metallic potassium or sodium, containing the alkali in a state of purity. When its crystals are ignited, these metals, when moistened, decompose the water with great violence, developing so much heat that the escaping hydrogen gas spontaneously ignites. These metals are not quite safe to handle, and had better be left alone by inexperienced persons. Serious accidents and explosions have resulted from their careless use.

J. M. N., Oregon.—What is the longest possible duration of a total solar eclipse?

Answer.—About four minutes is the greatest dura-tion of totality, and it is much usually less than this. The greatest width of country which such an eclipse can cover is 273 miles. Laughable mistakes have often been made by unscientific noveltists, who have introduced solar eclipses into their stories, in which the phenomena described varied widely from those possible under astronomical laws.

E. N. S., New Bedford.—You will probably find crystalline sodium, which is sold by all druggists, a good substitute for lemon juice in removing fruit stains from the hands. It is the same acid that occurs in the fruit itself.

LITERARY NOTES.


This favorite guide-book, now in its nineteenth year, has been carefully revised for the present season. It covers the ordnary range of summer travel in Britain and the continent, and is written in a style eminently sensible and practical in the information and advice it gives. It is compact and yet compre-hensive. Enough for the enough the visitor, but not too much for the tourist who wishes to be served and entertained by the most list of minor objects which it is better to ignore than to try to see in a brief trip. It is particularly valuable for the traveler or of hotels and transportation— not only first-class, but those less expensive. Indeed, it seems to be the only book of its class which is given to the present condition of affairs as well as of those who are not obliged to count the cost of a foreign tour. The maps are also much the same the English guide-book published on this side of the ocean.


This little book contains a concise discussion of corpulency and its cure by an dietetic, according to the latest views on the subject; followed by over four hundred receipts for dishes suited to persons who desire to reduce their weight. It might have been entitled "A Cook-Book for the Corpulent," and in this respect it is, so far as we are aware, a new departure in the anti-fat" literature. The cul-tinary receipts are English, but the great majority of them are none the less available in American families. The book has, moreover, been adapted to the American kitchen, and contains many receipts given by Sir William Farr, as he remarks in his introduction, "very many of the recipes will be found extremely useful to the household, and perhaps of special value in the treatment of obesity." Not a few of them will be new to our cooks.

Essentials of Poisonous Medicines, Toxicology, and Hy-giene, by C. E. Armand Semple. Published by W. B. Saunders, 913 Walnut street, Philadelphia.

Nearly every physician must, at some time, deal with a case connected directly or indirectly with his profession, or, in other ways, to have dealings with courts and lawyers. This little work gives many useful facts for such cases, and may be the means of saving much trouble and annoyance. The pages on hygiene, and the directions for the classification of poisons, are a valuable addi-tion to the work.

The value of this admirable treatise on chemistry is evident by the quick succession in which the editions follow each other; and, in fact, for a general work on all the different branches of the science, this will continue among the foremost. It is fully brought up to date, and—especially in the department of organic chemistry—many important changes and additions have been made.

The same firm publish A New Medical Dictionary, by George M. Gould, M. D., a compact volume of about 500 pages, but which, nevertheless, contains full definitions of all the words and phrases usually met with in medicine. While equally useful with the more bulky works of a similar character, its greater convenience and lower price will commend it to all.


Electrical accumulators, or storage batteries, are constantly coming into more extended use, and, although the absurd predictions first made in regard to these have not been realized, they have a definite and prominent place in electrical technology. This is the first book published that is entirely devoted to the subject, and written by an experient and authority on electricity. Everyone interested in the subject, either practically or theoretically, will find it a most valuable work.

Practical Mining, by John G. Murphy, E. M. Published by D. Van Nostrand Co., New York.

Investments in mining stock have an unenviable reputation; but the time has arrived when the risk of total loss of capital, and those who intend to make such ventures would do well to first obtain some knowledge of the sciences of mining and metallurgy. Mr. Murphy's little book will be found especially valuable to such persons, and practical mining engineers will also find it useful as a hand-book to be consulted while inspecting and examining mines, and for use in the field.


This is one of the most comprehensive commercial works ever undertaken, and should be in the possession of every business man. It comprises a list of every article manufactured or produced in the United States, with the address of the most reliable manufacturer or producer, their prices, and the number of dollars, according to binding. For sale by the New York Science News Co.

Every lover of birds should read the delightful work by Mr. Flagg, entitled A Year With the Birds, and published by the Educational Publishing Co., 249 Bromfield street, Boston, at 75 cents. This, with its companion book, A Journal of the Birds, will furnish a great amount of pleasure and instruction to all lovers of Nature.


The Suppression of Consumption by G. W. Hambleton, M. D. N. C. Hedges, 47 Lafayette place, New York.


POPULAR SCIENCE NEWS.

Medicine and Pharmacy.

[Original in Popular Science News.]

The Care of the Eyes.

CAPTAIN Maryatt has justly said: "A man may damn his own eyes, but has no right to exercise a similar prerogative over other people's visual organs;" and, while we shall not presume to "damn" at all, we shall endeavor to lead those who are suffering from remedial ocular defects toward the inconvenience, the headaches, and other afflictions which such defects occasion—to conduct, as it were, their visual organs through the courts of retributive justice, so that if they have given trouble, they may not only be worn out, but also indicted, condemned to trial, and sentenced to proper correction.

Throughout life, from youth to old age, there is a process of change occurring in the refractive media of all eyes, so that everyone who attains to a ripe old age will, at some time or other during his or her existence, be a fit subject for the oculist—or, in other words, will need to wear glasses. In young people this change is usually gradual and imperceptible, but from middle life onward its effects are most perceptible and alarming. A number of persons who are at least 75 years of age, while young will require glasses for reading when they have passed beyond the age of forty, and those who are near-sighted before this age is reached, need glasses in early life, if the degree of nearsightedness (myopia) be at all great, and yet they may be able to read perfectly well without glasses when fifty, or even sixty years of age. Persons who are alike weak in this category are not to consider themselves as lucky exceptions to general laws, and are usually very proud of their sharp sight.

But not only does the eye undergo certain normal changes as age advances, but it may be abnormally formed; and hence optical defects are not only possible, but quite common in infants. The eye is a camera, and, while it may be free from disease and perfectly sound, still vision may be bad because the rays of light are not focused upon the retina. Hence comes the necessity for wearing glasses, for, by placing suitable lenses before these eyes, normal, distinct vision may—within certain limits—be obtained. It is not generally known that it is the exception, and not the rule, to find eyes that are perfect in shape, or, technically speaking, that are free from myopia. What are nearly all eyes, however, are eyes that are not perfect in shape should have glasses fitted to them, for some errors of refraction do not interfere seriously with vision, and never give rise to disease or decided discomfort to the patient; but, as a rule, persons whose eyes are "weak," or who suffer from complaints similar to those which we have just considered, should present themselves to some competent oculist, and secure an examination and subsequent correction of any existing errors of refraction. Let me briefly say that by "competent oculist" is meant one who has not only a knowledge of the delicate mechanism of the eye, but of the other organs of the body as well; for abnormalities and diseases of the eye link themselves with peculiar conditions of other portions of the physical economy. Moreover, the competent oculist is a doctor of medicine, although he may devote himself entirely to the study and practice of ophthalmology. The jeweler and the peddler are not proper persons to fit glasses; and, while it is true that certain opticians are conscientious enough to send the party to an oculist when they find that they cannot correctly fit a patient with glasses, still there are opticians who are less conscientious, and who, lest the acknowledgment of incapacity might lower their standard in the public mind, or cause the loss of a customer, advise glasses which are not correct in every respect.

Moreover, this oculist has been drilled at his command for the detection of errors of refraction which cannot be applied by the optician, and possesses a knowledge of the proper correction of these errors which years of study and experience can alone bestow. There still exists quite a prejudice in the minds of many against the use of glasses, but why such prejudice should exist is often summed up on any other grounds than with fairness and ignorance. All ophthalmologists teach the great necessity of correcting errors of refraction by wearing proper glasses, and we shall herein endeavor to show some of the undesirable, and even portentous results of permitting optical defects to go uncorrected. As a rule, glasses add nothing to the appearance of the wearer, and they are often a definite object to be attained by their use, patients being better without them; but where they are indicated and advised by one competent to decide, neither vanity nor prejudice should prevent their being employed.

The purposes for which glasses should be prescribed may be briefly stated. First, to prevent disease of the eyes from "eye strain;" second, to aid in the curing of certain diseases and abnormal conditions, by releasing all strain and giving the eyes rest; third, to enable the patient to better pursue his avocation in life; and fourth, for his comfort and convenience. Our consideration of these items must necessarily be brief and, consequently, imperfect. The first two are of paramount importance, and afford material for many chapters in the study of refraction. In general, it may be said that all errors of refraction which reduce the patients' vision to any extent below the normal, or which produce any marked change in either the near or the far points, require correction by the use of suitable glasses. These errors are: hyperopia, or far-sight; myopia, or near-sight; presbyopia, or old-sight; and astigmatism, or irregular sight.

Let us first consider the dangers from hyperopia. There is a constant strain, known as "an effort of accommodation," upon every far-sighted eye when viewing both near and remote objects. This effort of accommodation is a muscular exertion, and hence a tax upon the nervous system, and, if long continued, may produce weakening and other deleterious effects. Far-sighted eyes are used for reading or near work, for any considerable period of time, the effort required produces congestion and redness of the eyes, a larger flow of blood is sent to them, and hence there is an increased secretion of mucus, or "wetting of the eyes;" and, if the work be still continued, dizziness, headache, a feeling of sickness, or even the production of delirium. Far-sighted children another condition not infrequently arises as soon as they are made to apply themselves to books. The child begins to have a cast in the eye—that is, to squint or "cross-eyed." At first the squint may be periodic, and appear only when close work is undertaken, but, unless means are taken to correct it in time, it may become permanent. In the great majority of cases, habitual squint is due to hyperopia. An excessive effort of accommodation is always associated with increased convergence, and, as a far-sighted eye must always increase its accommodation in order to gain clear vision, it naturally squints inward. Nervous switchings of the eyelids and other portions of the face are sometimes occasioned by hyperopia. Fortunately, the condition of hyperopia can be easily corrected by suitable convex spherical glasses, and thus the conditions of wearness and exhaustion

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of the eyes, astigmatism of the eyes, twitching, head-
ache, etc., can be prevented; or, where they have already occurred, obvious measures of long-sight, they are usually at once and permanently removed as soon as the hyperopia is corrected by appropriate glasses. Squint is also thus prevented by glasses, and in a certain number of cases where it is already manifested in children, it may be remedied by cor-
recting the existing error of refraction.

Myopia, or short-sight, is often hereditary or con-
tracted from prolonged strain-
ing of the eye. This condition is not infrequently the precursor of serious, and sometimes irremit-
table impairment of vision, and hence skilled advice and proper glasses are of highest importance to the patient in preventing the accidents to which every myopic eye is liable. In high degrees of myopia there is an excessive demand made upon the muscles that converge the eyes, in the efforts made to keep them both fixed upon small objects held close to the face, and sometimes, being unable to withstand this strain, they give out, and one eye is then turned outward by the opposing muscle, forming a diver-
gent squint. Very serious intra-ocular changes, that are beyond the reach of therapeutic measures, are sometimes occasioned by high degrees of myopia. Slighted short-sightedness, and all other refractive errors, are the most rigid hygiene. The vision should be rendered normal—except in very high degrees—by the use of concave spherical glasses, and everything which tends to congest the eyes—such as reading or write-
ing in the recumbent or stooping posture, or by faulty light—is to be most carefully avoided.

Presbyopia, or the far-sight of old age, is caused by lack of accommodation, and, although the distance vision remains unimpaired, there is a con-
stant recession of the near point. This is first noticed by the patient when he finds that he is obliged to hold his paper farther away from his eyes than before, and that the print is not so clear as formerly. Presbyopia is easily corrected by convex glasses for reading, and they should be employed as soon as the affection becomes manifest. It does not usually cause inconvenience until after the age of forty.

Far-sightness, when not corrected by appropriate glasses, causes the condition of presby-
opia to manifest itself earlier in life than it does in eyes not thus affected, or in those in which the error has been properly corrected. In this, far-sight, the refraction differs in different portions, or meridians, of the eye, and the retinal image is thus confused. This condition is usually congenital and may be heredi-

ary; it is, however, sometimes acquired, often occurring after inflammations of the cornea, and may even be occasioned by the use of improper glasses. It is a very common optical defect, and is corrected by convex glasses; or, with the variety—by con-
cylindrical lenses, or by combining cylindrical with either spherical or cylindrical lenses. Irregular astigm-
atism cannot be entirely corrected. As astigmatism is either a variety of hyperopia, or of myopia, or a mixture of both, it can be productive of the train of symptoms already shown to be occasioned by these varieties, such as headaches, nausea, and nervous irritability—and conse-
sequently, in all varieties of astigmatism, suitable glasses (preferably spectacles) should be worn con-
tinually, for both distant and near vision.

A different refractive condition in the two eyes of the same person is quite common. One eye may be correct, and the other long-sighted or short-sighted; or they may have different degrees of the same defect; or, again, one eye may be long-sighted and the other short-sighted. And since, in such cases, the condition of one eye can scarcely be improved by the same glass adapted to correct the error in the other, the vast impotency of selecting glasses at random from the counter of a dealer, is plainly shown. Obvious measures of long-sight, they are usually at once and permanently removed as soon as the hyperopia is corrected by appropriate glasses. Squint is also thus prevented by glasses, and in a certain number of cases where it is already manifested in children, it may be remedied by cor-
recting the existing error of refraction.

Heterophoria, or weakness of some one or more of the ocular muscles, is very often a complication of some error of refraction. In this condition there is a continual strain upon the weaker muscle in order to do its work, and this alone will cause very many headaches, neuralgias, and general nervous symptoms. We have already considered this sub-
ject in cases where the irregular action of the muscles of the eyeball is sufficiently marked to produce squint, but oftentimes there is merely a loss of function, which can be determined only by careful examination. This condition, which is termed muscular insufficiency, is overcome by correcting the refractive error, and combining the glasses thus required with proper, selective spectacles.

Let us now look at some common troubles not generally known to be due to ocular defects. Not a small number of reflex neuritis are caused by these defects. Headaches which come on after reading, reading, watching a play, or otherwise using the visual organs in a special direction for a period of time, are usually the direct results of these defects. Neuritic hemorrhage or central depression, or anoma-
lia, chorea, St. Vitus' dance, and even epilepsy, have been shown to be directly dependent. In certain cases, upon refractive errors for their causation. Out of nine cases of epilepsy in which there were optical defects, recently experimented upon, four cases were positively cured by correction of the defects; two of the cases were entirely relieved for periods of four and six months, respectively; in another case the fits were greatly reduced in number during a given period of time, after the application of proper spectacles; while two cases were not influenced by glasses. Recurring ills are not in-
frequently due to some optical defect, and when thus occasioned they are to be cured, not by pulling out the lashes, but by having the defect corrected. In making a choice between these two things, one is enabled to pursue life's duties to better advantage, and with increased convenience to himself, need not be insisted upon. Some people go through much or all of life content—through ignorance or preju-
dice—with seeing but half of their surroundings, and often enduring the ills which we have seen to be occasioned by these defects. Hence, it is true to say, that many people glasses are a revelation—revealing powers and beauties of vision never before known to exist.

In conclusion, let me repeat, that in the condi-
tions herein briefly considered, glasses not only increase the power of vision and greatly relieve the work of the eye, but they actually prevent the occurrence of certain diseases of the eye, and of serious and sometimes fatal affections in other parts of the eye, and in the condition of vision in general, they may, in every stage of vision, in every case, fill the place of the eye, and in the condition of vision in general, they may, in every stage of life.

J. H. E.

**DISCRIMINATING PROVIDENCE.**—It is remarked as a singularly thoughtful dispensation of Providence in Boston, that the influenza attacked most frequently those who were deepest in the error of hyperopia, and that those who worked by the piece or day were either spared entirely or had light attacks. "Tem-
pering the wind to the shorn lamb" is what one paper calls it.
as public school educations go,—is old enough to enter a school of pharmacy. She will have to put her whole attention to it, be interested in it, and study faithfully. In two years she ought to graduate. In the meantime she should be in a drug store a few hours each day. She should always be neat, cheerful, and attractive, wearing sensible gowns and low-heeled, easy boots, but not forgetting pretty laces and ribbons.

I remember the story of the old, rough miner who went into a store and was struck speechless by the bright eyes and sweet smile of the young lady behind the counter.

"Well, bless my soul!" he said, at last, taking off his hat and bowing to the ground; "I ain't seen a w'man with such bright eyes since m'little sister died. I didn't want a thing when I cum in lyer, but I'm a'gon't buy somethin' now, yuh bet!"

The following day that young lady's salary was raised, simply because she had given as kindly a smile to an old, shabby man as she would have given to a millionaire. This, by the way, is a true incident.

The young girl who enters a drug store must be willing to do anything and everything that would be necessary to make her position important, to do it cheerfully—never grudgingly. She should even be willing to wash bottles and clean lamps, sweep, dust, and polish show-cases. She must have no false pride. Such work is no harder, and certainly no more degrading, when done in a store than when performed at home. If you are ashamed to work you will never amount to anything so there is no use trying to help you. If you are ashamed to work, by all means marry some old man for his money and dawdle your life away as a society queen; shop, call, dance, receive, lounge about in tea-gowns, and have your picture in all the illustrated newspapers, as the "young and beautiful Mrs. So-and-So," and be sure that you wear a low gown and good brogues. This is what women were created for—a long time ago.

But, girls, if you want to work, you will find nothing so pleasant, so interesting, and, withal, so fascinating as the drug business. Your studies will be difficult, your discipline severe, your apprenticeship hard, and your trials and disappointments many; but you will be rewarded. By the time you are twenty-five your name will be a household word, and you will be a successful business woman, and you will be independent of everyone and proud of yourself. Do not ever be content to be a second-rate drug clerk though, for he comes next to the duds in insignificance. Be first-class, be thorough, be self-reliant, be conscientious, be affable, be cheerful, and, above and beyond all,—in the drug business,—be sure.

There is, I know, a mighty prejudice against "w'men folks 'a a 'pochtery shop;" but this must be lived down. Be the first, or among the first, to live it down. To be a thorough pharmacist and a successful business woman means that you must be proud of yourself; means that you will be sought by employers, instead of seeking employment; means that you will be busy and happy and independent. Besides, it is a business that thrives not over run, and a business that will not be supplanted by some new invention for doing the same work. We will always require doctors and doctors' prescriptions, and we will take them to the most competent prescriptonists to have them compounded.

I know a woman who went to a young Oregon town, where there were no drug stores, where swearing, fights, and murders were of almost nightly occurrence. She took a position in a drug store, and she found her pathway full of thorns. Everyone looked at her suspiciously. They were afraid of her; afraid she didn't understand what she was about; afraid she would give them something instead of Epsom salt, or laudanum instead of paregoric; afraid of anything and everything under the sun,—simply because she was a woman. But she did not grow discouraged. She never gave the thought of failure an instant's lodgment in her brain. She worked cheerfully and faithfully. If a man rudely and surely declined to let her "fill his prescription," she swept him a hand of revolver cards for his children,—although the little hypocrite knew that he had none. When an old farmer had kept her standing half an hour while he looked over books, and finally asked for an "alumline," she gave it to him as cheerfully and as prettily as if it had been twenty dollars' worth of drugs. She never became nervous or flustered; as railroad men say, she never got "rattled." She was always sure she was right, which gave her an air of self-possession which invited confidence. She was a good saleswoman. She learned to buy and to sell; and she gradually worked her way to success. Today people enter that store and inquire for her, instead of asking rudely, as they once did, if there "ain't a man 'bout th' shop." Every railroad man, every gambler, every woman (good or bad), and every child who is sick, is certain that the country knows her and respects her.

"Why," said a society lady who was out riding with her one day, "did that roughly-dressed man lift his hat to you?"

"He did," she replied, amusingly; and what is more, I gave him my sweetest smile, and was more sincerely glad to have him do me honor than I would be to one of your 'dudes' go down on his knees to me."

But, first of all, girls, make up your minds that you want to work, and to work well. Never do anything by halves. Do not think you can rush through a course of pharmacy and enter a drug store and carry everything before you. Impress upon your mind that those long rows of glittering bottles hold life and death, and that each one stopper must be removed with care and with steady fingers and clear eyes. Only think how many, many different things there are, and each has from one to six different names,—and you must know them all. Think, too, that you must know how each looks, smells, tastes; its properties, its dose, its antidote; if it be a poison. You must know a very great many of these things. You must keep your nose for new things and for old things still more. I realize what I am taking upon myself in making that last assertion, and I do not hesitate to repeat it. In a drug store, you may be wise as a serpent, but if you are so unfortunate as to look nervous or uncertain, it is all up with you. There is another thing, too. Do not expect to be "favored," or to have things made easy for you because you are a woman. Be cunningly, always, but if you take a man's place, do his work also. If your employer tries to make your work lighter, accept and appreciate his kindness; but do not expect it.

Girls, do you want to try it? If you do, and if you try honestly and patiently, you will succeed, and you will be delighted with your work. Anyone who has things made easy for you because you are a woman is an enemy to you. Be cunningly, always, but if you take a man's place, do his work also. If your employer tries to make your work lighter, accept and appreciate his kindness; but do not expect it.

Do girls, do you want to try it? If you do, and if you try honestly and patiently, you will succeed, and you will be delighted with your work. Anyone who has things made easy for you because you are a woman is an enemy to you. Be cunningly, always, but if you take a man's place, do his work also. If your employer tries to make your work lighter, accept and appreciate his kindness; but do not expect it.

I have known drug clerks who were competent, honest, industrious, and of good habits, who were not worth $20 a month to any employer. Why? Because they were afraid. They knew that Sulph. Magnesia is Epsom Salt, it is one; but they spelled teaspoonful with a double l, "several," "several;" "daily," "daily;" they had a dreary, vacant look in their eyes, as if they might be composing spring poems by the yard; in arranging a show-case, they placed all the dressing-cases, all the toilet-cases, all the reds, blues, and greens together, instead of arranging them so the colors would blend and soften each other, and gave as their excuse that "it made things sort o' handy!" But druggists are always on the lookout for good clerks, and they pay them well. Therefore, my dear girl, be a good one; be a thorough one; be a sure, a firm, a competent one; be one that everybody will want. You can do it. You are as bright and as self-reliant as your brother; and if you will just make up your mind to take the bitter along with the sweet, it will all come right. And Miss So-and-So, Ph. G., will answer in a firm, strong, business hand many of those little advertisements of "Wanted—a competent drug clerk,"—and she will get the situation, too.

OPEN-AIR EXERCISE IN CONSUMPTION.

Dr. H. A. Bowditch, of Boston, one of the most eminent sanitarians in this country, in an interesting paper read before the American Climatological Association, gives some interesting personal observations relative to the benefits of consumptive patients from exercise in the open air. He says that his father, at thirty-five years of age, had all the symptoms of consumption, and was situated in the midst of the most feeble and debilitated characters, into which he was thrown by his profession. He travelled on this tour 748 miles, and returned home greatly improved in every respect. He lived thirty years after this, dying at the age of sixty-five years of cancer of the stomach. It was his custom during these thirty years to walk two or three times daily from one and a half to two miles.

Further, Dr. Bowditch says his father married his cousin, who died, after many years of infirmity, of consumption. There were eight children as the result of this union, six of whom reached adult life. According to all laws of heredity it would be expected that at least there would be a marked predisposition to lung disease. The facts show, however, that of ninety-three children and grandchildren not one showed the least trace of consumption. The conclusion is, therefore, that the daughter of this father having required all his children to take all exercise out doors possible, knowing the great benefit that had come to him from such a course.

He says: "If any of us, while attending school, were observed to be drooping, or made the least pretense even of being not exactly well, he took us from school, and very often sent us to the country to have farm life and out-of-door play to offset our heart's content. In consequence of this early instruction, all of his descendants have become thoroughly impressed with the advantages of daily walking, of summer vacations in the country, and of camping out, etc., among the mountains. These habits have been transmitted, I think, to his grandchildren, in a strong degree, and to his great-grandchildren, with all the care his father had required all his children to take all exercise out doors possible, knowing the great benefit that had come to him from such a course."

In conclusion he said: "I submit these facts and thoughts for candid, mature, and practical consideration and use in the treatment all are called to make of this terrible scourge in all parts of this Union. For my own part, I fully believe that many patients new die from the want of this open-air treatment. From fifteen to twenty-six of every consumptive patient will die daily from thirty to thirty-six miles; power to stay all day at home unless a violent storm is raging. When they are in doubt about going out, owing to bad weather, I direct them to solve the doubt, not by staying in the house, but by going out."
THE RELIEF OF DEFORMITY FROM PROMINENT EARS.

The deformity from prominent and projecting ears is oftentimes very distressing to the unfortunate wearer, and may lend a decidedly unattractive effect to an otherwise worthy and dignified individual. Many a person thus afflicted would be only too willing to undergo an operation to remedy the defect, if he but knew that such means of relief existed. It is true that the deformity is not a serious one, objectively speaking, but still it is well worthy of attention and treatment. The operation required is quite a simple one, and should be almost invariably successful if carefully performed.

The operation seems to have been first performed by the late Dr. E. T. Ely, of New York, who removed an oval piece comprising nearly the whole length of the auricle and through its entire thickness, thus including the skin on its anterior surface. This, of course, involved a scar which would always be visible from in front.

Dr. W. W. Keen, of Philadelphia, describes a similar operation in the *Annals of Surgery*, which he seems to have originated without knowing that anyone had preceded him in the matter. His operation is preferable to Ely's, since the only scar left is a linear one on the back of the auricle, which is usually invisible only by standing behind and looking carefully for it.

The operation, as described, is as follows: A long oval portion of the skin is removed from the posterior surface of the auricle, the cartilage being laid bare by its dissection. In the long axis of the oval excision of the skin, a long, narrow piece is removed from the cartilage itself, V-shaped on cross section, and the edges are sutured together. A great care must be taken not to cut through the skin on the anterior surface of the auricle. Stitches of catgut, three- or four in number, are passed through the skin on the sides of the wound so as to bring it together. The edges of the cartilage may also be united with a few catgut stitches, and this seems to be preferable, though the results have thus far been equable to that of a plugging. The great care is attended with free bleeding, which, however, is easily controlled. Antiseptics must, of course, be observed during the operation and in the dressings. The patient may be up and about the next day, but unless the stitches drop out they should not be removed before the tenth day, in order to secure firm union.—*Medical Review.*

MUSIC AS A MEDICINE.

BY EZRAH CUTTER, M. D., LL. D.

Mr. Thompson, of S. Maw, Son & Thompson, London, tells a story of his son Willie, aged six years, morbidly with typhoid—quite insensible, abdomen tympanitic, pulse falling, and said by his physicians "not to last the night out." Carbolic acid was given with some good effect, while the doctor staid up all night at the bedside; but the coma continued. Finally, the father, knowing that the boy was melancholy, killed a fowl of musick, procur'd a nice large music-box. He asked his son if he would like to hear it play. No response, and no sign of recognition. The music-box was set ageing. It was not long before his countenance changed and his body became uneasy. After a while he turned on to his side. The box was put behind his back. After another time he turned over to it, and came conscious so as to respond to questions. "Now see here," said Mr. Thompson, "this is for your own use, and shall be called Willie's music-box." The boy showed signs of pleasure and wished it playing. The result was reaction continued; he respond to treatment and recovered. Certainly, music was a medicine in this case.

MEDICAL MISCELLANY.

The latest strategy of a Paris paper for attracting readers is the engagement of two eminent physicians to attend gratuitously upon its annual subscribers. Recently the manager of the paper gave notice of one to subscribe for it any more; his subscription has expired. The doctor replied: "So also has B."

THE NUMBER OF DENTISTS IN GERMANY.—According to Borner's *Reichs-Medizin-Kalender*, there are 16,854 medical men and 514 dentists in practice among a population of 46,840,587 inhabitants in the German empire, while the number of chemists' shops is 4,671, and of hospitals 2,737. In the face of these figures it may be truly said that the dental profession is not overcrowded in the Fatherland.

COCAINE PENCILS FOR USE ON THE SKIN.—A writer in the *British Medical Journal* makes a suggestion which is easily convertible into a capital article for a cosmetic "special." It is, in short, a pencil, or "stick," for use on the chafed and irritated skin, or on skins very susceptible to insect bites, etc. He says that an addition of two per cent. of cocaine to the ordinary cacao butter pencils converts the latter into a cosmetic remedy, which gives almost instant relief when rubbed over the irritated spot.

TRANSPLANTING TUBERCULOSIS.—The State Board of Health of California has been greatly exercised over the danger to which it believed the State is exposed through the immigration of a large number of persons suffering from tuberculosis. It even suggested, in a recent bulletin, the advisability of establishing a strict quarantine against consumptives until measures of isolation and disinfection could be undertaken. The daily press of San Francisco has not been slow to take up the question, and the result has been a scare and a sensation of such magnitude that even the proposed prise-fight has been for the moment forgotten.

EDISON'S NEW PHONOGRAPH AS A UNIVERSAL ACOUOMETER.—Dr. Lichtwitz, of Bordeaux, (Annals of Otology) says that in his opinion the new phonograph combines all the requisites of a good acouometer. Its use will enable the otoologist to measure auditory acuity as accurately as the oculist is able to measure visual acuity, and by methods quite analogous. An acouometer, to be satisfactory, should possess the power of emitting all sounds and noises perceptible to the normal ear, including speech with all its varied inflections. It should, at will, reproduce sounds with uniform intensity and quality, so as to permit a comparison between the hearing power of different patients, as also of the same patient at different periods. It should also always be of the same construction, so that ariists of all hands may compare their observations. It should not occupy much space, nor require much time for employment. It should measure the hearing capacity, not only through the medium of the external ear, but also through the medium of the cranial bones. The new phonograph of Edison, as now used, fulfils all these requirements except the last. All methods heretofore employed are far inferior. None of them could furnish a fixed volume of sound for purposes of comparison at different periods and in different places. The results obtainable from the use of a watch, moreover, were never very reliable, it being impossible to eliminate accurately the effects due to expectant attention and imagination.

[Original in *Popular Science News.*]

MUSIC AS A MEDICINE.

BY EZRAH CUTTER, M. D., LL. D.

Mr. Thompson, of S. Maw, Son & Thompson, London, tells a story of his son Willie, aged six years, morbidly with typhoid—quite insensible, abdomen tympanitic, pulse falling, and said by his physicians "not to last the night out." Carbolic acid was given with some good effect, while the doctor staid up all night at the bedside; but the coma continued. Finally, the father, knowing that the boy was melancholy, killed a fowl of musick, procur'd a nice large music-box. He asked his son if he would like to hear it play. No response, and no sign of recognition. The music-box was set ageing. It was not long before his countenance changed and his body became uneasy. After a while he turned on to his side. The box was put behind his back. After another time he turned over to it, and came conscious so as to respond to questions. "Now see here," said Mr. Thompson, "this is for your own use, and shall be called Willie's music-box." The boy showed signs of pleasure and wished it playing. The result was reaction continued; he responded to treatment and recovered. Certainly, music was a medicine in this case.
bottle, in which the angle of the upper and lower faces is determined by the amount of inclination given to the tumbler. Although upon which the action of "Barker's mill" and all turbine water-wheels depends—is shown in Fig. 2, the only apparatus necessary being a clay tobacco-pipe and a little sealing-wax. Grind or scrape off the end of the stem, as shown in A, and cover it with a bit of sealing-wax, as in B, so that the aperture at the end is changed into one at the side. Then suspend the pipe by a long thread, attached to the bowl by another piece of wax, and fill the bowl with water. As it escapes from the opening in the side at the end of the stem, the pressure of the water on the opposite side will cause the pipe to move backwards, away from the stream; and, after a short time, the pipe will revolve quite rapidly in a more or less perfect circle.

To show the power of centrifugal force, take a bottle, fill it with water, and then invert it until all the water has, apparently, run out. One would naturally say that only two or three drops remained adhering to the interior, but, if a sheet of blotting-paper is placed on a table, and the bottle—having been firmly grasped as shown in the engraving—is moved rapidly in the arc of a circle, with the mouth directed towards the paper, a surprisingly large number of drops will be found to have been absorbed by it. This is due to a twofold action of the centrifugal force developed by the motion of the bottle. The considerable amount of water adhering to the inside of the bottle is driven out of the mouth, and also broken up into a great num-

Familiar Science.

SIMPLE SCIENTIFIC EXPERIMENTS.

A plain glass tumbler, one-third full of water, forms an admirable substitute for a glass or liquid prism, to illustrate the refraction and dispersion of a ray of light. Take a sheet of thick paper, cut a narrow slit through it, and hold it in the sunlight so that the image of the slit shall be thrown upon a sheet of white paper placed on a table beneath. At first only a bright image of the slit will appear; but, if the tumbler of water, held inclined at an angle,—as shown in the illustration,—is placed in the path of the beam of light, not only will the course of the beam as a whole be refracted, or bent out of a straight line, but the light itself will be more or less perfectly decomposed into its constituent colors, forming a miniature solar spectrum. The effect is rendered more striking by cutting two slits in the paper along side of each other, so that the light passing through one goes direct to the paper screen below, while the other goes by way of the improvised prism. An examination of the illustration will show that the glass of water really forms a true liquid prism, similar to the more perfect ones of bisulphide of car-
A well-known optical illusion is that produced by the common tall, or "stove-pipe" hat. Let anyone not familiar with the facts in the case, try to estimate the comparative lengths of the height and width of such a hat, and he will invariably make the vertical distance from one-quarter to one-half greater than the horizontal one. But, by actual measurement, as shown in the engraving, the line A-B is longer than C-D; so that the very stylish and well-proportioned hat there shown is really not a "tall" one by any means, but its height is only an optical illusion produced by the projecting curved brim of the hat, which deceives the eye into a false perception of the relation between its different dimensions. In connection with this subject, we may also mention the fact that a horse's head of average size is just the height of an ordinary barrel, although most persons would require the evidence of an actual measurement before being convinced.

The illustrations to this article are reproduced from La Nature.

[BRIEF STUDIES IN BIOLOGY.

BY PROF. JAMES H. STOLLER.

IV.

THE GRASSHOPPER.

At this time of year, no class of animals is more readily available for observational study than the insects. To those whose special interest is in making collections, the beautiful butterflies and moths tempt to pleasant rambles and eager pursuits in the open fields. Others, who wish to gain broader information in entomological science, will seek to obtain specimens of the various orders of insects, and will compare them in respect to the structure of their bodily parts, their habits, food, etc. Whatever line of study is entered upon, none will omit to make observations upon the transformation, or metamorphosis, of some common insect, in its development from the egg stage to its full-grown, winged state. There is no simple study in biology which is at once so delightful and instructive as this; and, before passing to an examination of the insect chosen for special study in this paper, a few words of direction for the practical study of insect development may be given.

Obtain a leaf on which have been deposited the eggs of some common insect. For instance, on the leaves of the young cabbage plants may be found in small masses the eggs of the cabbage butterfly. They are yellow, oval bodies, with ridges running lengthwise, and have been well compared in appearance to ears of yellow corn. Put the leaf with eggs attached in a small tin or wooden box, with a piece of window-glass for a cover. The egg soon hatches into a small green and white worm—the larva of the butterfly. Fresh cabbage leaves should be supplied for food, and it will be found to have no lack of appetite. It is only required now to continue observations, noting the passage of the larva into the pupa stage, and the final emergence from the cocoon of the perfect insect.

A single remark, of general biological interest, may here be made: These transformations in the development of the individual insect are in no wise different in their nature from the changes through which any animal goes in its individual development. The chick which hatches within the shell of the egg passes through a series of developmental changes of the same nature. The main difference is this: In the case of the insect there is cessation of development at the time the larva issues from the egg, and, for a time, growth, instead of development, of the embryo (larva) takes place. Then growth ceases, when the pupa stage begins, and development goes on to completion. In the case of the chick, on the other hand, development continues without interruption for growth, from the earliest embryonic condition to the time when the young bird is fully formed. And the explanation of the difference in the two processes is evidently this: In the small insect egg there is insufficient nourishment, or food-matter, for the building up of a new individual; hence it hatches into a tiny worm, which feeds for itself, and, as we have seen, is not slow in improving its opportunities; the fact is, the worm is storing up material in its gorged body to complete its development (in the pupa stage) to the perfect insect. But in the case of the hen's egg, the egg is already complete and ready for the young bird to use as a food instead of for its own use.

In harmony with the plan of study of these papers, we take, in the present number, a type-form of the fourth great group, or sub-kingdom, of animals. This group is the Arthropoda, and includes all animals which agree in having bodies showing a segmented, or ringed structure, and in having jointed appendages. It includes the insects, the crustacea, the arachnida, and the myriapoda. Four animals, typical of these four classes of Arthropoda, in the order named, are: the grasshopper, the lobster, the house-spiders, and the thousand-legs.

Taking a specimen of any of the several common grasshopper insects, it may be observed that the exterior of the body is hard and crust-like, (compare with lobster and spider), and that this integument is segmented, or jointed, giving the body a ringed structure. These rings are most evident in the hinder part of the body, or abdomen, where there are nine or ten of them, so jointed that this region of the body is easily flexible. The middle part of the body, called the thorax, can readily be seen to consist of three rings. In each head a ringed structure is not apparent, but the paired mouth-parts, and, perhaps, the antennae and eyes, indicate that the head region represents several rings consolidated. The grasshopper, or any other member of the sub-kingdom Arthropoda, should be compared with the earthworm (see third paper of this series) in respect to the ringed structure of the body. It is seen that in the latter animal the rings are all separate and easily noticeable; but in the members of the higher group some of the rings are consolidated to form more general parts of the body, as (in the grasshopper) head, thorax, and abdomen. It is important to observe, too, that, as a rule, there are just as many pairs of appendages as there are rings; this is well seen in the thousand-legs. In the lobster, also, each ring has a pair of appendages; but in insects some are wanting, the abdomen being destitute of them. However, in the larval stage of insects there are generally as many pairs of legs as there are rings. This is well seen in the caterpillar.

It is characteristic of all insects that the body is divided into three pretty distinct parts, namely: head, thorax, and abdomen. It is this feature of bodily structure, indeed, that gives to the class its name, the word freely translated meaning cut into—the insect body being cut into three parts. Any insect may also be readily distinguished from other insects by observing whether there are three pairs of legs attached to the middle region of the body. In this way the larva of insects can also be distinguished from worms. In the larva, or worm stage of development, insects have quite a number of pairs of legs; but the three pairs of true legs are always larger than the others, and are near the head-end of the body.

The thorax also bears on its dorsal side two pairs of wings. If the wings are straightened out, it will be seen that the fore ones are narrow and straight-edged, and that the hinder ones fold lengthwise, in the manner of a fan. Now the classification of insects, in regard to the most general groups—that is, the orders—is based upon the form and structure of the wings. Accordingly, the grasshopper belongs to the order Orthoptera—straight-winged. It will be noted that the fore wings are thicker than the other pair, and it is evident that their chief use is to serve as covers for the latter, which act solely as organs of flight.

The abdomen forms rather more than half the length of the body. The rings of which it is made are smooth, and the dorsal and ventral arcs are evident and it is this structure that admits of the movements of respiration—the ventral side of the abdomen (as one may see by holding the living grasshopper in the hand) alternately raising and lowering. In each ring, at the sides, is a pair of breathing-pores, or spiracles, which admit air in and out of the system of branching tubes that penetrate every part of the body and constitute the organs of respiration.

It is instructive to compare this mode of respiration—which is common to insects, spiders, and myriapods—with that of animals that breathe by lungs or gills. It is seen that in the former, air is conveyed through the branching hollow tubes to the tissues in every part of the body. Thus a particle of air is brought in close contact with the place in the body where formed. In animals that breathe by lungs or gills, on the other hand, the waste matter is conveyed, through the circulation of the blood, from the place where formed to the organs of respiration, where air is contained, and where the waste is oxidized.

The grasshopper is especially interesting in this respect of organs of sense. The two large compound eyes are very noticeable. Under magnification their surface is seen to consist of very many polygonal plane surfaces, or facets, set at various angles, so that from whatever direction light falls, it throws an image upon the retina at the back.
of the eye. Thus the compound form compensates for the immobility of the organ. Besides the compound eyes, there are three simple eyes, or ocelli,—one in the middle of the front of the head and a pair at the summit.

The long, many-jointed, highly flexible antennæ attached at the front of the head, seem to be highly sensitive and efficient organs of touch.

The ears, curiously enough, are not situated in the head, but in the first (anterior) segment of the abdomen. The external part is a tympanum, or membrane upon which atmospheric vibrations act, thus affecting the nerve-centre of hearing. The ear can be readily seen by the naked eye.

A tongue is present, and while it does not appear to be a delicate organ of taste, it is not to be doubted that the grasshopper possesses this sense. As to smell, it is unlikely, perhaps, that this sense is differentiated from that of taste.

A distinctive feature of insects of the grasshopper family is the manner in which they produce sound. The sharp, stridulating noise with which the air resounds all through the day and far into the middle of the night, is produced by the rubbing of the stiff edges of the wing-covers against the basal joint of the hindmost pair of legs; or, in some species, by rubbing the edges of the wings against each other.

The interested reader, having observed these points in the insect selected for study, would do well to compare other common insects in respect to the same and other features. Any simple observational study thus begun is sure to lead to the acquisition of many interesting facts of knowledge, and to help to an understanding of the laws of nature.

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CURIOUS METHODS OF MAKING FIRE.

BY WALTER HUGH.

There are few things more curious and which furnish such food for reflection as the ways in which a civilized man makes fire. The problem of the easiest and best way to get a spark must have been worked at by every little boy, when the human race realized the need of fire, and the man who solved the problem is one of the world's great, but unknown, benefactors. It is not unlikely that various methods have been invented as the result of these attempts; it is true of the beginning of our marvellous age of inventions. The modern period furnishes the most singular ways, for the reason that chemistry and physics have taken hold. For an immense period in man's history the method of kindling fire afield was by turning or rubbing one stick upon another.

In Burma a tribe called the Kathiens carry for striking a light a cylinder of buffalo horn, with a central bore three-sixteenths of an inch in diameter and three thousand deep burned into it. A closely fitting plunger of iron-wood works in the hole. When the native wants a light, he withdraws the plunger and puts a bit of tinder into a cavity in the end of it. The photon is then inserted and driven down with a quick blow, suddenly withdrawn, and the tinder is found to be ignited.

The Dyaks of Borneo, who were sympathetic head-hunters before the advent of Rajah Brooke, also made use of a leesiott, or fire syringe of brass, lined with lead, fitted with a wooden plunger. This implement was known in this country, under the name of "instantaneous light-giving syringe," before the invention of matches, but it was not generally used, since, at best, it gave uncertain results, leading the lecturer to saturate the tinder with bisulphide of carbon to minimize the burden of proof. It is an interesting question how the Dyaks and Burmese came to employ the aeroplane for fire-making.

The Cock Chinsa people strike two pieces of bamboo together and ignite tinder. The coating of amorphous, silice-like flint on the surface of the bamboo yields a spark at a sharp blow. The traitor, Mr. W. T. Homaday, tells me that the jingles are frequently fired by the excessive friction of the bamboos during a gale. The Tungarans of British North Borneo and the Terante Malays carry attached to the girdle a joint of bamboo, often finely carved, containing tinder and, a fragment of porcelain. The bit of china with tinder is held in one hand and struck against the bamboo tinder-horn held in the other, generally getting a light at the first blow.

The Aleutians of Alaska make fire by dripping two pieces of quartz in sulphur, which abound in the islands, and striking them together over a small heap of down on which sulphur has been sprinkled. Some tribes of Eskimo use two pieces of iron and the gum of the stone plant. He fits them together with a tap.

Matches have gone everywhere and supplanted the native fire-making processes. Hodm, the distinguished Danish Arctic explorer, relates that an Eskimo, on being presented with a box of matches, gave away his fire-drill, saying he would have no further need of it. The National Museum has a collection of fire-making apparatus, showing the representations of making fire used in various parts of the world. It would be impossible to duplicate the majority of the pieces now, since trade has carried matches to the ends of the earth.

Blacksmiths can start a fire by pounding violently a rod of soft iron, first spreading on the anvil a layer of powdered coal-dust. This is a good illustration of the conversion of force into heat.

In Germany, before 1851, a chemical apparatus called a "Doberciner" was used for getting a light. It was manufactured for domestic use, and sold extensively until superseded by matches, which were invented in the year mentioned. The Doberciner was based on the principle that hydrogen gas played upon spongy platinum renders the latter incandescent.

UNITED STATES NATIONAL MUSEUM.

[Original in Popular Science News.]

FURTHER NOTES ON THE CHIGGER (Leptus Irrivans) *

BY H. M. WHELPLEY, F. R. S. N.

This exceedingly interesting little fellow forms the subject of a paper that I read before you some months ago. The publication of the article [Popular Science News, February, 1890] has attracted considerable attention, and brought me numerous communications on the subject from all sections of the country, a few from England, as well as Europe. From the Information contained in this chigger I have gathered several new points about the habits and life work of the Leptus Irrivans. These I have collected and bring you before you tonight.

In the first place, I desire to state that the Leptus Irrivans is no relation to the Palex penetranus of South America and the West Indies. The latter Insect is variously known as the chigger, gigger, chigoe, chigoe, chigoe, chigoe, chigoe, etc. It is a small insect of the flea family (Pulicidae). It is a small insect of the flea family (Pulicidae). It is a small insect of the flea family (Pulicidae). The application of the name chigger to both animals has caused some who are familiar with the South American insect, but not the North American one, to suppose that I was in error when giving the Leptus Irrivans the vulgar name of "chigger." As this is the most common name for the animal, I was obliged to accept it.

I find that this pest to human beings is not confined to as small a section of the United States as my first investigations indicated. The Eastern and Southern States share with the Mississippi Valley in harboring the chigger. I have not heard of it in latitudes north of the 40th degree, nor does it seem to thrive in the far West.

The chigger does not confine himself to a strictly human diet, but attacks the housefly (Musca domestica.) I have not personally observed the parasite on flies, but Dr. G. De Von Inform me that he has examined flies afflicted with chiggers. He thus accounts for the transportation of chiggers to infants that do not come in contact with living vegetation.

Dr. J. T. Whitlock finds that chiggers are also very troublesome to young fowls, especially small chickens. He has observed the parasites collected in lumps as large as the head of a pin, and has seen as many as a dozen such lumps on one chicken, not excluding the legs and tails. He finds that the chick generally dies promptly, with all the symptoms of poisoning by strychnine. He reports the case of a chick dying after a number of tetanic spasms, lasting for perhaps an hour.

There is a great difference in the degree of susceptibility of different persons to these parasites. Several persons have assured me that they are never attacked by chiggers, bed-bugs, or ticks. On the other hand, one of the most prominent microscopists of this age, writes that his daughter is so severely afflicted by chiggers that she has been confined to her bed for several days.

Some specimens of the insect are almost transparent, but they all become darker in color as they engorge with blood. I have also found another interesting detail for the investigators of these localities. It is known as the sea-tick. In addition to the list of remedies given in my last paper, I find that both kerosene and spirits of camphor are extensively employed to prevent the attacks of the parasite, and to cure sores when formed. Many correspondents have confirmed my statement that chiggers are parasitic on cherry bushes. Attention has also been called to the fact that the insects have a special liking for peach trees.

WONDERFUL OPTICAL PHENOMENA.

Among the most extraordinary and beautiful optical phenomena presented by organic compounds, it would be difficult, or perhaps impossible, to find any rival in this respect to two such products lately obtained in the laboratory of a Viennese chemist, Dr. Edmund Morvan. Nothing similar has been hitherto seen, and it is expected that the careful study of the physical properties presented by these compounds may ultimately bring out new ideas with respect to our theories of light and color.

The first of these is an organic compound of oxide of zirconium, and is named by its discoverer, monocyclyl-ethyl-methyl-phthalein. The other belongs also to the aromatic series and is called monooctyladilylydroyl-benzal.

These compounds exhibit hitherto unknown properties of refraction and fluorescence. The former appears yellow by transmitted light and green by reflected light—that is, it looks like a brilliant yellow liquid with a bright green fluorescence. The latter appears violet and green under the same conditions.

The first-named compound shows a remote resemblance to the substance known for some time past as fluorescin, but is distinguished from it by its
CULINARY RECIPES

SELECTED FROM FOREIGN SOURCES

LOBSTER OMELET.—Chop three ounces of lobster very finely, put in four tablespoonfuls of bechamel sauce in a stewpan, and add a little pepper, salt, and a few drops of essence of anchovy. Stew for a few minutes, add the yolks of an egg, and place inside the omelet, which has been made in the usual manner.

OYSTER OMELET.—Put in a teaspoonful of butter. When melted, add a tablespoonful of flour, a little of the oyster liquor, two or three drops of lemon, and sufficient milk to make it as thick as cream. Boil it up; then add the oysters, chopped, and the yolk of an egg, boil up slightly, and place inside the omelet.

PUMPKIN A LA PARMAISE (Italian recipe).—Clean and peel a pumpkin; let it stand in salted water, drain it, put it in a pan on the fire with butter, salt, and spices; let it fry, stirring it constantly; afterwards add another piece of butter and some grated Parmesan cheese; put the lid of the saucepan on, and let it roast with fire above and below it.

SALADS EN SURPRISE.—Make some light puff paste, and roll out quickly; cut out six circles, and bake in a quick oven; curl up into the shape of cornucopias; when hot these with lettuce cut up small, peas, etc., well soaked in Mayonnaise sauce. A little tarragon and chervil should be mixed in with the small salat. Dish these up like pastry and cream cornucopias.

LOBSTER SALAD EN MASQUERADE.—Take a plain mould and place a glass inside, and between the mould and the glass top, first, a layer of aspic-jelly, colored carmine, which has been whisked up and is nearly cold; when set, add a layer of natural-colored aspic-jelly, also whisked up, then a layer of green aspic, and so till the mould is full. Put on ice till quite firm; then fill the glass with warm water, and remove it; then put in a lobster Mayonnaise, which has been already prepared.

VEAL CUTLETS A LA MACARONI.—Dip veal cutlets in liquefied butter; then roll them in equal parts of Parmesan and bread-crumbs; pepper and salt to taste. When the bread-crumbing is quite set, dip the cutlets in egg, and again cover them with Parmesan and bread-crumbs. Let them stand for a couple of hours; fry a nice color. Boil a small quantity of macaroni in the usual way, dress it with butter and tomato sauce, in which the yolk of an egg has been stirred. Sprinkle freely with grated Parmesan.

GENOISE PATRY FOR AFTERNOON TEA.—Take eight ounces of butter, and cream it; then add the grated rind of a lemon and eight ounces of fine white sugar, and work the mixture till it is quite white, using a spoon and Viennoise flour, and five whole eggs. Add the flour and eggs very gradually, such as after two spoonfuls of flour, one egg. Place this mixture in differently shaped small moulds, and bake them. Then turn them out, and stand them on a wire sieve till cold, and then ice them with variously colored and flavored glaze. They can be ornamented with pistachio kernels or crystallized fruits placed on the top.

CHIC CeUON Essential.—Take three dozen oysters, hear the thin, strain the liquor from them, and chop them up in small pieces; then let them soak in Mayonnaise sauce, made with lemon instead of vinegar. Whip some nicely-flavored aspic-jelly to a froth. Put some of this at the bottom of the china soufflé dish, which it should serve in, then place a layer of the minced oysters, and then a layer of aspic; fill up the remainder of the dish till it is nearly full; pour over the remaining sauce, about two inches higher than the dish, and fill in with aspic-jelly. Place it on ice for two hours, remove the paper, and serve. Garnish with lemon, cut into fancy shapes, and rolled anchovies.

GNOCCHI A LA LOMBARDI (Italian recipe).—Boil one pound of potatoes, skin and mash them, and pass them through a sieve; then take half a pound of fine flour, add to the potatoes, and incorporate well together till an equal and consistent paste is made; then divide it into pieces as large as a lemon, roll them on a board with the palms of the hands, and form them into little sticks, which must be cut across in small pieces the size of walnuts; then mould them one by one with the fingers into any desired shapes; they must then be left to dry by leaving them exposed to the air on a drainer. When the sticks are well dried, they should be boiled in salted water, and when it boils throw in the gnocchi a few at a time, till cooked; then drain them and season to taste, arrange them on a dish and sprinkle with grated Parmesan cheese, and pour over a butter which has been melted and fried brown.

OYSTER BOMBS.—Take some large stewing oysters, scald them, and cut them small; make half a pint of white sauce, in which half an ounce of gelatine has been put, and a tablespoonful of lemon juice and a little cayenne. Put the chopped oysters into the sauce, and mix it well together; then put this mixture in a basin, and stand on ice till firm; when it is so, make it into round balls the size of greeneggs; they should be slightly flattened at the base. Have ready half a pint of rich bechamel sauce, to which should be added one gill of aspic; stir well, and put on ice in a mould, and well surround with ice. When the sauce has set, re-melt it, and place on ice again till beginning to jellify; then place each bomb, or ball, at the flattened side on a skewer; then carefully dip each one into the sauce, and, when completely masked, place them on a dish to get cold. After this, have ready two colored aspic-jellies—one red and one the usual color—melt, and, when in a half-liquefie d state, add the bombs on the skewer again, and dip some in one color and some in the other, and stand on ice to get cold; disk them up in alternate colors in the form of a pile of shot. Garnish here and there with chervil-leaves.

Practical Chemistry and the Arts.

[ Original in Popular Science News.]

CARBON.

By George L. Burditt.

In looking over Mendelejeff’s table, we find at the head of the fourth series the element carbon. It is one of the most abundant elements, and one of the most important in bombs. It is the characteristic element of organic chemistry, where it forms a sort of framework upon which the organic compounds are grouped. Indeed, inorganic chemistry is called by some the study of the carbon compounds. Carbon occurs in all vegetables, and in some minerals. It also exists in three allotropic forms, as the diamond, graphite, and charcoal.

The diamond is the purest form of carbon, occurring in nature usually in conglomerate formations. India, Brazil, and the Cape of Good Hope furnish most of the diamonds in use, the Cape of Good Hope mines being more recently discovered. The diamond has probably never been made artificially, although many attempts have been made. In order to make one, the carbon would have to be liquefied and crystallized. But carbon is free from all color in melted carbon, and is infusible; and so diamonds could not be got in this way. Making diamonds from benzolic was at one time tried by a Scotch chemist, but with questionable success. In nature they are probably made from some liquid form of carbon, but little or nothing is known of the process. Although they may be of almost any color, they are usually white, and when entirely free from all color, are called ”blown” diamonds. They are often found as one of the first water, and these are the most valued. However, owing to impurities, they may be gray, yellow, brown, green, red, blue, or black. The rose diamonds are valued highly, and next to them the green. To heighten the effect of a diamond, it must be cut. This is a very slow and tiresome job; sometimes taking many weeks or months to finish. The stone is first clipped off, piece by piece, until it is nearly the required size. It is then fixed upon a steel spring, by means of melted lead, and the lead allowed to solidify. This spring is then pressed down until the stone reaches a swiftly-revolving steel wheel, upon which there is a quantity of diamond dust, called “bort.” By the constant grinding of the stone against the bort, a smooth plane or face is formed. An artificial diamond is made by diamond-cutting. The operation must be repeated for each face. The commonest forms after cut are the rose and brilliant. The diamond is the hardest substance known, but it is quite brittle. Besides its extensive use as a gem, it is used for cutting glass, and in making diamond drills for boring rock. Quartz is hard enough to scratch glass, but the diamond point is more curved than that of quartz, by virtue of which it gives a cleaner scratch, and so is always used. Diamonds do not occur to any extent in the United States, although small ones have been found in North Carolina.

The second allotropic form of carbon is graphite—sometimes—but wrongly—called black-lead. It is a soft substance, and is used commercially as a lubricant in the Western’s, where it occurs as lumps between layers of slate. It is of a grayish-black color, soft, greasy, and has a metallic lustre. It can be made artificially by dissolving carbon in melted cast-iron, and treating the product with dilute hydrochloric or nitric acid to remove the iron. Owing to its high electrical conductivity, it is used in making electrical substances which require great heat. It is also used with oil as a lubricator; also in electroypting. Its most important use is in making pencils. The graphite is crushed fine under water, on top of which it floats off through a series of tubes, each a
little lower than the one before it; and in this way the fine powder is separated from the coarser. Pipe-
clay is then added to it, and enough water is made to make a paste about as thick as cream, and this is grooved until the substances are perfectly mixed. For hard pencils, more clay is added; for soft ones, less; medium hard pencils contain about seven parts of clay to ten of graphite. After grinding, the paste is put into canvas bags and pressed until all the water runs out, leaving a thick dough. This dough is then put into cylinders with a tight-fitting plug. In the bottom of the cylinder are holes the size and shape of the lead desired, and through these the dough is slowly forced by the descending piston, coming out in long strips. These strips are then cut into the proper lengths, baked, and put into their wooden cases.

The third or amorphous form is represented by charcoal. Charcoal is made by burning wood in a limited supply of air. Sticks of wood are piled up into a round heap, with a small hole in the centre for a chimney. Another hole runs from the chimney to the outside of the pile, so as to give a draft. The whole pile is then covered with sod and earth. The wood is lighted through the chimney, and charred slowly until it is all converted to charcoal. The temperature at the center is 1600°, according to the size of the pile. The best quality of charcoal is made by heating wood in iron cylinders. When made in this way, some other valuable substances—as wood-alcohol, etc.—are also formed, which run off as liquids and are collected. This kind of charcoal is used for gunpowder. Charcoal is black, lustreless, soft, and smutty. It has no crystalline form, but retains the internal and external
forms of the tree from which it is made. While the wood in the pits is charring, the walls of the wood-cells become charcoal, but the matter within the cells is driven off. This makes the charcoal very porous, and it absorbs air to such an extent as to float on water. Charcoal has a strong tendency to condense gases on its surface. It acts on different gases to different degrees, but most readily on ammonia and sulphuretted hydrogen. It is also used to absorb coloring matter in bleaching colored solutions; but bone-black—a sort of charcoal made by burning animal bones—is better for this purpose. Brown sugar is turned into white sugar by running it through a layer of bone-black from twenty to thirty feet high.

Charcoal is made in much the same way as charcoal, only no wood is used. Heavy oil of tar or natural gas is burned in a close chamber, at the top of which is a tight-fitting iron dome. The oil is lighted, and burns with a smoky flame, giving off small particles of carbon, which are condensed on the sides of the chamber into lamp-black. When the process has continued for a while, the lamp-black is taken off. It is tolerably pure, very black and permanent, and can be advantageously used in making paint, blacking, etc.

The question now sometimes arise: How do we know that these allotropic forms are really carbon? The proof is, if we burn twelve parts of carbon it will give forty-four parts of carbonic acid gas—and this is the case with each of the three forms.

**HOW THE BURMESE WORK THEIR OIL WELLS.**

Dr. Noetling, of the Indian Geological Survey, to whose report on the petroleum deposits of Burma reference has already been made, gives an interesting description of the native method of digging the wells. As soon as a native has made up his mind where he is going to have a new well, the workmen, usually four in number, begin to dig a square shaft, the sides of which measure between four feet and four feet six inches. Over this pit a cross beam, supported on stanchions at either side, is placed, in the centre of which is a small wooden drum or cylinder, which, with its axis, is made of a single piece of wood, the latter running on coarse fork-shaped supports. The leather rope used in hauling up the oil passes over the drum, and on it is fastened the workman who is going to be lowered down, as well as the common earthenware pot in which the oil is drawn up. If possible, the well is so placed that the workman can walk down an inclined plane along the slope of a hill. The tools employed in digging are quite primitive, and can only be used in soft strata. Timber is used to support the walls of the shaft, and the latter is lined with wood. This wooden wall has considerable strength, but it has to be carefully watched lest it should give way.

The workmen are housed in an ingenious way. The man sits on two slings formed of strong rope running between his legs and knotted over his left shoulder. To prevent sliding, a thin rope runs down from the knot, across the breast, underneath the right shoulder to the back, where it is fastened to the rope forming the slings. A second rope for the same purpose is fastened round the hips. On account of the explosive gas filling the shaft, the light can be taken down; the workman, therefore, ties up his eyes previously to descending, so as to enable him to see during the short time he is in the well, otherwise it would take him longer to accustom his eyes to the darkness than he is able to stay down on account of the gas, which renders breathing difficult.

The data obtained by Dr. Noetling as to the time occupied in the ascent and descent, and the period during which the laborer can remain below, show that not twenty-five per cent. of the total working time is really spent in extracting the oil. Two hundred and ninety seconds is the longest time any man, however strong, can remain below without becoming unconscious, while in some he can only remain sixty seconds. With increasing depth, the difficulties in obtaining the oil alter the Burmese methods become insupportable. Hence the limit is 300 feet, and the workers object to more than 250 feet.

The drawing up of the oil is as primitive as everything else. The rope is fastened round the neck of the ball-shaped pot, and, being lowered, is allowed to fall by sinking in the oil below. The oil is then drawn into the lamp by means of a flexible tube, but much larger, and twelve of these are packed on each country cart.—*London Times*.

**THE SIBERIAN RAILWAY.**—The Russian Gazette of St. Petersburg states that the special commission has just drawn up its report on the most practicable way of constructing the great Siberian railway. According to this report the work should be accomplished step by step, but with the result that the whole line should be completed in 1900. The cost of construction would not exceed 250,000,000 roubles, spread over ten years, so that the treasury would only have to advance 25,000,000 roubles a year. Judicious economy would reduce this sum by 100 per cent. In that case the work would not exceed from 25,000 to 28,000,000 roubles. The line would be as narrow as possible; conduits excepted, all the work would be in wood; and large stations would only be established at the most important points. At the beginning of the enterprise, also, there would be a minimum of rolling stock. For this reason engines of eight wheels would be employed, except in the steppes, where engines of six wheels might be adopted. Another suggestion is, that those sections most promising of revenue should be begun first.
named specimens that had been prepared by Mr. Bayley, of Elizabeth, was read by Miss Lilian Faulks.

The Secretary of the Assembly is Miss Susan Gilbert, of Plainfield. Applications for joining the State society should be addressed to her, as also proposals to unite in the statewide assembly to be held at Long Branch in July.

A CHAPTER AT THE ANTIPODES.

Our readers will notice in the list of new Chapters which follows, No. 271, of Port Chalmers, New Zealand. This Chapter is composed of twenty earnest members, led by Professor Chilton, and we extend to it most cordial greetings. It will be a pleasant thing for our American Chapters to write letters of welcome to this new member of our Association; and, besides the pleasure of making friends on the other side of the world, there will be an excellent opportunity of increasing our knowledge of New Zealand, and of obtaining, by exchange, specimens of the strange forms of life—both animal and vegetable—that flourish there. By the way, all new Chapters like to receive letters of welcome—even if they are not thousands of miles away.

CHAPTER ADDRESSES, NEW AND REVISED.

No. Name, Address No. of Members
243 East Greenwich, R. I. A. 5
246 Austin, H. (Cook Co.) A. 3
59 Pittfield, Mass. B. 12
Miss Mary L. Wellington, B. 7
251 Chalmers, V. H. A. 15
John W. Hoag, Box 223. 1
291 Harrisburg, Penn. B. 7
K. S., Lewis, Box 199. (Harris Chapter.) 4
134 De Pencier, M. B. A. 10
132 Locatell. 4
271 Port Chalmers, New Zealand. A. 12
Charles Chilton, B. Sc., District High School. 20
92 Nancy, Francis A. 1
7 Frederic de Motte Noblit, 27 Rue de la Harvinière. 7

MASSACHUSETTS STATE ASSEMBLY.

On May 30 the programme already announced in this journal was successfully carried out at Fitchburg. Owing to the faithful work of President Hall and the Executive Committee, a larger attendance was had than ever before, and the interest was proportionately greater. At the business meeting following the addresses and reports, President Hall was unanimously re-elected. It was voted that the Assembly make an exhibit at the World's Fair in 1893, and a committee was appointed to confer with all Massachusetts Chapters on the subject, and secure their co-operation. It was voted, "That the Massachusetts Assembly heartily endorses the two journals, Popular Science News and Santa Claus, and recommends every Chapter in Massachusetts to appoint a committee to make a thorough local canvas to secure subscriptions to the same." In the afternoon, delightful excursions were made to Wachusett and neighboring hills.

AN OPPORTUNITY TO BE OF USE.

Many Chapters and members of the Agassiz Association are interested in archaeology. Many more will become interested as they learn more of the scope of the field included by that science, and reflect upon the importance and magnitude of the problems to which it holds the key.

Believing that many of our members and friends would be glad of the opportunity of contributing toward the grand project of uncovering one of the most important monuments of antiquity, and thus revealing to science a new chapter in the world's history, a letter was written to Professor T. D. Seymour, of the Archaeological Institute of America, asking for such an account of the project as would make its importance clear to all our members. In reply the following letter was received:

ARCHAEOLOGICAL INSTITUTE OF AMERICA.

SCHOOL OF CLASSICAL STUDIES AT ATHENS.

May 17, 1893.

My Dear Sir: The case of the Archaeological Institute in connection with Delphi is, in brief, this:

Since excavations have been conducted systematically on Greek soil, Delphi and Olympia—the two most important sites of Hellenic worship in the classical period, and the homes of the festivals to which Greeks from all lands came—have been regarded as the most interesting and important sites, with the single exception of Athens, where, the modern city precludes extensive digging. The Greeks are too much pressed for money for the improvement of their country and the daily expenses of their kingdom to undertake excavations at Delphi, apparently; and they believe further, that such work by foreigners calls attention to their lands.

The Germans, about ten years ago, undertook excavations at Olympia, and are thoroughly well pleased with the result. The expense was borne by the German government. The French began some excavations at Delphi twenty years ago, and have claimed it as their ground. But more than a year ago, the Gallo-Hellenic treaty, which contained the concession of Delphi as one of its clauses, failed in ratification by the French parliament, since the wine-growers of France were jealous of the privileges offered to the wines of Greece.

Then the privilege of excavating at Delphi was open to Americans; and this concession is at present reserved for our Archaeological Institute, on condition that we shall buy from the owners, the land on which the Temple of Apollo (Kastri) stands. This land will cost about $80,000. Of this sum, something more than $30,000 has been raised near Boston. Smaller sums have been contributed in other places. No vigorous effort has yet been made in New York and the West. Professor Charles Eliot Norton, who has been the President and soul of the Institute for eleven years, is confident that the entire sum will be raised and the opportunity gained.

When Delphi is once secured, the funds for conducting the work of excavations will be furnished largely by the Institute, which pledges about $4,000 a year for this purpose. This does not seem a large amount for a great enterprise, but the conditions of the slopes and soil there are such that a very large number of men can be employed to advantage, and labor is cheap in Greece. The work of excavation would be conducted by the American School of Classical Studies at Athens, which has already discovered two deme-sites in Attica, has uncovered the ruins of the theatre at Thorikus, and part of the great theatre at Sicyon; besides extensive explorations at Plataea. The greatest exploit of the school in this line was the excavation two years ago at Icaria, the original home and birthplace of Greek tragedy.

Delphi will be excavated. Science has nothing to fear on that account. But it would be a great glory for America if it would undertake the work. No other similar site remains. Who has not heard of the Oracle at Delphi? Who would not like to add in this enterprise?

Very truly yours,

T. D. SEYMOUR.

All who wish to have a share in taking the earth off from this inestimable treasure, may send their contributions to the President of the A. A., before September 1, and they will be promptly forwarded to the Archaeological Institute. Many hands make light work. One cent will pay for the removal of at least one shovelful of earth. Let each one give according to his inclination and his means.

REPORTS FROM ACTIVE CHAPTERS.

45, Fitchburg, Mass., [A].—Our society was thoroughly reorganized on May 17, 1889, and has since then received many additions. At present we have thirty-one members, who are all interested workers. Two are at work on a catalogue of Fitchburg birds; four are revising the "Flora of Fitchburg and Vicinity," which we published some years ago; and six have united to make a geological map of this vicinity, including all the towns that border upon Fitchburg. We have received much encouragement from Professor W. O. Crosby, of the Boston Society of Natural History, and also from Professor N. S. Shaler. We hold regular monthly business meetings, at which methods of work are discussed; and we have special meetings once a week for actual work, when we dissect some animal, study some mineral or insect, work on our herbarium, etc. We have already had some bird cases, of which Professor Real had collected in Iowa, and two of the members have mounted them. We have had one hundred and twenty-five cases made to hold our herbarium—one family in a case. We have received one hundred and eighteen birds' eggs from across the Atlantic—the gift of a Fitchburg boy living in London. In October, 1889, Captain Robert Davis, realizing that he had not long to live, presented to us his cases and cabinets of insects, shells, minerals, and ferns. These additions, together with our previous collections, required more room than the Knights of Honor in whose hall we held our meetings—could well spare, and the School Committee kindly granted us the free use of the High School building for our museum and our meetings.

—E. Adams Hartwell, Cor. Sec.

51, Mt. Union, O., [A].—In June, 1889, our Chapter was reorganized, with two of the old members and two new ones. Since then we have increased to twenty. In September we lost one of our best members by the death of Mr. H. S. Clark, the founder of the Chapter. Our work tends chiefly in the direction of ornithology and botany. We have a nice room of our own, and have started collections in several lines. We have a full meeting every Wednesday evening, the exercises consisting of debates, essays, and the practical study of specimens.—V. N. Marsh, Sec.
The botanical section has made a good collection of leaves, lichens, and woods; the zoological section has collected many insects, and closely studied their development. Many observations have been made on the migrations of birds. Among the important additions to our cabinet are a large rattlesnake secured in Brown County, and some copperheads found here. The Agassiz Association is a valuable aid to the scientific department of Moore's College.

—Professor A. Bigney, Pres.; Rev. V. G. Cobbett, Sec.

125. Camden, N. J. [A].—The past year has been the most prosperous and interesting year of the existence of this Chapter, and it affords me great pleasure to forward the following report.

During the year we have held thirty-two meetings, no meetings being held in July and August. We have been increased by three new members, and three have resigned (from business causes) and made honorary members; making a total membership of eleven. During last spring we took up the study of entomology and entomology, which proved very interesting, and we are now engaged in the study of physiology.—Samuel Carl, Pres.; Newton L. Snyder, Sec.

132. Buffalo, N. Y. [B].—The records of the past year show progress in every department. Twenty-one meetings have been held, besides our working meetings and meetings of sections. Twenty carefully-prepared papers, giving the results of personal observation, have been read. Among the topics treated have been: "Erosion in the Vicinity of Buffalo," "Minerals of Erie County," "Archeology of Buffalo," "Birds of Erie County," "An Indian Fort Near Buffalo," "Geology of Erie County," "Observations on the Habits of Limna," and "Limestone of Buffalo." A course of six illustrated lectures on "Natural Philosophy" was delivered by Mr. J. P. Haas, and one on "Fixed Stars" by Professor W. Grabau. From another course of three lectures, given under our auspices, we received enough money to procure a large and handsome cabinet. Our collection is chiefly local. We have sixteen members, having gained three and lost none. On January 1 we united with the Buffalo Society of Natural Sciences. Amadeus W. Grabau, Sec.; Edw. J. Weber, Pres.

141. Canton, O., [A].—As our Chapter disbanded a year ago, and has been maintained by one member since, my report becomes a personal one. During the summer of 1889, I collected and mounted seventy birds and mammals. My collection of minerals numbers 225 specimens, together with 100 fossils. I have skeletons, skulls, prepared brains, embryo lizards, snakes, and frogs, in all more than 1,000 specimens—all classified and arranged so that any specimen may be reached at a moment's notice. As all the classes are represented, this makes a very handy working collection for the students. My library, and work and microscope tables, quite fills my large room. Among the most attractive of my birds is an albino kingbird. I have just observed an albino English sparrow, which I hope to secure. Some weeks I preserved and mounted a monstrous Jersey calf, which had two heads, eight legs, and two tails. All the limbs were normally developed, and the heads were nearly alike. There were two sets of viscera, two stomachs, two pairs of lungs, four kidneys, and two sets of smaller intestines; but the two livers were merged into one very large one, and the two bladders were grown together, but with an internal dividing wall. There was, however, only one heart, of normal size and construction, except that it had four divisions of the aorta instead of two. —X.

158. Davenport, Iowa, [A].—The work which we have done and are doing is not small. What time we can get after attending to our school duties is spent in the field—and very profitably, too. Twice during the year our members visited a number of places and gathered a record of their observations to the government entomologist—although we consider this action more profitable to ourselves than to the government. Having been a member of the A. E. in this city for more than five years, I am willing to say without hesitation that scientific study has been steadily progress-

—H. Benfell, Sec.

202. St. Louis, Mo., [C].—Our work, steadily carried on during the year, has been chiefly limited to systematic microscopical study in histology, entomology, and botany. The microscope suggests more queries in five minutes than can be answered in a whole lifetime. We cordially invite exchange of microscope preparations and mounted slides.—M. A. Goldstein, Sec., 1,421 Missouri Avenue.

216. Hanover, N. I., [A].—We have had forty-four meetings, and read thirty-four papers on subjects of natural history. We have also been favored with nine lectures by members of the college on the following subjects: "Microscopic Flora of Pennsylvania;" "Extinct Volcanoes," by Professor Hibbard; "Electricity," by Professor Emerson; "Switzerland," by Professor Ruggles; "Water," by Professor Fletcher; "My Trip to the Adirondacks," by Professor Lord; "Invertebrates," by Professor Jesup; "Entomology," by Professor Jesup; and an address on microscopy by Professor Hitchcock. Two of the members are: taking Professor Gutenberg's enjoyable course in mineralogy, and have derived much pleasure and benefit from it. Several rare specimens and relics have been added to our cabinet. I should deem this report inadequate should I neglect to mention the pleasant held in commemoration of Agassiz's birthday. We rowed down the river to a charming spot where we spent the afternoon indulging in games common to such occasions. On the whole, we have passed a very successful year.—Maurice S. Sherman, Sec.
Since the death of Mr. Lindsay, and the subsequent withdrawal of a number of our members, the club membership has practically been reduced to four. Our plan of work has consequently been somewhat modified. The subsequent “talks” were:

June 15—C. T. Westcott, “Transformations of Insects.”
F. G. Calvert, “A traveller’s experience in Animals.”
F. G. Calvert, “Viscera of a Field-Mouse.”
September 24—F. P. Calvert, “Characters for Classifying Desert Piles.”
October 5—C. T. Westcott, “Wings of Lepidoptera.”
P. P. Calvert, “Insects of a Shrub-Loc.”
L. L. Calvert, “Salt-Flats in October.”
November 15—F. G. Jones, “Karyokinetic Changes.”
December 17—F. P. Calvert, “Biological Notes on the Cell.”
January 21, 1890—F. G. Jones, “Bacteria Cultures and Species Characters of Bacteria.”
February 18—F. G. Jones exhibited tubes containing yeast cultures.
F. P. Calvert, “A Unique Anatomical Flexibility of the Male Dragon-Fly.”

A number of these “talks” have been illustrated with crayon sketches and specimens. On October 22, 1889, in consequence of the little time for scientific work possessed by members, the number of meetings was changed from two to one each month. Philip P. Calvert, Sec.

No reports are required from our Chapters during the vacation months August and September; but the reports of the Eighth Century (Chapters 701-703) should reach the President before October 1. There are, however, a number of Chapters whose reports are overdue, and a few from whom no word has been received this year. It is hoped that all such will communicate at once with the President, as it is important that he be informed of the condition of every Chapter.

“Better late than never.”

All are cordially invited to unite with the Agassiz Association. Printed blanks for application and descriptive circulars are furnished free on application. Address all communications intended for this department to Mr. Harlan H. Ballard, Pittsfield, Mass.

[Written for “The Out-Door World.”]

PILE-DWELLERS.

By Hildreth T. Creason, Of the Agassiz Association.

Probably the earliest mention known to scien-
tists of the present day concerning pile-dwelling people and their habitations, is that made by the great Queen Hatsus, who ruled in Egypt among the sovereigns of the eighteenth dynasty. Along the side of the third terrace of Hatsus’s temple of Deyr-el-Bahrei, she caused to be gravestone for the information of posterity an account of an expedition to Pun-t, a locality, the site of which is supposed at the present day to be the South Arabia and Seminolit coast, as far south as Cape Garbis-
futi. The enterprise of the Egyptian queen was undertaken, according to inscriptions, for the exten-
sion of commerce and increase of gold to fill the royal coffers. It would be interesting to give a detailed description of the sailors, ships, and precious freight described by Hatsus’s sculptors, but in the absence of reliable reference it can only be made to the representation of a village built upon piles by the natives of Pun-t.

The huts are conical in shape, raised on beams, with ladders leading from the surface of the marsh to the platform above. An animal resembling the ox repose underneath some trees; turtles and fishes swin with the current in the water. It is necessary to suppose that it was in a country subject to inundation, or, perhaps, a village built over water, and accessible by gangways from the shore.

Herodotus, at a much later date, makes mention of pile-dwelling people. This fact has frequently been alluded to by well-known German and French anthropologists, so that a quotation from the “Father of History” will not be necessary. A few years ago, remains of pile-dwellings were discovered in the lakes of Switzerland, and, later on, crannogge struc-
tures among the marshes of Scotland and Ireland. Full accounts of these discoveries may be read in Keller’s admirable work upon the lake-dwellers of Europe.

People in other portions of the globe, far removed from the localities just mentioned, in a like manner have erected their dwellings over the water and on tracts of land subject to inundations. The early Spanish-American historians tell us of the pile-
dwellings of Teaucan and Iztapanal,—the latter pueblo built half on land,—also Ayotzinho, founded entirely on piles, and having canals instead of streets. It is the opinion of these piles that these peculiar Lake-Turk, which were the crannogge of Cuibi, together with the Guariro, and remarked by Alonzo de Ojeda when he visited that coast in 1499, may have resembled the conical huts shown to us in Queen Hatsus’s picture. Villages of pile-dwelling people still exist over the by lakes, rivers, and marshes of the northern portion of South America, the little children, in some cases, being secured by ropes from falling into the water, just as heretofore describes the custom in his day in the Old World.

Pile-dwellings have been remarked in Polynesia and New Guinea; other instances, also, might be quoted, but the reader who may be especially inter-
ested is referred to any well-appointed library for further information upon the subject.

A yet more primitive style of habitation is seen where huts have been erected on platforms lashed to the trunks and branches of trees. The tree-
dwellings of the Guarinos, a tribe living in the swamps of the Orinoco delta, and the doho houses of the natives of New Guinea, are instances of this kind of architecture, which may originally have suggested the pile-dwellings.

In von Thurn, Col. Albert, Kentucky, a soldier in the first Florida campaign, has furnished the writer of this article with sketches of Seminole pile-dwellings, the houses of which are square. He mentions that Major Hearme, of the U. S. Army (retired), now living in Frankfort, Kentucky, saw round pile-huts (five or six in number) at Bow-Leggs-Town, south-east of Fort Myers, on the Cooosa-hachi River.

CHEMICAL NOMENCLATURE.—At the International Congress of Chemistry, recently held in Paris, M. Lcrhelial declared that theories were not to be con-
sidered, but only practical questions, such as relate to analytical methods and nomenclature. The last, he said, urgently needs revision and improvement. The system hitherto followed has become insuffi-
cient. So many new compounds have been discovered, that they are bursting through the frames formerly intended and thought wide enough to con-
tain them. This is especially true of the hydrocar-
obons and the numberless substitutedazo-compounds derived from coal distillation products, and used in pharmacy and the arts. We cannot continue adding syllables and thus forming endless names for new combinations. A new and clearer system is now become absolutely necessary, and it should be one with lines broad enough to last for some generations at least.
The Popular Science News.

BOSTON, JULY 1, 1890.

A few subscribers who are still in arrears for 1890 will find their bills enclosed in the present number. As these small amounts, taken collectively, are of great importance to the publishers, it is to be hoped that the bills will be promptly returned to them, with draft or money order for the amount due.

The competition between the various Atlantic steamship lines for the doubtful honor of making the quickest passage, is even greater the present summer than in previous seasons. Up to the time of writing, three mail steamers are running, and two others are expected. They will probably all arrive on schedule time.

The general collapse of the overstrained engines of the City of Paris is still fresh in the minds of all; and the unsuccessful attempt of the City of Rome to go over, instead of around, Fastnet rock, has just become a matter of history. It is suggestive that the same dispatch which brought the news of this accident, stated that the steamer was ninety minutes ahead of a boat of another line, which, however, it is needless to say, arrived first at Liverpool. If these occurrences had taken place on the Mississippi River, a general howl at American recklessness would have gone up from the foreign press; but a "trip of speed" between British steamers is, apparently, a perfectly safe and proper proceeding. If the managers of these lines would pay more attention to the safety and comfort of their passengers, we think little fault would be found if the length of the voyage was thereby increased by a few minutes or even hours.

While waiting in a drug store, recently our curiosity was excited by a call for "colorless iodide," and, after the customer had been supplied with the preparation, we made some inquiries in regard to its composition. It appeared that the iodide solution was bleached by the addition of ammonia, so that what the purchaser really obtained was a solution of iodide of ammonium, possessing none of the characteristic properties of iodide itself. Colorless iodide is said to be in considerable demand; but it contains no active iodine at all, and is evidently the invention of some druggist or physician with more ingenuity than chemical knowledge.

The possibility of the formation of the violently explosive iodide of nitrogen is a point of positive danger in its manufacture, to say nothing of its valueless properties as a counter-irritant.

Those people who like to find medical authority for the use of alcoholic stimulants, and who live in regions where yellow fever is liable to prevail, will be gratified to learn that Dr. G. P. Maxwell, of Jacksonville, Fla., in the New York Medical Journal for April 26 and May 3, comments a "gin cocktail"—concocted of one part of compound tincture of cinchona to four parts of "good gin"—as a prescription in the incipient stages of the disease, "when the pulse begins to falter." He regards it as far preferable to morphine, which has apparently been recommended by some physicians. He says he "must have given half a barrel" of this "cocktail" medicine to his patients in 1888. Possibly some of them who had heard of his method of treatment were prompt in fancying that their pulses began to falter from the onset of the epidemic. In a "prohibition" district we can imagine that this might be no uncommon occurrence.

An extremely severe earthquake shock occurred in California in the latter part of last April, the centre of the disturbance being located about one hundred miles south of San Francisco, in the vicinity of Monterey. The writer, who was at the latter place, was awakened by the shock, or rather by the characteristic and peculiar rumbling noise preceding it, in time to observe the very interesting phenomenon. The building—a frame one—was quite violently shaken for several seconds, the culmination of the shock being of the nature of a violent blow, as if some giant had struck it with his fist. The gas chandelier vibrated like a pendulum in an arc of considerable magnitude, and the plastering overhead cracked, and small pieces were detached. Two other much less violent shocks followed within a few hours. Several persons reported that they were thrown out of bed by the shock, but this is a manifest delusion. A movement sufficient to accomplish this would not have left a building standing in the whole region. While we have no doubt that the "quake" was very conducive to early and immediate rising on the part of those who experienced it, the result was due to mental and physiological, rather than to seismological, causes.

The effects of this earthquake upon the surrounding country, as observed the next day, were very interesting. A railroad bridge near Monterey was lifted up and moved two feet out of its place, and several smaller injuries to embankments and cuttings delayed the trains for several hours. At one place we observed a fissure in a hillside several feet in width and extending for half a mile or more, which was formed during the previous night by the extraordinary vibration of the earth, while fallen chimneys in the region affected were very numerous. Fortunately, no loss of life or serious damage to property resulted from this remarkable manifestation of the forces of Nature, the cause of which still awaits a satisfactory scientific explanation.

A peculiar freak of lightning occurred last month near Salem, Mass., where a horse was struck and instantly killed, while the buggy to which he was attached was entirely unharmed, and the harness left intact, with the exception of one of the blinders. The driver was also unhurt, and only felt a slight shock in one arm. It was a most remarkable and narrow escape, and also an excellent illustration of the high tension and small quantity of this form of electrical energy, which caused its destructive effects to be confined within such narrow limits.

Professor William James, of Harvard University, Cambridge, Mass., is conducting an inquiry, or private "census," in regard to the prevalence of hallucinations, and requests that as many persons as possible will send him answers to the following question: "Have you ever, when completely awake, had a vivid impression of seeing or being touched by a living being or inanimate object, or of hearing a voice; which impression, so far as you could discover, was not due to any external physical cause?" It is obvious that for the purely statistical inquiry, the answer "No" is as important as the answer "Yes." Professor James will be happy to supply blanks to any volunteer enumerators who may be willing to assist him in the inquiry.

Dr. John C. Rolfe, son of the Shakespearean scholar, William J. Rolfe, and teacher in the Latin department of Harvard University, has accepted an election to an assistant professorship in the University of Michigan, and will enter upon his duties in the autumn.

A VISIT TO THE LICK OBSERVATORY.

It is not alone the possession of the largest telescope in the world that renders the Lick Observatory pre-eminent among all others. Situated as it is on the summit of Mount Hamilton, in California, overlooking the beautiful Santa Clara Valley, it has not only the advantages of a most magnificent and healthful location, but, what is of more importance from a scientific point of view, an atmosphere of unequalled clearness and transparency, which is of no small importance to the successful working of even the...
magnificent instruments with which the observatory has been equipped, through the liberality of its public-spirited founder, James Lick.

Everyone, doubtless, is familiar with the history of the observatory and its eccentric millionaire founder, whose remains now find a fitting sepulchre in the massive stone piers which supports the great telescope. Under the conditions of the bequest, a fine road, twenty-eight miles in length, has been built from the city of San Jose to the summit of Mount Hamilton, and visitors are always courteously received, and given every opportunity to inspect the buildings and instruments. On one evening of the week, the great telescope itself is placed at the service of the public, and large numbers avail themselves of the opportunity of looking through "the biggest telescope in the world;" although we doubt if the non-professional eye would note any great difference between the heavenly bodies as viewed through the thirty-six-inch object-glass and a much smaller one. A very free-spoken tourist expressed a similar feeling by inquiring, in a rather disappointed tone, "Is that all?" after a somewhat cursory examination of the moon, which probably failed to show her the "man" of our satellite wandering over its mountains and valleys.

The ride from San Jose to the observatory is in itself a trip worth the taking, the smooth road, with its easy grades, passing through vineyards and orchards such as only California can boast of. Arrived at the top, a magnificent prospect opens out, extending over the Santa Clara Valley to the Pacific Ocean on the west, and to the snow-capped peaks of the Sierra Nevadas in the east. Often in the early morning the valley is filled with a dense mass of fog, out of which the mountain peaks stand like islands, making a scene which can never be forgotten.

As we had followed the process of manufacture of the great object-glass at the Cambridge factory of the late Alvan Clark with much interest, we were naturally very desirous to see it in its final position, and to learn regarding the results accomplished by it; and, by the courtesy of the director, Professor E. S. Holden, every facility was given to inspect it, as well as the no less important and novel accessory apparatus, without which the glass itself would be valueless. Some of the best results obtained from the object-glass have been in the direction of celestial photography; and it was no small privilege to examine the original negatives of the moon and planets, which preserve so many minute details for future study and examination, thus continuing indefinitely favorable conditions for observation, which would occur very infrequently, and for short periods of time, if it was necessary to observe them directly through the telescope itself.

The diameter of the dome containing the great telescope is seventy-five feet. It is made of steel plates, and weighs one hundred and thirty tons; yet by the turning of a little wheel, the dome is noiselessly moved so that its window opens to any part of the sky that is desired. The telescope is fifty-six and a half feet long, and weighs twenty-four tons, and is so poised that it can be moved to point in any direction by the turning of a wheel or by placing ones hand on the lower end of the telescope. The entire floor of the observatory can be lowered or lifted, by hydraulic power, a distance of seventeen feet; so that the observer may sit in his wheeled chair and follow the moving telescope from the zenith to the horizon.

The principal function of the object-glass—the lens placed in the upper end of the telescope—is to gather the light proceeding from any object and form an image of it at the focus. This image is then magnified by the smaller lenses in the eye-piece of the telescope, by which it can be enlarged to any desirable extent. It will thus be seen that it is the light-gathering power which is desired in an object-glass, and this is dependent upon its area. The object-glass of the Lick telescope has an area of 1,018 square inches, while the next largest—that at Pulkowa, in Russia—has an area of only 706 square inches; the former glass thus has nearly one-third more light-gathering power.

The other apparatus of the observatory is well worthy of mention. A twelve-inch equatorial telescope is in constant use, and is a very valuable adjunct to its giant neighbor. The meridian circle, the transit instrument, the photographic laboratory, as well as the numerous smaller telescopes, clocks, meteorological instruments, etc., are all constructed in the best manner and with every modern improvement. Earthquakes are not uncommon, and might produce serious errors in the adjustment of the instruments if they should pass unnoticed; so a complete seismograph registers automatically the slightest tremor of the earth, upon a sheet of smoked glass, showing the time, the direction, and the force of the vibration.

The value of the great object-glass in the study and photography of stellar spectra is evident, and when its capabilities in this direction are fully developed and utilized, very valuable results will undoubtedly be obtained. A most ingenious form of spectroscope has been devised by Professor Holden, which, when adjusted to the eye-piece of the telescope, can be moved so as to bring all parts of the circumference of the sun successively into the field of view without readjustment. The condition of the solar prominences, or "flames," can thus be observed in all the solar latitudes at the same period without any loss of time.

The large staff of observers, together with the mechanics and laborers employed about the observatory, make up quite a little colony, which is housed and cared for in the best possible manner. A bed of fine clay was fortunately found near the summit, and a temporary brick-yard was established, which produced the bricks used in the construction of the buildings, thus saving an expense of nearly $10,000 in freight charges. An abundant supply of water is found upon the mountain, and a daily line of stages to San Jose keeps the observatory in constant communication with the lower world; and, altogether, the lot of the Mount Hamilton astronomers seems a most happy one, wanting nothing, either in material comfort, or opportunity for pursuing the noble and fascinating study of astronomy under the most favorable conditions.

[Concluded from June number.]

REVIEW OF MR. ALFRED RUSSEL WALCLES, "DARWINISM."

BY KATHERINE R. CLAYPOOL.

There exists today a great difference of opinion as to the exact value that should be attached to the agency of natural selection in the evolution of species, many eminent naturalists maintaining that certain fundamental principles of variation or laws of growth have played the greater part in the production of new organic forms. That species arise from species by the natural law of "descent with modification," was established by Darwin, whose celebrated hypothesis gave the long-looking for support to the philosophy of evolution. One other theory, it is true, had been offered, but, as stated and illustrated by its originator,—the gifted Lamarck,—it was so beset with difficulties that it exercised little influence on the scientific mind. That new species of animals could be formed by changes in the structure of organisms, appeared to be capable of proof; but that these changes arose, as Lamarck taught, under the direct influence of new conditions of life,—the neck of the giraffe lengthening as the creature stretched higher and higher for leaves; the feet of the duck becoming webbed in its efforts to swim; and so on,—and that the modifications thus effected were transmissible to offspring, could not be accepted without strong evidence. This evidence Lamarck was unable to produce, and his theory was still further weakened when effort directed by the wish of the individual was called on to explain changes in the structure of plants.

Through the impetus given to the study of biology by the hypothesis of natural selection, research has been carried into many new regions. Each fact that has been discovered has opened the way for many others, at the same time giving glimpses of ever-widening fields of inquiry. No one naturalist can now attempt to explore more than some limited part of the great whole, and year by year the limits are being drawn more closely. The more the field is narrowed, the greater the number of minute and detailed observations that can be made in it. There is, therefore, at the present time a marvelous wealth of facts and observations that is simply enormous compared with the small number that were within the reach of Lamarck. Though none of these are found to support extravagances such as the agency of the wish of the individual in producing organic change, many seem, to
some of the ablest biologists of the day, to indicate that external influences and direct inheritance are, after all, insignificantly important—producing, through the various combinations involved, an infinite possibility of variation on which natural selection may work. The characters, therefore, that are transmitted from parents to offspring are—according to

Welsmann—those that were latent in the germ-plasm from which the parents were themselves derived, and that could be selected within them for the production of a new generation is passed on without carrying with it any of the characters acquired during the life of either parent.

Even though Mr. Wallace finds that in no case have the Neo-Lamarckians been able materially to diminish the power of natural selection, and that Welsmann's theory of heredity strongly supports it, to a large extent he concludes that the last word has yet been spoken. The almost simultaneous appearance of Wallace's "Darwinism" and an English translation of Welsmann's essays on heredity, at the close of last summer, led to very vigorous formal and informal discussion among the naturalists assembled. In September, at the meeting of the British Association for the Advancement of Science. Knowledge born of minute research in special lines was brought to bear on this question of the transmission of acquired characters, and the views stated by the leading biologists may be found in the September issues of the London Nature.

The pages of Nature, also, have been, and still are, open to further discussion. Dr. Ray Lankester, speaking at the meeting, Mr. Wallace, Dr. Spencer, Sidney Vines, the Duke of Argyll, Dr. E. D. Cope, Thidkleton Dyer, and Welsmann and Wallace themselves, have all written on this important subject, and the controversy is not finished yet.

It is probable that it must remain open until the discovery of fresh facts shall make some points clear, or until—as suggested by Mr. F. Galton—facilitate experiments can be devised that shall be accepted as crucial tests of the possibility of a parent transmitting a congenital aptitude to his children, which he himself possessed not congenitally, but merely through long and distasteful practice under some sort of compulsion.

But, while Mr. Wallace is convinced that natural selection is supreme as an agent of the modification of organisms, he is by no means inclined to claim for it unlimited power. There is a point at which it must, he thinks, stop short; and this point is the moral and Intellectual nature of man. Darwin's conclusion as to the essential identity of man's bodily structure with that of the higher mammals, and his descent from some ancestral form common to man and the anthropoid apes, is fully accepted by Mr. Wallace. But what is very doubtful is to derive the moral nature and mental faculties of man by gradual modification and development of their rudiments in the lower animals, in the same manner and by the action of the same general laws that produced his physical structure, Mr. Wallace takes issue with him. Natural selection cannot, in his opinion, have produced those emotions and faculties that form an unbridled chaos between man and even the most mentally endowed of the animal kingdom. Taking the mathematical, musical, and artistic faculties as examples, Mr. Wallace maintains by two lines of argument that natural selection has had nothing to do with their development. What relation, he asks, have the successive stages of improvement of the mathematical faculty had to the life or death of its possessor? to the struggles of tribe with tribe? or nation with nation? or the ultimate survival of one race and the extinction of another? Again, natural selection by its very nature acts only on useful or hurtful characteristics, eliminating the latter and keeping the former to a fairly general level of efficiency. The characters developed by its means shall, therefore, he holds, be present to some degree in all the individuals of a species; and, as a matter of fact, there are found in all savages those qualities which were essential to man in the early stages of his development. But in}

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### METEOROLOGY FOR MAY, 1890, WITH REVIEW OF THE SPRING.

#### TEMPERATURE.

<table>
<thead>
<tr>
<th>Average Thermometer</th>
<th>Lowest</th>
<th>Highest</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>At 7 A. M.</td>
<td>53°F</td>
<td>76°F</td>
<td>23°F</td>
</tr>
<tr>
<td>At 8 P. M.</td>
<td>64°F</td>
<td>78°F</td>
<td>14°F</td>
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<tr>
<td>Whole Month</td>
<td>69°F</td>
<td>78°F</td>
<td>9°F</td>
</tr>
<tr>
<td>Second Average</td>
<td>64°F</td>
<td>76°F</td>
<td>12°F</td>
</tr>
<tr>
<td>Last 20 Mays</td>
<td>57°F</td>
<td>75°F</td>
<td>18°F</td>
</tr>
<tr>
<td>Average</td>
<td>65°F</td>
<td>79°F</td>
<td>14°F</td>
</tr>
<tr>
<td>Spring of 1890</td>
<td>46°F</td>
<td>78°F</td>
<td>32°F</td>
</tr>
<tr>
<td>Last 20 Springs</td>
<td>45°F</td>
<td>69°F</td>
<td>24°F</td>
</tr>
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</table>

The lowest point of the thermometer the past month was 42°, on the 2d, and this was also the coolest day, with an average of 46 33°. The 8th was the 3d warmer. The highest point was 87°, on the 14th, which was also the warmest day, averaging 68 66°. The entire month was 1 26° above the average of the last twenty Mays. The lowest daily range was 4°, on the 8th; the highest 25°, on the 1st. The excess of heat above the average since January 1 has been 34°, an average daily excess of 3°. The season continues about one week in

The average temperature of the present spring has been just above that of the last twenty years.

The face of the sky, in 93 observations, gave 42 fair, 19 cloudy, 22 overcast, and 10 rainy,—a percentage of 45 2 fair. The average fair for the last twenty Mays has been 34 2, with extremes of only 29 in 1888, and 78 5 in 1871,—a wide range of 49 5. A foggy morning on the 25th, a thunder-storm on the 26th, and a heavy rain on the 27th, have completed the month. The 26th, and a heavy rain on the 27th, have completed the month. The 26th, and a heavy rain on the 27th, have completed the month.
The average pressure the last month was 29.952 inches, with extremes of 29.68 on the 5th and 6th, and 30.19 on the 22d and 23d,—a range of only .51 inch. The average for the last seventeen Mays has been 29.652, with extremes of 29.958 in May 4, and 30.068 in May 15,—a range of .97 inch. The sum of the daily variations was 4.131 inches, giving a mean daily movement of .133 inch. This average for the last nineteen Mays has been .233, with extremes of .573 and .170,—showing a quiet state of atmospheric pressure in May. The largest movements were .44 inch on the 21st, and .28 on the 7th.

The average pressure the present spring has been 29.797 inches, while that of the last seventeen springs has been 29.917.

WINDS.

The average direction of the wind the last month, calculated as usual, was W. 23° 14' S., or most nearly W. S. W., while the average for the last twenty-one Mays has been W. 1° 13' N., or nearly W. The extremes have been E. 65° 45' N. in May 11, and W. 57° 32' S. in May 18, or nearest N. N. E. and S. W. by S.,—showing a difference of nearly fifteen points of the compass.

The average direction of the last spring was W. 17° 14' N., and of the last twenty-one springs W. 38° 21' N.

COMPARATIVE METEOROLOGY OF NEW ENGLAND FOR APRIL, 1890,
gathered from the Bulletin of the New England Meteorological Society. The average temperature and precipitation are presented in the following table, State by State, with that of all combined, under the title of New England. That of Natick is also subjoined.

The average temperature of New England for a series of years at twenty-four stations for April is

- 14° 7', or .5° below that of 1890. The average precipitation at thirty-one stations for a series of years has been 31.9 inches, or .68 inch above that of 1890. The maximum and minimum standing against Natick are the extremes of twenty and twenty-two Aprils, of which the means are 41.3° and 3.87 inches.

On examination of this table we notice the gradual rise of temperature from Maine to Rhode Island, and that Massachusetts stands one full degree above the mean of New England. The precipitation for April bears a similar comparison. Natick stands near the mean of Massachusetts. The warmest station in New England was Springfield, Mass.; the coolest, Berlin Falls, N. H. The extremes of precipitation were at Voluntown, Conn., and West Milan, N. H.

ASTRONOMICAL PHENOMENA FOR JULY, 1890.

The earth is in aphelion—that is, it attains its maximum distance from the sun—on July 2. Mercury is a morning star at the beginning of the month, but it is hardly far enough away to show well, having passed its greatest western elongation on the night of June 23-24. It rapidly approaches the sun and is seen last on the month, on July 22. It is in perihelion on July 15. Venus is an evening star, and sets a little more than two hours after the sun. It is moving out toward eastern elongation, but will not reach that point until late in September. It is also gradually growing brighter, but will not reach its maximum brilliancy until late in October, when it will be nearly three times as bright as it is during July. This month there will be a near approach of Venus and Saturn. The nearest approach comes at about noon on that date, but the planets will still be quite near each other after sunset.

Mars is still conspicuous in the evening, but has begun to lose light. It moves westward until July 4th, after which it moves eastward. At the end of the month it is not far from Beta and Delta Scorpion. It is on the meridian and at about 9° M. at the beginning of the month, and at a little after 7° M. at the end of the month. Jupiter comes to opposition on the month of July 30. It rises a little after 9° M. on July 1, and at about 7° M. on July 31. It moves westward about 4° during the month. The following eclipses of his satellites may be seen from one part or another of the United States. The phenomena all take place off the left-hand limb of the planet, as seen in an inverting telescope, and are all disappearances, as the satellites come out of eclipse while they are behind the planet. Times are Eastern Standard.

IV. D. July 3, 4h. 1m. A. M.
31. B. July 4, 3h. 45m. 30m. P. M.
31. I. July 5, 8h. 21m. A. M.
31. L. July 9, 8h. 30m. P. M.
31. H. July 9, 9h. 41m. P. M.
31. D. July 10, 10h. 14m. A. M.
31. B. July 11, 11h. 31m. A. M.
31. L. July 15, 12h. 51m. A. M.
31. I. July 16, 10h. 44m. P. M.
31. I. July 17, 11h. 48m. P. M.
31. H. July 18, 10h. 21m. A. M.
31. L. July 19, 11h. 1m. A. M.
31. I. July 21, 1h. 50m. A. M.
31. B. July 22, 2h. 10m. A. M.
31. D. July 25, 2h. 23m. A. M.

Note: \[5/10\] is Saturn is still to be seen in the western sky, but sets not long after the sun—about three hours after on July 1, and only about one hour after on July 31. It is still in the constellation Leo, and is moving slowly eastward. Uranus is in the western sky in the evening, in the constellation Virgo, to north and east of Spica (Alpha Virginis). Neptune is in Taurus, and is a morning star.

THE CONSTELLATIONS. The positions given hold good for latitudes differing not many degrees from 40° north, and for 10° P. M. on July 1, 9 P. M. on July 16, and 8 P. M. on July 31. On the southern meridian are Corona Borealis, near the zenith, and Scorpions, down near the horizon. Sagitarius is just passing through the southern horizon, and Hercules is east of the zenith. Aquilla is about halfway up, a little south of east. Lyra is a little north of east, somewhat higher than Aquila, and Cygnus is below Lyra. Delphinus is near the eastern horizon. Draco lies on both sides of the meridian, between the zenith and pole. Cepheus is to the right of the pole star: Cassiopeia to the horizon, a little east of the meridian. The principal stars of the Minor is near the meridian, above the pole. Urna Major is to the left, with the pointers at about the same altitude as the pole star. Bootes is just west of the zenith, and Leo is near the western horizon. Virgo follows Leo, low down in the southwest, and Libra lies between Virgo and Scorpions.

M. LAKE FOREST, ILL., June 5, 1890.

CORRESPONDENCE.

Brief communications upon subjects of scientific interest will be welcomed from any quarter. The editors do not assume liability for views and statements presented by their correspondents.

Editor of Popular Science News:

In your April number of Popular Science News an article by C. E. Washburne, M. D., describes an "Operation Under Hypnotism." The interesting point to me is, to know by what method hypnotism was produced. The reading of this article brought to my mind some experiments made nearly fifty years ago by Dr. Butler Wilmurt, then of Leverett, Mass., in so-called animal magnetism, to which I was a witness. The doctor, in his practice, found himself possessed of a power over certain individuals, whereby he could induce hypnotism, subdue pain, control the actions of the subjects, and limit or extend these conditions by hours, at his will, without the use of drugs. In at least one case he did successfully command his patient to wake up at a specified moment, and return to sleep five minutes later. During the five minutes' wakefulness pain was intense, but the sleep before and after was quiet, restful, and painless. Being wholly averse to quackery, he made no further observations, and no mysterious power to perform wonderful cures, but left it with only the most limited upon way upon a few chronic cases. The burden of his experiments was more in line of mind-reading of affairs in other and distant localities, some of which were at least astonishing.

JEROME WILMURT, M. D.
MILFORD, MASS., April 17, 1890.

Editor of Popular Science News:

In your issue of May an experiment in magnetism is described, and the statement made that the cause of the phenomenon is not clear. An explanation which goes as far as that of any of the phenomena of magnetism, may be given. The tongs in standing become magnetized by induction from the earth, with the north-seeking pole downward. When this pole is rubbed over the knife-blade in the manner described, its action is like that of any
other magnet, and the point of the knife becomes a polar of the opposite kind—called north in France and south in this country.

Very truly yours,

MARIA A. KEITEL.

MOUNT HOLYOKE SEMINARY AND COLLEGE, SOUTH HADLEY, MASS., MAY 10, 1895.

Editor of Popular Science News:

The answer given to the question, "How long can a solar disc remain total?" as published in the June number of the Science News, is erroneous.

It is possible, at the equator, for totality of a solar eclipse to last 7m. 38s. A person, however, moving eastward on a rapidly-moving train during totality could prolong it to 8m.

LEWIS SWIFT.

WARREN OBSERVATORY, ROCHESTER, N. Y.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

H. C. W., MASS.—In the common copper-oxide cell, why is it necessary to put a strip of mercury and a strip of copper into the cell? Is it not possible to use two copper strips? Also, in the Callan battery, where one pole consists of iron immersed in strong nitric acid, why is it not dissolved?

Answer.—(1) The chemical affinity between zinc and sulphuric acid is much greater than between mercury and nitric acid, so that the chemical action, and with it the generation of electricity, will only affect the zinc as long as any remains undissolved. (2) When iron is immersed in strong nitric acid, it enters into a peculiar condition known as the passives state, in which it is quite insoluble even in weaker acid. The cause of this phenomenon is not fully understood, but it is probably due to the formation of a protecting coating of insoluble oxide of iron.

N. J. B., CHICAGO.—What is the strongest electric current that a man can endure without injury?

Answer.—The strongest electric current which the human body can tolerate is extremely variable, with different persons and under different conditions, but it is believed that it is not greater than a tenth of a milliampere. We know of a case where a person received a current of 2,000 volts, at first without apparent injury, and it is believed that this strength has been exceeded, and in 99 cases out of 100 the current would have caused instant death.

P. S. M., NEW YORK.—Does an electric current pass through the entire mass of a solid or through a solid rod of the same size?

Answer.—A current of electricity passes through the entire mass of the conductor. That is, the conducting power (resistance) of any body is proportionate to the weight of similar conductors. Consequently, a solid rod of copper is as strong as a thin wire of the same diameter. Static electricity, on the contrary, remains upon the surface of the charged body, as long as it is not in motion.

W. S. T., NEW YORK.—The tarnishing of your watch-case is, undoubtedly, due to the sulphur contained in the rubber. A pocket of oiled silk or some similar impervious substance may remedy the trouble.

B. S. P., VERMONT.—Among the other valuable properties of platinum is its comparatively small coefficient of expansion when heated, which approximate to that of glass. It is used in making the platinum wires which can be fused into glass—as in electric lamps, Geissler's tubes, etc.—without danger of subsequent cracking of the glass.

STUDENT, META.—We should strongly advise you to have nothing to do with chlorides of nitrogen. It is an extremely dangerous substance to work with, and liable to explode at any moment with terrific force. Even the most experienced chemists have not always escaped unharmed.

J. M. M., PITT.—Does the microscope reveal any difference between human blood and that of domestic quadrupeds, and does the domestication of wild animals alter the condition of the blood-corpuscles?

Answer.—We have had no opportuni-ty to observe anything more than that which appears in the size of the blood-corpuscles of different animals, including man. As far as we know, domestication causes no change, either of size or shape.

LITERARY NOTES.


This charming book on botany for young people is a popular illustrated botany for home and school. It is written in language easy to understand, and full of interest. It contains facts and observations about something more than give merely analytical tables and descriptions of species. She has tried to relieve the usual dryness of detail botanical work by mingling with her text some of the legends of flowers, and here and there a story or a poem by Robert Newman, M. D., New York. She has done wonderfully well. Many a young reader will be led by this book to almost unconsciously know something of botany, who would turn with weariness from the average textbook on the subject.

In the physiological part of her work, Miss Pratt has treated the subject easily, presenting what is absolutely essential to know in a simple manner, and leaving the rest to the larger text-books and later years of the student. This same simplicity of treatment makes this book not only in a purely technical, but "Flora," which takes the last ninety pages of the book. Here, the young reader is led to recognize and name a great many of the species on which he may be working. The book is a quart, beautifully printed and profusely illustrated, and will undoubtedly find ready acceptance with the young people.

The third volume of the magnificent Century Dictionary, including the letter L, is now ready. The lexicographers assert that new words are more and more impressed with the completeness, thoroughness and reliability with which it is edited. It is evident that by this time there is no weaker point in most dictionaries—are defined and explained with the utmost correctness and precision. Taken altogether, the work is a great credit to American scholarship.

The Master of the Magicians, by Elizabeth Stuart Phelps and Herbert D. Ward. Published by Houghton Mifflin Co., Boston. Price, $1.00.

The extraordinary success of New-Hor has stimulated the production of what may be described as the religious historical novel, and this present work can be recommended as the best and most interesting of its class. The names of the authors are a sufficient guarantee of its high value from a literary point of view. The story is that of the prophet Daniel and the ancient Chaldean empire. It is of additional interest as a popular archaeological work, describing the manners and customs of those ancient pre-historic times.

The Report of the Royal Commission upon the Mineral Resources of Ontario has been received, and is of interest as showing the variety and richness of deposits of valuable minerals and metals existing in the territory of our northern neighbor. There is evidently much irnural wealth in that region, awaiting proper development.

Special mention should be made of the receipt of the dedications of the Lock Observatory and the Astronomical Society of the Pacific. The latter publication contains full reports of the work accomplished at the Lock Observatory and is furnished free to members of the Society. The membership dues are five dollars per year, and application may be made to the Secretary at 408 California Street, San Francisco.


Medicine and Pharmacy.

VITALITY.

The greatest of all mysteries is that of the true nature of Life, or the principle of vitality. Without going into abstruse philosophical reasonings, the fact of the actual existence of life must be an admitted fact, even if the question of the subjectivity or objectivity of what we call matter and energy is left undecided. The writer, or the reader of these lines must necessarily be sure of his own existence—that is, the existence of perceptive faculties, although the certainty of the actual existence of anything else may be unprovable. We are unable to separate our intelligence from ourselves; and, although it is a fanciful, and perhaps illogical speculation, yet the idea that all the surrounding universe has no real existence, but is only the "baseless fabric of a vision," and that I—the ego—is the universe, must have occurred, at times, to every thoughtful person.

Practically, however, we must base our actions upon the existence of an outside world, and the more we can bring ourselves into harmony with the conditions which environ us, the greater happiness and satisfaction we shall obtain. Pain and pleasure are realities; and to avoid the one and attain the other in the highest degree is the "chief end of man"—actually, at least, notwith-standing the doctrines of the "shorter Cathe-chism.

A newly-laid egg is, apparently, nothing but a mass of albumen, with a few other complex organic chemical compounds; but the miraculous changes which occur when it is submitted to a gentle heat for a few weeks, show that this mass of albumen is wonderfully different from the simple organic substance known by that name. The little microscopic cell, or germinal vesicle, in the yolk possesses the power of setting up a rearrangement of the molecules of the material of the egg, which results in the formation of such complicated substances as are represented by feathers, bones, skin, flesh, etc., and, as a whole, endowed with the power of voluntary motion, of obtaining and assimilating other material into its structure, and—most wonderful of all,—in due time, of producing other eggs endowed with the same remarkable properties, and thus preserving and transmitting the principle of vitality for an unlimited period.

If, on the other hand, we destroy or remove the germinal vesicle before submitting the egg to heat and moisture, what a different set of chemical reactions occur. It is like a clock from which the escapement has been removed. The complex molecules of the albumen and other compounds tumble down like a house of cards; the sulphur unites with hydrogen,—forming the familiar and offensive
hydric sulphide,—while the other elements rapidly pass through a series of changes continuously tending to the formation of simpler compounds, until finally the bulk of the egg is transformed into the carbonic dioxide and water from which it originally came, the small amounts of sulphur, phosphorus, nitrogen, and other elements being also reduced to their simplest inorganic terms. And what is the cause of this difference? Something,—whether matter or energy, we know not what,—conditioned upon the existence of a little microscopical cell, which is, apparently, no different from any other, and refuses to yield up its secret to the most powerful microscope, or the most delicate chemical reagents.

A similar condition is found in the vegetable world. The little "germ" present in every seed contains something which sets up and sustains in action the chemical changes which build up the tree from water, carbonic dioxide, nitrogen, and a few mineral salts of the soil. When the time arrives that this mysterious sustaining force is withdrawn, the reactions are at once reversed, and the cellulose and other organic compounds of the plant slowly but surely return to their original water and carbonic dioxide,—perchance to again pass through the same cycle of transformations. From the smallest almeha,—which, as far as we can tell, is only a bit of almeha endowed with the power of motion,—to man himself, everything possessed of what we call life, is ruled and preserved by this mysterious principle which differentiates living from dead matter.

That our bodies are not ourselves is beyond question, but just what relation the chemical compounds of which we are formed bear to our consciousness, or ego, and in what respect one is dependent upon the other, no one can say. The brain of a Hottentot has, as far as we know, the same chemical composition as that of a Newton or Faraday; but the vital force which governs its actions must be different, either in its nature or in its mode of action. Nor can we say with certainty that the vital force resides in the brain at all. Portions of the brain may be removed, and life still remains. Only when the nerve-centres which govern important bodily functions,—such as the action of the heart or lungs,—are destroyed, is the protecting influence withdrawn and the elements of the body permitted to return to their more stable combinations.

We cannot say from direct experimental evidence that the vital force is indestructible. Whether an almeha or a philosopher die, both revert to the same forms of matter, and we know no more of the future destiny of the force which has conditioned their lives than we know about its nature. But we know that life has certainly existed from the earliest geological ages; and, if we speculate—as we may legitimately do,—upon the identity of the force which builds up the living being, and that which builds up the inorganic crystal, perhaps from the commencement of the existence of matter. Every manifestation of its action in living beings tends to bring about its constant reproduction and transmission to successive generations; after a plant or animal has reproduced its kind, or passed beyond the period when such reproduction is possible, the vital force is gradually withdrawn, and what we call death takes place. And more than this: the constant tendency of this vital principle seems to be towards the production of more complex and highly organized and differentiated forms of life, each generation, on the whole, slightly surpassing its predecessors. In this sense, at least, life may certainly be said to be immortal and progressive; and as the vitality which now animates our bodies must have had an existence for an almost infinite number of previous generations, so it is not illogical to infer that, after the vital principle ceases to govern the matter which now composes them, it may still exist and manifest itself in other ways, in which our individuality or consciousness may be retained and even extended and amplified in the same chain of progress which, according to the best modern thought, has developed the most wonderful of Nature's products, Man, from the lowly ascidian of the primeval seas.

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARKE, M. D.

WHAT CAN AND SHOULD BE DONE TO LIMIT THE PREVALENCE OF TUBERCULOSIS IN MAN.—This comparatively new question, which is very far from being solved, formed the subject of a discussion at a recent meeting of the Association of American Physicians, the principal paper being contributed by Dr. Edward Q. Shakespeare, of Philadelphia. It was now generally admitted, the writer stated, that tuberculosis was an acute infectious disease due to the bacillus tuberculosis of Koch. It was essentially non-hereditary, though a weak and enfeebled system may be infected, thus rendering a person more susceptible to the disease or less able to throw it off. In view of the admitted inefficiency of all present modes of treatment of actual cases of tuberculosis, effective prophylactic measures are infinitely more important to the general public, and should also be to the physician, than the most skilful therapeutic measures, in real efforts to limit markedly the enormous mortality due to tuberculosis. Since analysis of the fullest records bearing upon the relation of family history to the causation of tuberculosis could possibly account, through hereditary predisposition, for little more than one-fourth of the cases, the most perfect measures conceivable for the lessening of that influence cannot be rationally compared to importance to those which are essentially based upon the destruction of an infective poison which is virulent enough to produce the disease, not alone in this comparative few who may be born with hereditary predisposition, but also to cause tuberculosis in the majority who succumb, notwithstanding the absence of a hereditary weakness. While the discovery of this bacillus has little advanced the treatment and cure of tuberculosis, it has revealed most important principles upon which to base efficient means of preventing the spread of the disease. In the prevention of tuberculosis the following principles formed the basis of an efficient system: (1) With regard to those already diseased, effective preventive measures should look to the rapid destruction of the tubercle bacillus in the excreta and to some desert spot whatever of the affected, and by little as possible prolonged close association of the well with the sick. (2) With regard to those liable to become infected, nothing which may contain the living tubercle bacillus should be permitted to enter the digestive apparatus. Rigid inspection of meat and milk is a necessity. (3) Tuberculous subjects should not be admitted to hospital wards in which those with other diseases, especially of the lungs, are confined. In general hospitals, consumptive should be assigned to special consumptive wards. (4) Special hospitals for the treatment of consumption should be established.

The Rev. O. S. Park of Saranac Lake, spoke of the decrease of the number of cases in England resulting from proper separation of consumptive patients and the care of the sputum. Dr. Johnson, of Chicago, speaking with reference to the practice of sending patients with consumption to certain western localities, said he preferred sending them to some place where they were practically isolated from others suffering from the same disease, stating that vegetation was scanty, and the conditions for increase in bacillary growth unfavorable.

Dr. Ernst, of Boston, related the circumstances of a case which had lately come to his notice, showing how rooms might become infected, and be the cause of extending the disease to others, in whom family and personal history were perfect. An early diagnosis of tuberculosis could be made only by finding the characteristic bacillus on microscopic examination. The treatment is more favorable if an early diagnosis is made.

Dr. Bridge, of Chicago, said that in a few weeks signs could generally be found in the chest, but that the time for treatment that would avail, was in the disease before physical signs could be found, and hence the importance of a microscopic examination of the sputum.

OLIVE OIL AND GALL-STONES.—The old treatment of biliary calculi with large doses of olive oil, which had lapsed into partial desuetude, has been brought into fresh prominence within a few years, though its value is still in doubt. In an article which Dr. Seelig Rosenberger read at a meeting of the Medical Society of Berlin, the writer reports three cases successfully treated by this method. Including his own, he finds recorded in the medical journals twenty-one cases in which the olive treatment has been tried; in nineteen of these the patients were partially or very much relieved or well at the time of their discharge, while in two cases no improvement resulted.

In considering the modulus operandi of this remedy, he takes exception to the theory which assumes that the oil in some manner finds its way into the biliary passages, where it produces a softening of the gall-stones, or that the oil may act as a solvent along the same lines. He believes that the exhibition of a large amount of oil or fat in the stomach and duodenum excites a correspondingly large flow of bile, and that this flushing of the channels with bile dislodges the calculi and cures the colic. He argues...
that, since bile plays so important a role in the absorption of fat, it is fair to assume that the presence of fatty food in some way calls forth the bile which is so necessary for its assimilation. In his endeavor to prove this, he tried a number of experiments on two dogs with permanent biliary fistula, giving them in the morning a large dose of oil (sometimes a quarter of a pound of solid fat of very rich or bacon substitute in a mixed diet), and noting each hour the amount of bile which had flowed from the fistula. In every case he found a very considerable increase in the amount and duration of the flow over that produced by an ordinary meal of carbohydrates and albuminoids. It was also considerably more than the secretion he could produce by giving salicylate of soda or bile itself. Both of which had previously regarded as active exciters of the biliary function. He concludes from his experiments that oil acts as a powerful choleragogue, perhaps the most active of any, and to this action he attributes his success in the treatment of gall-stones.

Dr. Rosenberg considers it very important to flavor and disguise the oil as much as possible, for the very idea of the medication administered is extremely disquieting to patients. To remove the nauseating taste, he adds one-quarter of one per cent. of menthol and ten or fifteen per cent. of brandy; and also advises adding the yolks of two eggs, finely divided and worked in, so as to be perfectly smooth; this materially alters the appearance of the oil. The dose should be from five and a quarter to seven ounces in twenty-four hours. The oil is best given about an ounce at a time, in such a way that the whole amount will be consumed in three hours.


HYDROPONIA.—Dr. N. S. Davis, of Chicago, an ex-president of the American Medical Association, formerly editor of the Journal of Medicine, and a patient of many years' experience, said in a recent discussion that he had seen but one case of supposed hydroponia. It was that of an engineer, who had first been seen by other physicians, who sent him to the hospital, where he died within eighteen hours. Neither the patient, while conscious, nor any of his friends, could recall the history of a dog-bite or of any injury. He had been and remained in perfect health for two or three weeks before a job. Dr. Davis had seen many cases of dog-bite, but none in which the animal had not been killed, so that the existence of rables could not be proven. During the past twenty years he had directed such patients to keep the wound covered by a cloth saturated with soda and vinegar, and to use the gauze in a solution of mercuric chloride and hypo- sulfite of soda, and to take in water ten grains of the hypo-sulfite of soda three times a day, continuing it three or four weeks. He did not pretend to say this prevented the development of hydroponia, but none of his cases had had it, and therefore, it could be said he had had better results than Pasteur.

USE OF CHLOROFORM.—Dr. Arthur Neve contributes to the British Medical Journal a statement of his experience with chloroform, and his disbelief in much of its alleged dangerousness. He says that in 3,000 operative cases chloroform has been administered in his presence; not a single fatal case has occurred. The cases in which serious danger had threatened might have been controlled on the fingers of one hand. None of these cases were due to any heart affection; it was a question of arrested respiration. While the patency of the respiratory tract was secured, and a few artificial respiratory movements were performed, all danger passed away. Promptitude is necessary, but it is not a quality in which surgeons are deficient. It is a general surgeon, not to anesthetists, that we are indebted for the knowledge how to meet the danger. As far as the Inhabitants of Central Asia and North India are concerned, chloroform may be regarded as a perfect anesthetic. True, the beer-drinking Tibetans occasionally struggle before succumbing to its influence, but of other races—Yarkandis, Hillisens, Pathans, and Dard-Rashmiris, etc., may be said that to ninety-nine per cent. chloroform may be given deeply and its administration prolonged without a drawback—no cardiac weakness, no bronchial irritation, very rarely signs of an over-dose. That no powerful anesthetic is free from risk is a truism. Professor Chiene used to say that it was like a fast train passing many stations without stopping, and halting or fluctuating between the signal-point of semi-conscious reflexes and the terminus of cessation of vital reflexes, namely, respiratory stoppage, arrest of heart action, death. Let every driver beware the pace, watch the signals, and he will be safe.

EMBOLISM AND THE Concealment OF Crime.—Attention has been recently directed by Dr. T. M. Dorell, one of the medical examiners of Massachusetts, (Boston Medical and Surgical Journal,) to the hinders to a proper post mortem examination, in cases of suspected poisoning, occasioned by the practice, common with undertakers, of so-called "embalming," or injecting into the body, soon after death, a solution of chemicals intended to preserve it. These consist, for the most part, of arsenic or mercury, and it is plain that the question would be at once raised by the attorney for the defense, where, upon the strength of the medical examination after death, homoide by poisoning was alleged, whether the poison was introduced before or after death, by the criminal or the undertaker. The question might be very difficult to settle, and, in any case, the issue would be unnecessarily fogged. Presumably bodies could be as well preserved by ice.

ICHTHYOL.—Among a long series of remedies for skin diseases, there is perhaps none which has made such strides in favor and use as ichthyol, a substance prepared from the petrified remains of prehistoric fish and sea animals, which are found in large beds in the Tyrol. This bismuthous mineral, when subjected to dry distillation, yields among other products a brownish-yellow translucent oil, of a specific gravity about 0.865. This raw oil is treated with an excess of concentrated sulphuric acid, and warmed; subsequently the excess of acid is removed, and from the product the salts are prepared. Ichthyol was first recommended for rheumatism, and the success which attended its use was described as astonishing. Further and recent experience with ichthyol preparations has developed new features in its therapeutic action. Externally it still maintains its reputation as a remedy for rheumatism, while for chilblain, erysipelas, and eczema, the legs, it is highly recommended. For all these affections it is being applied in the form of an ointment, composed of ichthyol one part, and lanolin ointment nine parts. In this form the substance is used in some of the leading hospitals. Internally ichthyol is found to be useful in all forms of indigestion and diseases of the liver, and such morbid conditions as arise from hyperemia and capillary dilatation will benefit in the circulatory system, of disturbances of the digestive organs, of neuralgia, etc. The average internal dose is about eight grains of the sodium sulphhydrate twice a day; it is given either as pills or gelatine enclosed capsules.—Cor. Jour. Amer. Med. Asso.
mination of life. This is spoken of as "descending" development, and normally consists in the preservation of the relative proportions of the several structures, under the influence of a well-adjusted diminution of material and of nutritive activity. The author cites as an example the increasing lightness and brittleness of bone with age, proceeding pari passu with a narrowing range of muscular activity; until a time comes when the machine stops, rather than is stopped by accident or disease, and old age terminates in natural or physiological death.

The requisites for longevity are found to be an inherent quality of endurance, popularly known as a "good constitution," derived, as the statistics show, rather from maternal than paternal sources; a steady, persistent, nutritive force, and a good proportion of balance between the several organs. More than fifty per cent. of the centenarians are women, and a greater number of the female sex attain an advanced age, notwithstanding the dangers inherent to the child-bearing period of life. The more pronounced healthiness of the female infant is not without its share in the production of longevity.

Dr. Humphry says that the greater proportion of cases are reported to be of long-lived families, to have enjoyed good health throughout their lives, and to have been moderate or small eaters, especially in the matter of meat. They have generally been accustomed, too, to much outdoor exercise. Let those who are pen up in an office for nine or ten hours a day, and then only creep home to rest a brain, wearied with having to deal with badly oxygenated blood, remember this, and take a hint from the next point wherein our old friends excel, viz., early rising. Sleep should come early in the night, certainly before midnight, and healthy people should be able to wake at six and rise at once. With regard to general circumstances, it seems that those who are accustomed to live in comfort rather than luxury attain old age. Moderate drinkers and abstainers are well to the front, although in one or two instances some "have drunk as much as they could get," but from the very fact of their surviving one hundred years of age we are not disposed to believe that they ever could get much.

With regard to disposition, it is interesting to note how often the words "cheerful," "cheery," "amiable," "placid," "good tempered," "energetic" occur. Thus we find one dear old soul dancing on her 101st birthday, and another, Peggy Walsh, reputed to be 124, remained perfect hearing and such good sight as to be able to thread a needle without glasses. Surely the length of their days was not full of sorrow and labor. Vigorous mental labor appears, other things being equal, to predispose to length of days, a capacity for prolonged mental strain arguing great brain power. Happily old age is not often accompanied with dementia, although frequently some evidence of childishness appears.

It is important to note that there is only one instance of death of a centenarian from cancer: It seems that the liability diminishes from about 45 to 55 onwards, and that after 70 there is but little to fear in this direction. With reference to bladder trouble, arising from enlarged prostate, only seven per cent. were found afflicted, and it was found that after 65 was passed the liability becomes constantly less.

The remarkable preservation of the teeth is an object of common remark when skeletons of our forefathers are brought to light, and the conclusion is lastly arrived at, that we of the present generation have certainly degenerated in this respect. There may be some truth in this, but it must be remembered that such skeletons are those of people often cut off in their prime by battle or disease, and that nowadays a larger proportion of people attain to old age than formerly, thus allowing time for dental decay and loss to occur.

But after all, as the author says, "length of life is to be really estimated not by the number of years so much as by good work done; not by the amount of time spent in the tame, fruitless manner indicated by the pithy lines of Cowper,"

sACCHARIN IN BELGIUM.

Some time ago, a heavy import duty of 140 francs per kilogramme, practically amounting to prohibition, was placed upon saccharin in Belgium, in the supposed interest of the sugar industry. It is now discovered, however, that this law is quite inoperative, the consumption of the sweeter being noticeably on the increase and the article being freely obtainable from a number of dealers, while yet not a single instance has passed the customs-house since the promulgation of the new law. And no instances of smuggling have been traced. The explanation is now given, that in the preparation of commercial saccharin the process is one of seven distinct stages. The product of the sixth stage is quite different from saccharin in physical and chemical properties, and so, consequently, the duty cannot be applied.

In this state it is imported into Belgium, and across its frontier it is subjected to the final process—a simple treatment with an acid, which converts it into the commercial article.—Chemist and Druggist.

MEDICAL MISCELLANY.

PROBABLY—A new western post-office has been named Malaria, probably because the mail service of the place is intermittent.

A DANGEROUS TOOL.—M. de Freycinet, the French minister of war, has published a decree forbidding surgeons in the French army to make use of hypnosis in their practice, or to experiment with it.

THE SPECIALIST AND THE BURGLAR: A FABLE.

A burglar entered the office of a specialist, bent on plunder. The specialist saw him, walked him to a chair, sprayed him, prodled him, sprayed him some more, had ten dollars out of him, and commended him to "call again tomorrow," before the burglar could formulate an excuse for his intrusion into the doctor's office.

Moral: It is better to be a specialist than a burglar.

THE PHYSIOLOGY OF A KNOCK-OUT.—The death of a man in a "friendly" contest at sparring with gloves, is something unusual in the history of the manly art. Despite the terrific hitting often done in pugilistic encounters, a fatal accident rarely occurs. It is almost impossible, for one man to kill another with his fists, provided the other is in good health and his equal physically. The mortality from pugilism is less than from foot-ball. It often happens in boxing by professionals that a man is knocked "silly," in other words, knocked down by a blow on the side of the neck, which stuns him. The probability is this that it is due to the severe concussion and sudden compression of the soft parts of the neck, including the vagus nerve and the cervical sympathicus. Carotid inhibition, or arrhythmia, and some degree of vasomotor paralyzis would naturally result. It was by a blow in this region that death was caused in the exhibition sparring contest above referred to.—Medical Record.

HABits should never be signed with initiahs; the name should always be written with an ENGLISH NAME. PEN.

WHILE MALTINE contains the nutritive elements of malt, it is free from the objections which may be urged against the use of beer or ale. It is furnished either by itself or in combination with standard therapeutic agents.

THAYER'S NUTRITIVE is a most excellent preparation for the purposes for which it is recommended. Combining the qualities of tonic, stimulant, and food, it is well adapted for strengthening the assimilative functions of the body and restoring them to their natural condition.

In the "battle of the baking powders," the Royal Baking Powder has always been victorious. Its success is not entirely due to the skill with which its merits have been brought to the public notice, but to the purity, reahbility, and wholesomeness of the ingredients entering into its composition.

AMONG the various preparations of cocoa, that enamorled by Van Houten, easily holds the foremost place. A good article of cocoa—or cacao, as it should be spelled—is not only a delicious beverage for the well, but a nourishing and soothing food and gentle stimulant for invalids, free from the nerve-distracting principles of tea and coffee.

Even those tides which have a good supply of natural ice during the partially frozen summers prevailing, are benefitted by the invention of the Artificial Ice Machines, and the improvements made therein by David Hoyt, of Chicago, as otherwise the price of this necessity of life would be so high as to put beyond the reach of those of moderate means.

I have had occasion to use, in my practice as physician, "Golden's Liquid Dressing," and found it highly recommended it as extremely useful in cases of debility and general depression. In the sick room, as an article of food, combining at the same time tonic properties, it is highly useful. In all cases requiring strengthening nourishment, such as aged persons of weak digestion, it may be given with advantage. (Signed) A. JACKSON, M.D.
brought from the vicinity of a cavern in the valley was, in olden times, occupied by a giant; and it would be curious if the discovery of M. Lapouge should show it to be founded on fact, and handed down from father to son during the centuries that have elapsed since the time when the ancient inhabitants of France knew of no other material for their implements and utensils than the stones which they so laboriously worked into the desired shapes.

A CURIOUS EXPERIMENT IN PNEUMATICS.

Take a short tube, provided at one end with a funnel-shaped opening, (Fig. 1), and a small ball of wood or other light material. Place one end of the tube in the mouth, and attempt to hold the ball against the other end by drawing in the breath. The attempt will be unsuccessful, as the ball will fall immediately to the ground; but if one places the ball against the funnel and blows strongly outward, it will remain in position overcoming, apparently, both the attraction of gravitation, and the force of the current of air.

This paradoxical result is explained by
the curious fact that, as the air rushes out around the ball, a partial vacuum is produced in the funnel-shaped end of the tube, and the ball is thus held in position by the excess of atmospheric pressure on the outside.

If any reader of the Science News desires to try the experiment for himself, a similar apparatus can be made out of a piece of tin, or even a pipe-stem. (B-C), to one end of which is attached a circular piece of cardboard (A), as shown in Fig. 2. A second disk of cardboard (D) is then placed on top of the first, and it will be found impossible to blow it off; and the apparatus may even be inverted without its falling, while the blast of air is kept up. To prevent the upper disk from sliding off, the edges of the lower one should be turned up as shown in the engraving, or a pin may simply be passed through the centre of the upper disk so as to project into the tube.

The Illustrations accompanying this article are reproduced from La Nature.

[Original in Popular Science News.]

ARITHMETICAL CALCULATIONS AMONG THE ANCIENT GREEKS AND ROMANS.

BY JOHN C. ROLFE, PH. D.

It is obvious from their system of figures that the methods used by the ancient Romans in performing arithmetical operations must have been essentially different from our own. They represented units not only by simple, but by compound and complex signs (V, VI, VII, VIII.); two places in our decimal system were represented sometimes by two figures (XI) and sometimes by nine (LXXXVIII); and they had no zero. These peculiarities made mechanical assistance necessary in performing operations in whole numbers, as well as in their system of duodecimal fractions. Instruction in these operations was the most difficult work of their schools, and the calculator, whose classes were attended by grown-up young men, was held in greater estimation than the litterator, and received higher pay.

We learn from Horace that the simple operations were performed mentally, but the more important ones required the aid of the fingers or of the abacus. Finger-reckoning was a natural development of the gesticulation common to the existable Southern races, with which they always accompany speech, and by means of which they can carry on conversations without words. It was common in Italy, as well as in the Orient and in Greek lands, and its use continued until the Middle Ages. By means of eighteen positions of the fingers of the left hand they represented the nine units and the nine tens, while an equal number of corresponding positions of the right hand gave the nine hundreds and the nine thousands. Ten thousand and higher numbers were indicated by touching the breast and different parts of the trunk with one or the other hand. It will readily be seen that long practice was necessary to give the hands the machine-like accuracy which this system of figuring demanded. A landlord, reckoning up the amount owed him by a departing guest, counted off the single items, indicated the amount of the first by a position of the fingers, added to this the second and represented the sum by a second gesture, and so on until the calculation was complete. The same process was used by a lawyer who wished to reckon an account before a jury, and Quinlinian tells us that it was highly important for an advocate to be able to perform such operations correctly and gracefully, as awkward gestures and hesitation stamped him as ignorant and uncultivated.

The abacus (in the sense of a reckoning-table, for the word has other meanings) was a table of stone, wood, or metal, which was a common piece of house furniture, and was kept also in public treasuries and similar places. It was used in all payments which involved any but the simplest calculations. We find it represented in many works of art. In one two women sit before a reckoning-board, engaged in verifying a payment. In another we see the master of the house at dinner, while before him stands a slave with a reckoning-board. In a third we see an abacus in the hands of a revenue collector. Moreover, several specimens have come down to us. They are of two kinds. In the simpler form, which consisted merely of a flat table, reckoning-pebbles (calculi) were used. A form of this kind of abacus was in use as late as the seventeenth century, coins taking the place of pebbles. It was used for reckoning small sums. If, for example, one wished to subtract 25 from 83, one put down 83 pebbles, took away 25, and counted the remainder. To divide 96 by 26, one took from 96 pebbles 26 at a time until the remainder was less than 26. The 37 times which this had to be done gave the quotient; and the 7 pebbles which left, the remainder. Addition and multiplication were done in a similar way. This form was adapted for larger operations by ruling on it seven horizontal lines, representing, respectively, 1000, 300, 100, 50, 10, 5, and 1. Then two pebbles on the 1000 line represented 2000, etc. The operations were performed in the way just described.

A more elaborate form of the abacus is represented in the figure. It had vertical grooves, in which were inserted buttons which could be moved back and forth. There were eight long and eight short grooves opposite to each other, and a ninth long groove which had no corresponding small one. In each of the first seven long grooves were four buttons, while the short ones had one each. The grooves were marked with signs for 1, 10, 100, 1000, 10,000, 100,000, 1,000,000. Thus every groove represented a decimal place, while the buttons, which represented the nine units, were divided like the Roman nine itself into V, (in the short groove) and IIII. (in the long groove.) Thus in groove 7, each one of the four buttons represented one, and the single button five; and so on. Thus to represent 59,615, one would push up the V. in groove 2, the V. and three ones in 5, the V. and two ones in 4, the V. and one in 6, and V. in 7. Grooves 8 and 9 were used for reckoning in fractions. Groove 8 was used for duodecimal fractions having the denominator 12, while the ninth was used for smaller fractions. The four buttons of groove 9 were distinguished from one another by three different colors; or in some forms of the abacus they were divided between three separate grooves, which represented 1-2-1, 1-2-2, and 1-2-2 (two buttons.) The method of reckoning with this abacus was the same in principle as that used in the simpler form. A special difficulty in its use—which, of course, was overcome by practice—was that not only the buttons which were in use in any calculation, but also all the others, were visible, so that the eye had to be trained to take account only of the former.

Among the Greeks the designation of figures was at first the same in principle as among the Romans, and the same aids in reckoning were used, namely, the fingers and the abacus. In comparatively late times, probably not long before the Christian era, the use of the Greek letters to designate numbers on a decimal system superseded the old method. By this system, one digit letter represented a decimal place, arithmetical operations could be considerably simplified. An example in multiplication given by Eutokios, who lived during the sixth century of our era, illustrates this:

\[ \begin{array}{c|c|c|c|c|c|c|c|c} \hline & 25 & 8 & 2 & 0 & 0 & 4 & 2 & 0 \\ \hline \times & 5 & 2 & 6 & 4 & 0 & 0 & 0 & 0 \hline \hline & 25 & 160 & 120 & 0 & 0 & 0 & 0 & 0 \\ \hline \end{array} \]

This process became rather complicated when larger numbers were multiplied, and where fractions were involved. In the example given, of course, the two numbers and the several multiplications were represented by Greek letters. The several multiplications were done mentally, or, if this was impracticable, with the abacus.

[Original in Popular Science News.]

THE SIXTH CENTENARY OF THE UNIVERSITY OF MONTPELLIER.

The last day of the month of May have witnessed a series of interesting ceremonies which have been held in the town of Montpellier. In France, the seat of one of the oldest known universities. Montpellier is a town of the south of France, situated in one of the richest vineyards of the country, at half an hour's distance from the Mediterranean, close to the prosperous harbor of Cete, and in sight of the first beginnings of the Cevennes mountain ranges. It is a very ancient city, and as far as one can know, for nearly seven centuries—Montpellier has been an important scientific center. While the ancient professors of Paris were more especially proficient in theological studies, and while those of the medieval schools of Orleans, Bourges, and Poitiers were principally concerned with law studies, Montpellier was and has remained an important medical school, and for a long period this school has been the glory not only of the town, but of the whole country and of entire Europe. Montpellier entertained numerous commercial relations with Egyptian and Arab merchants, and it is supposed that in the 11th and 12th centuries the medical works of Avicenne, Averroes, and others were imported into Montpellier, and became the
FLIES OF PREY.

BY GRACE HENDRICKSON.

Many distinguished family names in the history of entomology are comparatively familiar to us, but perhaps some of us are not acquainted with the celebrated family of "Ichneumon." They are extremely numerous. Gravenhorst has described 1,650 European species, and they are equally abundant in other parts of the world. Some of the family are very minute insects, and a few of the tropical species are among the largest insects. Their abdomen is united to the thorax by a pedicle, and the whole form is attenuated. The antennae are generally thread-like, and composed of a great number of joints; these are kept in constant vibration.

But the particular reason that brought the ichneumon into notice, was the fact that it deposits its eggs either in or on the bodies, eggs, or larvae of insects, and, sometimes, in spiders. This makes them extremely useful to the farmer and gardener in destroying noxious insects. Some species which have a long ovipositor use it to reach eggs or larvae under the bark of trees, in holes in wood, etc.

Arthur Lakes, the geologist, related an interesting incident that occurred while he was in camp, on Trout Creek, in Colorado. He said: "While I was snoozing on a ledge of rock, my attention was attracted to what seemed to be a large grasshopper, travelling very briskly over the turf. On closer inspection it proved to be a sort of ichneumon-fly, something between a small black hornet and a large flying ant, with a tight-laced waist, packing a green caterpillar at least ten times its own size and as stiff as a bundle of straw; it was flying rapidly and kept its valise on his shoulders. The fly, standing with his long legs astride of the body of his victim, held him tightly with his jaws by the throat, upside down, to prevent the caterpillar's legs from catching at obstacles on the road. The strength and leverage applied must have been comparatively enormous. Presently the fly reached the bush, and climbed it, tossing and dragging his prey among the branches, till he succeeded in hanging it securely in a fork, out of reach of marauding ants and other flies of prey, as a hunter slings his venison out of reach of wolves. Then he descended and proceeded for a suitable den. Presently he reached a small round hole,—either his own, or, more probably, a spider's,—and hustled in without ceremony. Apparently satisfied with his lodgings, he returned to his quarry and hauled it down from the bush to the hole; dropping it at the entrance, he descended and drew the body down lengthwise after him.

Returning again to the surface, he began carrying out of the way his large stones and sticks near the entrance, preparatory to covering them up. As the thing proceeded, two or three large dogs barked a bone, by rocking the fine sand behind him into the hole, descending every now and then to press and thump it down tight with his head. More dust-rocking and more packing till the hole was filled; and then, collecting on his jaws all the larger stones and rubbish he had laid before so carefully out of the way, he strove them around in a careless, natural sort of manner over the surface. Thus, by a fly, as complete a cache of his larder was made against other marauding insects as ever wily hunter or Indian made of his dried meat and powder, with every precaution against possible discovery. All made safe, like a good business man he did not stop to loaf, but started promptly after fresh prey.

Arthur Lakes amusingly added: "I once saw one of them reversing the order of things by packing home a good-sized spider, 'to his parlor,' without even the polite invitation to 'walk in.'"

VARIETIES OF COAL appear to depend greatly upon the nature of the plants from which they have been derived. This will be necessary in order to determine the conditions (action of volcanic rocks, etc.) under which they have subsequently been placed, must be taken into account.
GRASS OF PARNASSUS.

BY S. E. KENNEDY.

This plant of exalted name is said to have originated upon Mount Parnassus, but the spec-
men before me is of much lower birth. It grew, with hosts of companions, upon a sunny slope in
the town of KIllingly, Conn., some fifteen miles, perhaps, from my valley home. It was brought to
me in September of last year, and, as I had never seen one, it was examined with an unusual degree
of care.

I found that the five creamy-white petals were curiously marked with many green veins, extending
from base to apex, and that upon the margin—where they were much less distinct—they run in
the opposite direction, that is, toward the edges of the petals—an arrangement I had not noticed in a
flower before, adding to its beauty as well as interest. Another characteristic I found to be a row of
stamen-like appendages at the base of each petal; three in a group, cleft nearly to base, and tipped
with tiny round heads, not at all like the anthers of the inner row of true stamens. These are alternate
with the petals, and fall between each in such a way that they may be seen from the under side of the
flower.

Wood says that this flower is remarkable for having the four stigmas placed over the central
placenta as if each stigma was compounded of the two adjacent halves of the two divided stigmas.
The long, naked scape bears one flower, which is about an inch in breadth. The smooth, broad
leaves are chiefly radical, there being but one cauline leaf, which clasps the stam a few inches
above the root.

This species is Parnassia Caroliniana, the only one found in the Northern States. I believe, P.
palustris and P. asarifolia belonging to the South and West.

MOOSUP VALLEY, R. I.

SCIENTIFIC BREVITIES.

An attempt has lately been made in the United States Navy to light the binnacles of ships by
electricity instead of oil; but it was found that by bringing an incandescent lamp close to the
compartments, a deflection of the needles could be produced.

INK FOR WRITING ON PHOTOGRAPHS.—The fol-
lowing answers very well for numbering and mark-
ing proofs, the writing being executed on a dark
portion: Iodide of potassium, 10 parts; water, 30
parts; iodine, 1 part; gum, 1 part. The lines soon
bleach under the strokes by the conversion of the
silver into iodide.

FAST TIME.—A special train on the Philadelphia & Reading, and the Central Railroad of New
Jersey on March 10, made the run between Philadelphia and New York, a distance of ninety miles, in eighty
five minutes. This is at the average rate of 61.53
miles per hour. At times the train is said to have
exceeded eighty-five miles per hour.

FLUID CRYSTALS is the appellation given by Dr.
O. Lehmann to certain products, such as benenate
of cholesteryl, first prepared by M. Reiniger, which,
although apparently melting at 143° C., behaves
comparatively as if it still had a crystalline structure. Between these temperatures the compound in question is perfectly
fluid.

The applications of Photography are becoming
very varied. In a law suit in Germany, Dr. J.
M. Eder was called upon to see if he could deter-
mine the writing upon a document which had been
rendered illegible from ink spilled over it. By
using an erythrosyne plate properly exposed by
gaslight, and developed with pyro and soda, he was
able to show the hidden characters beneath the blot that covered them.

A PRACTICAL USE OF CHEMISTRY.—An explosion
and fire at Antwerp reduced to a charred mass a
bundle of one-thousand-florin Austrian obligations.
Within a few hours a man was able to recover with
the usual methods the writing on the paper, and
find out the number; and upon his report the money has been
paid. Capitalists owe innumerable obligations to
science.

A very simple apparatus for obtaining an electric
spark is made by a German physicist. Round the
centre of a common lamp-chimney is pasted a strip
of tin foil, and another strip from one end of the
chimney to within a quarter of an inch of this ring.
Then a piece of silk is wrapped around a brush, and
the interior of the chimney is rubbed briskly. In
the dark a bright electric spark may be seen to pass
from one piece of tin foil to the other each time the
brush is withdrawn from the chimney. Many other
experiments can be tried with this apparatus.

ELECTRICAL BASE BALL.—A veteran base ball
player, who is now on the Pacific coast, writes as
follows concerning an electrical device which is
the introduction of some identical form: "In our game
yesterday we tried the new first-base bag. It is
made of rubber, with an electrical attachment, and
the minute the fielder or runner touches it, a bell
rings in the grand-stand. It is hoped that this
arrangement will assist the scorer or reporter in
deciding whether the umpire's decisions on close
plays are correct; but, to my mind, there is nothing
that can be improved in the old canvas bag."

CORE Ropes.—A cork core floating rope has been
invented. The inventor claims that his floating
rope of one inch thickness will stand a strain
of more than one thousand pounds. The rope con-
ists of a core of small round corks about three
quarters of an inch long, placed end to end, around
which is braided a network of cotton twine. This
network is surrounded by another layer of strong cotton
twine, braided in heavy strands, which is about a
quarter of an inch thick. The rope is very soft
and pliable, and even after being tied into a small knot
will return to its original shape. It can be used in
life lines or life rafts, and as a clothing line to tie
heavy hawsers to. At a life saving station such a
rope would be very valuable.

A NEW USE FOR THE MICROPHONE.—Capt. du
Place has devised what he calls the schizophone,
modified by Prof. Hughes's sonometer, but which
may be useful in the shops in detecting con-
cealed flaws in, say, crank-axes of locomotives and
propeller-shafts of steam vessels, especially as
experiments made in the Ermont shops of the
Northern Railway of France are reported success-
ful. The instrument comprises a striker and an
auxiliary piece of a very thin metal, which is sur-
drounded by another layer of strong cotton
twine, braided in heavy strands, which is about a
quarter of an inch thick. The rope is very soft
and pliable, and even after being tied into a small knot
will return to its original shape. It can be used in
life lines or life rafts, and as a clothing line to tie
heavy hawsers to. At a life saving station such a
rope would be very valuable.

Practical Chemistry and the Arts.

AN ANCIENT CHEMICAL LABO-
RATORY.

An interesting department of the late
Paris Exposition was that illustrating the
conditions of different industries in former
times. Among the exhibits was a reproduc-
tion of a chemical laboratory of the seven-
teenth century, as shown in the engraving on
page 117,—a period when the science of
chemistry could hardly be said to exist,
except in connection with the superstitions
and absurdities of the alchemists. Although
in the light of our present knowledge we can
but smile at the theories of the medieval
chemists, yet there were many among them
who were genuine seekers after truth, and
we owe much to their patient investigations,
which often led to the discovery of important
truths, although their true value was not
perceived at the time of their discovery.

When we remember that it is scarcely a
hundred years ago that the doctrine of phio-
giston was universally held, and that even
Faraday could not at first accept the theory
of the conservation of energy, we should not
miss too strongly upon the absolute truth
of many of our modern scientific conceptions
—such as the existence of atoms or the ether,
which, as yet, remain in the border-land
between theory and fact. The chemist of a
hundred years hence may look upon both
ether and phlogiston as the products of a
disordered scientific imagination, and treat
the theory of elementary atoms with as little
respect as that of the philosopher's stone.

When we consider the limited and imper-
fect apparatus with which the chemists of
former times performed, in many cases,
such excellent work, our respect for their
ability is greatly enhanced. A modern chem-
list would feel lost without gas-lamps and
furnaces, balances which will weigh the frac-
tion of a hair, and an unlimited quantity of
glass vessels and utensils of every conceiv-
able size and shape; but without the aid
of these ingenious devices, and with only a
few dishes and bladders, from the stock of a
Swedish country pharmacy, Scheele not only
discovered oxygen gas, contemporaneously
with Priestley, but also a large number of other
chemical substances, solid, liquid, and gaseous,and described their properties so accurately
that no change has been found necessary up
to the present day. With Scheele's facilities few
modern chemists could have equalled, and
none excelled him.

There are two thousand engines on the London
and Northwestern Railway that will take the same
boiler. A change of boiler from one engine frame
to another can be made by taking out eighteen
bolts. The superintendent believes he could run
an engine around the world without a hot box or
losing a pin.
POPLAR SCIENCE NEWS.

OUR COMMON PIGMENTS.

BY LYMAN G. SMITH.

Nearly all our common colors are either chemical preparations or natural mineral earths.

Of the black pigments, lamp-black is the cheapest and most common. It consists of nearly pure carbon, deposited in the familiar form called soot. It is manufactured by burning some hydro-carbon with an insufficient supply of air. Pine knots and resin are frequently employed for the purpose. The dense smoke which results from the imperfect combustion is drawn through a chamber lined with canvas or sheepskin, and having an outlet in the roof. As the lamp-black accumulates on the walls it is scraped down to the floor from time to time by lowering a dome from the roof. This dome has the shape of an inverted funnel, and is made to fit inside of the chamber. This pigment is very stable, as it consists essentially of carbon and is unaltered by all ordinary conditions. A lamp-black called "gas-black" is sometimes made from coal gas.

Another black pigment is the so-called ivory-black. This is made either from the bone-charcoal, formed by heating bones to redness in closed vessels, or from the soot produced by the imperfect combustion of an oil formed by the distillation of bones. In the latter case it must necessarily be the same as lamp-black. When made from bone-charcoal, however, it contains several of the mineral constituents of the bones; which give it a different character. It is necessary to subject the bone-charcoal to a most thorough grinding, and the last time it is ground, oil is generally used, and is placed upon the market in this form. A very fine quality of ivory-black is said to be made from the genuine ivory.

Among the white paints, white lead certainly stands at the head. It is a basic plumbic carbonate. The ordinary method of manufacture is as follows: The metallic lead, in sheet form, colored, or cast into lumps, is placed in earthen pots. These pots have a few inches of vinegar or acetic acid in the bottom. The pots are covered, and piled up in sheds, buried in spent tan or manure. The heat developed by the decay of the organic matter volatilizes a little of the acetic acid, changing the lead into a basic acetate. The basic acetate is in turn changed into the basic carbonate by the carbonic dioxide given off by the decaying of the organic matter. The process takes place from four to six weeks. The white lead is carefully removed and ground in oil. It has a wonderful covering power, and combines remarkably well with oil, two properties which the substitutes which have been proposed lack. On the other hand, it blackens very rapidly when exposed to sulphured hydrogen, and is very poisonous to those engaged in its manufacture.

Zinc-white, which has been used to some extent as a substitute for white lead, is an oxide of zinc. It is made by heating the native red oxide in a current of air. The zinc-white is formed as a flocculent mass, which is blown through passages to purify it, and is finally collected in flannel bags. It is generally sold ground in oil like white lead.

Another white pigment is occasionally used, called permanent white. The name is very inappropiate, as it does not really combine with the oil, and rubs off easily. It is used to adulterate the other white paints. It is sulphate of baryta, BaSO₄, prepared in the wet way by precipitation, which is the better method, or by grinding the natural basic sulphate, known as heavy spar. Prussian-blue is probably the most important blue pigment. It is a chemical product, obtained by precipitation. It is principally a compound of cyanogen and iron, Fe₄(N=CN)₄. It was accidentally discovered by Diesbach, a color-maker of Berlin, early in the 18th century. It is obtained by adding an excess of a ferric salt to potassic ferrocyanide. In practice a ferric salt is generally used, and the precipitate afterwards subjected to oxidizing agents. It is carefully purified, washed, and dried, and is put and kept so for two hours. It was finally cooled with the cover on, and the resulting greenish yellow product was again heated in very porous crucibles. It was then levigated and washed, giving the pigment in the powdered state. The value of this discovery may readily be seen from the fact that the price is said to have fallen in England from five guineas per ounce, to about a shilling per pound. It is a good stable color, and a very brilliant blue.

Chrome yellow is a chemical product, plumbic chromate, PbCrO₄. The best quality is made by precipitation from plumbic acetate by potassic chrome or potassic dichromate. It is a very fine yellow, and an important pigment.

Vermilion is the most brilliant red. It is formed either from the natural sulphide of mercury, cinnabar, or from an artificial sulphide. Its brilliant color depends in great measure upon its being in a finely divided state. It is generally made artificially by subliming a mixture of sulphur and mercury, and pulverizing the artificial cinnabar formed by the process. It may also be made by a wet process. Chinese vermilion, which is said to be made by a laborious mechanical process, is the purest and best. Vermilion is a very brilliant pigment, but is apt to grow dark when exposed.

The ochres form a large class of useful colors. They consist principally of a clay, colored by certain oxides of iron. They contain water, and are gently heated to expel it, when they are known as "raw" colors. If calcined they turn reddish and are said to be "burnt." The ochres take their names from the places where they were formerly obtained in Italy. They are much used in stains. Some of the roof paints contain much hematite and have a very good red color. Owing to their cheapness and permanence, the earth colors are very much used. They furnish a great variety of yellow and brownish reds.

DIFFERENT KINDS OF LIGHTNING.

1. As to the term "forked lightning," the representations of it given by artists, which resemble the so-called thunderbolts placed in the hand of Jupiter, are quite absurd. The flash, when photographed, exhibits itself as a line which is continually changing its course, and is described as "intensely crooked" by a very careful observer. It never proceeds for a time in a straight line, and then, turning at a sharp angle, goes on further in an equally straight line, as is represented in pictures. The forking of it is very marked, and this occurs by side flashes passing off from the main track, and eventually losing themselves, like the ramifications of tree roots. Occasionally the lightning appears to start from a point from which several flashes diverge in different directions.

2. "Sheet Lightning."—Whenever a flash passes from cloud to earth, the light produced by it illumi-
The Out-Door World.

EDITED BY HARLAN H. BALLARD.

PRESIDENT OF THE AGASSIZ ASSOCIATION.

[P. O. ADDRESS, PITTSFIELD, MASS.]

BETTER THAN WAS PROMISED.

We announced in our May number that the proprietors of the Popular Science News, desiring to encourage members of the Agassiz Association in their work, had offered a fine microscope, valued at twenty-five dollars, to the member or Chapter sending the best record of personal observations to the President of the Association before September 1, 1890. In looking about for the best instrument for the money, Dr. Nichols found that for thirty-seven dollars he could secure the excellent "Student's Microscope" manufactured by the Bausch & Lomb Company, of Rochester, N. Y., and he has secured it. It has both coarse and fine adjustment, two objectives, etc., and is a really good and practical instrument. Papers sent in competition for this beautiful prize should be distinctly marked with the full name and address of the sender, and it should be distinctly stated that they are entered in competition. Thus far, no papers have been received, and the field is open to all members of the A. A. Doubtless many are holding their papers, desiring to embody the results of their summer's work. Do not hesitate to try for this prize because your observation may seem to you of slight importance. It is not expected that great discoveries will be made. If the notes are original and carefully made, they will be of interest and value. It often happens in cases like this that the prize goes to the one who least expects it. In any event, whoever does conscientious work, though he should fail of gaining the microscope, will gain something of more value in the experience and training of the trial. Let every one try, young and old.

THE AGASSIZ ASSOCIATION

ATTACKED BY A LEADING ORNITHOLOGIST OF BUFFALO, N. Y.

Under this heading an extract from a book recently issued by E. E. Fish, a writer whose name does not appear in the "Scientists' Directory" for 1888, has been printed in Our Dumb Animals. Only the first paragraph of the extract, which is more than a column long, refers to our Association, and we exempt Mr. Fish from the responsibility of including it all under this heading.

But the first paragraph, if correctly quoted, indicates that the balance in which the author weighs his words lacks delicate adjustment. He says: "The Agassiz Association soon had thousands in its ranks who degenerated into mere specimen-gatherers. The egg-collecting craze affected boys alike in cities, villages, and rural districts. Within the last few years millions of eggs have been thus destroyed." After denouncing the wanton cruelty of the boys, who do not spare "even our cemeteries," Mr. Fish concludes his attack by saying that it is evident these eggs are not taken from any desire to learn about the birds, because he has discovered that the young collectors are very ignorant. Thousands of eggs have been brought to him for identification, and in many cases the boys actually did not know the species of the bird that laid them. Moreover, he adds, "not one egg in a thousand was preserved two months," and only a very few were kept for forty-eight hours.

If this article had been printed in a scientific journal it would have needed no reply. It would then have been read with the intelligence with which it was not written. It would have been seen that the statements are untrue. The Agassiz Association has always stood as strongly for humanity as for science. In our zeal for mercy we have so steadfastly opposed such conduct as Mr. Fish deplores, that we have rather wronged our students than injured our birds. Many young ornithologists have left us, asserting that bird-students do not have a fair show in the Agassiz Association.

Not one boy has ever been encouraged by us to take eggs for his subject of study, under any circumstances whatever. We have refused to print exchanges either of eggs or birds. We have always favored the opera-glass, and not the shot-gun. The Agassiz Association is not responsible for the slaughter of a single bird or for the destruction of a single egg. What Mr. Fish charges upon us is not only what we have not done, but what we have always most vigorously prevented. If any of our members are guilty of such wantonness, they have acted contrary to our teachings, and have rendered themselves liable to expulsion from our society. If thousands of our members are "mere specimen-gatherers," destroying "millions of eggs," they have not "degenerated" to this low estate either because of, or after, their connection with the Agassiz Association.

But the premises from which our wantonness has been inferred are not true. We have not in our total membership so many as five hundred egg-collectors, good or bad, and when Mr. Fish speaks of "millions of eggs," he is using numbers which he has not counted. Again, of the comparatively few eggs that our young men have gathered, nearly all have been taken conscientiously.

The fact that "thousands" (?) of eggs have been carried to Mr. Fish for identification does not necessarily prove that they were collected with no desire to learn. The boys supposed that Mr. Fish could give them information.

Nor does their ignorance of species demon-
strate their cruelty. It is the learned ornithologist who should first outgrow the necessity for collecting.

Finally, it is not true that "not one egg in a thousand" has been preserved two months, barring the distressing accidents incident to inexperience in handling the fragile shells, most of the eggs are still in good condition, carefully blown through one well-drilled hole in the side, packed in neat cases (made, usually, by the boys' own patient fingers), classified, and neatly labeled; and in several of our local museums they may be seen today, silent witnesses to the earnestness and conscientious industry of our students.

This unfounded attack upon an Association that has for fifteen years been endeavoring to train the youth of America into habits of accurate observation and a considerate treatment of all God's creatures, has been widely circulated and copied. Our reply cannot hope to overtake it, but we trust that those of our friends who know the facts will help us counteract its influence.

NEW YORK CITY ASSEMBLY OF THE A.A.N.U. ANNUAL REPORT.

The meeting of September 16, 1859, was held at the Friends' Seminary. William T. Demarest, of Chapter 57, (B), delivered an illustrated paper on "Photography."

The next quarterly meeting was held at the rooms of Chapter 197, (2), on December 19. The program consisted of papers on methods of work, in mineralogy, G. S. Stanton; in botany, E. B. Miller; in entomology, H. Ries. A number of plans were discussed in regard to a geological survey of Manhattan Island, the official organs of the A. A., and the offering of competitive diplomas for Chapter work.

A meeting was held on the evening of February 27, as a preliminary session to the Convention of the New York and New Jersey Assemblies on the following days. The reports of Chapters received on this occasion were encouraging. Chapter 67, (A), reorganized, and a new Chapter—312, (Y)—was admitted. Mr. W. S. Bridgman, of the Wilsoy Ornithological Chapter, gave an interesting sketch of the work of that Chapter.

The very successful Convention on the two days following, full reports have already been published in the Popular Science News. Mr. Kunz's paper on the mineralogy of New York City, Mr. Ballard's address, and Prof. Allen's speech have been published in the University Forum, copies of which may be obtained from Mr. J. F. Tucker, New York University. We sincerely hope that the success of this Convention may lead to others, in which all the Assemblies and Chapters on the Atlantic Coast may unite.

At the meeting of March 31, President C. H. Bushong read a paper on "The Physiology of Plant-Life." The election of officers for the ensuing year resulted as follows:

President—Dr. C. H. Bushong, 59, (W).
Vice President—Messrs. L. G. Levy, (Q), (A).
Secretary—Messrs. H. W. Tammes, 97, (II).
Corresponding Secretary—T. G. White, 919, (2), 266 Fifth Avenue.

ORIGINAL OBSERVATIONS BY MEMBERS OF THE AGASSIZ ASSOCIATION.

251. A Curious Jumping Gall.
OAKLANDS PARK, WYETHURIDGE, ENGLAND.
April 22, 1859.

We have found a most curious insect on a bough of May blossom. Both in form and color it is exactly like a large bud of the blossom just before it opens. The skin is just turning a shade creamy, and is of very fine, leathery texture. It makes frequent bounds or springs from the table to the height of nearly six inches. Why not for this, one would pass it by as a May bud. Can you enlighten us?

E. M. McDowell.

[This interesting letter was sent to Professor Lintner, State Entomologist of New York, and a member of the A.A. New York, and we give his reply nearly in full.—Editor.]

ALBANY, June 7, 1859.

DEAR MR. BALLARD: Thank you for permitting me to read the letter of E. M. McDowell, which has interested me much. You ask what the curious insect referred to therein may be. It was something that I had never met with nor read of, and I therefore sent the description given to Professor Riley, thinking that perhaps it might have come under his observation while in England, during his early life.

He kindly returned me the following reply:

"I was much interested in the account of the deformation of the May bud from my old boyhood tramping-ground, Oatlands, Weybridge. I regret to be unable to positively state what the deformation is. It must, however, be some kind of gall, and the movements are caused by the gall-maker; as there is but one kind known to me, viz., the bedeguar of the hawkmoth (Oedemagia cragiini, Winn.). It is peculiar that the deformity is quite different from (Kaltenbeck), but I never heard of its jumping so.

I have not Kaltenbeck at hand to refer to for a description of the gall, but in a publication on the 'Gall-Making Diptera of Scotland,' by Prof. J. W. H. Traill, I find: 'Oedemagia cragiini, Winn., often galls the terminal buds of the hawkmoth (Cratrgia oxytenthala), producing a rosette of sessile deformed leaves, often covered with prickly lasses. The rosette may be an inch and a half across. Between the leaves live several of the larvae.'

If we accept the probable determination of Professor Riley, the curious object observed must have been the gall of the fly, containing its nearly matured larva. Its remarkable bounds of nearly six inches in height (1) would be the result of the larva growing from a formed gall and then by a strong muscular action suddenly throwing itself into a reverse position. It is quite probable that this gall is identical with that described in Science Gossip for December, 1857, in a communication from Ventnor, Isle of Wight, quoted by Mr. Charles R. Dodge In Field and Forest, II, p. 55, as follows:

"The writer describes the 'jumping seed' as a 'small excrecence' which had been taken from a hawkmoth; it was about the sixth of an inch in length, pear-shaped, and in size resembled a grape or raisin stone. The specimen had been seen to jerk or leap nearly an inch from a given point, though while in his possession it had not shown such activity, leaping only a third or a quarter of that distance. On opening the case, it was found to contain a whitish maggot with a small, yellowish, scaly head, the body bent into a semi-circle, and the tail-end slightly flattened. It had no legs, but the shining skin was deeply corrugated, or thrown into folds, which appeared to serve in some degree as limbs.

"From the description of the larva it appears almost correct, it could not have been a Oedemagia. Quite a number of "jumping galls" and "jumping seeds" are known to science. Of the former, one of the most interesting is a species occurring as a small globular body of about the size of a mustard seed, formed on the under side of leaves of Quercus olivifolia, Q. macrocarpa, and Q. alba, in California, Missouri, Illinois, Indiana, Michigan, and less frequently eastward. Sometimes a thousand of these galls are found on a single leaf. "The gall drops in large quantities to the ground, and the insect within can make it bound twenty times its own length, the ground under an infested tree being sometimes fairly alive with the mysterious moving bodies. The noise made by them often resembles the patterning of rain. The motion is imparted by the insect in the pupa, and not in the larva state." (Riley: American Naturalist, X, p. 218.) The insect forming the above gall is known scientifically as Neuroterus ulsitatorius. (11. Edwards.)"

Mr. Ashmead has published an account of another of these curious forms, which he has named Ancistrocnemis atlantica, (Trans. Amer. Entomol. Soc., XIV., 1857, p. 142.) Two or three of the galls are formed on the bud-axils of the blue-jack oak (Quercus cinerea) in early spring, in Florida. "It appears the last of March, and when first taken from the tree and for several weeks thereafter, it has the power of jumping, due to the contraction and expansion of the gall. In the middle of the year, it will jump three-fourths of an inch from the table."

An interesting jumping gall was received by me last year, from a gentleman at Fort Edward, N. Y., which had been found beneath a tree, leaping actively about, by his little daughter. Unfortunately, I was not able to obtain the insect from it and learn the particular species.

The insect borrows additional interest from the fact that it is cogenic with our well-known and common coding-moth (Carpocapsa pomonella), which is responsible for the annoyance of the fruit-eater, and serious losses to the fruit-grower, from the defecation, disgorgement, and destruction of the "apple-worm."

The following is a report on the insects of New York figures, and a pretty full account of these jumping seeds have been given, and reference made to other literature on the subject.

Regretting that I cannot give a more satisfactory reply to your inquiry,—one which would enable you to return a positive answer to your correspondent,—

I am

Very truly yours,

J. A. Lintner.

262. CHERRY-BIRDS EAT APPLE-BLOSSOMS.

[See Swiss Cross, May, 1859, p. 156; Note 242.—Two years ago you published in the Swiss Cross an account which I wrote of cherry-birds eating the petals of apple-blossoms. A gentleman from New York—Albany, I believe—wrote to me, thinking that I must have been mistaken, and suggesting that the birds were probably eating insects from the blossoms rather than the petals themselves. This spring three of the birds came into an apple-tree under my window. I could see distinctly that two of the birds swallowed several petals. Some they would run through their bills and drop; some bit pieces from; but I feel certain I am not mistaken in this time in saying that they ate the petals. I have, unfortunately, lost the address of the gentleman who wrote to me about the matter.—FANNE E. LANGLEY, Plymouth, N. H.]

265. FLOWERS IN WINTER.—On January 2 I found the following flowers growing in exposed...
CHAPTER ADDRESSES, NEW AND REVISED

No.  Name. No. of  
311  Ellerslie, Mass.  4 212  H. N. Ingalls St.
296  Davenport, Iowa.  6 213  Highland Museum, 7 211  Highland Place.
302  Hills, South Dakota.  8 306  Miss Kate J. Doolittle.

[Written for "The Out-Door World."]

PHOTOGRAPHY ABROAD.

By ELLERSLIE WALLACE.

I can think of no more delightful place to visit than the quaint old city of Nuremberg, in Bavaria, and if a photographic camera forms part of the travelling impediments, the pleasure will be greatly increased. There is no other European city or town that offers such a wealth of picturesque material to the photographer, and few—or perhaps none—where the interesting buildings stand in such favorable situations for the camera. I have before remarked that none but those who have had some practical experience will be fully able to appreciate the advantages of having plenty of room for the camera. The following brief details concerning this famous old city may be of interest:

Nuremberg is mentioned in history as early as the year 1590. It was an independent imperial town until 1806, and was an important member of the Hanseatic League. The great and wealthy patrician families originally governed the city, and it is doubtless owing to this fact that the arts and sciences flourished there as they did. The private dwellings, where many of these families resided for centuries, are among the most interesting features of the town, and give an excellent idea of the magnificence and the art-loving character of these ancient burghers. Painting was much cultivated here from the early part of the fourteenth century, down. Everybody familiar with the names, at least, of Albrecht Durer and Michael Wolgemuth. Sculpture, stone-carving, and literature were also by no means neglected, and very clever work for those times was done by the brass-founder Peter Vischer, the artist in wood Veit Stoss, and the cobbler-poet Hans Sachs.

The pleasant situation of Nuremberg is well described by Longfellow:

"In the valley of the Pegnitz, where across broad meadow lands Rise the blue Franconian mountains, Nuremberg, the ancient, stately city.
Quaint old town of toil and traffic, quaint old town of art and song.
Memories haunt thy pointed gables, like the rocks that round them thronging."

It is certainly true that a visit to Nuremberg is like walking in a poem. My own experience on arrival here was different from that of most travelers. I had been all night in the train from Dresden and arrived at the station at Nuremberg just as the sun was rising on June day about 4 o'clock in the morning. The station stands outside the town walls, and in the few moments that passed before the conveyance to the hotel was ready, I could smell the sweet air from the fields, and get my first suggestive glimpse of this wonderful old place. A ride to the hotel through the darkened streets in an early hour was most picturesque interest; neither for fear to prevent interfered to produce the grand medieval architecture from producing its full effect, and the graceful church spires and high gables of the older houses were brilliant in the haze, blood-red sun of the early morning, while the unvaried details of the crooked, narrow lanes were veiled in almost complete darkness.

A leisurely stroll after breakfast convinced me that not only were the finest of subjects for the camera everywhere to be had, but that there were some neighborhoods—particularly near the walls in the Panier's Platz, by the Thielgarten Thor, in the Maximilian's Platz, etc.—where every separate house offered something of interest to the photographer, either in detail or as a whole. The town walls and fortifications, which date from medieval times and are still in excellent preservation, would alone command some many exposures to do justice to them. The four huge round towers close by the walls at the Neue, Spittler, Frauen, and Laufer gates give a very old-world look to these parts of the town, and come out admirably in photographic street views.

The castle, gray with age, and standing on a height at the back of the city, makes capital pictures from every direction, particularly from the street by the side of Albrecht Durer's house. These two buildings no one will omit to visit. The collection of instruments of torture in the lower part of the castle gives only too vivid an idea of the atrocious cruelties practiced upon unfortunate criminals and prisoners of war in the Middle Ages. The most interesting instrument of torture is the "iron virgin," a bow figure with folding doors furnished with iron spikes. The victim was secured to the inside, and the doors gradually closed upon him; and to render it still more terrible, the chamber where the figure stands is far away from all the others, and perfectly dark, so that torch-light had to be used for carrying out the cruel purpose.

The views over the town to be obtained from the castle heights are quite unique, and show the steep pitched roofs with row after row of dormer windows, so characteristic of old German buildings. These bird's-eye views are, of course, not so suitable for photography, but if the weather was very clear an attempt might be made.

Modern buildings in Nuremberg possess little or nothing that is worth noting. In other cities, the German Museums, however, will surely not be passed by, as it is famous throughout the world for its national curiosities. I can, personally, offer my heartiest congratulations to anyone fortunate enough to go to Nuremberg on a photographic trip; and perhaps the best advice I can give him is, to leave his photographic outfit behind him. Let him just wander about the town with his guide-book and map, noting down what strikes him as particularly worthy of being photographed, and then return at his leisure with the camera.

The largest barometer yet made has been put in working order in the Solent Jacques tower, in Paris. It is 12.65 metres high.

[Written for "The Out-Door World."]

WILD ROSES.

By PROF. W. WHITMAN BAILEY, Of the Aegis Association. SUMMER is at her best when the wild roses open to the sunlight. As the meadows are bespangled with daisies and buttercups; when the bees hum about the clover-tops, we love to wade knee-deep in the billy-go grass upon which these beauties seem so content. It is then that the sweet wild roses gather about the stone-walls of New England. They come quietly into bloom. It is peculiarly inappropriate to say of them that they burst into flower. Creatures so gentle have not so demonstrative an evolution. All their movements are, like their outlines, graceful. The colors are the most delicate conceivable—an embossed blush; a sunrise glowing. The perfume is as sweet as the memory of our loved and lost; it is not over-powering, but pervasive, subtle, delicious.

In the rose season we keep a cluster of these native blossoms—the full-blown flowers and the opening buds—upon our table. They hallow our thoughts and make us at peace with all men. They are as transient as all things worthy. Hardly can we consider them desirable when the petals fall upon the table. With their waxy yellow mountain laurel they are commencement flowers, opening into loveliness at the time when the young graduate tries his wings. The kalmia is a type of mature summer; the rose of the later days of spring. For our spring is not confined to May; if we possess such a season at all it is in June. We do not underestimate the roses of the garden when we express our delight in their unpretending field relative. The undoubled flower, as nature designed it, is dearer to us than the long-ridged and modified horticultural favorites. In the early morning, when the dew beads its wondrous petals, we seek the rose as a part of our devotion. Surely no sweeter incense rises to the throne of God?

 PROVIDENCE, R. I.

CURIOUS FACTS.

The height of ocean waves has recently been measured in a very ingenious way by floating a sensitive aneroid barometer, to which a recording apparatus was fitted, on the surface of the water. It has thus been proved that waves attain a height of forty feet from trough to crest in a fairly heavy sea, and probably very much more in violent gales. A relationship between the flora of Eastern Asia and of Eastern North America was pointed out, as to Japan, by Dr. Asa Gray thirty years ago. It has been illustrated since by discoveries of new species alike in both regions, but they have been for the most part unimportant herbs. Greater force is now given to the fact by the discovery, by Dr. Augustine Henry, that the Chinese and American tulp-trees are identical. The discovery is significant in that it gives evidence that the climate of Eastern America and of China have continued to be alike since the Tertiary period.

At an exhibition given by the department of microscopy of the Brooklyn Institute, seventy-two exhibits were shown, and one of them consisted of: Teeth of mosquito, showing eleven teeth at the back of the upper edge of each flattened, bristle-like mandible. Another slide showed the stinging hairs of nettle, how the top of the sting is broken off on entering the skin while poison from the gland below is pressed through the tube of the sting into the flesh. Thus insects are plants provided with instruments of torture for men; though these are only two minor examples of hundreds of tortures to which we are liable.
The American Association for the Advancement of Science will hold its meeting this year at Indianapolis, commencing on the 19th of August. From its central location and the fine facilities placed at the service of the Association, this meeting promises to be one of the most important ever held in the West.

Thioketone is the innocent name of a recently-discovered substance which has the proud distinction of being the worst-smelling substance known. Naturally, it belongs to the class of sulphur compounds, and may be chemically considered as a nio-n-sulphurreted acetone (C<sub>6</sub>H<sub>4</sub>S). It was first prepared by two German chemists, but their investigations were brought to a premature end by the protests of the residents in the vicinity of the laboratory. Even with the most perfect methods of condensation, it was impossible to distill a small quantity of this fragrant substance without infecting the whole neighborhood with an odor in comparison with which that of sulphurreted hydrogen or mercaptan must be considered as agreeable. It is a curious fact that sulphur, an inodorous substance in itself, should almost invariably confer a most atrocious fragrance upon any compound of which it forms a constituent part.

The superior photographic qualities of the great object-glass of the Lick Observatory are well illustrated by some recent experiments upon a photograph of the moon taken with its aid. The photographic image of the moon was enlarged two times without perceptibly losing its sharpness of definition, the whole enlargement being equal to a magnifying power of 1,100 diameters, which practically brought the moon to within a distance of 217 miles of the observer. In this enlargement the walls of the "rill" crossing the crater Higginson are plainly visible, although only 6,000 feet apart, while the bright tops of the walls, which are also very distinct, are only about 600 feet wide. This is a most remarkable test of the power of definition of the object-glass, and fully justifies the wisdom of the large expenditure of time and money required for its production.

A message was recently sent by the optical telegraph from Mt. Reno to Mt. Graham, a distance of 125 miles, which is the longest on record, and would scarcely be possible in an atmosphere less clear than that of the mountain regions of the West. This form of telegraph is simply a small mirror so mounted that a ray of sunlight may be flashed in any desired direction, long and short flashes corresponding to the dashes and dots of the Morse alphabet. At night an artificial light is substituted. It has been found a valuable means of communication in the deserts of New Mexico and Arizona, where the expense of maintaining regular telegraph lines would be too great, to say nothing of their probable destruction by hostile Indians.

One of the oldest persons in the country, Captain Nicholas Costello, recently died at Haverhill, Mass., at the probable age of 108 years. He was a native of Ireland, but came to this country some sixty years ago. While his exact age may have been somewhat uncertain, there can be but little doubt that he was considerably over one hundred years old, to which age he preserved a fair measure of health and strength. It may be noted in this connection that on the tenth anniversary of the taking of the Bastile, Bonaparte, then first consul, received two invalid soldiers, one of 106, the other of 107 years; and that, in 1822, Pietro Huei, who was then 177 years old, and the only Frenchman living who had seen Louis XIV. assisted at the inauguration of the statue of the grand monarch.

Some curious electrical and magnetic phenomena have been observed at the Montsouris Observatory, at Paris, due to the trains on two neighboring railroads. A registering bifilar magnet is so greatly disturbed whenever a train passes near the observatory, that the photographic curve shows clearly the exact time of the passage of every train. This phenomenon is due to the fact that, as the line crosses the direction of the magnetic meridian, the wheel-tires of the carriages become magnetized by induction, and so produce, in consequence of the laws of magnetism, a deviation of the bifilar magnet. It has also been noticed that whenever steam is allowed to escape from an engine, the electric potential of the air is considerably lowered, and the electrometer in the observatory is partially discharged. These phenomena have caused much annoyance to the director, and have led him to protest against the proposed extension of one of the lines.

One of the most mysterious of physiological phenomena is the influence of minute quantities of certain substances when introduced into the circulatory system. The wonderful effect of vaccination is familiar to all, and even more remarkable are the terrible results produced by a mere trace of saliva from a hydrophobic animal—a poison which, apparently, remains dormant in the body for days or weeks, and then suddenly springs into fatal activity. Similar effects follow from inoculation with the venom of serpents, but in such cases the poisonous effects occur almost immediately. Even more powerful are the poisons used by the natives of Africa to render fatal the wounds made by their arrows, as described by Mr. Stanley in his recent work on Africa. These, when fresh, are of most extraordinary power. Fainting, palpitation of the heart, nausea, pallor, and beads of perspiration break out over the body with extraordinary promptness, and death ensues. One man died within one minute from a mere pin-hole puncture in the right arm and right breast. A headman died within an hour and a quarter after being shot; a woman died during the time that she was carried a distance of a hundred paces; others in varying spaces of time up to a hundred hours. The activity of the poison seemed to depend on its freshness. The treatment adopted was to administer an emetic, to suck the wound, syringe it, and inject a strong solution of carbonate of ammonia. This carbonate of ammonia injection seems to have proved a wonderful antidote if it could be administered promptly enough. One of the poisons with which the weapons are smeared is a dark substance like pitch. According to the native women, it is prepared from a local species of urum. Its smell when fresh recalls the old blister plaster. It is strong enough to kill elephants. This poison is not permitted to be prepared in the village. It is manufactured and smeared on the arrows in the bush. All these phenomena are certainly wonderful and unexplainable; but, for that matter, there is hardly any action taking place in the living body of which we can form any satisfactory conception of the true nature.

Another practical point, not entirely unknown before, but confirmed by Mr. Stanley's recent journey, is the protection against malaria afforded by trees, tall shrubbery, or even a high wall or close screen, around a house, between it and the wind-currents. Emin Pasha told him that he always took a mosquito-curtain with him, as he believed that it was an excellent protector against malarious exhalations of the night; and Stanley thereupon suggests a respirator, attached to a veil or face-screen of muslin, to assist in mitigating malarious effects, for travellers in open regions. These facts would tend to confirm the view that malarial affections are really caused by a microbe living in the air, which is unable to pass by mechanical obstructions in its path.

Another "electric" humbug has recently been brought forward, and is worthy of notice from the ingenuity displayed by its originator. It is alleged to consist of a series of steam boilers connected with powerful dynamo machines in such a way that the
electric current produced by them is transformed into heat, which is used to produce steam in the boilers, and set engines in motion, which, in their turn, operate the dynamos, thus completing the circle of transformations of energy. It is claimed that the apparatus, once started, will not only run itself, but produce a surplus of power which can be used for industrial purposes. This brilliant scheme would have a very plausible appearance to one unacquainted with the principle of the conservation of energy, but it is a scientific and mathematical impossibility. No power can possibly be produced without the expenditure of energy previously stored up, and there is no better or cheaper way of doing this than by the burning of coal, in which the radiant energy of the sun, stored up in past geological times, has been awaiting the coming of man for countless ages.

LIMITATIONS OF ELECTRICITY.

A promising railway financier has recently been reported as saying that in five years every railroad in this country will be run by electricity, and there will be no further use for the thousands of locomotives now in service. If the gentleman ever did hazard any such rash prediction, it only illustrates the old proverb about the shoemaker sticking to his last, for there is a wide gulf fixed between the financial reorganization of a railroad, and the practical operation of its trains.

We do not believe that it is practically possible to operate an ordinary railroad by electric power. It would require the erection of immense power houses every few miles, fitted with costly steam engines and dynamos, which must be arranged to develop many hundred times the power required to operate the street railways of a city, and the expense would be much greater than that of the locomotives now in use. The uncertainty of this form of power would also be an objection; stoppages of the entire traffic for periods varying from five minutes to several hours are not uncommon on electric street railways at the present time, and, while this is a comparatively unimportant affair on a short local line, it would be a very serious matter in the case of a great railroad with its hundreds of trains.

The economy of electricity as applied to street railways is found in the fact that it displaces the much more costly form of power in the shape of horses previously in use. Electric power is produced by burning coal; horse power by burning hay and grain. If the conditions were such that locomotives could be used in the streets of a crowded city, and the cars run in long trains instead of separately and at frequent intervals as at present, the electric form of power could not be used in competition with that produced directly in the boiler of the locomotive. It is a matter of convenience and especially adaptability to the conditions required in operating a street railway, that renders electricity so successful, and not any particular economy of this form of energy.

The great error almost invariably made by persons unfamiliar with the subject, is in considering electricity as a source of unlimited power in itself, when, in reality, it is only one of the many manifestations of energy, and a convenient way of applying power previously produced. A current of electricity is like a current of water. It gives out power in falling from a higher to a lower potential, just as the water turns the mill-wheel as it falls from a higher to a lower level, but neither have any power in themselves. The radiant energy of the sun has lifted the water from the ocean to the hills, and the same radiant energy has been stored up in the coal plants of previous ages, and is liberated and transformed into power in the furnaces and boilers of our modern steam engines. Whether this power shall be used directly, as in a locomotive engine, or passed through the intermediate form of electricity, as in the street railway motors, is a question to be decided by special conditions, and these conditions in the case of a long line of railroad are such that we have no hesitation in saying that it will always remain impracticable to operate such trains by electric motors, and there will probably be no radical change in the present type of steam locomotive for many years to come.

Electricity is a very convenient means of applying a limited amount of power, but it is only a manifestation or form of energy, and in no sense a source of energy or power in itself.

THE WATER-WAYS OF NEW MEXICO.

BY MRS. M. J. GORTON.

One hundred and fifty million acres of land were captured as lawful prey from Mexico by the United States government in 1848. Part of the State of Colorado, the Territory of Arizona, and the Territory of New Mexico were the result of General Kearney’s prise stake when Mexico came to settle with her conqueror. Of this large area of land, New Mexico has taken within her borders seventy-nine millions of acres. This Territory is a parallelogram in shape, and has no natural boundaries on either of its four sides. The Rocky Mountains extend from north to south through the centre of the land, and the Rio Grande River, the natural channel for the electric generated water-floes, of the upheaved barren skeleton ribs, of the rocky heights lying perpetually snow-covered and mist-enwrapped, extending its huge length down through this land of the sun, gives rise aloé to the many mountain torrent tributaries of the Rio Grande. Looking upward to the battle-torned crowns of these majestic peaks, marking the scars and furrowed gorges wrought by the torrential floods and thunderbolts, and noting the devastating ravages left to mark the fierce battles of the elements amid the surging whirl of these frothy, misty, billowy-veiled storm-drenched heights, it is with the force of logical certainty that we note the signs of the scenes when the over-gorged channels of the mountain brooks overflow as they tear and dash down to the bosom of the turbid Rio Grande, carrying devastation in the onward path, during the wet season. Although seen when the lost, lonely stream was meandering through the bleachèd waste land, murmuring under the glare of a semi-tropical sun, it was easy to imagine the broad margins, the flowing surges of the Rio Grande and its tributaries, when it covered the thirsty land and justly appropriated the descriptive title of the “Nile of New Mexico.”

The destruction of fields, vineyards, and orchards during the short wet season is of vast proportions. The river, in its course down through the sun parched land, carries with it the vast water-power conveyed by such a great volume of water, as there is a fall in the river from ten to twenty feet per mile almost the whole length of its course through the Territory. Thus the wealth from the heavens, so necessary to the development of the fertilization of the arid land, not only rushes away in needless waste, but is a power for destruction in its onward course, when it might be made a benefit. Water storage with capacity to fertilize 30,000,000 acres of land, dashing down in its headlong course, carrying havoc and destruction, to subside and leave thirst and famine for the wasted product. A system of reservoirs and canals to save this surplus of the drainage of the uplands would serve two purposes: stop the destruction of property during the wet period, and reclaim the barren waste and make it tillable land by irrigation during the dry season.

During the past year there were over twenty irrigation companies formed, with the direct end in view of forming commercial leagues to utilize the resources of the Territory by saving the vast waste water of the flood period of the year. But unless the plea of statehood be allowed, it is difficult for the local government to interfere in the interests of this much needed improvement.

The principal river in the Territory is the Rio Grande. It rises in southwestern Colorado, at an elevation of nearly 12,000 feet. Flowing through the centre of the Territory, the broad valley extending on either hand gives indications of the great lake of the glacial period once penned up in the western and northern sections, and which in time wore itself an outlet, rived out, in Rio Grande. The tributaries of the Rio Grande are, Chama, Socorro, Chama, Jemez, Puerco, Alamosita, Chuillo Negro, Los Animas (lost souls), and Polomas: from the east, Costilla San Christobal, Uondo, Taos, Placitos, Santa Cruz, Nambé, Santa Fe, Gallisteo, Turco, and Alamitú.

The Rio Colorado (Canadian) River drains the northeastern part of the Territory, flowing into the Arkansas. Its chief tributaries are the Cimarron, Mora, Sapello, Concho, Pajarito, Ute, and Trullillo Revuelta.

The central, eastern, and southeastern lands are drained by the Pecos, with its tributaries, which debouches about the Santa Fe range of mountains, and finds its way into the Rio Grande. The main seeder is the San Juan, which issues from the high mountains south of the Río Puerco, and drains the volcanic mountains to the southeast by the Rio Puerco, and the Rio Tularosa which is in the far west. The San Francheles, Rio Gila, and Rio Members are found in the earth plains and the alkali lands of the extreme southwest. Springs and numerous small streams, and the arroyos found all over the Territory, testify to nature’s abundant providing of the precious fluid.

It remains for human skill to treasure and apply
PRESUMPTIONS OF AUTUMN.

BY PROF. W. WHITMAN BAILEY.

In the first days of August we begin to have forebodings of prophecies of the year’s decline. It is still full summer, and the flowers are gorgeous; indeed, the most splendid of the year; but they are the offspring of the mature season, and have a thoughtful, introspective look. A few golden rods have already put in an appearance. They are species of Solidago, danica and arguta. With them is a conspicuous species, not yet in bloom, and much rarer, the Solidago rigida, Linn. We have not yet seen any of the true asters, but the nearly related white-topped aster, or Sericeus, is abundant.

The roses are beginning to be brilliant with the crimson crowns of the summer. They are as attractive here as the red-berried clusters of elder in the White Mountain region. We are often struck with the regular intervals with which these masses of berries appear above the flatter foliage. The sumacs present another indication of autumn in the occasional reddening of one whole leaf, a coloration which purifies the entire leaf, and becomes as much lovely as the reddest scarlet.

Other trees also show some few branches with the hues of September. The red maple may exhibit a whole branch of rusty foliage; the elm a bough of gold; the chestnut its amber tints, and the beech its delicate salmon color. But fruits, after all, give us the most intense feeling of perfected work.

The white rain of probable productions where the land is arable,—the fruits and vegetables ranging from tropical and semi-tropical to the hardy varieties of the far north,—shows to how wide a field in the industrial world the extending the amount of arable land tends. With such a network of flowing streams of water, irrigation should be made available, and the surplus of water, river and canal, to be used to the advantage of the agricultural world.

The valley of the great river, prepared by glacial cold and lava heat, the summer’s sun and winter’s storm, he stirs the soil containing valuable mineral ingredients,—potash, ammonia, etc.,—and, being wrought upon by the sunlight, is led the necessary moisture in regular and proper proportions, so long as the crop demands it, from the irrigating canal. Success is sure, and certain, and the yield is prodigious.

POPULAR SCIENCE NEWS.

[Original in Popular Science News.]

PARIS LETTER.

The vacations are not very far off, and the scientific world—mostly composed of professors and lecturers—is busily engaged in the performance of the last duties of the season. The examinations for most government schools are beginning, as well as the competitions for many diplomas, and some of the last are to continue till September. We pity the unfortunates who are obliged to spend a warm summer in the labor and anxieties of competitions, which will provide them with a living, or oblige them to work one year more and submit again to the trying ordeal. Examinations for admittance to the Ecole Normale, to the Ecole Polytechnique, to the Ecole de Saint-Cyr, and to many others are beginning soon, and, excepting the number of candidates, the number of “élèves” who get the prize, the number of the “élèves” remaining always the same.

In the Medical School and in the Paris hospitals, candidates are always most numerous; recently, for two appointments of hospital physicians, there were eighty candidates, and all of them able and highly-educated men. The situation of physician to a hospital is much sought after, not only for the greater amount of leisure, but also for the greater security.

The situation of physician to a hospital is much sought after, not only for the greater amount of leisure, but also for the greater security. The amount of time is paid $3000 a year,—but on account of the title, which is useful in securing a large practice. But the number of applicants for the competition—a very difficult one, of course—is so great that many men do not succeed before forty years of age, and now a man is physician to a hospital and a fellow of the Medical School at forty, he is among the lucky ones. This is a very unfortunate fact from one point of view, because the man who has begun studying medicine at nineteen or twenty, and who till forty has spent his life learning what others have done and cramming his memory with an immense amount of miscellaneous knowledge, is no longer in the prime of his life.

The examination is certainly very much opposed to the benefit of science and of scientists, because men of capabilities are confined too long in inferior situations, where they have to work in some uninteresting manner and spend the best time of their mental life in unprofitable tasks. When they, in turn, become professors, they are tried and have no relish for original work—the sole manner of advancing science.

Before scientific men run off to the country and seashore, I am sure many will secure M. Berthelot’s recent volume on La Revolucion Chimique: Lavoisier. Some three years ago, M. Grimmaux, an able chemist, professor in the Ecole Polytechnique, published a very interesting book on the history of Lavoisier’s life, based on numerous documents hitherto unknown, among which were letters and various writings of the “father of chemistry.” But M. Grimmaux had in view only the life-history of his hero, and did not study the influence exerted by the scientist. This is what M. Berthelot has done, and none was better qualified than he for the task he has undertaken. He is one of the masters of modern chemistry, and his summary of the state of chemistry before Lavoisier, brought together by the great discoverer, is excellent. A very interesting part of his book is that in which M. Berthelot gives an abstract of the registers in which Lavoisier day by day wrote down his experiments and the results thereof. These registers, large manuscript books, are thirteen in number, and cover the period from 1772 to 1789. They show how Lavoisier performed all his experiments and followed his ideas, and are written partly by himself, partly by his wife,—who was a very devoted assistant in his laboratory,—and also by some other persons who wrote under Lavoisier’s dictation. There are seventeen other smaller registers, older than the thirteen large ones; they are of less importance, and they yield valuable information concerning the methods and manner in which Lavoisier achieved his discoveries. This work will certainly be translated, and many of our readers will be much interested in it. Lavoisier, it is well known, was beheaded by the French revolution the 5th of May, 1794. In his fifty-first year. He was one of the fermiers-généraux who were so unpopular, and his government was one of those who raised taxes. As Lagrange, the great mathematician, said the next day, “one moment has been enough to cut down that head, and a hundred years will, perhaps, not suffice to furnish another one of the same worth.” However, France and science have not lost all in Lavoisier: Wurtz, Dumas, Pasteur,—to
The proceedings of the numerous scientific meetings held in Paris last year are being slowly published. The two last ones I have seen are those of the Congrès de Psychologie Physiologique and of the Congrès de Climatologie. The latter is good, but in the first too much space has been given to discussions and theories, while many facts which had been communicated by members at the meeting have not even been mentioned.

Here is our old friend cholera again; it is in Spain at present—perhaps in Italy. Will it come to France? Who can tell. At all events, when it came some three years ago, it did but little harm. Many in Paris would feel inclined to try Ferran's inoculations or vaccinations; the point is well worth investigating. Cornil and Babes's third edition of their excellent work, Les Inoculations, is just out, greatly enlarged and bettered, shows the present state of the question in a capital manner, and truly that is the matter which must be studied. Now is an opportunity.

To those who have visited the Paris exhibition and are interested in scientific matters, I would recommend Les Sciences Biologiques en 1890, a book written by numerous competent writers, published in monthly parts, well illustrated, and published by the Société d'Éditions Scientifiques, a society of men who are inaugurating a new method of publishing; they want the author to get half of the net profits, apibus restituo fructum suum, they say. The plan is a good one, but it will not be easy to become one of the privileged authors, as they will, of course, undertake to publish only books which seem certain to secure a large sale.

I wish to signal to geologists and paleontologists a posthumous work of Frederic Troyon, L'Homme Fossile. Although written many years ago, it is interesting in the manner in which the author tries to reconcile science and theology—those two old antagonists, real or feigned. It is published by Bridel, in Lausanne, Switzerland.

Paris, June 23, 1890.

[Specialy Observed for Popular Science News.]

METEOROLOGY FOR JUNE, 1890.

TEMPERATURE.

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<td>At 7 A. M.</td>
<td>60°F</td>
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<td>At 9 P. M.</td>
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<td>Whole Month</td>
<td>66°F</td>
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The lowest point of the mercury, at the hours of observation, was 51°F on the 13th, and this was also the coolest day, with an average of 52.3°F. The day preceding was but one degree warmer, with a range of only 2°F. The highest point of the month was 94°F, on the 11th and 24th, and these were the warmest days, averaging 74.6°F and 76°F, respectively. The first half of the month averaged 62.0°F, and the last half 68.5°F. The entire month was nearly 2°F below the average of the last twenty June. There have been but three June cooler than the present in twenty years, and these were in 1890, 1883, and 1875. A very sudden change of temperature occurred between the 11th and 12th;—one of the coolest days followed one of the warmest in the month, a fall of 31°F in twenty-four hours.

The face of the sky gave 52 fair, 11 cloudy, 22 overcast, and 5 rainy observations,—a percentage of 57.8. The average for the last twenty June has been 58.4, with extremes of 40.4 in 1874, and 75.5 in 1871. The average fair the last ten June has been five per cent. less than the preceding ten. On the evenings of the 4th, 5th, and 6th were thunder-showers, as also on the afternoon of the 11th and morning of the 13th. The morning of the 16th was foggy. We had quite a number of fine June days, but not as many as usual.

PRECIPITATION.

The amount of rainfall the past month was 1.52 inches, while the mean for June the last twenty-two years has been 2.09 inches, with extremes of zero in 1875, and 5.30 in 1873. The showers of the 12th and 13th yielded 1.06 inches, after which not a trace fell to the end of the month, and vegetation began to suffer. The small remainder (0.44 inch) fell during the showers on the 4th, 5th, and 6th. The amount since January 1 has been 25.91 inches, while the average for the first half of the year has been 24.74 inches, showing an excess this year of 1.17 inches.

PRESSURE.

The average pressure the past month was 29.99 inches, with extremes of 29.75 on the 26th, and 30.20 on the 16th,—a range of .45 inch. The average of the last seventeen June has been 29.96 inches, with extremes of 29.85 in 1882, and 30.05 in 1884,—a range of .21 inch. The sum of the daily variations the last month was 3.24 inches, an average daily movement of .108 inch, while this average in seventeen June has been .185, with extremes of .208 and .218. The largest variations were 2.9, on the 8th, and 2.16 on the 11th and 14th,—showing a quiet state of atmospheric pressure during the month.

WINDS.

The average direction of the wind the last month was W. 35° to N., or nearly N. W., a northerly extreme for June. The average direction the last twenty-one June has been W. 18° to S. W., or nearly W. S. W., with extremes of W. 76° to S. in 1876, and W. 30° to N. In 1890,—a range of nearly ten points of the compass. This large excess of northernly winds has been one cause of the unusually cool June, and has united with the light rainfall in retarding the progress of the season a full week or more.

COMPARATIVE METEOROLOGY OF NEW ENGLAND FOR MAY, 1890, WITH REVIEW OF THE SPRING;

gathered from the Bulletins of the New England Meteorological Society.

Under "No." is given the number of reports from each State and from New Newfoundland. The upper horizontal lines against each State give the figures for May; the lower lines, those for the last spring. Under "Max." and "Min." are given the average temperature, or amount of precipitation in inches, for the highest and lowest stations. Multiply the lower mean of precipitation by three, and we have the entire amount of the spring in each State.

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<tr>
<th>State</th>
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The mean temperature of all New England for May, ascertained from numerous reports kept over a series of ten years, is 60.7°, and the average spring 43.8°,—showing the present May and spring to have been only a fraction below the average. The mean precipitation—obtained in like manner—for New England has been 3.64 inches for May, and to 8 for the spring,—showing an excess of precipitation of 2.04 inches in May, and 3.63 in the spring of 1890.

To obtain the figures condensed in the above table has required many thousands of careful observations, by about a hundred and fifty observers well scattered over all New England, and the result must be a near approximate to the exact truth in regard to the most important branches of New England meteorology.

D. W. Natick, July 5, 1890.

[Specialy Observed for Popular Science News.]
The Constellations.—The positions given hold good for latitudes differing not more than degrees from 40° north, and for 10, 9, and 8 P. M. for the beginning, middle, and end of the month, respectively. Lyra is in the zenith, Aquila is shining to the meridian, and Sagittarius is low down south on the meridian. East of Sagittarius is Capricornus, at about the same altitude, with Pisces Australis just rising below it. Aquarius follows Capricornus, and Pisces is just rising in the east. Above Pisces are Pegasus and Cygnus, the latter near the zenith. Going from the eastern horizon toward the pole star, we find the first Andromeda. Perseus is on the horizon below Cassiopeia, and Cepheus is above. The head of Draco is just west of the meridian, and a little north of the zenith. Ursa Minor is mainly to the left and above the pole, while Ursa Major is to the left below. Hercules is to the west of the zenith, high up, and below it are Corona Borealis and Bootes, with Virgo just on the west horizon. Libra and Scorpius follow Virgo, and are both low down in the western sky. Ophiuchus is above Scorpions.

L. A. C. Illinois, July 3, 1890.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

N. T., Indiana.—If two wheels of different sizes are connected by a belt or gearing, how may their relative speeds be determined?

Answer.—The speed of such wheels is directly proportional to their circumferences. Thus if the driving wheel is twice the circumference of the driven one, the latter will turn twice as fast. If, on the contrary, the driven wheel is twice the circumference of the driver, the former will turn only half as fast as the latter. In all such cases, an increase of speed is accompanied by a loss of power, and rice serum.

Builder, New York.—What chemical changes take place in the drying and hardening of ordinary mortar?

Answer.—Mortar is usually composed of one part of slaked lime (calcic hydrate) and two or three parts of sand. The hardening appears to be due, first to the absorption of carbonic acid from the air, by which a portion of the lime is converted into carbonate, and this unifying with the unaltered calcic hydrate forms a solid layer, adhering strongly to the surfaces of brick or stone. In the course of time, the lime unifying with the sand forms a calcic silicate, which renders the adhesion even stronger and more perfect.

H. T. H., Boston.—How can I make platinic hydrate from platinum scrap?

Answer.—Dissolve the platinum in nitro-hydrochloric acid, to form a solution of platinic chloride. Then boil the nearly neutral solution with potash, and treat the resulting precipitate with acetic acid. This leaves a nearly white powder of the composition Pt(HO)₂(Cl₂). At 100° C. this becomes Pt(HO)₆Cl₂. Unless you are accustomed to chemical manipulation you will find platinum a very difficult and unsatisfactory experiment with.

H. A. C., Illinois.—Will vines growing around a lightning rod injure its protective power?

Answer.—The presence of vines will make no difference whatever, and the rod will be equally efficient if it is moistened by the foliage.

H. W., Mass.—What can I use to remove lichens, etc., from an old gravestone?

Answer.—A solution of caustic potash, or "concentrated eye," will doubtless be effective. It will not injure the stone; should be kept away from the hands or clothing as much as possible as it is a rather powerful caustic.

C. D. N., Mass.—Does electricity exist upon the surface of an electrified body, or through its entire mass?

Answer.—Static electricity, or electricity at rest, as in the case of a piece of glass or scaling wax electrified by friction, exists only on the surface of the body, but when a current of electricity passes through a conductor it traverses the whole mass, and the conductive power of any two substances of similar composition being proportional to their mass, or, in other words, their weight per linear foot. You will thus see that the shape of a lighting rod is of no consequence whatever, if it contains a sufficient weight of metal to carry off the current.

C. A. G., Alabama.—Quite a number of trains are now running which are lighted by electricity. The system is quite practical, the only objection being the great cost at which the electric lights are maintained in comparison with oil lamps.

LITERARY NOTES.

How to Examine for Life Insurance. Under this title, P. Blakiston, Son & Co., of Philadelphia, have published a book written by Dr. John M. Keating, who is the president of the Association of Life Insurance Medical Directors, as well as the medical director of one of the large life insurance companies of the country. Dr. Keating's book might be presumed to be, therefore, what its author says he intended it to be: a plain and practical manual for the life insurance examiner. Such is, and as such it will prove a very useful companion for a class of men who are obliged to form an intelligent and fair opinion upon an important matter in a brief space of time.


This work, which treats of the science of astronomy as developed by the discoveries of modern times, is a most interesting and valuable treatise, and can be read with profit and pleasure by anyone having an acquaintance with the elementary principles of the science. The chapters on celestial spectroscopy are especially full, and include the results of the most recent investigations.


This work describes the best methods of disposing of the waste matters of houses in the country or small towns, whereby, as is often the case, there is an abundant supply of water, but no system of public sewers. This difficult problem is treated in a scientific and sensible manner, and the book will be found very helpful by those interested in the matter.

Protoplasma and Life, by Charles F. Cox, is published by N. D. C. Hodges, of New York, at $75 cents, and will be found an interesting and popular account of the tendencies of modern biological thought, including the views of the author on the theory of spontaneous generation, and its relation to the general theory of evolution.

Philosophy in Homoeopathy, by Charles S. Mack, M. D., is published by Gross & Delbridge, of Chicago, and is recommended to the perusal of those who wish to become better acquainted with the principles of the system of medicine, as held by a practical physician.

The Open Court Publishing Co., of Chicago, have just published a very dry essay entitled "The $1.00 upon labor and social questions," by a writer under the name de Plume of "Wheelerbarrow." A few of these essays are sensitive, the majority are as insipid as possible, and none show the slightest trace of any original or independent thought.

The Engineers' and Constructors' Diary and Reference Book, published by E. & P. N. Span, New York, at $50 cents, contains many useful tables, and interesting information especially adapted to the use of the civil engineer, and makes the space for memoranda, etc., for every day in the year.

Pamphlets, etc., received: An Improved Tape Measure, by Wiliam C. Krauss, M. D., Buffalo; Report of the Intercollegiate Committee of the American Institute of Homoeopathy; Catalogue of Pratt Institute, Brooklyn, N. Y.; and the Circumferents of the National Bureau of Statistics and Education.

Medicine and Pharmacy.

AUTOGRAPHISM.

Under this name Dr. Mesnef has recently described to the Paris Academy of Medicine, a curious disease, or condition, of certain patients of his, which manifests itself in a remarkable sensitiveness of the skin to pressure or friction.

Dr. Mesnef finds that when the skin of such a person is pressed upon with a pointed instrument, pressed with the fingers, or even rubbed by a fold of the clothing, a very curious set of phenomena occur. In the first place a slight redness of the skin appears at the points where pressure is applied, or follows the point of the instrument forming the letters or figures. In about two minutes the characters appear in lines of a pale red color and increase in height, until the inscription stands out on the skin of the patient in red letters of bold relief. The characters remain visible for a considerable time, varying, with different subjects, from a few minutes to several hours, after which the skin resumes its normal appearance. The accompanying engraving is copied from La Nature, and is a reproduction of a photograph of a subject upon whom the phenomenon was produced for the express benefit of our contemporary.

While Dr. Mesnef is unable to find a satisfactory explanation of this phenomenon, he considers it as due to a disordered condition of the nervous system, of a hysterical nature, affecting the circulation of the blood-vessels of the skin. Nearly all the patients showing this autographism had various other nervous affections, and were easily affected by hypnotic influences. Local anesthetization of the skin by ether spray temporarily prevented the occurrence of the phenomenon, but it reappeared as soon as the effects of the ether passed away. This effect would naturally result, for in this form of local anesthetization the
skin and blood vessels are really frozen, and all circulation is temporarily stopped. The condition is a most curious one, and, as far as we know, has not been observed in this country.

The phenomena of autographism naturally bring to mind the *stigmata* of spots, sometimes appearing on the bodies of religious devotees, which they claim to represent the marks made by the nails by which Christ was fastened to the cross. In olden times these persons would have been considered as sorcerers, and the peculiar marks appearing on their bodies as direct proof of their dealings with the devil, and worthy of punishment by death. Fortunately, in this more enlightened age, the matter is of scientific interest only, and the unfortunate "autographists" are considered to be neither saint nor sorcerer, but only as subjects for the healing skill of the physicians.

STATE REGULATION OF MEDICINE.

Until recently the Popular Science News has stood almost alone in opposing the so-called "regulation" of medical practice by the State—or, in other words, by the professional politicians. We have always held that governmental interference in any business not distinctly criminal or immoral is a violation of personal liberty and inherent natural rights. While quackery is bad enough, the suppression of individuality is a great deal worse, and the only just and rational system of government is that which upholds the right of every individual to act exactly as he pleases, only preventing him from infringing upon the similar right of his fellow beings to act as they please.

It is with peculiar pleasure, therefore, that we copy the extract given below from a recent editorial in the *Popular Science Monthly*, as showing that similar ideas are now being supported by journals of the highest standing and authority, and we notice also that it has been copied into several other high class periodicals, apparently with approval of the views therein put forth.

Justice consists in defending Individual citizens against the violence or fraud which these fellows might otherwise exercise against them, while leaving to each as far as possible the conditions of existence natural to him as an inhabitant of the planet.

Established for quite a different purpose, the government has no competence to industrial matters, and can only act therein upon the advice of others. This advice is nearly always interesting and unjust.

The above remarks apply to tariff legislation, but individual liberty is abridged in many other ways that seem essentially wrong. That the members of a particular profession should have laws passed in their special interest, and should be empowered to decide who may or who may not enter into competition with them, is, we think, a violation at once of justice and of liberty. It would scarcely be too much to say that the most offensive forms of trade-unionism are found in connection with the so-called learned professions. Time was when it was supposed that the state had to look after the spiritual health of individuals; and for that purpose to prescribe their theological beliefs and religious observances. That belief has for the most part been exploded in the modern world, but its place has been taken by the notion that the state is responsible for the intellectual health of its members; and in lieu of the state church we have the state schools. As regards the physical health of the community, the general method is to legalize one or two—possibly quite conflicting—schools of medicine, and to empower them to rule out, and if necessary to prosecute and punish, all others. Nobody, broadly speaking, seems to believe that, in the absence of all legislation of this character, people could in any adequate manner preserve their health or protect themselves against gross impositions. We believe in—believe it most heartily; and we believe that the science of medicine would advance far more rapidly, and that, on the whole, the public health would be far better, if every man were left perfectly free to employ any one he chose to attend him in sickness. At present every licensed practitioner feels himself authorized to call every unlicensed practitioner a quack. We should prefer a system under which, to a quickened public intelligence in questions of health and disease, the quack should stand revealed by his quackery.

As an instance of the abuses which may and do arise under such a condition of affairs, we may mention the case of a New York druggist, who was arrested and fined fifty dollars for giving a simple remedy to a customer who happened to be afflicted with some trifling ailment—a sore throat, if we remember rightly. A similar outrage occurred in this State not long ago, when some officious and ignorant "inspector" caused a manufacturer of vinegar to be arrested and heavily fined on the pretext that his vinegar was adulterated—with salt (!), the facts being that the vinegar was stored in a barrel which had previously contained brine. This whole matter of "inspection" and "regulation" of legitimate industries, is a violation of natural and constitutional rights, an insult to reputable professional and business men, and an utterly inefficient and impracticable method of protecting the citizen from the actions of those who are not reputable. With the advance of civilization we may expect to see such laws relegated to the oblivion where now repose the statutes which were once intended to "protect" the citizens of this enlightened Commonwealth from the evil machinations of sorcerers and witches.

SOME OLD PATENT MEDICINES.

The evident powerful and physiological effects of certain medicinal substances are, to a considerable extent, responsible for the popular faith in "medicine" of some sort, as a sure remedy for all conceivable diseases, functional or organic, curable or incurable. The action (usually beneficial) of a dose of jalap or "salts and senna," is adapted to the meanest comprehension, and a traveller in Central Asia gives a most amusing account of the widespread reputation as a doctor to which he almost instanceinantly attained by administering two or three catheric pills to the chief of one of the native tribes.

This popular demand for "medicine" has led to an unlimited supply of nostrums of every conceivable sort, and warranted to accomplish everything except restore the dead to life—and it is not impossible that somebody may yet advertise a "corpse-reviver" at only one dollar a bottle. The greater part of the advertising space of the daily and weekly papers is occupied by the proprietors of these preparations, and is a reliable indication of the immense quantity of the stuff which is consumed by a credulous public.

From the earliest times we find the nostrum vender to occupy a prominent position in the world of trade. Lyell relates that in one of the shops of Pompeii a box of pills was found "which had crumbled away to an earthy substance: " and a distinguished archaologist has added to this statement the opinion that those pills probably never did contain anything but some "earthy substance." The *materia medica* of the ancients, as given by Pliny and other classical writers, is most amusing, but excites our wonder as to how anyone, even of such limited scientific knowledge as we may suppose the Romans to have been possessed, could believe in their efficacy for a single moment.

One of the earliest patent medicine advertisements on record is found in the *Mercurius Politicus*, published at London in 1660, and reads as follows:

Gentlemen, you are desired to take notice, That Mr Theophilus Buckworth doth at his house on Mile-end Green make and expose to sale, for the publick good, those so famous Lozenges or Dexterores, for Coughs, Colds, Catarrhs, Asthmas, Hoarseness, Strength of Breath, Colds in general, Diseases incident to the Lungs, and a sovereign Antidote against the Plague, and all other contagious Diseases, and obstructions of the Stomach: And for more convenience of the people, constantly leave them filled up with his cost of arms on the papers, with Mr Rich. Lowndes (as formerly), at the sign of the White Lion, near the little north door of Pauls Church; Mr Henry Selle, over against S. Dunstan's Church in Fleet Street; Mr William Milward, at Westminster Hall Gate; Mr John Place, at Furnivals Inn Gate in Holborn; and Mr Robert Horn, at the Turk's Head near the entrance of the Royal Exchange, Duckstreet, and one not far off.

This is published to prevent the designs of divers Pretenders, who counterfeit the said Lozenges, to the disparagement of the said Gentleman, and great abuse of the people.

Four years later we find the following advertisement of a certain royal physician:

Whitehall, May 14, 1664. His Sacred Majesty, having declared it to be his Royal will and purpose to continue the healing of his people for the Evil during the Month of May, and then to give o'er all Michaelmas next, I am commanded to
give notice thereof, that the people may not come up to Town in the Interm in and lose their labour.

Probably the "merry monarch" himself must have laughed in his sleeve at the credulous multitude who believed that his royal touch could cure the King's Evil, or scrofula; but the vagaries of the modern mind-healers are not one whit more sensible.

Some years later, in 1711, The Spectator advertised a sure cure for stammering in these words:

An admirable confection which assuredly cures Stuttering and Stammering in children or grown per- sons, though never so bad, causing them to speak distinct and free without any trouble or difficulty: it remedies all manner of impediments in the speech or disorders of the voice of any kind, proceeding from what cause soever, rendering those persons capable of speaking easily and free, and with a clear voice who before were not able to utter a sentence without hesitation. Its stupendous effects in so quickly and infallibly curing Stammering and all disorders of the voice and difficulty in delivery of the speech are really wonderful. Price 2s. 6d. a pot, with directions. Sold only at Mr Osborn's Toys-shop, at the Rose and Crown, under St Dunstan's church Fleet street.

But a still more remarkable compound was the "electuary," also advertised in the same periodical:

Loss of Memory, or Forgetfulness, certainly cured by a grateful electuary peculiarly adapted for that end: it strikes at the primary source, which few apprehend, of forgetfulness, makes the head clear and easy, the spirits free, active, and undisturbed, corroboreates and revives all the noble faculties of the soul, such as thought, judgment, apprehension, reason and memory, which last in particular it so strengthens as to render that faculty exceeding quick and good beyond imagination; thereby enabling those whose memory was before almost totally lost, to remember the minutest circumstances of their affairs, etc., to a wonder. Price 2s. 6d. a pot. Sold only at Mr Payne's, at the Angel and Crown, in St Paul's Churchyard, with directions.

In the British Chronicle of February, 1753, we find the following:

Warham's Apotheotic Balsam, so well known as an excellent remedy against Fits, Convulsions, &c., cures Deaftness, bad Humours in the Eyes, inward Bruises, dissolves hard Lumps in the Breast, and has often cured Cancers, as can be proved by Facts; is a sovereign salve for green Wounds, Burns, &c. Is prepared and sold only by W. Strode, at the Golden Ball, Tottenham Court Road, London.

Who also prepares and sells Warham's Cephalick Snuff, of a most grateful smell, and an effectual remedy for giddiness, nervous pains in the Head, &c.

Also Warham's excellent Mouth water, which certainly cures the toothache, strengthens and preserves the Teeth, takes off all smells proceeding from bad Teeth, &c.

A balsam that would cure not only deafness, but canccrs and "inward bruises," must certainly have contained some most powerful ingredients.

Testimonials to the wonderful efficacy of these medicines were not lacking, as witness the following from the Daily Post (London) of July 14, 1736:

These are to certify, that I Richard Sandford, Waterman, dwelling in Horsely-down-street, near the Dipping Pond, have a Son, who for a considerable Time was troubled with a Pain in his Stomach, a Sleepiness and Giddiness, whereupon I calling to Mind the same Years since my Wife's Mother, between 60 and 70 years of Age, afflicted with a Palsy or Hemiplegia, or loss of the Use of one Side of her Body, had been cured by Mr. JOHN MOORE, Apothecary, at the Pestle and Mortar in Laurence-Pountney's Lane, the first Great Gates on the Left-Hand from Cannon-street.

I applied to him for Relief of my Son, who, after having taken a few of his Worm-Powders, they brought from him a WORM (or INSECT) like a Hogg-Louse, with Legs and hairy, or a Kind of Down all over it, and very probably more, but he going to a common Vault they were lost: upon which he is amended as to his former Illnesses, and I desire this may be printed for the Good of others.

Witness RICHARD SANDFORD.

Oct. 6, 1735.

It is curious to find here the familiar yarn of modern times concerning the presence of living reptiles in the human stomach.

"Medical Institutes" and "Colleges of Physicians and Surgeons" are not unknown in our own enlightened times, and the following, published in the reign of William and Mary, except for the old-fashioned spelling and phrasingology, might be taken from almost any daily newspaper of the present day:

Advertisement.

The Physicians of the Colleges that used to consult twice a Week for the benefit of the Sick at the Consultation House, at the Carded Angel and Crown in King-street, near Guildhall, did not four times a Week; and therefore give Publick Notice, that on Mondays, Wednesdays, Thursdays and Fridays, from two in the afternoon till six, they may be advised by the known Poor, and meaner Families for nothing; and that their Expectations and Demands from the middle Rank shall be moderate: but as for the Rich and Noble, Liberrity is inseparable from their Quality and Breeding.

Coming down to more modern times, we may mention Bishop Berkeley's tar-water, Parr's life pills,—said to prolong life indefinitely beyond a hundred years,—Perkins's metallic tractors, and so on through galvanic and magnetic belts, liver and kidney pads, "safe" cures, oxygenated air, and non-alcoholic "bitters" especially adapted for the prohibition districts, till we find the nostrum vender abreast of the latest discoveries in science; and in the recent absurdity of a "microbe-killer," alleged to cure diseases by cutting off the microbes producing them in the flower of their youth, we recognize the latest development of the patent medicine, and can only wonder what worthless preparation will next be brought forward for the healing of the nations from all manner of diseases.

Prof. Parvin considers it a mistake to make a routine practice of giving ergot after each case of labor. It should not be given unless indicated.
with perforations in its sides was to be preferred. In general, drainage should be used in all cases in which there were intestinal or pelvic adhesions, in cases in which the peritonum was manifestly diseased, and in cases in which for any cause irritation had been required; in a word, in all cases in which there was doubt as to the ascitic condition of the abdominal or pelvic cavity.

Oleum Chelonei is an oil derived from a plant (Chelone lutea) and is refined for medicinal purposes. Dr. Gustav Guldberg speaks highly of it in the Monatshefte für Praktische Dermatologie. He states that: "The oleum is more valuable than any other animal oil, that it is easily absorbed, and that it possesses marked penetrating properties. It follows from this that it is indicated in those cases in which it is desirable to rapidly render the skin fatty, flexible, and extensible. It is also indicated in those cases in which it is desired to promote a rapid absorption of medicaments. The combination of this oil with chloroform is said to surpass every other combination of that anesthetic with oils. A mixture of equal parts is said to penetrate the skin rapidly and to act upon the nerve terminations very efficiently, thus offering a good application in all forms of pruritus, neuralgia, etc. A good ointment base may be made by adding one-fourth as much wax. The oil is forty per cent. cheaper than olive oil and is superior to many more expensive oils. At present the refined oil is only procurable in Christia. The crude oil should not be employed, as its smell is abominable.

A COMPARISON OF BIRTH-RATE BETWEEN CIVILIZED AND SEMI-BARBAROUS NATIONS.—This is the title of an article by Dr. P. B. Greenley, of West Point, Ky. He takes the ground that in advanced and civilized people the birth-rate has become so low that in the absence of sanitary regulations which have been instituted, the population would become extinct. In the New England States the birth-rate exceeds the death-rate very little, and were it not for the prolific foreigner it would be materially less. The birth-rate among native women is 9.4 per 1,000, while among foreign women 29 per 1,000. The causes are found in the evils attendant on high life and the deteriorations produced on the various organs consequent upon the abuses in highly civilized countries of tight lacing, late hours, exposure, indigestible food, free use of wine, etc.

A STRANGE ACCIDENT.—Death sometimes seizes his victims in most queer and unexpected ways, but a stranger accident than one that happened not long ago in New York has seldom been recorded. A lady who had been suffering for several years from pulmonary trouble had been advised to try inhalations of hot air, and had purchased an apparatus for that purpose. In this apparatus there was a white powder in the inhaling tube. Removing this, she resumed the inhalations, but was soon obliged to desist on account of a sudden illness. This increased, and in spite of treatment the lady died the following day. Examination of the apparatus showed that the thermometer had broken, and the mercury falling out had been volatilized by the great heat and had caused fatal mercurial poisoning. — Med. Record.

Asphixia from Round Worms.—Dr. Nikolai A. Parfinovich, of Kaluga, (Proceedings of the Kaluga Medical Society for 1889), narrates the following instructive case: A robust young woman of thirty, addicted to alcoholic excesses, was found dead, totally plugged up with four, expelled round worms. Another round worm was extracted from the left nostril, and again another from the mouth. The stomach and small bowels also contained ascarides, five in number. Dr. Parfinovich gave his opinion to the effect that death had occurred from asphyxia, caused by a complete occlusion of the glottis by round worms.

To Prevent Toxic Effects of Cocaine.—Dr. Isidor Gluck states (Med. Record) that he was led into a series of experiments with a view to rid cocaine of its toxic effects, the result being the discovery that cocaine in combination with phenol not only removes the objectionable features, but increases its usefulness. He adds to ten grains of cocaine a dram of water containing two drops of phenol. He has been using this formula for over a year, and since using it has never had to deal with the toxic effect of the drug. In fact, he has been able to use it in any quantity, and in any part of the nose or throat, without the least fear of harmful consequences.

Test for Typhoid Fever.—Says the N. Y. Med. Jour.: Recently two observers have reported favorably on the method by Ehrlich's test, a test that cannot be well called new, having been published in tSSa, but that does not seem to have attracted much attention. Two solutions are prepared: one containing seventy-two minims hydrochloric acid and water; and the other containing of hydrochloric acid in three ounces of distilled water; the other a freshly prepared half per cent. solution of sodium nitrite in distilled water. Twenty-five parts of the first solution and one part of the second are mixed with twenty-six parts of patient's urine and the mixture is rendered alkaline by the addition of strong ammonia-water. In urine from a typhoid patient a bright orange-red color appears.

Medical Miscellany.

For a clinical patient, with beginning cirsosis of the liver, Prof. da Costa prescribed milk diet, large doses of ammonium chloride, and — every morning before breakfast — sodium phosphate.

A Report of the Epidemic.—During the late influenza epidemic in Edinburgh the lay press published with avidity "Interviews with Leading Medical Men." Somebody succeeded in "stuffing" the Evening Dispatch with the following Information, which was greatly published: "There are a number of complicated cases occurring, such as interstitial nephritis and severe head pains, but the most serious of those are where the throat symptoms are associated with, in the male, salpingitis; in the female, either tracheotomy or hysterectomy. If hyperesthesia occurs, it may be well to give iron in large doses, but if a rupture of a Graafian follicle supervenes, it may be serious, or even fatal. This last complication is believed to be due to an organism not belonging to the bacteria, but like them not containing chlorophyll."

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Seth C. BasSETT.
Manager.

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The first steel pens were all made with fine points. In ad-
dition to these they are now made with blunt, broad, and turnedup points. En Esperance makes them all in great variety.

Dr. R. R. WATSON, Annapolis, Md., says: "Golden's
Liquid Breezy Tone" is a most excellent preparation. It is
pur excellence. Superior to cod liver oil or anything I have ever used in wasted or impaired conditions.

As Dixon's "American Graphite" Pencils are some-
what less in price, are American made, and are, to say the
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a place in every drafting-room in America in preference to
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Up to the present time one hundred and fifty-three Ice
Machines have been made and placed in position by David
Boyle, of Chicago, and every one has given perfect satis-
faction. Many of these machines replaced those of other
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Billings, Clay & Co. in this number. This house is one of the
oldest in Boston, and physicians and druggists can be
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Phosphorous is a most excellent preparation of cod liver oil
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There are but two qualities of artificial, or chemical, fertil-
ers—the very good and the very bad. The farmer who buys
of unknown or unreliable parties may save a few dollars in
the first cost of his fertilizer, but he will lose a great many more in the complete or partial failure of the crops to which it is applied. The farmer is really a manufacturer: he buys the raw materials,—seeds and fertilizers,—and sells the finished prod-
ucts, in the shape of fruits, vegetables, milk, eggs, etc. A
mill-owner would soon come to grief whose cotton or wool cost
him more than the finished cloth would sell for; but many
farmers proceed on this same principle, and then wonder why
"farming don't pay." The proper and profitable way to do it is
by buying a first-class article of fertilizer from responsible parties, who have character, skill, experience, and facili-
ties; and there is no firm which possesses these qualities in a
greater degree than that of the Bridgewater Fertilizer Co., 27
Kansas Street, Boston, who have held the leading position in
the trade for nearly thirty years. By sending a postal card
with your address, you can obtain their beautiful Illustrated
album, which gives full information regarding the different
fertilizers manufactured by them.
Familiar Science.

ROCK-BORING MARINE ANIMALS.

It has long been known that certain marine animals, particularly the sea-urchins, have, apparently, the power to dissolve or excavate holes in the rock bordering the sea shore, thus making a sort of nest for themselves. In some localities the rocks are fairly riddled with these holes, and this not only in the soft and easily dissolved limestone, but in the hardest granite and lava. Fig. 1 shows a colony of these curious little animals, as left by the receding tide. The way in which these holes, or cavities, in the rocks are formed is a matter of some dispute, and in a recent paper in the American Naturalist, Mr. Walter Fewkes gives an interesting résumé of the different theories advanced.

In Fig. 2 is shown a sea-urchin, covered with the characteristic spines, (A), and at B an enlarged view of the mouth, or what answers for that organ. Some naturalists suppose that the cavities in the rock are produced by the sharp points of the spines with which the animal is covered, slowly slipping away the rock like the action of a file. Others consider that the powerful teeth are the active agent—a supposition which is strengthened by the fact that the stomach and intestines of the sea-urchin are found to contain minute fragments of rock. Another theory attributes the work to the combined action of the spines and teeth. The more plausible theory that the sea-urchin secretes a liquid capable of dissolving stone, seems to be disproved by the fact that the cavities are found in the insoluble granite and gneiss as well as the more easily soluble limestone.

It has been noticed that the "kettle-holes," or cavities worn in the rock by the action of stones rolled about by the waves, are a favorite resting-place for the sea-urchins, who often cover the sides with their nests. One of these kettle-holes thus occupied is shown in Fig. 1. It has even been supposed that the kettle-holes themselves often have their origin from the small cavity of a sea-urchin, which is afterwards enlarged by the action of the waves.

In whatever way the sea-urchin excavates his nest, the process goes on constantly; he has nothing else to do, and by constant application of the means with which nature has provided him, he toils on, night and day, without rest or holidays, until he finally attains the desired result, which is so astonishing to the less industrious human animals.

SOME INTERESTING EXPERIMENTS IN ELECTRIC INDUCTION.

A correspondent of La Nature describes some novel and interesting experiments which may be performed with a common induction coil and an incandescent electric lamp.

In Fig. 1 in the engraving, two fine spiral wires are attached to the poles of the coil, each supporting an electric lamp. When the coil is set in action, the two lamps will not only be illuminated, but will be attracted towards each other. To show the attraction properly the lamps should be attached to very flexible wires, and placed about a quarter of an inch apart. Care should also be taken that no sparks pass directly between the wires or metallic sockets in which the lamps are set; the action is strictly inductive. The same phenomena take place when one lamp is attached to the coil and the other is held in the hand, (Fig. 2). A single lamp attached to one pole of the coil (Fig. 4) also becomes luminous, even when there is no connection.
with the other pole. In fact, it is not necessary to connect the lamp with the coil at all. Simply attaching it to a glass rod or other insulated handle and bringing it near the pole (Fig. 3) will develop considerable light. The experiment may be also varied as in Fig. 5, where the lamp is suspended by a wire, and an insulated metallic point connected with the induction coil brought near to it, when the lamp is both attracted and excited into luminosity. Numerous other variations of the experiment will suggest themselves.

The small incandescent lamps of one or two candle-power are best adapted for these experiments, unless the induction coil is of unusual size; and it is hardly necessary to warn those accustomed to the handling of such coils that the wires conveying the secondary current should never be touched directly with the hands, or unpleasant, or even dangerous shocks may be felt. A glass rod, or some other good non-conductor, forms a convenient handle, around which the wires may be twisted.

**LIQUID GASES.**

The word gas was coined by the alchemists, and is probably from the German geist, or ghost, showing the superstitious ideas which they connected with this mysterious form of matter. In a gas the molecules, or ultimate particles of matter, are at such a distance from each other that there is no mutual attraction between them, and each separate particle is free to move in any direction that external or inherent forces may impel it. It may be asked how we know that the molecules of gas are separated from each other, and why the matter of which they are composed may not be absolutely continuous. The simplest answer to this question is found in the fact that gases change their volume under varying conditions of pressure. A gas can be squeezed together, as it were, and, as we cannot conceive of the possibility of doing this with an absolutely continuous mass of matter, it must, therefore, be made up of separate particles.

The nature and properties of gases have only been well understood during the present century. Atmospheric air being everywhere present, was, of course, recognized from the earliest times; and, although the early chemists soon discovered other forms of gaseous matter, they did not thoroughly understand them, and their terms fixed air, dephlogistated air, etc., showed their inclination to consider them as varieties of the most familiar form.

The distinction between a gas and a vapor is not a well marked one. A gas is a form of matter which retains the gaseous form at ordinary temperatures and pressure; while a vapor is formed at a higher temperature or lower pressure, from a usually liquid or solid substance. Oxygen, for instance, is a true gas; while steam, although resembling a gas in every way, is formed from water at high temperatures, and when the temperature falls is condensed back into water again.

Faraday first showed that many so-called permanent gases could be changed to liquids, or even solids, by cold and pressure. By generating chlorine in a closed glass tube, he easily succeeded in changing it to a yellowish liquid, which, when the pressure was removed, returned at once to the gaseous state.

Sulphurous acid, the gas formed by burning sulphur, although gaseous at the usual temperatures, is changed to a liquid at a temperature of about 0° F. Without any increase of pressure; while carbonic dioxide requires a pressure of over 500 pounds to the square inch at a temperature of 32° before it will assume the liquid form.

Up to within a few years, certain gases—such as oxygen, nitrogen, and hydrogen—had never been liquefied, and it was supposed that it was impossible to do so with any amount of cold or pressure that could be produced. By the aid of powerful apparatus, however, invented by Cailletet and Pictet, by which a temperature of over 200 degrees below zero, and pressures exceeding two tons to the square inch, were produced, oxygen, and finally all other gases, were liquefied, carbonic oxide being the most refractory one.

When ammonia gas is exposed to a temperature of —40° at the ordinary pressure of the air, or to a pressure of about 100 pounds to the square inch at the ordinary temperature, it is readily condensed to a liquid. When the pressure is removed, it returns to the gaseous state, and in so doing it absorbs a great deal of heat from the air or surrounding objects, quickly reducing their temperature many degrees below the freezing-point of water. This property is utilized in the artificial ice machines, in which liquefied ammonia is allowed to resume the gaseous condition in coils of pipe placed in a tank of strong brine in which cans of pure water are placed. The temperature of the brine is reduced far below the freezing-point of water in the cans, which is so transformed into a solid block of ice. The short ice crop of the past winter has led to the use of so many artificial ice machines that the price of ammonia has materially risen in consequence, and, unless the temperature of the ensuing cold season more nearly approaches the average, the demand for this most useful substance will be greater than ever.

**Posting Flowers.**—To send flower buds by post, cut a potato into two pieces, bore holes into them, and insert the stems of the buds, with cotton to support them. There is sufficient moisture in a good-sized potato to support a flower for two weeks in a moderately cool temperature. Flowers from bouquets or baskets may be preserved in the same way. The potatoes can be hidden by leaves or moss.

**Crushed Steel** is said to be coming into use for cutting stone. It appears to be made by quenching very high-carbon steel in cold water from an excessively high temperature, such as would over-heat steel for most purposes. This renders it not only hard, but rather brittle, so that it is possible to pulverize it. It is crushed in a stamp-mill, and sifted closely to size. It is said to be not only cheaper but much more effective than emery, giving a better and quicker polish, and lasting much longer.
POPULAR SCIENCE NEWS.

GEOLOGICAL FORMATION OF THE EARTH—ITS EVOLUTION FROM CHAOS TO ORDER.

BY JOSEPH WALLACE.

In this article we have given the readers of POPULAR SCIENCE News an outline of the geological development of the earth, its most recent strata and fossils of the different systems of formation, and a summary of the classes of animals and plants which have existed in their respective ages. Knowing well the objection of POPULAR SCIENCE News to serials, and knowing the impossibility of giving in a limited space the desired information demanded by such subjects, we must necessarily treat our subjects singly and independently to make them interesting and instructive.

Geology will be barren and almost useless without the aid of palentology. In one sense, it may be regarded as a branch of zoology and botany, while its claim in this view to rank as a separate science is resting on the fact that, of the forms with which it treats, a small proportion belongs to the living one (that is, to the living earth), while the rest are regarded as a branch of geology, seeing that its assistance is absolutely indispensable in many of the most familiar and fundamental problems of the latter science. In its proper sphere, it is a science which treats of the structure, affinity, classification, and distribution in time of the forms of animal and plant life imbedded in the rocks of the earth's crust. It is considered a branch of no one or none, to regard it here, because without the leading features of palentological inquiry, progress in modern geology would be impossible.

The first class of the lowest rocks are those resting next to the primitive rocks,—gneiss, mica schist, and chlorite slate,—in which no fossils are found. The eozoan canadensis, discovered in these rocks, is generally supposed to range from the close of the Cambrian to the beginning of the old red. It is regarded as a branch of zoology, because, by common consent, it is supposed, such deposits took place at a time when there was no organized being upon earth; therefore, these formations belong to the Azoic or Eozoic period, and are called as such. This is the first period of the earth's formation; the first adopted system of ancient metamorphic rocks of Scandinavia, Canada, etc., first in the class of eozoan, and probably other primary rocks; first in graphite and iron ores, representing vegetable matter. It is proper to state here that many geologists and naturalists doubt the organic nature of the eozoan.

The fossilsiferous strata are divided into Paleozoic, Mesozoic, and Cainozoic Ages, that is, formations belonging to the older, middle, and modern periods of organic life on earth. These four periods are also called Archozoic, Paleozoic, Mesozoic, and Cainozoic periods. The formations made from deposits in the geological period may be reckoned as a fifth class—those of the Recent Age, including coral islands, river deltas, sand hills, deposits of calk-sinter, turf beds, etc.

Second Primary or Paleozoic period.—Embraces first the Cambrian strata of formation; classes of animals and plants as follows: radiata,—of this there are the hydras, echinoderma (cystideans); mollusca;—brachiopoda, lamellibranchia, gastropoda, cephalopoda (bivalve and univalve shell-fishes); articulata;—amphipoda, crustacea (worms and soft shell fishes of the lowest grade.) Lower Silurian system two classes of the (coral animals), echinodermata (sea stars, etc.); mollusca—polychaeta, and other molusks and articulata as mentioned before; plants—algae: Upper Silurian: radiata, mollusca, and articulata as before; vertebrata—first bony and placoid fishes. Erian and Devonian: articulata—insects and higher crustacea, vertebrata—fishes, ganoid and placoid; plants—acrogenous land plants, acrogenous and gymnosperms. Carboniferous: mollusca—pulmonata (land snails); articulata—myriapods, arachnids, gally-worms, spiders, and scorpions; vertebrata—lastrachians or amphibians prevalent. Permian:—radiata,—echinoderma—trilobites, vertebrata—higher reptiles prevalent, supial mammal; plants—acrogenous, gymnosperm, endogens (7).

Third: Secondary or Mesozoic period.—Jurassic formation: vertebrata—great prevalence of higher reptiles, fishes, homocercous, earliest birds. Cretaceous—vertebrata—decadence of reptiles, ordinary birds; higher mammal; plants—endogenous trees, angiospermous exogens.

Fourth: Tertiary or Cainozoic period.—Eocene and Pliocene formations: vertebrata—mammals prevalent (especially pachyderms), cycloid and ctenoid fishes prevalent, first living invertebrata; during the Pliocene period living invertebrata more numerous; plants—exogens prevalent, also some modern species plantae.

Fifth: Post Tertiary or Modern period.—Post Pliocene, Post Glacial, and Recent formations: first living mammals, living invertebrata prevalent, man and living mammals; plants—existing vegetation.

This concise tabular view is mainly from Dr. Dawson's work, Origin of the World. It gives us an idea of the arrangement at present generally recognized, and the more important in the succession of animal and vegetable life. It begins with the oldest periods known to geology, gives the animal and vegetable kingdoms, and first appearance of each class, with a few notes of the subsequent history of the principal forms. It must, however, be borne in mind that further discoveries may extend some classes further back than we at the present know.

The great mass of the unstratified rocks which underlie the stratified ones are supposed to be the oldest portion of the earth's surface. They are found in parallel layers, but occur irregularly in their stratification and succession, under, among, and above the stratified rocks; and these are therefore called primitive. It is generally supposed by geologists that the earth during the past two years, a note of results might be interesting. I thought.

As to the growth of one plant since last April. From the first appearance of the bud above ground it looked remarkably healthy. In seven days it had grown two inches, in another seven days it was four and one-half inches high, and the leaves were opening out. On the twenty-first day it was seven inches high with leaves fully developed and flower bud visible. On the twenty-eighth day it was eight and one-half inches high, and on the thirty-fifth day the plant seemed to be fully developed and had grown to the height of eleven and three-quarter inches, this last rapid growth occurring during very unfavorable weather. The flower was now half open, and after coming to perfection lasted but a few days.

The fertilization of this orchid, like some others of the same order, such as Epipactis latifolia, Cephalanthera grandiflora, and the Listeras, is highly interesting and somewhat complicated, and after careful observation in the matter one has to come to the conclusion that this, like Epipactis latifolia, is a self-sterile. The fertilization has the power of reproducing itself in a more certain manner, viz., by increase of the root, for it certainly does increase rapidly when in favorable situations, even in Britain.

That the plant is entirely reproduced by insect agencies, as was inferred by Darwin and others, is
THE STAR MIZAR.

Every observer of the heavens, who knows by name some of the brightest stars, is familiar with the constellation called the Great Dipper, visible in the northern sky through the whole night and throughout the year. It consists of seven stars, four in the bowl and three in the handle. An interesting discovery has recently been made by Prof. Pickering, of the Harvard University observatory, concerning one of the stars of this beautiful group. Mizar is the name of the star. It is the middle star in the handle, is of the second magnitude, and has attracted much attention ever since men began to study the stars, because even to the naked eye it is double. It has a companion, Alcor, plainly visible to observers endowed with good visual power. Alcor is of the fifth magnitude, and is about 17° distant from Mizar. The tiny star seems to be growing brighter, for the Arabs considered it a severe naked eye test, and it is now comparatively easy to detect. The telescope shows plainly that Mizar is a double star, its components being of the third and fifth magnitudes, the one a brilliant white, the other a pale emerald. The marvellous discovery is now made that the larger star of the pair is also double, the two stars that compose it being so close together that the telescopes are unable to separate them. The spectrum of each star, like the solar spectrum, consists of the seven primary colors, crossed by dark lines. These lines form a kind of astronomical alphabet. If the star is coming toward us, they shift toward the violet end of the spectrum. If the star is receding, they shift toward the red end. Two stars very near together, having the same spectrum, cannot be distinguished as a single star as long as they are at rest. If they revolve round each other in a plane inclined to the line of sight, the lines of their spectra will be single when the stars are in conjunction, and double when they are at elongation. This is the case with Mizar, and the doubling occurs at intervals of fifty-two days. Prof. Pickering, therefore, infers that these two stars are immense suns revolving round each other. He has estimated that the period of revolution of each star about the common centre of gravity is one hundred and four days, and that the maximum velocity is one hundred miles a second. These conclusions are the result of measurements of almost inconceivable delicacy—YOUTH'S COMPANION.

SCIENTIFIC BREVITIES.

The Khojak Pass, pierced by the recently-completed tunnel, is 7,500 feet above the sea, and about 2,000 feet above the level of the surrounding country. The tunnel pierces the range at right angles, and its course is, therefore, due east and west, and it enters the hill about 1,000 feet below the crest of the pass. The length of the tunnel is 1,500 feet, and to two and a half miles approximately, and it will carry a double line of rails.

To CUT LARGE GLASS TUBES.—The process of cutting glass tubes by electricity appears to have met with success. The tube is surrounded with fine wires, and the extremities of the latter are put in communication with a source of electricity, it being also necessary, of course, that the wire adheres closely to the glass. When a current is passed through the wire the latter becomes red hot, heating the glass beneath it, and a single drop of water deposited on the heated place will cause a clean breakage of the glass at that point. Contrary to what takes place in the usual processes of treating this material, it is found that the thicker the sides of the tube, the more successful is the operation likely to be.

Practical Chemistry and the Arts.

SOME UNCOMMON BUT USEFUL METALS.

There are quite a number of metals which are very sparingly distributed over the earth, and which few people have ever seen, but which have some exceedingly useful applications in the arts, and, in small quantities, are in almost constant use.

Hydrogen, the lightest of all the elements, was discovered by Cavendish in 1766, and is considered by the best authorities to be a gaseous metal, just as mercury is a liquid metal at ordinary temperatures. Very few persons have ever seen solid hydrogen. Mercury becomes solid at —4°, but, according to Professor Pictet, hydrogen gas requires a temperature of —140°, and pressure of over two tons to the square inch, before it liquefies even. By suddenly removing the pressure from this liquefied hydrogen, the cool produced by its evaporation is so great that a part of it solidifies into a state resembling metallic grains, which remains visible for several minutes. Its metallic nature is also rendered probable by its directly uniting with a metal resembling platinum, and known as palladium, to form a sort of alloy. The weight of a single molecule of hydrogen has been calculated not to be greater than one ten thousand millionth of a gramme, and a cubic centimetre of the gas contains at least twenty-one trillions of such molecules. Although these figures are quite incomprehensible to the human mind, they must be approximately correct, and represent actual and existing magnitudes.

Lithium is a quite rare mineral, which occurs in some varieties of mica, and also in small quantities in the waters of certain mineral springs. It is considered to possess a distinct medicinal value by some physicians, and is probably taken into the system, at least, as we have detected it by spectroscopic analysis in the blood of a person who had been drinking a strong lithia water.

Barium is a metal closely allied to calcium, the metallic base of lime. It is never used in the metallic state, but the sulphate of barium is quite extensively used—either honestly or dishonestly—as a substitute for white lead in paint. It is cheaper than white lead, and is not changed in color by the sulphur compounds often present in the air, but possesses less covering power than lead, and is less permanent in other ways. The peroxide of barium is used in the preparation of peroxide of hydrogen, and the phosphorescent sulphide of barium is a constituent of some varieties of luminous paints. The green fire used in pyrotechny is also due to the presence of this metal in the form of a nitrate.

Strontium, which is, chemically speaking, the brother of barium, is even more rare, but...
iridium is usually associated with platinum, and is even more infusible and insoluble, besides being very much harder. By combining it with a small amount of phosphorus it becomes more fusible, without losing much of its hardness. The so-called "diamond" points of gold pens and stylographs are made of this metal, and it has now replaced agate for the knife-edges of chemical balances, and in other scientific apparatus.

Zirconium, or rather its oxide zirconia, has recently found an extensive application in the manufacture of the "hoods" for the Welsbach incandescent gas lights. This oxide, when heated in a gas flame, glows with a pure, steady, while light, equal to that of the incandescent electric lights, and costing much less.

Selenium is not a metal, but belongs to the sulphur group of elements. We must mention, however, the wonderful property by which its electrical conductivity varies according to the amount of light falling upon it, just as the chemical relations of silver are altered by the same means. By this power Professor Bell was enabled to construct an optical telephone, and actually transmitted words and sentences between two distant points which were not connected in any way except by a beam of light, which faithfully carried the vibrations of his voice to a selenium disk, by which they were transformed into electric energy and reproduced in an ordinary telephone. Whether we shall ever be able to see our friends at a distance, as we now talk with them, is exceedingly problematical; but if we ever do so, it will doubtless be through this mysterious connection between light, electricity, and the element selenium.

[Original in Popular Science News.]

TWO CARBON COMPOUNDS.

BY GEORGE L. BURDIT.

Besides the three allotropic forms in which carbon occurs, it is found in a number of important inorganic compounds, a few of which are quite common, and at the same time quite interesting. One of the commonest of these compounds is carbonic dioxide (CO₂), sometimes called carbonic anhydride, or carbonic acid gas. This is formed when carbon is burned in air; but the best way of obtaining it for laboratory use is by the action of a strong acid upon calcium carbonate, the carbonate being in the form of pure chalk or marble. The process is carried on in a retort or gas-flask, and the following reaction takes place, if hydrochloric acid is used:

\[ \text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2 \]

The CO₂ may be collected over water, or by displacement of air in the receiving vessel, it being heavier than air.

Under ordinary conditions, CO₂ is a colorless gas, having a slight acid taste and odor, and is heavier than air. It will neither burn nor support combustion. This may be illustrated by a simple experiment. CO₂ is generated, and a tumbler is put into it in the same way it would be into water when taken out again the tumbler is apparently empty, but is really full of the gas. The CO₂ is then poured upon a lighted candle, in the same way as water would be, and the flame goes out. But CO₂ is not the only gas that acts in this way, and so a special test is necessary. When lime-water is shaken with CO₂ a white precipitate is formed, and in this way its presence may be detected. Besides being heavier than air, CO₂ does not diffuse very readily, and has a tendency to sink, often settling in old cellars, mines, vats, etc. It does not support life any more than it does combustion, and men going down into cellars or mines in which it has settled are frequently overcome and die before help can reach them. Therefore, it is always wise to lower a lighted candle into such a place before descending. If the candle burns, the air can be breathed with safety; if not, the air is dangerous. Carbonic dioxide is deadly because it acts as a poison when breathed into the lungs, acting directly upon the blood. Striking examples of this may be seen at the Grotto del Cane, a small grotto in Southern Italy, partly filled with CO₂ gas. A man may stand upright in this grotto and not be affected, because the gas extends no higher than his shoulder; but a dog, when thrown in, is almost instantly killed. Another example is the Vale of Death, near Batar, Java,—a sort of valley filled with CO₂. Upon looking into it, the spectator sees the ground beneath the homes of animals and birds which have unconsciously entered and been overcome.

CO₂ is a difficult gas to condense. It is soluble in about its own bulk of water, but more is absorbed under pressure. The gas escapes with rapid effervescence when the pressure is removed. Water thus charged is known as soda water, and the excess of gas forced into the water gives the agreeable taste. And here it may be noted that carbonic acid, although poisonous when breathed into the lungs, is harmless—and sometimes even beneficial—when taken into the stomach. A solution of CO₂ in water—H₂CO₂ in the above reaction—gives a weak acid reaction; but the acid is very unstable, and breaks up into water and carbonic acid gas, as shown by the reactions. Although a weak acid, it forms an important class of salts, called carbonates. All carbonates dissolve in dilute nitric acid, with brisk effervescence, and those of the alkaline metals are soluble in water.

Besides the sources already described, carbonic dioxide is formed in great quantities in nature.

1. Great quantities are formed by the respiration of men and animals, the proportion in respired air being from three to four per cent. This free CO₂ does not injure anyone, because there is so little of it, and because the air, which is always in motion, diffuses it. Plants absorb the CO₂ to form their tissues, and give off the O₂, which is necessary to sustain animal life.

2. CO₂ is also formed in the fermentation of beer, champagne, and some other liquors, and causes their sharp taste. It is formed in the process of bread-making from yeast or baking-powder, and rises through the dough in bubbles, causing the bread to rise.

3. In burning lime the lime-kiln, the heat of the great quantities of carbonic oxide from the limekiln, and it escapes. This process goes on underground as well as above. In certain volcanic regions subterranean heat acts upon lime-stone, setting free large volumes of this gas, which finds its way into the atmosphere through the craters of volcanos or fissures in the Earth. The springs in such places are sometimes strongly charged with it, the gas excreting with effervescence when the springs reach the surface.
4. It is also formed in enormous quantities by the decay of animal and vegetable matter. It is often found in spring waters, where it is formed by oxidation of the animal and organic matter held in solution by the water. If the spring flows through a sandy district, where vegetation is scarce, there will be very little CO₂ in the water; but if the spring flows from a well-cultivated district, the amount will be considerable.

CO₂ may be solidified, and when solid looks like snow. When in this condition it will produce violent burns if pinched or mixed with ether and brought in contact with the skin.

If carbonic oxide is added with potassium, its oxygen is entirely taken away; but if iron or zinc-metals having a weaker affinity for oxygen than potassium—be used instead, only one-half of the oxygen is absorbed, leaving a new gas called carbonic oxide (CO). This may also be obtained by passing steam over charcoal heated to redness, free hydrogen also being formed, (C+H₂=CO+H₂).

Carbonic oxide is formed in considerable quantities by combustion in stoves and furnaces. In an open fire, burning quietly without smoking, a flickering blue flame is seen, which is due to the formation of CO. In such a fire, CO₂ is first formed at the bottom of the grate, but as this travels up through the red-hot coke, it combines with more carbon, giving off CO₂ and forming CO₂ again. Meanwhile, the carbon of the fuel with which the detached oxygen has combined, furnishes an equal volume of the same gas. The hot carbonic oxide ignites as soon as it comes in contact with the air passing over the upper surface of the fire, forming CO₂ again.

Carbonic oxide is a transparent, colorless gas, with a faint, oppressive odor, and a specific gravity much below that of CO₂. It is very slightly soluble in water, and condensed with great difficulty. It is poisonous even when mixed with large quantities of air, and, if breathed, produces a peculiar headache. It does not support combustion, but burns with a pale, bluish flame. Water gas, is largely carbonic oxide, with small amounts of other substances.

Although CO₂ and CO differ widely in properties, they have been found to consist of the same elements, the proportion of oxygen only differing in each case.

ABORIGINAL CARPENTRY.

In speaking of ancient American tools, Mr. H. F. McLeod, of the Smithsonian Institute at Washington, recently said: "Aboriginal carpentry was the chief trade of our predecessors on this continent. The Indians and the mound builders had a very good idea of wood-working. You will see now some very pretty joining done by Sioux Indians. Their tent poles make a fit which many a white carpenter would not try better. Of course, of course, were the Aztecs, who had arrived at quite a high stage of art, and whose tools, although they knew nothing of steel, are really excellent. We have a few of their tools at the Smithsonian, but the best collection is, of course, in the City of Mexico. The material used was almost wholly glass, especially for the finer parts of the building, the cutting tools, chisels, axes, and for the rough hewing out of logs the same, but when it came to the accurate fitting in of the hewn timber, they handled glass knives, chisels, and saws very dexterally and with beautiful results. There is a cacti wood post in Washington with hieroglyphics and faces cut upon it all with glass. You can see bits of the original chisel still sticking in a corner of the wood, where it broke off three centuries ago under the hand of the workman. The Aztecs knew how to make a very good and manageable glass, and their best cutting blades, swords, daggers and spears, saws, chisels and axes, were made of it. When the edge dulled they broke it into a dozen pieces and instead of sharpening it, got a new cutting line.

"You can see a great deal of aboriginal carpentry still in use among the Moqui Indians of the United States. Of course they use our tools now, but they follow their old patterns. They know how to make ladders, and they swing their doors on hinges from the top, and they know how to mortise timbers,—they know how to put a timber between timbers. Of course they use our tools differently from our way. The chisel they push rather than hammer, and they work the board up and down on a fixed saw rather than the saw on the board, and withal they get creditable results. The frame work in the Pueblos is as honest as anything we have in America."

INDUSTRIAL MEMORANDA.

A NOVEL INDUSTRY is to be introduced into Leadville by the opening of an establishment for boothmaking on a patent system, which consists of the stamping out of a boat from a single plate of soft steel. Of course only small craft, such as rowing boats and steam launches, can be made by this process.

A NEW WAR ROCKET has been tried by the troops at Aldershot. It has been called a "smoke rocket," and is used to screen the advance of a body of troops. A battalion of Infantry advanced under cover of the rockets against Jubilee Hill, which was held by a stronger body of infantry. The experiments were of a successful character.

A REMARKABLE RAILWAY.—The most remarkable short line of railway in the world is probably the submerged railway at Onton, near Bilbao. It runs down an easy sloping shore in double line to a distance of 660 feet, and has been constructed by a Spanish engineer for the sole purpose of facilitating the shipment of iron ores. The track is a mass of iron ore in the form of a pyramid, rising seventy feet from the track. Upon the platform of this tower the ore is placed, and thus they are conveyed to the vessel; the pyramidal cars, whose wheels are always under water, returning automatically as soon as its cargo has been mechanically shot into the ship's hold.

COCA IN BOLIVIA.—The cultivation of Erythroxylon coca, as carried on in Bolivia in the present day, does not appear to differ from that which prevailed previous to the conquest; and the province of Yungas de la Paz is that which, since the Spanish occupation, seems to have supported the most considerable plantations. All the slopes of the mountains, below an elevation of 7,000 feet, are literally covered with them, and the traveller has continually to pass through large forest when in the vicinity of this plant. The leaves of this gathering are larger and more nutritious than those of subsequent collections, and also have less flavor. They are mostly consumed during the early spring, and are generally known by the name of mitha, and take place three times, or exceptionally, four times per annum. The most abundant harvest is that occurring in March, that is, immediately after the rains; this is the mitha de marzo. The most scanty is that which takes place at the end of June or beginning of July, and which is called mitha de Santa Juan. The third, named mitha de Santa Ana, is made in October or November.

SOME NOTES ON THELYPHONUS GIGANTEUS, LUCAS.

Thelyphonus giganteus is an arachnid of the sub-order pedipalpi. No less than the familiar whip-scorpions. (whip-scorpions.) The genus Thelyphonus is characterized by an oblong body, usually ending in a slender, many-jointed filament, and the specific name, giganteus, evidently signifies that this is the largest of its kind. The anterior pair of legs are very long and slender, much more delicate than the others, while the maxillary palps are very large, and are a mass of the creation.

The young Thelyphonus is not to be envied, for, all things considered, he is about as repulsive as any living thing you will find in a long day's travel. He is at home in the country, under some large stone, although now and then one ventures into town, where he causes great consternation in whatever house he enters. When surprised by the unconscious, he at once notifies you of his presence and by his resentment, while imparting to the atmosphere an effluvium which, if your olfactories are not under perfect control, will turn you inside out. The natives call him "vinegar," which seems to mean "the vinegar bug," but this fellow's "vinegar" would have to be diluted several thousand per cent. with water, in combination with a powerful deodorizer, before it would be ready for table use. I was told that he is poisonous, but the Mexicans think every "creeping thing" is poisonous—even the harmless little lizards. He certainly cannot sting with his tail, as it is too flexible, and I think that he must either bite like a spider, or overcome his victims by his "vinegar." I experienced a few with difficulty in this way: I always carried a tin box with me during my mountain tramps. I set this on the ground uncovered. Then I cut a long switch, leaving a few leaves on the end. Carefully raising a stone, I found beneath it a gigantic thelyphon, and started him up with my switch. He crawled upon the leaves, and I then transferred him easily to the box. Then a little alcohol poured over him gave him a complete bath, quieted his nerves, and prepared him for safe exhibition to my friends. I never found any on the Pacific slope, but invariably on what are known as the Chihuahua table-lands, also called "the cold country." My largest specimen was captured in the city of Chihuahua.

E. C. WILKINSON,
Secretary, Chapter 537, A. A., Mansfield, O.

SNakes SWALLOWING THEIR YOUNG.

One of the facts settled beyond controversy by members of the A. A., if, indeed, it were not determined long ago, is that, under certain circumstances, snakes swallow their young, and allow them to emerge again from their retreat when the formation is by no means complete. Some of the members of the A. A. sent us records of their own observations, which were published from time to time in the Swiss Cross, (notes 115, 189, and 236.) These notes were as follows:

A. While hunting last September with several companions, on the big marsh in Fairfied, we saw some little snakes near a creek, and wishing to get one of them, I asked the boys to help me catch one. Just then one of the boys saw the old snake and told us to look out. We all stopped and looked at
the old snake, and then to our surprise, one of the little snakes crawled down the old snake's throat, the second one did the same, and the third would have followed if we had not interfered.—Edward L. Fox, Vice President Chapter 404, Baraboo, Wis., January, 1888.

B. While walking in a vacant lot near my home, I started from a pile of leaves a garter-snake about fifteen inches long. A man who was working there struck the snake to kill it, when I saw four or five little snakes, about three inches in length, run out from its mouth into the grass. I was standing very near, and could not have been mistaken.—Kate Brower, Pittsfield, Mass., January, 1888.

C. Papa says that about thirty-five years ago, in haying time, he cut a garter-snake with a scythe, and, seeing little snakes, he cut the mother clear open, and got seventy-four young ones. They were all about six inches long. They were not tangled, and tried to wiggle away, but the hot sun soon killed them. They were little garter-snakes.—Emma Heilman, Kittanning, Penn., July, 1888.

D. When a child, I was running along a footpath and came suddenly upon a snake, lying in the path, while five (I think) little snakes played around her. In my terror I sprang over the creatures, ran a few steps, and then turned to look behind. I turned in time to see the large snake open its mouth very wide, while the little ones, every one of them, ran down her throat.—Clara C. Smith, Berlin, Conn., August, 1888.

E. Going along the bank of a creek in Moscow, Livingston Co., N. Y., I saw a black-snake about two feet long. As I approached, I saw a number of little slivery snakes squirming about, which, on my nearer approach, ran to their mother, who opened her mouth, down which they ran. I called to one of the farm-hands, who came and killed the snake, and then cut her open, whereupon at least a dozen little ones ran out. They were about the length of a lead-pencil, but not so large round.—J. S. Tryon, Jr., August, 1888.

F. In 1883, while strolling through the woods on Grand Island, I came upon a number of what I supposed to be garter-snakes. As I raised my stick to kill one, which was about two feet long, it suddenly opened its mouth, out of which crawled two small snakes, about six inches in length. I killed them both.—Edward Weber, Chapter 132, Buffalo, N. Y.

These notes I reproduce here together, as introductory to the following, which comes from another member, who wishes only initials given:

A snake, to my mind, is not a pleasant thing to write about, but when we undertake to study the animal creation we must not be governed by antipathy or disgust. The ancient mythology found a symbol of eternity in the serpent, because, with its tail in its mouth, it represented endlessness; but to a child of modern days, a snake is the symbol of deadly venom, lying in flowery woods and shady lanes, and this feeling grows with our growth in many cases. This is no mere superstition, no mere legend; the snake is a horrible and deadly thing, although there are some harmless varieties. It is the symbol of venom and enmity to mankind. But in regard to the question, Do snakes swallow their young? It was a tradition with our family when we were children that snakes swallowed their young for the purpose of taking them about with them. We were very much afraid of being suspected of falsehood by our parents, and therefore did not tell all the strange and marvellous things we saw in our rambles in the woods, for our parents knew how prone children are to dwell on the marvellous and draw on the imagination; but we knew that little snakes were sometimes in the bodies of snakes that were killed. Our father was very careful in his observations and accurate in his statements. One day, when he returned from a walk, he said he had seen a strange thing: a large garter-snake was lying in his path through the woods, and near it were several little snakes, and while he stood looking and preparing to strike, the large snake opened its mouth and the little ones darted down its throat, after which it moved quickly away to a hiding-place.—H. V. A.

WANTED—ADVICE ABOUT TRAPS.

Wycliffe College, Toronto.

One division of the Picton fauna to which I have never paid any attention, and which I should much like to study, is the mammalia. I thought to make a beginning last summer, but was stopped at the outset by the fact, that with the exception of the ubiquitous red squirrels and a common meadowmouse or two, I could obtain no specimens. I made a few attempts with traps, but not even a squirrel or a mouse desiged to enter one. I greatly wish that some practical student and collector of small mammals—such as are found in settled districts—would tell me through your columns how to collect specimens of mice, shrews, moles, chipmunks, dible-squirrels, weasels, woodchucks, bats, etc. I know of the existence of these creatures in Picton by hearing about them from the country folk, and by seeing them skurry away from me now and then when I happen on them in the fields, or from seeing their mangled remains brought in by the dog or cat. Books on collecting seem to consider it sufficient to remark that most mammals must be trapped, but it is altogether beyond their ken how to make traps, or, what is much more important, how to construct them in such a manner that they will not be útil to the kind of traps to use, where to set them, or how to bait them.

Yours sincerely,

W. SHERATON.

[Will some one kindly send us an answer—Editor.]

A GOOD PLAN.

The following programme, which Chapter 218, Cornwall, N. Y., has followed during its summer meetings, combining each week a formal paper, a discussion of notes of personal observation, and a session of united laboratory work, is helpful and suggestive:

PROGRAMME OF STUDY FOR JULY.


SOUTHERN INSECTS.

I wish to exchange insects found in this vicinity for minerals.—C. M. CLARK, Savannah, Ga.

EXCELLENT CHAPTER WORK.

351, Newark, N. J., [B].—Our President is Prof. George C. Sonn. The Chapter has increased from sixteen to two hundred. These are divided into four sections. The first has taken geology, and is now taking chemistry; the second is taking physics; and the third and fourth have taken physical geography, and are now taking physiology. All have weekly meetings. The four sections have a joint meeting once a month. There have also been formed from the Chapter sections for the study of botany and mineralogy. During the summer many iron mines were visited, such as the Andover, Glendon, Willis, Old and New Gen. Dickerson, Byram; and others. All these are in Morris County, and the members had their headquarters at Mount Tabor. We also visited Torrence Mountain. Since September we have had a phonographic entertainment and a lecture by Mr. Hammer, Mr. Edison's representative at the Paris Exhibition, who was sent at the joint New York and New Jersey Assembly. We also went to Schuyler copper mine, at Belleville, N. J., with the "Hill and Dale Club" on April 9th. All the meetings are well attended, and all the sections report good progress.—John D. Fitz-Gerald, Jr., Sec.

397, New York, N. Y., [II].—Our meetings are held fortnightly, the time being devoted to performing experiments by each member in turn, following the arrangement of "Williams' Laboratory Manual of General Chemistry." Every fourth meeting is devoted to the examination of mineral specimens, a certain number of them being placed on a table, to be examined and classified by our physical properties. We are allowed the use of the school laboratory and geological cabinet. Our active membership is limited by vote to ten, our ranks being full at present with students of the two upper forms of the school. We take the Popular Science News, and are much pleased to have for our paper one which is especially devoted to the study of chemistry. We should be pleased to exchange methods of work and organization with other school chapters.—H. Tiedemann, Sec.; Dr. C. E. Moore, Pres. Permanent address, Agassiz Chapter, Columbia Grammar School, 34 East 31st Street, New York City.

This is an excellent time for organizing new Chapters of the Agassiz Association. All are invited, young and old. Circulators and full details free. To every Chapter organized during September, and mentioning this offer, one of our beautifully engraved charters, with portrait of Agassiz, will be sent free. The usual price is seventy-five cents. Address all communications to Mr. H. H. BALLARD, Pittsfield, Mass.

[Written for "The Out-Door World."]

ABOUT GRASSES.

BY ALFRED H. PETERS, OF THE AGASSIZ ASSOCIATION.

A very wise countryman of ours once said that "the first care of a man settling in the country should be to open the face of the earth by a little knowledge of nature—or a great deal if he can—of birds, plants, rocks, and astronomy; in short, the art of taking a walk." There is scarcely any intelligent country boy to whose understanding, as regards the first three of these, the face of earth is not, in a measure, open. He knows by sight, if not always by name, the great majority of the birds, reptiles, and insects found in his neighborhood. He can tell the difference between lime, slate, flint, and granite. He knows by their familiar names almost every tree and shrub, and, with the exception of one order, of the more common sorts of herbs. But of one order not only he, but his father, and probably his sister who has studied botany, will generally be
found to know very little. And this order is the most common and most important of all—nearly or more of its species trodden every day under foot, going by the general name, “grass.” There are about four hundred and seventy-five species of grasses in the United States—including the grains, which are only improved grasses, —whereof one-third or more are found in New York and New England. Those described in this article are the most common ones—the ones forming the bulk of pasturage and hay. There is hardly a square yard of old turf in the Middle or the Eastern States which is not made up of a mixture of these grasses.

The difference between the blades of separate species is often so slight that it is not safe for even an experienced observer to try to distinguish them by that means alone. The rank growth of springtime looks everywhere the same; but, beginning in the latter part of May, the meadows take on a variety of form and color, which is continually changing until the middle of July. During this period most of the grasses are in flower. From the same spot of earth shoot up slender stalks bearing tiny blossoms,—purple, yellow, and white,—the heads of which differ as much as an elm tree differs from an oak. This is the time to study the grasses, they being easily distinguished when in flower, at which time the accompanying illustrations were made.

Next to the little annual spear-grass, found about our door-yards, the earliest to flower is the sweet-scented vernal grass (Anthoxanthum odoratum), (Fig. 1), a small, delicate species, the only one of its genus, with light green, open blades, and slender stalks from twelve to fifteen inches in height. Its heads—looking like those of small, heartless wheat—are in bloom from a little after the middle to the end of May, in color a kind of dull yellow or buff. It is common in old meadows and pastures where the sod has been long undisturbed, and “comes in,” as the farmers say, of itself. When wilted it exudes a rare fragrance, somewhat like—or rather more delicate—than vanilla. It is this grass—and not, as is often supposed, the millet, or “sweet clover”—which gives the odor to new-mown hay when cut from old meadows. Cattle are said to be not over fond of it; perhaps because, in common with most other four-footed creatures, they prefer their food unflavored. Like many other of our pasture grasses, sweet vernal is not a native grass, but one long ago naturalized from Europe.

The widest distributed and most valuable of all our pasture grasses is that known as June or spear-grass in the East, and blue grass in the West and South, (Poa pratensis), (Fig. 2). This native American grass is the base of all our seeded meadows and pastures, as well as of the velvety turf of our lawns and parks. It propogates itself everywhere, driving out the coarser kinds sown for hay, and increasing from the roots as well as from the seed. So hardly is it that it appears to grow underneath the snow, through which its purple-green, spear-like blades may be seen pricking erect

and vigorous, even in mid-winter. Its dense sod, while affording the best of pasturage and hay, is, as every farmer knows, the surest of fertilizers when turned under and planted to Indian corn. The blades of this grass are long, sharply keeled, of a full green color, and very abundant. Its stalks vary in height from one to three feet, and its open, spreading heads flower, in New York and New England, from the first to the fifteenth of June; in the West and South from two to four weeks earlier. The flower is light purple, or lilac, and the panicle, or head, partially closes after it is gone, often taking on for a while a darker tint of the same color.

At the same time that June grass blossoms, comes orchard grass (Dactylis glomerata), (Fig. 3), a fine, rapid-growing species, the only one of its genus, and so unlike anything else belonging to the order of grain-fields. Tall fescue appears to have two well-marked varieties, which some botanists consider to be distinct species. Illustrations are given of both. The smaller variety, besides flowering a few days later, is in every way more delicate, as well as less abundant, than the other. The two varieties are always found growing together, and appear to thrive in the shade better than any other pasturage grass. This is also a European grass, but was very early naturalized, being found in almost every doorway, roadside, and meadow of the Northern United States. The seed of tall fescue is seldom or never sown by farmers, though it is worth their while to try it. It is easily grown, and would be sold for a low price were there any demand for it.

[Concluded in next number.]

**AMONG the loveliest of plants are the “fairy illies” (zephyranthes or Amaryllis atamasco), with their deep pink flowers.**
A NOVELTY in New England meteorology was a typical western cyclone which passed over a portion of the city of Lawrence, Mass., on the morning of July 26th, causing great destruction of life and property. The weather was warm and rainy, and about nine o'clock dark clouds appeared in the southwest, and shortly a terrific blast of wind occurred, which completely devastated a tract of country several rods wide for a distance of about a mile. Every house on one street suffered more or less, some being unroofed, others losing their side walls, while one building was turned completely over. One large, well-built house was completely transformed into kindling-wood in an instant, while another one not ten feet away suffered no injury beyond the loss of a chimney-top. Another house was lifted off of its foundations, and set down again overhanging the cellar walls, without further damage, many of the panes of glass in the windows, even, remaining unbroken. A fine plantation of trees was utterly ruined, the large trunks and branches being tangled and twisted together like a skein of thread. Occasional gales of wind have been noted in New England before, but this exceeded all previous ones in force and destructiveness, travelling, as it did, through a thickly inhabited section of country.

The execution of the murderer Kemmler by electricity, at Auburn, New York, was successful from a scientific point of view, although from the published reports it would appear that certain changes should be made if this method of execution is to be used on future occasions. It is beyond question that the criminal suffered no pain whatever, and that death was practically instantaneous, although a second application of the current was necessary to suppress certain involuntary movements of the body, which might or might not have resulted in a return of animation. The sensational accounts in the daily papers are unworthy of the slightest consideration, and, in fact, many of them show from internal evidence that they were prepared beforehand to be used in any case. Even under the conditions necessarily present in a novel and previously untried experiment, we think that the execution was less revolting than an old-fashioned hanging. The taking of human life is a terrible necessity; but it is a necessity, if society is to be protected from those who would destroy it, and the instinct and right of self-preservation is paramount above everything else.

A WESTERN correspondent, writing in regard to the use of salicylic acid as an agent for preserving food, says that it is extensively used in his section, and, speaking of the prohibition of its use for such purposes by the French government, inquires as to whether any injurious effect upon the health is likely to occur from its use. The question is an important one, and does not seem to have ever been fully settled. Salicylic acid is certainly not a poison, and it is doubtful if the small amount used in preserving food would do any particular harm. Still, the substance has well-marked medicinal qualities, and the continued daily consumption of even small quantities is not to be recommended. We do not attach much weight to the prohibition of the French government,—sanitary matters are becoming a fruitful field for the professional politician,—but the subject is a most important one, and worthy of a careful and impartial scientific investigation.

A MUCH more dangerous adulteration of food is found in a baking-powder sold under the name of "French Tartar," which, according to the American Analyst, contains varying amounts of oxalic acid as one of its ingredients, some samples showing as much as 40 per cent. of this extremely poisonous substance. If these statements are correct, no punishment would be too severe for such criminal ignorance or recklessness as has been shown by the manufacturers. In any case there is nothing to be gained by buying cheap baking-powder, and the only safe way is to use that prepared by firms of well-known reliability, even if the cost of such powder is slightly higher than that of unknown strength and composition. It is, however, only fair to say that the powder above referred to has been certified by a firm of New York chemists to be "free from adulterants."

The probable future pollution of the water-supply of many New England cities threatens to become a very serious matter. The whole country is dotted over with lakes and ponds of the purest water, many of which have been utilized to furnish a supply to the neighboring communities. But, as the population has increased, the watersheds of these bodies of water have become more thickly settled, and, with utter recklessness and disregard for the rights of others, the drainage of houses, barns, pig-pens, and manufactories is allowed to flow unchecked into them, rendering the water both distasteful and dangerous to health. The water-supply of the city of Boston has been seriously affected from this cause, and, with the increasing growth of the smaller cities and towns, the evil bids fair to be an increasing one. All legal measures have hitherto proved ineffective to stop this pollution, and every year renders a solution of the water-supply problem a more difficult one.

A PRELIMINARY announcement of what may prove to be a most remarkable medical
discovery was made by Dr. Koch at the recent Medical Congress at Berlin. He stated that he had not only succeeded in conferring upon guinea-pigs, which are known to be peculiarly susceptible to tuberculosis, perfect immunity against that disease, but had also discovered means of arresting the growth and multiplication of tubercle bacilli after inoculation. If he should be equally successful in preventing and arresting tuberculosis in man, it was not too much to hope that means would be found for successfully combating other diseases. If Dr. Koch’s future investigations confirm the results already obtained, his discovery will be of equal or even greater importance than that of vaccination as a protection against small-pox.

There have, however, been so many alleged specific brought forward lately as a cure or preventive for consumption, that we are inclined to wait for further developments before forming any opinion as to the value of the new method of destruction of the tubercle bacilli.

A recent number of the Science News (March, 1890) contained an account of some peculiar crystalline hailstones which fell in Russia. A similar phenomenon recently occurred in this country, at Holderness, N. H., where, during a severe hailstorm last July, many of the stones proved to be sharply defined crystals having the form of a double hexagonal pyramid, resembling dodecahedral quartz, while others were rounded and flattened, and some had a spherical nucleus with small, partially formed crystals projecting from it. As the formation of a crystal usually occupies a considerable length of time, the occurrence of these hailstones only increases the difficulty of suggesting a rational theory of the method of their formation.

THE ALCOHOLS.

An alcohol may be broadly defined as a compound of carbon and hydrogen, in which one atom of hydrogen (H) has been replaced by the radical hydroxyl (HO). Thus common alcohol is derived from the hydrocarboxylic ethane (C_2H_6), which may be represented by the structural formula as follows:

\[ H - C - H \]

Replacing one H by HO, we have:

\[ H - C - O - H \]

Methyl alcohol, or wood-spirit (CH_3OH), is derived from methane, or marsh-gas (CH_4), in a similar manner. Numerous other alcohols have been prepared from the hydrocarbons of the marsh-gas series, the one best known being amyl alcohol, or fusel oil, (C_8H_17OH), which is often present in distilled liquors, and, when occurring in any notable quantity, is a very deleterious and unwholesome ingredient.

The alcohol used in the arts is always obtained from glucose by a process of fermentation, but it has also been made in the laboratory by the direct union of its elements, thus proving the connection between the so-called organic and inorganic bodies, and showing that a living plant or animal is not necessary for the formation of the first-named class, as was formerly supposed.

A curious property of alcohol is that of uniting as a whole with certain crystalline bodies, just as water does when in the condition of water of crystallization. Calcic chloride unites with alcohol in this way, forming an alcoholate, with the formula (CaCl_2) (C_2H_5OH).

Each alcohol, by further oxidation, is transformed into a substance known as an aldehyde, but which is of interest only from a theoretical point of view. Common alcohol, for instance, (C_2H_5OH), is converted into ethylaldehyde (CH_3CHO) by removing two atoms of hydrogen. A still further oxidation converts the aldehydes into acids, many of which are of much importance. Ethylaldehyde, (CH_3CHO), for example, is easily oxidized into acetic acid, (CH_3COOH), which is the acid present in vinegar.

Butyric acid, from butyl alcohol, is too often present in rancid butter; while the medicinal value of valeroniac acid is well known. The fatty acids used in soap and candle-making also belong to this family or series.

Sulphur and oxygen are closely related chemically, and often replace each other in compounds of a similar nature, and so we find alcohols in which the atom of oxygen is replaced by one of sulphur. The best known of these is mercaptan, (C_6H_5SH), corresponding to common alcohol. It unites directly with mercuric oxide to form a solid body, whence its name; but its most evident characteristic is its horrible odor, which renders any investigations upon it a form of scientific martyrdom.

Returning to the base of common alcohol, ethane, (C_2H_6), there would seem to be no reason why two atoms of hydrogen might not be replaced by an equal number of hydroxyl radicals, and we find that such is the case. These diatomic alcohols—or glycols, as they are called—are well known, but are rather difficult to prepare, and have no practical value. Ethylene glycol (C_2H_6(OH)₂) corresponds to common alcohol.

If we replace three hydrogen atoms of the original hydrocarbons by hydroxyl, we obtain a class of triatomic alcohols, or glycerines. Common glycerine is a triatomic propyl alcohol, (C_6H_9(OH)₃), and is the only one of the series having any particular value.

Hexatomic alcohols, containing six hydroxyl radicals, are known, the most familiar being the sweet principle of manna, or man-nite, (C_6H_5(OH)₆).

Carbolic acid, or phenol, is really an alcohol, derived from the benzol or aromatic series of hydrocarbons; benzol (C_6H₆) giving phenol (C_6H₅OH). Like common alcohol, phenol may be oxidized further to an aldehyde and an acid, the latter being the well-known benzoic acid.

The hydrogen atom in the hydroxyl can also be replaced by other atoms or radicals. A most important instance of this is shown in the manufacture of ether from alcohol, where the hydrogen of the hydroxyl is replaced by another ethyl radical; thus alcohol (C_2H_5OH) = ether (C_2H_5, O, C_2H_5). In the commercial manufacture of ether this reaction is accomplished by the action of sulphuric acid upon alcohol.

We have given above only a few of the transformations and derivatives of the bodies known as alcohols, but they are sufficient to show their chemical importance, and also to give a glimpse at the most difficult and complicated subject of organic chemistry. We might have spoken, in addition, of the primary, secondary, and tertiary alcohols, and their normal, iso, and para modifications. When we consider that these numerous forms are subject to every possible change in the way of combination, substitution, and addition of other elements and compounds of elements, without altering the original radical, or skeleton, on which the molecule is built up, we can begin to realize what an infinite number of combinations of carbon, hydrogen, and oxygen are possible, and that when we have, apparently, analyzed a body into its ultimate elements, we have only just begun to comprehend the mystery surrounding its formation and existence.

[Original in Popular Science News.]

BRIEF STUDIES IN BIOLOGY.

BY PROP. JAMES H. STOLLER.

v.

THE STARFISH.

It is well known that the ocean is as populous with living creatures as the land; but few have opportunities of acquainting themselves with the inhabitants of this great realm. The appearance of the starfish, however, is quite familiarly known. Everyone who has been at the sea-shore has been interested in observing the curious five-fingered creatures that cluster at the bottom, just below low-tide mark. Those who have not had an opportunity of observing them in their native domain have seen specimens in museums or private collections, preserved in alcohol or in a dried state.

Under the popular name of starfish are included many genera and species, differing considerably in respect to secondary characters. The common five-rayed star, Asterias vulgaris, found everywhere on our northern Atlantic coast, is a good type of the order. Of this species there are several varieties;
specimens varying in size from a diameter of two inches to a foot, and in color from a yellowish to a reddish, are commonly met with.

We take this animal as a representative of the sub-kingdom Echinodermata, the fifth great branch—in the order of our examination—of the animal kingdom. It happens that a rather superficial feature of bodily structure gives the name to this group, namely, the spines which cover the body, these being fanned to resemble, in the case of some members of the group (the sea-urchins), the quills of the porcupine, the name of which in Greek is echinos. The name which Cuvier gave to the animals now forming this group, namely, Echinata, is a much better one, since the radiate structure of the body is a fundamental feature. But in Cuvier’s classification this group included so wide a variety of animals that later systematicists subdivided it, making that section which possesses carbonate-of-lime skeletons, covered with spines, a sub-kingdom by itself, and terming it Echinodermata.

In the case of the animals studied in the last two papers the parts of the body were readily distinguishable as anterior and posterior, and the aspects of the body as dorsal and ventral. But one is puzzled to know what application of these terms to make in the case of such an organism as the starfish. There is no head-and-tail structure to the body, and observation of the manner of locomotion shows that any one of the five divisions of the body may form the front end as well as another. And as to the terms dorsal and ventral, since these terms imply aspects correlative to antero-posterior differentiation, they do not apply to the starfish. A different nomenclature, with the surface or object to which the animal is attached, agreed upon as best designating the conspicuous structural features is as follows: The central, undivided portion, pentagonal in shape, is the disc; the five radiating parts, the rays; the more flattened side of the body, on which the mouth is situated, the oral aspect; the opposite side, the aboral aspect.

In the living starfish the oral side is always in contact with the surface or object to which the animal is attached. If the specimen be lifted up, it will be seen that five rows, or bands, of soft, white, tubular feet radiate out from the center of the disc, where the mouth is situated. These tube-feet are suckercd at their extremities, are highly flexible, and capable of being extended and retracted. By alternately fixing and loosening them, and by the use of muscles within the rays, the animal is able to slowly creep about. In this way it can climb vertical surfaces, as the piers of wharves or bridges. The tube-feet are, in fact, filled with water, and form a part of a somewhat complex system of organs, called the water-vascular system. On the aboral side of the body may be seen a small tubercle, perforated with many minute holes, through which water passes. Noting is more distinctive of the Echinodermata than this curious and admirable mechanism of membranous tubules and vesicles, which serves the functions of locomotion and grasping, and—not improbably—also that of respiration.

In picking up a starfish it is often found clinging to some rock, usually a mussel or small, the side of which the animal is in the act of devouring alive. What the starfish does is to evert its stomach, and, in a manner, wrapping it about the soft body of its prey, gradually eat it away. Thus it may be said of the stomach of the starfish that it actually goes outside the body in search of food. In fact, in addition to its digestive function, it performs an office analogous to the grasping organs—as the mouth-parts of insects and crustacea—of other animals. This is a curious case of adaptation, the lack of one set of parts being made good by the extraordinary use of another member of the body. The facility with which the starfish thus gets at the molluscs and other invertebrates living in crevices of the shell when once a hold has been secured, makes it a very damaging factor in the business of oyster culture. The starfish gather in great numbers at the oyster-beds, and make much havoc in the growing crops of our favorite bivalves.

A fact of biological interest about the starfish is its power of reproducing miltion. One, two, three, or four arms may be cut off—albeit, in the case of a young animal—and the creature seems to suffer no inconvenience from the loss. Eventually new rays will grow out again. This restoration of lost parts by a process allied to budding, or a kind of vegetative growth, marks the starfish as low in bodily organization. That interdependence of parts, that individualization of the organism, which renders mutilation precarious to life—is not quite destructive—in the higher animals, does not obtain in the starfish.

In animals of low organization it is always interesting to observe what sense-organs they possess, and to consider the possibility of their having sensations, and thus a low order of mentality. In the starfish there are definite organs for receiving impression, in the form of many cup-shaped eyes, if we keep in mind that vision to the starfish is, doubtless, a very different thing from what vision is to us. At the tip of each of the five rays is a small reddish spot, and microscopic examination shows it to be a mass of pigmented cells, which adjourns a nerve-end, the trunk of which runs inward to unite with a nerve-ring, which surrounds the oral opening. The function of the pigment-cells appears to be to absorb light, and that of the nerve-end to receive the impressions of light—that is, to play the part of the retina of the eyes of higher animals. So much may be safely said, but whether there is an attendant sensation of vision it is impossible to affirm. If so, it is certainly, considering the simplicity of the organization of the eye, that it only enables the starfish to know light from darkness—not to distinguish the forms of objects. The membranous integument, in which the framework of carbonate-of-lime ossicles is imbedded, is sensitive to contact, and so constitutes an organ of touch. No other sense-organs are present, but it is not improbable that the membrane of the stomach has functioned as an organ of taste and smell.

Space remains only to mention other points of interest about the starfish: 1. The alimentary canal, beginning with the mouth and enlarging into the capacious exorable stomach, is continued into a short intestine which opens by a small anal orifice on the aboral aspect. Thus the digestive canal, as in all animals above those of the hydras and medusas, has an unsegmented type (Coelenterata). 2. The blood-vessels consist of a blood-system, consisting of a circular tube surrounding the gut, and five main radiating vessels passing out into the rays. The blood is a white fluid, consisting of a plasma and white corpuscles. 3. Reproduction is sexual, there being five reproductive organs in each animal—one near the base of each ray. After the eggs are ripened, escape through the ducts of the organs opening on the oral aspect.

4. In the course of its development the embryo passes through a stage when it is a free-swimming organism. This is before it has any resemblance to a starfish, the body having a sack-like structure, being in the gastrula stage of development. (See article on hydras, No. 2 of this series.) The passage of the embryo through a stage when it leads an active locomotive existence facilitates the distribution of the species over wide areas.

The present July has been remarkable chiefly for its continued dryness. The lowest point of the mercury the last month was 56°, on the 10th, and this was also the coolest day, with an average of 61.66°. The 19th and 20th were but a fraction higher. These three days averaged just 62°. The highest point was 91°, on the 1st, and this was also the warmest day, with an average of 91°. The 8th, 16th, and 20th were nearly as warm, the mean of the four days being a small fraction over 80°. The mercury stood at 82° at 9 p.m. on the 8th, but fell to 67° on the following morning—a fall of 15° in ten hours. The entire month was seven-tenths of a degree below the average of this month for the last twenty years. In only five Julys in twenty years has the average been below the present. The long, severe drought has probably given the general impression of an unusually warm month, although actually below the average. A few days, however, were intensely hot, as noticed above.

The face of the sky, in 93 observations, gave 48 fair, 25 cloudy, 16 overcast, and 4 rainy,—a percentage of 51.6 fair. The average fair the last twenty Julys has been 60.9, with extremes of 41.9 in 1889, and 76.3 in 1878, with only four Julys more cloudy than the present. The morning of the 14th was foggy.

The amount of rainfall the last month was only 1.65 inches, and most of this (1.37 inches) fell on the 25th and 26th. The average amount in July the last twenty years has been 3.99 inches, with extremes of 1.20 in 1888, and 9.27 in 1889. The small amount in June (1.52), with scarcely a trace after the 13th, caused an unusual drought, being continued till the 25th of July, scarcely checked by three slight showers of only .03 inch each. The spring rains secured a good hay crop, and the drought favored a speedy and safe gathering of it, but scorchcd the naked fields and pastures as in a hot oven, withering small fruits and causing much injury. Potato fields have been destroyed, in some instances, and ploughed up. The small amount of rainfall in this vicinity on and since the 25th has been quite insufficient, as yet, to restore fully the normal state of vegetation. Heavy showers have been round about us, but generally only the extreme northern borders have received any locality. The amount since January 1 has been 27.56 inches—a near average of these seven months, which has been 27.95, showing now a slight deficiency.

The average pressure the past month was 29.991 inches, with extremes of 29.68 on the 9th, and 31.12, at nine observations between the 22d and 29th,—a range of .44 inch. The average for the last seventeen Julys has been 29.988 inches, with extremes of 29.820 in 1884, and 29.991 in 1890,—a range of .17 inch. The sum of the daily variations was 2.61 inches, giving a daily movement of .085. This average the last seventeen Julys has been .091, with extremes of .074 and .118. The largest changes
were .26 on the 9th and 10th each. Twenty-four observations were noted stationary.

WINDS.

The average direction of the wind the last month, calculated as usual, was W. 22° 17' S., or nearly W. S. W., while the average direction for the last twenty-one Julys has been W. 24° 20' S., with extremes of W. 4° 51' N. in 1889, and W. 66° 15' S. in 1878—a range of 71° 9', or over six points of the compass.

COMPARATIVE METEOROLOGY OF NEW ENGLAND FOR JUNE, 1890.

gathered from the Bulletins of the New England Meteorological Society. The average temperature and precipitation are presented in the following table, State by State, with that of New England combined, all ascertainment from careful observers, widely distributed in each State. The extremes and range are also given, with the number of reports thus condensed.

<table>
<thead>
<tr>
<th>State</th>
<th>Average Temperature</th>
<th>Average Precipitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Hampshire</td>
<td>68.5°</td>
<td>3.44 in.</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>69.1°</td>
<td>4.12 in.</td>
</tr>
<tr>
<td>Maine</td>
<td>68.7°</td>
<td>3.92 in.</td>
</tr>
<tr>
<td>New England</td>
<td>69.0°</td>
<td>4.05 in.</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>69.3°</td>
<td>4.18 in.</td>
</tr>
<tr>
<td>Vermont</td>
<td>68.2°</td>
<td>3.21 in.</td>
</tr>
<tr>
<td>New York</td>
<td>69.6°</td>
<td>4.42 in.</td>
</tr>
</tbody>
</table>

The above table is sufficiently plain, except, perhaps, the last line, which gives the average temperature of June from twenty stations in New England having records of more than ten years, and the average precipitation from twenty-nine stations having similar records. Comparing these figures with those in the line above, we learn that the last June was below the mean in both respects.

I may add that the warmest locality reported in New England is not Northampton, Mass. (68.5°); and the coolest Eastport, Me. (54°); the highest rainfall at West Milton, N. H., (6.46 inches), and the least at Swampscott, Mass., (1.18 inches).

D. W. NATICK, August 5, 1890.


ASTRONOMICAL PHENOMENA FOR SEPTEMBER, 1890.

The sun crosses the equator and autumn begins about 9 P. M. September 22. Mercury is an evening star at the beginning of the month, and comes to its exact elongation at 4 A. M. on the morning of September 3, at which time it is 27° east of the sun; but, as it is also 15° south, the elongation is not at all favorable, and it probably cannot be seen with the naked eye. It rapidly approaches the sun, and comes to inferior conjunction on the afternoon of September 29. Venus is also an evening star, setting two hours or more after the sun. It comes to eastern elongation about midnight on September 23, when its distance from the sun is a little less than 47°. It is growing brighter, but will not attain its greatest brilliancy until a month later, about halfway between elongation and inferior conjunction. Mars is now in western sky in the evening, passing the meridian on September 27. P. M. It is quite far to the south. Its meridian altitude being only about 25° for the northern part of the United States. It is moving eastward somewhat reminiscent of the stars,—20° during the month,—and passes from the constellation Scorpions into Sagittarius. It is also growing fainter, owing to its increasing distance from the earth, and at the end of the month its spherical figure will be almost equal to that of the sun. Jupiter is in the constellation Capricornus, and comes to the meridian a little before 10 P. M. on September 1, and about two hours earlier at the end of the month. It sets or rises about five hours earlier or later, respectively, than meridian transit. It moves slowly westward among the stars until September 25, when it begins to move eastward. The following eclipses of its satellites are visible from one part or another of the United States. The phenomena all take place near the right-hand limb of the planet, as seen in an inverting telescope. D. denotes disappearance; R., reappearance. Times are Eastern Standard.

- R. September 2, 7h. 50m. P. M.
- R. September 5, 8h. 46m. P. M.
- R. September 8, 7h. 22m. A. M.
- R. September 11, 6h. 50m. P. M.
- R. September 14, 5h. 17m. A. M.
- R. September 17, 4h. 32m. P. M.
- R. September 20, 3h. 48m. A. M.
- R. September 23, 3h. 55m. P. M.
- R. September 26, 3h. 12m. A. M.
- R. September 29, 2h. 28m. P. M.
- R. September 30, 1h. 44m. A. M.
- R. October 2, 1h. 22m. P. M.
- R. October 5, 1h. 14m. A. M.
- R. October 8, 12m. 45m. P. M.
- R. October 11, 11m. 17m. A. M.
- R. October 14, 10m. 41m. P. M.
- R. October 17, 9m. 43m. A. M.
- R. October 20, 8m. 35m. P. M.
- R. October 23, 7m. 28m. A. M.
- R. October 26, 6m. 19m. P. M.
- R. October 29, 5m. 7m. A. M.
- R. October 31, 4m. 10m. P. M.

Saturn is not in good position for observation. It passed conjunction with the sun on August 30, and became a morning star, but will not get far enough away to be easily seen near the end of the month. It will then rise two hours or more before the sun, and about 10° north of the east point. Uranus is an evening star, setting soon after the sun—less than an hour later at the end of the month. It is now a little north of Spica (Alpha Virginis). On the morning of September 2, Venus passes 2° south of Uranus. Neptune is a morning star, between the Pleiades and Hyades in Taurus.

The Constellations.—The positions given hold good for latitudes differing not much from 40° north, and for 10, 9, and 8 P. M. for the beginning, middle, and end of the month, respectively. Cygnus is directly overhead. Delphinus, high up, and Capricornus, low down, are on the southern meridian. Piscis Australis is below Capricornus, and not quite up to the left of Capricornus, at about the same altitude. After Aquarius come Pisces and Arius, the latter being almost due east, at about 10° altitude. Taurus is just rising, a little north of east. Pegasus is between Pisces and the zenith; and Andromeda is above and a little to the north of Arius. Cassiopeia is to the right, east and above. Perseus is low down in the northeast, and Auriga is just rising below it. Draco is to the west of the meridian. Ursa Minor is mainly to the west of the pole star, at about the same altitude. Ursa Major is below the pole, a little to the left. Lyra is just to the west of the zenith, with Hercules, Corona Borealis, and Boötes below it, the last being near the horizon, a little north of west. Scopius is setting in the southwest, with Ophiuchus above it.

Sagittarius is low down in the south, a little west of the meridian; and Aquilla is high up, between Sagittarius and Cygnus.

M. LAKE FORREST, ILL., August 1, 1890.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

S. S. B., California.—(1) Why does a train, on being stopped on a level track, go back a little just before coming to a stop?

Answer.—This effect is probably due to the release of the brakes from the wheels at the last moment, allowing the car to settle back a little. It may also, sometimes, be an illusion, due to the fact that when the speed is reduced the muscles of the body involuntarily hold it braced backwards, to counteract the forward motion of the car, especially at a greater rate of speed. Now if the train stops before the muscles resume their usual tension, the body will be pulled back a little, producing the impression that the whole train is moving in the same way.

(2) How can a hawk soar around in circles and rise in the air without moving his wings, and where does the power come from?

Answer.—The mechanism of the flight of birds, especially the act of "screaming," has never been satisfactorily explained. The power by which the soaring and circling is produced in the air comes, undoubtedly, from the wind, but just how it is applied is not thoroughly understood.

MERCHANT, NEW YORK.—What is the scientific principle upon which the so-called "fire-proof" safes are constructed?

Answer.—The end sought in these safes is to prevent the heat penetrating into the interior, where the contents—books and papers, etc.—are placed. This is attained by making the sides hollow and filling them with substances that are non-conductors of heat. Steam is a most excellent non-conductor, and the walls are usually filled with some substance chemical, like alum, which contains a large amount of water, combined with it as water of crystallization. When exposed to the fire this water is driven off as steam, filling the safe with the non-conducting vapor, and preventing the access of heat to the interior. This compound is filled with paper, and metal bars are placed to prevent the introduction of heat.

B. T. C., Iowa.—How does light act upon the silver salts in the production of the photographic image?

Answer.—The action of light upon the silver salts is to render them reducible by the pyrogallic acid to metallic silver. Just how it does this is a scientific mystery, which cannot be explained with our present knowledge.

N. D. G., Detroit.—Is it true that there is no chemical difference between the various essential oils?

Answer.—Yes; the oils of bergamot, birch, chamomile, caraway, hops, juniper, lemon, myrtle, nutmeg, orange, parsley, pepper, savin, ylang, tolu, allspice, and valerian, all have the same composition, expressed by the empirical symbol C6H12O. The widely differing properties of these oils are explained by chemists as due to the different structure, or way in which the atoms are arranged in the molecule, just as the same number of bricks may be arranged to form a house, church, store, or many other different buildings.

ELECTRICIAN, Boston.—The increasing cost of platinum is due to the large demand for it by the manufacturers of incandescent lamps and other electrical apparatus. Is it not possible to use a smaller and the annual production limited. Unless richer deposits of this invaluable metal are discovered, the price bids fair to advance indefinitely.

B. F. T., Conn.—Is it true that a horse-hair will turn into a worm if kept in water for some days?

Answer.—This is an old superstition without any basis whatever. It probably arose from the peculiar form of an aquatic animal known as Oudais, which has a dark-colored, hair-like body,
POPULAR SCIENCE NEWS.

Medicine and Pharmacy.

A PHYSIOLOGICAL VIEW OF THE EIGHT-HOUR MOVEMENT.

The human body is a machine for the production of power, by the oxidation of hydrocarbon compounds in the shape of food, just as a steam-engine effects the same results, more economically, by the oxidation of similar substances in the shape of wood or coal. But an important difference is, that while a steam-engine will run continually if supplied with fuel, the human organism can only work for a comparatively short period of time, when it must stop until, in the mysterious state of semi-existence known as sleep, the exhausted tissues are repaired, and the supply of the incomprehensible vital force renewed.

The modern tendency of the so-called "reforms" in the conditions governing the performance of labor is in the direction of shorter hours, that is, the performance of less work for the same wages, rather than in increased pay for the same amount of work. From an economical point of view, either plan amounts to about the same thing, but the effect upon the individual workman is very different.

A definite amount of work will always command a definite price, depending upon the condition of the labor market, which is governed by the laws of supply and demand, in exactly the same way as the wheat or cattle markets; and it is mathematically impossible that a man can, for any length of time, obtain as high a rate of wages for eight hours' work as he can for ten hours, unless by some means he is able to produce as much in the eight hours as he previously did in ten.

The advocates of the eight-hour day claim that this is the case, and that, owing to the physical exhaustion produced by ten hours of toil, no more work is accomplished in this time than in eight hours, with the increased mental and physical vigor arising from a shorter period of activity.

It is evident that there must be an average daily time of labor in which the greatest amount of work may be produced. It would be impossible and uneconomical to work, say, twenty hours a day, and equally wasteful to only devote one hour or less of each day to labor. It may be safely assumed that the average man will endeavor to so regulate his work as to produce the greatest possible daily amount, and, although unconsciously, yet none the less certainly, will an independent worker strike a very accurate balance between the production of energy in his body in his hours of rest, and its dissipation in his hours of labor.

The question of a shorter period of labor, then, resolves itself into one of the natural strength and vigor of the laborer. For many years ten hours a day in the mechanical trades has been considered as the most economical period—that is, the time in which the greatest amount of daily production may be accomplished. The general adoption of an eight-hour working day would, therefore, indicate one of three things: either the average of human strength and vigor has been reduced by one-fifth, or that there has been for many years past an entire misapprehension as to the proper balance between work and rest, or, what is more improbable than either, that the great majority of men are willing to voluntarily accept a reduction of twenty per cent. in their wages—for that is what it would inevitably amount to—for the sake of more leisure time. The indifferent success of the eight-hour movement, which seems to have been the work of professional agitators, whose only occupation is to stir up strife between employer and employed, would indicate that the ten-hour day is founded upon a scientific physiological basis, and that, in the mechanical trades at least, the energy produced in the average human body in twenty-four hours can be most profitably and economically dissipated in ten.

LITERARY NOTES.


The safe and economical disposal of sewage is a difficult problem, and one that has enlisted the services of many distinguished engineers. Few cities are so favorably situated as to be able to run their sewers directly into the ocean, or a stream of water which can carry it off without creating a nuisance in the water supply. The work is, therefore, an important one, and one that has been the subject of much study, and much that has been written upon the subject.

Bibliography.

The Ethical Problem, by Dr. Paul Carus, is published by the Open Court Publishing Co., Chicago, at 35 cents, and consists of three lectures delivered by the author upon the science and theory of ethics. The subject is well treated, and the work is worthy of a perusal by those interested in the matter.


Pamphlets, etc., received: Bulletin of the Laboratories of Natural History of the State University of Illinois; Über Furthestging, by Dr. Friedrich Goppelsroeder, of Mahulassen, and the Twelfth Annual Report of the Rhode Island State Board of Health.
of work which can be accomplished with the complete instrument, and the more perfect and satisfactory it will be. In considering the various parts of the stand, the following illustration of the Grifith Club Microscope will serve to make them clear.

The base, or lower portion of the stand, first attracts our attention. Instruments can be found with bases of almost all conceivable forms, but the only one suitable for draughts is the tripod.

The feet forming the tripod may be disguised in the form of the base; but that does not matter, so long as there are three, and only three, points of support. This not only gives the greatest stability to the instrument, with the least tendency to vibrate when the table is jarred, but also has other advantages. One of these feet should always point towards the observer. This is of importance to the pharmacist, who has frequent occasion to incline the instrument while measuring or drawing objects by means of the camera lucida. The only exception to this is when the tripod has two long feet, as shown in the extra foot of the above illustration. In such a case it is justifiable to have the short foot directed from the observer.

The pillar, or support, requires no special attention. With some Instruments it is single, while others have a double support, so that the mirror bar swings between them. Pharmacists are not especially interested in either of them.

The joint seen at the upper end of the pillar is a feature of more importance, and every pharmacist should see that the instrument can be inclined to any desired angle. If it is required that the instrument be used upright, it can be so employed just as well as the stiff-backed ones that we still see in the market. However, it is seldom that a draughtsman has occasion to use an instrument in that awkward position. This joint is usually a single hinge, but it may be strengthened by means of trunnions, and in such cases is usually provided with some means of tightening or loosening the bearings. Some instruments can be locked with the body at any desirable angle. This, however, is not necessary for a pharmacist’s use.

The arms is not very prominent in our illustration. It is the portion above the joint, and bears the body. In some instruments it is prominent, and closely resembles in form the flexed human arm. If it supports the body firmly, that is all that is required.

The body is supported by the arms, and has attached directly to it the optical parts of the compound microscope. The body varies in size and length in different instruments. The size is not of very much importance, but in length it should be what is known as “standard,” or so arranged that it can be lengthened out. The body must be perfectly black inside, and this is best accomplished by means of black cloth. Cloth is more permanent than the blackened metal surface.

The drawer tube is found only in the better class of instruments, and is a provision for adjusting the length of the body. With very high power objectives, it is very essential to have a drawer tube. It should be marked to indicate when the body is “standard” length. A great convenience is a “society screw” in the lower end of the drawer tube. Pharmacists have frequent occasion to use quite low powers, and if the low power objective is placed in the drawer tube there will be plenty of working distance, which I have found is not the case with some instruments. Again, it enables the pharmacist to place the analyser of the polarscope in the drawer tube when there is no working distance for it with low powers.

The collar is the ornamental ring, or projection, at the upper end of the drawer tube, or of the body when there is no drawer tube. It is unimportant to the pharmacist.

The nose piece is the portion at the lower end of the body. It is provided with a female screw, into which the objective is fastened. By all means purchase a microscope with what is known as the “society screw,” so that any ordinary objectives can be fitted to it. I have found that the English and American objectives are made of the same name as the American, and I was obliged to get an adapter for the use of English objectives on an American stand. This nose piece has nothing to do with the double, triple, and quadruple nose pieces, which are accessories, and not a part of the stand.

The stage is of importance. The best for the use of pharmacists are made of glass, so that they are not affected by liquids or chemicals. It is an item to have a thin stage which admits of oblique illumination in the examination of crystals. The expensive mechanical stages are very convenient, but not essential for the use of a drug clerk.

The sub-stage must be so arranged that it will admit of the use of sub-stage condenser, polariscope, etc.,. It is hardly worth while for a pharmacist who expects to do much work to purchase a stand without a sub-stage.

The diaphragm is a contrivance for regulating the volume of light which is admitted to the object. When a sub-stage is present, the diaphragm is adjustable to it; otherwise it is attached to the stage in place of the objective.

The mirror bar and its arrangement is plainly shown in the illustration. All modern microscope stands have the mirror bar so attached that the mirror can be raised above the stage for the illumination of opaque objects. This is a great convenience for the pharmacist who has many substances to examine by reflected light. It is best to have a mirror bar which can be lengthened or shortened as may be required.

The mirror, if single, must be a concave one. Where there are two, one is plain and the other concave. As far as the plain mirror is concerned, the size does not make much difference, but the larger the concave mirror the better. Pharmacists are not usually interested in this feature.

The clips are for holding the slide in position. The ones which can be removed are preferable for the pharmacist who occasionally has liquids to examine, when the clips are in the way unless removed.

The coarse adjustment is found on all instruments. The rack and pinion arrangement is the best, and is the one used on the better class of instruments.

The fine adjustment, or micrometer screw, is also a feature of the better instruments, and should be present on every one owned by a pharmacist who intends to do much work. It is much more convenient to have the fine adjustment near the coarse one. By all means avoid the instruments with the fine adjustment on the body near the nose piece. They are inconvenient, and the use of them has a tendency to vibrate the body of the instrument.

As stated above, the ocular, or eye piece, and the objective do not belong to the stand, so I will not consider them here. The lamp and attachment, as well as the turn-table, shown in the illustration, are accessories which require special description, not in place at this time.

**Increasing the Mobility and Power of the Musician’s Ring-Finger.**

A paper by Dr. F. W. Langdon, in the Cincinnati Lancet Clinic, discussed the above problem as follows:

*The limited range of independent extension possessed by the fourth digit of the hand is well known, and is usually a most formidable stumbling-block to the pianist and other performers on key instruments. In the production of certain notes and musical effects, as trills, for example.*

*The causes of this Impairment of mobility, which is associated with a corresponding lack of power in the digit, are two in number, namely: (1) mechanical, due to structural peculiarities of the parts; and (2) physiological, due to insufficiency in the development of the latter being dependent on the former.*

*The mechanical obstacles to free extension, as any one may satisfy himself by dissection, or even by examination of the average living hand, are two oblique tendinous bands, situated about three-quarters of an inch above the knuckle line, connected with the proximal common extensor tendon of the ring-finger and distally with the common extensor tendons on either side, namely: those to the middle and little fingers.*

*That the subsidiary tendons act as ‘guy ropes,’ and limit the extensor range of the ring-finger especially, may be determined by any one for himself, by placing the hand on a flat surface and extending, first, the ring-finger alone; then extension of its neighbors on either side will demonstrate that all three can be brought higher than either one alone. The little finger is seen to be less affected than either of the others, owing to its possession of a proper extensor, which is free, while the middle finger is less limited than the ring, by reason of having the ‘guy’ tendon on one side only.*

*That the two tendons are constantly present, though varying somewhat in development and position in different persons.*

*Not only extension of the ring-finger diminished, but separation of the three inner digits is materially lessened by the presence of these apparently insignificant slips, so that the lateral spread of the digits is impaired to such a degree as to become an important matter to the musician. Again, in addition to the mere limited range of motion, both vertically and laterally, due to the mechanical effects of these slips, there is also to be considered the physiological factor, namely, lessened functional activity and consequently faulty development of the muscular fibres acting on the extensor tendon of the ring-finger, namely the common extensor, fourth dorsal Interosseous and third lumbricales.*

*This fault of development is a more important matter than would appear at first glance, since it is mainly by the Interossei and lumbricales that the first phalanges are flexed and the second and third extended, whence the name ‘filiaciles.’*
fourth metacarpals in the neighborhood of the proposed incision. Moderate flexion of the patient's fingers made it possible even to fixing the position and direction of the outer (radial) connecting slip, which varies slightly in different subjects; its middle averaging perhaps three-quarters of an inch above the knuckle line. With an ordinary sharp-pointed tenotomy knife a longitudinal incision, one-eighth inch in length, midway between the third and fourth metacarpals, and just to the distal side of the slip to be divided, is carried through the skin and superficial fascia. The exact location of the slip having now been determined by means of a probe, the deep fascia is incised at the lower edge of the slip and the point of the knife carried directly upward, that is, toward the wrist, beneath the slip, which parts with the characteristic cranking sound and feel. If not sufficiently tense to divide easily, it may be made more resistant by directing the patient to flex the fingers a little more strongly. The dressing consisted of a pledget of absorbent cotton held in place by adhesive strapping.

A marked increase in range of independent extension was at once evident, and within a few days the patient remarked a greater precision of touch, there being no tendency to the lateral twisting which had before annoyed him, and which was at this time observable in the other hand. Union of the wound was complete when the dressing was removed on the third day, and the result of the operation was so satisfactory to the patient that he at once submitted the other hand to be operated on.

The motion attained in both cases was so satisfactory as unnecessary to divide the slip going to the little finger tendon. In some extreme cases, however, this also would probably require division, in which event it would be well to bear in mind its lesser length, and not mistake for it the common extensor tendon, going to the fifth digit.

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARKE, M. D.

THE TENTH INTERNATIONAL MEDICAL CONGRESS, the largest, so far, of them all, was held at Berlin, August 4-9. Prof. Virchow, the famous pathologist, who received a hearty welcome, was chosen president of the Congress.

THE PRESENT STATUS OF SUSPENSION IN THE TREATMENT OF LOCOMOTOR ATAXIA.—In the Progress Medical, Dr. Raoulit, of Paris, examines the results obtained by different observers, in different countries, who have conscientiously used this mode of treatment. It seems that in England and America the results have not been as favorable as those obtained in Germany and France. An American observer explains this by saying that the French people are more impressionable than the Anglo-Saxons, and present symptoms more functional than organic. In all probability said observer has been looking for a cure instead of amelioration. Among the recent contributions to this subject the majority still favor suspension. Balaban, of Paris, in his THESE de Paris, reports nine cases of tabes treated in this manner under the direction of Dujardin-Beaumetz. In eight cases the gait was considerably improved, and the incoordination and lightning pains diminished. In one case the vesical troubles disappeared. In three cases the subject was anesthetized. In but one case were the results unsatisfactory, and treatment was suspended after twenty-five trials. Dujardin-Beaumetz reports twenty-five cases treated at L'Hopital Cochin, with good results in the majority of cases. In four patients the gait was much improved, while in six patients the improvement was but slight, it occurred before the fifteenth day of treatment. After that time the symptoms remained stationary. Dr. Ladame treated fifteen cases of locomotor ataxia, twelve males and three females. He reports on eleven cases, four having disappeared. Of eleven cases only two were benefited. In those cases where the improvement was but slight, it occurred before the fifteenth day of treatment.

Extraction of a Key from the Trachea.—Dr. M. G. Sloan, of Dexter, Iowa, writes to the Journal of the American Medical Association: A boy, aged two years, was brought to my office by his father, who stated that the boy had swallowed a key a few minutes before. The patient was voiceless, dyspnoea was constant, and coughing, and there was an escape of liquid cough. The conclusion of the soft parts about the clavicles and in the intra-mammary regions in inspiration. It was very evident that the foreign body was somewhere in the air passages, and it seemed to me probable that it had not passed much below the larynx, as I could on no other theory account for the complete aphonia. However, neither with the finger nor with a pair of forceps was I able to reach it through the mouth. It was plain that relief, to be of avail, must be speedy. Accordingly, after ineffectually trying a vigorous shaking with the patient inverted, I proceeded to perform tracheotomy under chloroform anaesthesia. The operation just above the isthmus of the thyroid was chosen, and in making the incision in the trachea I was so fortunate as to come directly upon the lower and smaller end of the offending key; and now came the part of the affair that seemed to me to be of peculiar interest. The key, or at least the large end of it, was so much wider than the diameter of the trachea that with the ordinary laryngeal forceps I was wholly unable to remove it from its position, as the blades of the instrument could not encompass it sufficiently to grasp and remove the foreign body. It was only by taking a stout pair of polyphenic forceps that I was enabled to extract it. The key was of steel, and measured thirty millimetres in length, and, at the widest part, thirteen millimetres in width. I have not been able to find in any authority accessible to me a table of the diameters of the trachea at different ages, but I am confident that in a patient of this age it did not exceed seven and a half or eight millimetres. Relief to respiration was perfect, and as soon as the little fellow had perfectly regained consciousness he audibly expressed his satisfaction with the result, as I held my finger over the tracheal opening to enable him to use his vocal organs. No tube was used, as I could see no indication for it, and the incision was made over a space of eight to nine inches of trachea. A pretty severe broncho-pneumonia came on at the second day and lasted four or five days. The patient is now practically well.

Trephining Under Hypnotism.—It is not generally known that Dr. A. B. Shaw trephined a man in St. Louis on May 13th last, while the subject was under hypnotic influence. The case was one of traumatic epilepsy, Jacksonian convulsions and hemiplegia existing. Dr. Benno von Steinmetz hypnotized the patient, and the operation was successfully performed before quite a large audience of physicians. The operation lasted one hour. The trephine or other cut could not be administered without safety on account of the heart and kidney lesions which existed. This case is one which, so far as we know, is a unique one of its kind. —St. Louis Med. and Surg. Jour.

A Curious Case.—The following is reported in the American Lancer: An interesting case, owing to the mistaken diagnosis and curious termination, occurred in one of Philadelphia's leading hospitals during the past month. A man was run over by a carriage, his injuries consisting of a fractured rib and an injury on the left side of the head directly over the speech centre; one side of the face was paralyzed, and he made no answer to questions. It was believed the skull was fractured, and trephining was advised. One of the physicians, however, was doubtful regarding the fracture, though all the symptoms were indicative of its presence; with the exception of a perfectly healthy appearance, very contradictory to the injury. The man was asked if he could speak, but no reply was received. Finally a pencil and paper were handed him with the request he write his name. In response to this the man, who had great difficulty in breathing, had had facial paralysis since birth. The case is of interest, showing how an incorrect diagnosis may be reached, though the symptoms present point strongly to its correctness.

Fracture of a Rib from Coughing.—Mr. E. C. Masset reports in the British Medical Journal for April 22, 1890, the case of a man, aged fifty-four, who was suffering from bronchitis and Bright's disease. One evening he sent for the reporter, saying that he had great pain in his side. Upon inquiry it was ascertained that during a violent fit of coughing he had heard a snap, and had since felt a sharp pain in the same spot. Examination revealed the presence of a fracture of the rib. This healed as readily as could be expected in a man with bronchitis, and there were no signs pointing to any previous disease of the rib which would render it especially brittle.

Compound Committted Fracture of the Patella.—In the British Medical Journal, Altham reports a case of compound committted fracture of the patella, with comminution and avulsion of the ligament patellae. The entire bone and ligament were removed, together with small pellibules and dirt, the joint thoroughly cleaned and drained posteriorly, and the wound accurately united. The result was very good, the joint freely movable; patient could go up and down stairs, the only thing noticeable in the gait being a slight shortening of the leg as it was brought forward.

The Origin of Hospitals.—In the Lancer is an archaeological summary of the most recent discoveries and researches regarding primitive institutions for the care and cure of the sick and wounded. Hospitals existed in ancient times, as early as the fifth century B.C. in Ceylon, according to the Buddhist orientalist, Turnour, King Pandukabhya established a hospital in his palace, and one of his successors, King Duthagamini, in the second century before Christ, established eighteen such institutions in as many different localities, with a medical staff for each, and the remedial agents of those days. The Buddhist King Asoka, as shown by Dr. Buhler, had, about the year 250 B.C., hospitals both for man and animals. There were, doubtless, many other founders of hospitals whose names are lost, but the Lancer thinks that
CRESOL.—The salicylate of cresol, or cresol, is analogous to salol, or the salicylate of phenyl, (Journ. Am. Med. Ass.) is crystalline, insoluble in water, sparingly soluble in alcohol, tasteless, and having a pleasant odor, resembling somewhat that of salol. Its antiseptic properties seem to be about the same as salol, but has a therapeutic preference over the latter in that it is relatively harmless, especially in the antiseptic treatment of the alimentary canal.

Cactus Grandiflorus in Heart Disease. Dr. Orlando Jones publishes his experience of cactus grandiflorus, which he claims is likely to prove a useful adjunct to our resources, especially in asthenic conditions of the heart. Digitals, strophanthus, and convallaria are not always reliable in the varied conditions of the heart with which we daily meet. The action of blood-stimulating drugs frequently disappointing when we are dealing with a feeble heart, especially if that feebleness is excessive and of long duration. In such instances cactus grandiflorus may fill a gap where other remedies appear to be lacking. The action of this remedy seems to be the very opposite of that of digitals, that is, in the final stage it strengthens the heart.—Brit. Med. Jour.

Ludertiz has lately demonstrated by a series of experiments at the Berlin Institute of Hygiene, (Berlin Klin. Woch.), that coffee (infusion) has very decided antiseptic properties. Several kinds of bacteria were experimented upon, and it was found in all cases that their growth was interfered with by adding a small quantity of the infusion of coffee to nutrient gelatine, while in the pure infusion all bacteria were rapidly destroyed. It is not yet known to what constituents of the coffee the antiseptic action is due. The caffeine, certainly, is but slightly active. The tannic acid is more so, but probably the substances which are most active are those formed during the roasting. It is an interesting fact that a cup of coffee left standing in a room remains almost free from micro-organisms for a week or more.

CHOICE OF HYPNOTICS.—Prof. Germaine See gives (Med. Age) the following classification of hypnotics, according to the cause of the insomnia:
1. Insomnia from pain: Morphine, or antpyrin, acetylandil or phenacetin; sometimes bromides. If visceral, opium or belladonna.
2. Digestive insomnia: Hot, alkaline water laxatives, regulation of digestion.
3. Vascular, cardiac, and dyspeptic insomnias: Secured principally by bromides, by loddles, ethyl or pyridin; morphine, if loddles fail. Amyl, chloraloid, and especially sulphonal are safe; not chloral or bromides. In cardiac lesions uralphem and sulphonip may suffice; probably not, but they are safe. In angina they are dangerous.
4. Cerebro-spinal insomnia: Sulphonial, amylen, and chloraloid can be advantageously altered in agitated and persistent insomnias of organic diseases or insanity. Functional affections have insomnia from cerebral anaemia. Hypnotics, if given, must be watched.
5. Physical insomnia: Sulphonial, paradexy, chloral succeed best if the loss of sleep be due to worry.
6. Genito-urinary insomnia: Rare. Use in- dides, cold douches, antpyrin, and hypnotics rather than narcotics; with proper regimen.

MEDICAL MISCELLANY.

The following advertisement lately appeared in an Irish daily: "Wanted, a gentleman to undertake the sale of a patent medicine. The advertiser guarantees it will be profitable to the undertaker." ECONOMY DOWN EAST.—A woman in Saco, Me., recovered too rapidly, and had half a bottle of medicine left of the prescription ordered by the attending physician. Having been brought up to believe that wastefulness was sin, and the drooglist refusing to refund anything on the offer to return the half bottle, she gave it to her pet dog which seemed to ill. The dog died.

REUNION OF CUT-OFF FINGERS.—Dr. S. W. Sanford tells a story said to have happened to an old physician many years ago—long before antiseptic surgery was practiced. A man, with a finger cut off, came to him, bringing the finger. The doctor was drunk, and sewed the finger back. It united nicely. But lo! the doctor had sewed it on with the palm surface turned the wrong way. The doctor, after sobering up, wanted to amputate the finger and try to put it back right; but the patient declined, and the doctor was annoyed many years later by having his mistake constantly exhibited as a great curiosity.

PROF. BILLROTH IN A BUSINESS TRANSACTION.—An exchange advertisement in which a friary member of a class noted for its thrift got ahead of Prof. Billroth. It seems that he stipulated to perform an operation on a Russian Jew, in a small town, for 5,000 marks. On making the journey he was informed that the Jew was dead, but, to render him some equivalent for his loss, an offer was made him to treat five hospital patients at 1,000 marks each. He accepted the offer, and before starting homeward learned that one of the patients whom he had just treated was the supposed dead man, who had received the professor's services for one-fifth of the original fee.


ONE DOLLAR A YEAR IN ADVANCE. SETHI C. BASSETT, Manager.

Publishers' Column.

LUCFER matches when first invented in 1837 were sold fifty for twenty-five cents. Now whole forests are made into matches, and the price of a gross, like that of Boker's steel pens, is next to nominal.

ATTENTION is directed to the Hot Water Apparatus advertised in this issue by N. F. Sawyer. The hot-water system of heating is rapidly supplanting all other methods, and Mr. Sawyer's apparatus has given universal satisfaction wherever introduced.

Even if the coming winter produces a crop of natural ice, I doubt if the ice machines used by David Horay are sure to be in demand, as their superior reliability and efficiency have been proved by the extensive use made of them during the "famine" of the present summer.

By the decomposition of the permaanitite, nascent oxygen is produced. This substance is many times more active, chemically described as a peroxide, and is made available for use upon proper organic matter. It is doubtless to this property that the high efficiency of the Ozonos Disinfectants may be attributed.

AFTER the brief mid-summer absence of the more beautiful forms of flowers, the magnificent blossoms of the autumn months are doubly welcome to the lover of nature. The work advertised on the next page by Educational Publishing Co. will tell you all about them and point out many beautiful horto随 overlooked.

FOR SALE.—A very superior rapid rectilinear photographic objective, with double achromatic combination. Will cover 50 squares, and is equally adapted to instantaneous or time exposures. Price $500, a large reduction from original cost. Has been but little used and is warranted perfect. A remarkably superior lens for the price. Address POPULAR SCIENCE NEWS Co., Boston, Mass.

The specialties advertised by the old established house of T. Stevens, & Co., are now offered by an exchange advertisement by D. W. Coster. Their wash powders are composed of the finest perfumes known, and while their odor is very permanent, it is also of the utmost delicacy, and free from the rank odors of the cheap and the publishers to all who will send this paper, their preparation of wood-fat, known as Aegida, for several years, and has found it a most superior article as an emollient and basis for ointments.

STARCH foods, such as Irish potatoes and breads, have often been regarded as the immediate and irritating cause of infantile enteric disorders. In part this may be true, and yet these starch foods were the very ones the lacteals and absorbers were crying for, and needed to stay the waste that was going on with fatal rapidity. Here the inestimable value of Maltine—its diastatic solvent properties—it quickly made manifest in changing the character of the discharge, and causing an irritant factor to become one of nutrition. Given in sterilized milks, the benefit of both is obtained.

The great interest shown in the beautifully illustrated four-page articles by Thomas Stevens, describing his experiences in interior Africa, as given in the leading periodicals for May, has led to their publication combined in book form. Mr. Stevens describes in a happy and interesting way the political and customs of an African expedition, a week's sport in the prolific game country adjoining the famous snow-capped mountains. Kilimanjaro, with a valuable commentary on the latter; the killing of a huge African python, and other incidents of his trip. This publication is entitled "Africa as Seen by Thomas Stevens and the Hawk Eye," and is sent post-paid by the publishers to all who will send this paper, their preparation of wood-fat, known as Aegida, for several years, and has found it a most superior article as an emollient and basis for ointments.
charcoal, closely packed in the powder of the same substance. A piece of muslin may be tied over the bowl to prevent the charcoal from becoming displaced, and a bit of cotton wool in the bottom of the bowl will prevent the dust from entering the stem of the pipe. Attach a piece of rubber tubing to the pipe, and, having previously filled it with water, place the apparatus in a vessel of water, as shown in the engraving. The rubber tube must be long enough to reach below the bottom of the vessel containing the water. Under these conditions the water will slowly pass through the apparatus, being more or less purified by the charcoal in so doing, and, flowing through the rubber tube, fall into a vessel placed to receive it. The flow may be conveniently stopped at any time by compressing the tube with a pinchock, which may be easily made from a stout hairpin bent into the form A B C. One of these filters in constant operation will supply water enough for several persons, but their value is more scientific than practical.

An ingenious French toy is the electromagnetic top, which is, in effect, a miniature dynamo machine. The interior is divided into two parts, only one of which rotates when the top is spinning. In one compartment are placed three small magnets, as shown in 2. In the lower compartment (1) are three little coils of fine wire connected together. These are connected to a toothed wheel (3), which acts as a circuit breaker. In the act of spinning the top, the axis is supported by a handle, around which is wound a string, which is pulled by the other hand (see engraving). The connections are so arranged that when the top rotates, the current of electricity passes through this handle and into the hand of the person spinning the top, giving him quite a perceptible shock, much to his surprise and mystification. Probably the current produced by such an apparatus would be sufficiently powerful to admit of other and even more surprising manifestations.

The accompanying engravings are reproduced from La Nature.

SOME ANCIENT CHEMICAL SYMBOLS.

We give below a reproduction (from Meyer Bros. Druggists) of some chemical and pharmaceutical symbols used by the medieval alchemists in their mystical, and often nonsensical writings. Each separate character on the same horizontal line is a symbol of the same substance, the names of which are given below.

\[
\begin{array}{c}
\text{A} & \text{B} & \text{C} \\
\text{D} & \text{E} & \text{F} \\
\text{G} & \text{H} & \text{I} \\
\text{J} & \text{K} & \text{L} \\
\text{M} & \text{N} & \text{O} \\
\text{P} & \text{Q} & \text{R} \\
\text{S} & \text{T} & \text{U} \\
\text{V} & \text{W} & \text{X} \\
\text{Y} & \text{Z} & \text{\textbullet} \\
\end{array}
\]

Albumen Camphor
Alcohol Drench
Alkali Gold
Alum Gum
Arsenic Honey
Borax Iron

The character for drachm, it will be noticed, is still in use, but the other symbols have long since been given up and the simpler forms of letters and figures substituted. These modern chemical symbols are in themselves only much-condensed abbreviations, and indicate to the eye of the chemist, facts in regard to the properties and relations of the substances they represent, that, if written out in full, would cover many pages of text. The modern tendency in naming new substances is also in this direction, so that even such a polysyllabic atrocity as methylmethenephosphonium iodide indicates most clearly
the composition, structure, and properties of a substance which few chemists have ever seen.

A CURIOUS TREE.  
(Dracaena Draco.)

The accompanying engraving of this rare tree is taken from a photograph—made for La Nature—of one of the few specimens naturalized in Europe, and growing in the gardens of one of the royal palaces of Portugal. It is probably about 250 years old, dating from the time when the species was first introduced into Europe.

The head of the specimen illustrated measures 115 feet in circumference, and begins about seven feet above the ground. The thickness of the trunk is often equal to the height of the tree. The leaves, growing in terminal bunches, are about two feet long and one to two inches wide, terminated by a sharp point. The greenish-white flowers are borne in loose terminal panicles. The most important product of the plant, however, is the red gum which exudes from the trunk, and forms one of the several kinds of dragon’s blood of the druggists.

The Dracaena is a native of the East Indies, and only thrives in Europe in exceptionally favorable situations. Probably the warmer climate of certain parts of this country would allow it to be easily naturalized and become an acceptable addition to our flora, both for purposes of ornament, and as a source of supply of a valuable ingredient of paints and varnishes.

WITH THE MICROSCOPES AT DETROIT.  
BY KATHARINE B. CLAYPOLE.

It is now thirteen years since a few microscopists met together and formed the American Microscopical Society. Since that time annual meetings have been held in various cities of the Union, and interest in the proceedings has steadily increased. Nevertheless, considering the number of microscopes in daily use among professional men and amateurs, the membership of the society is far smaller than it should be. Two opinions, diametrically opposed, though equally erroneous, contribute to this result: On the one hand it is held that the society is only for amateurs, and that nothing is likely to be brought forward worthy of the attention of a professional worker; on the other, that among an assembly of professional workers the amateur and the beginner would be out of place. For either of these prejudices the best cure is attendance at one of the annual meetings. But as the opportunity has passed for this year, a short sketch of the meeting held in Detroit during the second week of the past August may contribute to more just views concerning the work of the society.

There were there gathered together some fifty persons of intense earnestness. Among them were practicing physicians, professors of biology, chemists, men from agricultural experiment stations, experts, opticians, and a few—too few—whose acquaintance with the microscope was limited and recent. If any readers are in this last position, let it be urged upon them to identify themselves with the society. The consideration and generosity of the older workers is unbounded. The beginner is welcomed into their midst, and in three days learns more than he can in three months of solitary study.

The microscope being an instrument of the highest complexity, and all success in its use depending on the nicest adjustment of all its parts, it is natural that its mechanism should occupy a large part of the attention of the society. Many and vigorous were the formal discussions concerning the means of obtaining the full capacity of the instrument; while those carried on around the fine microscopes and accessories displayed by the leading makers of America were so engrossing that the first business of every session was to summon the members congregated in the exhibition room.

The use of the microscope in biological inquiry was well illustrated by papers giving the results of much patient work in animal and vegetable histology. Some physiological subjects were treated, as also matters pertaining to the mounting of objects, and to the imbedding, slicing, and staining of tissues. The representation of the society at the World’s Fair at Chicago in 1893, and the fees of experts with the microscope, drew forth a lively exchange of opinions. An important communication was presented on the microscope and camera in the detection of forgery, showing clearly how little chance there is for a false signature to escape detection when once submitted to the test of these instruments. The discussion of greatest general interest was introduced by a review of some of the medico-legal questions involved in the Cronin case. The experts, both for prosecution and defense, were present, and in giving the reasons that had led them to such opposite convictions, they showed the immense amount of experimental work on which these convictions were based. At the same time it was clearly brought out that vast ignorance exists concerning what a microscope can and cannot do in the determination of spots of blood, fragments of hair, etc. A committee was therefore formed to prepare a report which should serve as a basis of information regarding the nature of testimony which, at present, can be expected from a conscientious microscope expert.

The work of the session was relieved one morning by projections on a screen of some of the more interesting objects brought by members of the society. A magnification of signatures lately figuring in a forgery case made clear the points by which the false had been detected from the true. Projections of photographs taken with the crystalline lens of a calf and with the compound eye of a beetle, were a valuable contribution to our knowledge of the world as it appears to our poor relations. The picture that would be formed on the retina of a calf is much the same as that which reaches our own, the outlines being a little more blurred and the figure slightly dimmer. As for the beetle, the rays that pass through the lens of any one of his eyes carry an image of singularly sharp and well-defined outlines.

The difficulty in this case is the number of these images, the microscope, and the eye being projectors, but a small part of all those formed by the wonderous complex beetle-eye. A comparison was also made of the blood taken from the thigh of Kemmner—the murderer who recently suffered the penalty of the law by electrocution—with that from his forehead. The former showed the corpuscles unchanged, while those of the latter were completely and somewhat distorted. Dr. George Fell, President of the society, took this effect of electricity on protoplasm as the theme of his address, in the course of which he detailed the careful experiments on which the mode of applying the electricity had been evolved. He also condemned the sensational accounts that have been given of the event, saying that in his opinion—and he was present—both was almost instantaneous and entirely painless.

It is the custom of the society to give the afternoon of one day to a working session. This, too, is most the profitable part of the meeting. Skilful manipulators sit at their tables and give practical demonstrations of the part of microscopic technique with which they are most familiar. The
After this gradual lowering of the waters, and consequent elevation of the vast mountain ridges, we find the verdure representing Arctic, sub-Arctic, temperate, semi-tropical, and tropical plants,—for, as the waters cut and scooped out channels for themselves, the plants must needs accommodate themselves to the widely different altitudes. A marked peculiarity is the noticeable sparseness of the individuals, and the large number of the different species. An acre of ground in the rich alluvial soil of the river basins on the Atlantic slope or in the Mississippi Valley contains more than ten times as many plants as an acre of land in the valley of the Rio Grande. It must be remembered that the tones and colors of this vast grayish-green land, always bounded by a mockit, fugitive horizon, forever receding, is over 7,000 feet above the level of the sea; that the vast arid wastes are all broken about the edges by the traversing canons—the sluce-ways for the drainage of the majestic flint vertebra of the old Rockies; and that where aridity prevails, browns and blacks prevail. The great falcate leaves stain the sun's rays in all directions and the grand proportions of the articulated skeleton show but slight vegetable clothing with which to drape and save from utter nakedness.

The vast plains absorb distance. Travelling over miles of apparently endless sameness, it is as if you had not moved; pursue the vanishing point before you, and there is no visible shortening in the perspective—the enormous horizons, the ages, with your progress. This is the bed of the former great lake. In shrinking, the thousands of square miles left exposed, saturated with alkali, were left unfitted for any of the usual plants, but in time alkaline plants, of grayish tint, and covered with minute scales of scurfy meal, filled in. These may be the representatives of those forests of the prairies, the prairie oaks, ashes, elms, the many of them—to the beam family (Chionopappus), the prominent horsetails and sedge, and the more noble [Grasses which], but there are grasses, also, which thrive upon desolate wastes. There are many of this family of plants, the different species including both shrubs and herbs. The scrobicula, salicornia, and succa are mostly annuals with flat leaves, while the saccand sprostachys are shrubs.

The dry plains, sage-brush, rabbit-bush, and greasewood. The flowers of these flats are quite short-lived, and are composed chiefly of annuals. Among them are the little golden poppies, eschscholtzias, gillias, composite, phlox, peucadamn, and phacelias, which mature in a few weeks, ripen, and blow away, leaving no trace behind to cover the bare earth during the many dry months.

The clothing of the foot-hills are shrubs, from two to four feet high.

The higher slopes are covered with black-jaack, a hardy scrub-oak. Lower down the gray sage-brush (Artemisia), the green rabbit-bush (Listereria), and greasewood (Bigelovia) abound. Carpeting the ground beneath these are many pretty flowers: penstemons, callirhonnas, lupines, wild roses, and snow-bush, and such flowers as asters, delphiniums, and grasses, purple astragals, and a great variety of yellow and purple peucadams and varieties of composite.

Advancing upward, we now consider the flora found on the slopes of the ranges facing the continental divide; but what is true of the soil in a given altitude in this region, is, in measure, true of the products of the valley at the same altitude. All throughout the Rocky Mountain system the higher mountains are so variable in their flora—according to the moisture, soil, and position—that the species are very diversified. It contains most specimens of the forests, although the timber, as a rule, is almost exclusively evergreen. The mountains are magnificent during the flowering season, and "Solomon in all his glory" could never bear the shadow of a comparison,—asters, columbines, painted-cups, clematis, primrose, milk-vetch, the leaper, and many others.

In the driest portions of the country—dry hills and sandy plains—are found those parodies on the luxuriant flowers of the tropics, the cactusae, whose suggestive shapes, sharp needles, and deliriously luxurious flowers are the delight, tantalizingly guarded, of the too confiding traveller. By using precaution, however, the beauty and sweets may be gathered and the thorns avoided. The prickly pears are very abundant, and have a beautiful bloom and edible fruit, with flat-lobed stems, resembling a leaf and shaped like a pear. The mammillariases are fitted to each situation by giving a circle of needles defending the little ball on every side; and the stem, thrusting itself upward from the spaces between the tubercles, bears the most beautiful bell-shaped flowers, and the bloom is quite profuse. From the glow of the blood-red center the corolla shades to a pale pinkish tint at the tip of the fringed petals. These flowers only open in the afternoon and at night.

The barrel cactus (echinocactus) is perfectly round, may be from one to four feet high, has neither leaf nor stem, and is provided with vertical or spiral ridges the entire length, about an inch apart; these ridges are furnished with formidable spines, which are often hooked. When standing out on the desert they look like a sentry on guard. These flowers are less showy than those of the boll cactus. The bush cactus is the most profuse bloomer, growing in a dense circular mass, often five score stems in a bunch. Out of each stem arise several blood-red flowers, so numerous that the plant takes the form of a pagoda of bloom, and seems some freak of beauty from the brain of the god of the gods, naught in "Arabian Nights." A barrel cactus.

One of the remarkable features of the distribution of the flora in New Mexico is, that the lofty mountain peaks, far distant and separated by arid, parched plains and alkaline wastes, have the same flora and the same distribution of flora at the same altitude, showing the height of the water; and, as the climatic changes swept on, period following period, the flora adapted itself to the changes, and the cacti which appeared in the "Arabian Nights," although it often fell low down upon the mountain sides. The lake drained by the turbid Rio Grande on the south and the Rio San Juan on the west, was drained of its vitality to swell the waters of the Gulf of Mexico on the one hand, while the rapid Colorado received the overflow on the other; and as the rivers wore away deeper and deeper canons for themselves, the water shrank and shrank, and as the snow disappeared from the mountains, the forest climbed up the moist defiles and the bold spurs, and the warmth of the climate invited a semi-tropical luxuriance.

Then, as the water shrank lower and lower, and the snow crept higher and higher, most of the deciduous trees, and most of the grasses and flowers, perished. The lake, in shrinking, left the mineral salts in the basin, now the alkali plains; a few species perished, and the thousands and thousands of acres, left exposed were plains covered with alkali, in which no ordinary plants could grow. Sage-brush, grease-wood, and rabbit-bushes in time covered the land, and a variety of feces grass.

Therefore, from the Arctic zone to the tropics there are found the necessary conditions, and a great variety of species representing each gradation of moisture, temperature, and soil. The Alpine flora at the high altitudes—evergreen and most specimens of deciduous trees and shrubs known in the temperate zone, and the mosses, ferns, and lichens to correspond, with a great variety of shrubs and plants. The crucifers, leguminosae, rosaceae, composite, polemoniaceae, scrophulari-
ace, polygonaee, cyperaceae, gramineae, and fungi are represented by ninety, one hundred, one hundred and fifty, four hundred species, and so on throughout the list. Hundreds of species are largely represented.

At a lower altitude are found eurolia and abrispil, and here the flora glissia, eschscholtzia, and compositae are found. On the plains at the mountain bases are grasses and sedges, the great resource of the stockmen. On the sandy plains and the dryest hills are the cactaceae and various members of the beet family.

The total number of species is over twenty-five hundred, as is now known, and doubtless in time there will be found many more, enlarging the list to nearly twice that number; while in the area of any State in the Mississippi Valley the highest number of flowering plants is under five hundred.

A strange, far off land is this land of the sun, and it is one that admits of much scrutiny in many ways, and is full of interest.

[Original in Popular Science News.]

A FEW RHODE ISLAND ORCHIDS.

By S. E. Kennedy.

Along the margin of our little streams, among the ferns and our swampy pastures, or afar in the depths of our pleasant woods, grow several species of Interesting orchids. Early in June we find the beautiful arethusa rising from a small, round bulb, hidden deep in the sprays of feathery moss, with its one large, fragrant flower crowing the short stem, clothed with its three lanceolate sheaths. I like to hold this dainty blossom in the sunshine, and, looking across it, catch the silvery lustre reflected from the glistening surface of petal and sepal. To me this blossom is "spring-time's richest dower," and I cannot do otherwise than mourn its departure, although its loss is partially made up in coming or petal of its less comic sister, the calopogon. This grows in much the same kind of soil, its delicate perfume leading the enthusiastic botanist direct to its locality. Its slender stem bears from three to eight large purple flowers, remarkable for the inverted position of the lip, owing to the ovary not being twisted as in other orchids.

Another denizen of our swamps is the pogonia. *P. phlogisoides* bears a light-purplish flower, quite pretty, but without having reached handspan. At one time that these are in bloom, *Cyperisum sativum* may be found in shady situations, its large, plated, downy leaves being by no means the least interesting part of the plant. They say that the yellow lady's-slipper is found here also, but I have never been fortunate enough to obtain a specimen.

Next in order of blossoming is the *Habenaria resinosa*, a famous type of incomparable green flowers entitle it to no particular respect. Somewhat more worthy of notice is the *H. labiosa*. Its loose spike of greenish-white flowers, though not showy, are made interesting by the reflexed lip with its deeply-parted capillary segments. We find this, as well as *H. resinosa*, among the tall grasses along the banks of the rivers.

Contemporary with these is the Goodyera, with its curiously motiled leaves and small white flowers. This we find under evergreens in the woods and in shady places in swampy pastures. Spiranthes is another small but interesting flower, found in old woods and among the grass of our wet meadows. *S. grandiflora*, with fragrant white flowers upon their twisted racis, was one of the wonders of my childhood—a feeling in no wise lessened by the research of later years.

The next to bloom is the beautiful *Habenaria floribunda*. It grows two to three feet high, bearing a long raceme of lilac-puple flowers, and is considered by some the most superb of all the orchids. Somewhat resembling this, but inferior in size and beauty is *H. pygotes*, also a purple-fringed orchid, common in our meadows.

But if these are beautiful, what may not be said of *H. elisoria*, the crowning glory of the genus? Its bright orange-colored flowers make it a conspicuous object in any locality favored by its presence—for this is no common plant, and we may, perhaps, be forgiven for boasting of its partiality to our own country and our swampy marshes. There are some who may be confused by the fact that it does not grow here in such abundance as the less beautiful varieties do.

MOOSUP VALLEY, R. I.

Correspondence.

Brief communications upon subjects of scientific interest will be welcomed from any quarter. The editors do not receive early indorse all views and statements presented by their correspondents.

**AUTOGRAFISM.**

**Editor of Popular Science News:**

While I was reading the article on "Autograftism," I was filled with wonder that the facts mentioned should have left anyone in my boyhood. I had observed them, i.e., I had seen that a scratch with the finger-nails, that did not break the skin or roughen it, was often followed by the appearance of a red line that seemed slightly raised above the general surface. This was recalled to mind when there appeared before the public, about the year 1870, a so-called spiritual medium, who claimed to show the name of a friend in his body, by the initial letter of a spirit friend's name. I then thought—that and since had no reason to change my opinion—that the so-called medium retired for a refreshing draught, or some other ostensible purpose, and then and there traced on his arm, with a smooth glass, wood, or metal point, a letter or letters. I have often demonstrated to friends that it could be done in any way, and on anyone's arm; so that there is no call for a spirit presence, or diseased condition theory, to account for the facts. The newly-born Infant has the redness of skin over the entire body which is there observed, only under what seems abnormal conditions. In a few individuals where the warmth and nourishment are proportional, and not to the next, the normal conditions continue, but in the vast majority of cases the skin shrinks and pales, and disease comes as a result of an abnormal condition, by which the heart's work in circulating the blood is greatly increased, and the most poisonous waste of the body prevented from passing readily to the air, to the detriment of those organs by which it is eliminated vicariously, or, being retained in the body, poisons the blood and causes death. I have relieved infants that had laid coma from cholera infantum for three days, by producing, in a mechanical way, the normal condition of the skin. The relief is immediate in the coma of cholera infantum, and, indeed, any coma, in sudden, acute mania, chloris, and many other nervous diseases. They originate in this abnormal condition. I am sure that more than seventy-five per cent of human diseases have their inception or acceleration in abnormal conditions of the skin. Even a burn may have the pain relieved and the surface more quickly healed by keeping the circulation in the skin normal.

Dr. Nesnet can have a satisfactory explanation of all his phenomena from yours truly. Geo. F. Waters.

**BALLHATCHET—BALLHACHE.**

**Editor of Popular Science News:**

When I was on a pleasant visit in New England last month, an esteemed friend called my attention to a paragraph that occurred in your May number relative to the name Ballhatchet, and by this mail the friend in question has sent me a copy of the paper. I find the paragraph runs as follows:

It is a well known fact that in ancient times, the Phoenicians had numerous settlements on the southern coast of England. An interesting discovery has recently been made, in a little village in Devonshire, of some direct descendants of these ancient colonists. For many centuries the name of Ballhatchet has resided on a farm known as Ballford, or Bal's ford. The name Phoenoe, it is evidently a corruption of ball-akhed. Immediately afterwards a bill, which is known to this day as Ball-Tor, or rock of the Phoenoe. The last male survivor of the family, Mr. Thomas Ballhatchet, is seventy-four years of age, and is said to have a facial type quite distinct from that of the natives of Cornwall and Devon, and distinctly of a Levantine character. The long survival of this name of the Phoenician deity is very interesting, and it is quite possible that the present Mr. Ballhatchet is a direct descendant of an ancient Phoenician priest of Bal, whose temple formerly stood upon the ground now occupied by his farm buildings.

This story seems to have originated in the *Manchester Guardian*, wherein its London correspondent—the latter part of last year—wrote almost word for word the same. A writer in *Notes and Queries* (London, Eng,) for January 14th, 1859, quotes it and says: "Surely such a statement deserves a niche in *Notes and Queries*, if only to show that this marvelously mild autumn has produced big geeseberries in more ways than one. The surname in question is simply a corruption of Ballhache, a family which has existed in Jersey (Channel Islands) from time immemorial, members of which, like those of so many ancient British surnames, have doubled settled on the opposite coast (Devon)."

I may add that so far from Mr. Thomas Ballhatchet's—his name, I see, is spelt Ballhatchett in White's "Devonshire Directory" for 1850—being the last of his race, the patronymic is by no means an uncommon one hereabout.

I am sorry to a story possessing so little foundation that I can add to its daily in your admirable little paper, and thank you greatly, in anticipation, for inserting this correction.

Yours obediently,

Harry Items.

**FIR PARK, EXETER, ENG., August 11, 1890.**

**THE CHIGGER.**

**Editor of Popular Science News:**

Your correspondent (H. M. Whelply, F. R. M. S.) on the chigger would hear it called in New Jersey "sand-tick," and it is the worst on the sweet-fen. It is said that it is to be avoided. I do not know as the native population use any remedies, but those that have come here to live from other sections of the country use salt-wash in strong salt water. In my family we frequently rub dry salt over us to prevent the itching caused by them. In East Tennessee it is called chigger. We find it worse on the raspberry than on the blackberry here on my place.

Respectfully yours,

Mrs. H. B. Perry.

**Lakewood, N. J.**

**THE EIFFEL TOWER TO BE UTILIZED.**—It is stated that advantage is to be taken of the elevation of the Eiffel Tower to erect a manometric tube to contain mercury, so that at the bottom a pressure would be obtained equal to 100 atmospheres (roughly speaking, about 6,000 pounds, or two and a half tons to the square inch). M. Call teut proposes to utilize this enormous pressure in his investigations concerning the liquefaction of gases.
Practical Chemistry and the Arts.

THE MANUFACTURE OF SODIC CARBONATE.

The history of the manufacture of sodic carbonate, or sal soda, is an interesting one, as it was a direct result of a chemical research, and has been an important factor in the commercial prosperity of France and other countries. Carbonate of soda is used in immense quantities in the arts, especially in soap and glass making; and its cheap production is of a matter of great importance.

Carbonate of soda occurs but very sparingly in nature; the native of Egypt and the tare of Africa and South America are examples. Up to the latter part of the last century the principle source of supply was obtained by burning the ashes of a marine plant growing on the coast of Spain. This ash contained about one-fourth its weight of sodic carbonate, and the cost of its production was necessarily large. But even this limited source of supply was curtailed during the wars of the French Revolution, and Napoleon, realizing the importance of a supply of the substance, offered a premium for the discovery of a process by which it could be cheaply manufactured at home; and this led to the discovery of the Leblanc process, by which sodic carbonate can be abundantly produced from sodic chloride, or common salt, at a cost far less than that of the old-fashioned way of burning seaweed.

The first step in the process is the transformation of the sodic chloride into sodic sulphate, which is accomplished by heating it in a reverberatory furnace with sulphuric acid, the reaction being as follows:

$$2\text{NaCl} + \text{H}_2\text{SO}_4 = 2\text{HCl} + \text{Na}_2\text{SO}_4$$

The hydrochloric acid gas (HCl) is absorbed by water to form the commercial muriatic acid, which commands a ready market, and is an important factor in the economy of the process.

After the sodic sulphate—or "salt-cake," as it is called—has become thoroughly dry, it is mixed with fragments of limestone and coal, and again strongly heated, when it fuses to a dark-colored mass, known as "black-ash," composed of sodic carbonate, lime, and calcic sulphide. The chemical reactions which take place are rather complicated, but we give them below, as they may be of interest to students of chemistry.

First, when the sodic sulphate is heated with the coal, or carbon, it is changed to sodic sulphide, while carbonic oxide gas is evolved, thus:

$$\text{Na}_2\text{SO}_4 + \text{C}_2 = \text{Na}_2\text{S} + 4\text{CO}.$$ Again, when calcic carbonate is heated with carbon, carbonic oxide gas is given off, and calcic oxide, or lime, remains: $\text{CaCO}_3 + \text{C} = 2\text{CO} + \text{CaO}$. Finally, when sodic sulphide and lime are heated together in the presence of carbonic acid gas, sodic carbonate and calcic sulphide are produced:

$$\text{Na}_3\text{S} + \text{CaO} + \text{CO}_2 = \text{Na}_2\text{CO}_3 + \text{CaS}.$$ The soda-ash produced by treating the black-ash with water and evaporating the solution to dryness, is not pure, but contains a certain amount of caustic soda, formed by the action of the excess of lime upon the sodic carbonate. So the crude soda-ash is mixed again with powdered coal, and heated, when the carbonic acid gas formed converts the caustic soda once more into carbonate, and it is only necessary to dissolve the mass in water and crystallize out the pure sodic carbonate.

Later, the Solvay, or ammonia-soda, process for the manufacture of the carbonate was introduced, and would have entirely superseded the Leblanc process if it were not for the fact that the latter produces, as a by-product, a large amount of hydrochloric acid, which finds a ready sale, thereby rendering it slightly more economical than the Solvay method. The latter process depends upon a curious reaction between sodic chloride and hydro-ammonio carbonate, as follows:

$$\text{NaCl} + \text{NH}_3 + \text{H}_2\text{CO}_3 = \text{NaHCO}_3 + \text{NH}_4\text{Cl}.$$ In practice the solution of sodic chloride is mixed with about one-fifth its volume of ammonia, and carbonic acid gas passed into it, when the sodic bicarbonate is precipitated. The bicarbonate is converted into carbonate by simple heating, while the ammonio chloride is decomposed by lime, and the resulting ammonio gas used over again. Several methods have been proposed by which the chlorine at present lost in this process may be recovered, but until this can be profitably accomplished, the rivalry between the Leblanc and Solvay systems will probably continue.

Another by-product of the Leblanc process is the sulphur, from the sulphide of calcium. This was formerly thrown away, thereby creating a nuisance, but the sulphur is now recovered in its elementary form and sold at a profit.

Hydrosodic carbonate, or saleratus, (HNaCO$_3$), is formed directly in the Solvay process, but is usually made by exposing the moist carbonate to an atmosphere of carbonic acid gas, thus:

$$\text{Na}_3\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O} = 2(\text{NaHCO}_3).$$ It is principally used in the manufacture of baking-powder.

The interdependence of the arts is well illustrated by the history of the Leblanc process. The cheaper production of the soda-ash led to its increased use in glass and soap making, and the consequentcheapening of those articles led to an increased demand, which, in turn, created a still larger demand for soda-ash. The extension of the soda-ash manufacture led to a demand for larger quantities of the sulphuric acid used in the process, which gave rise to so many improvements in its manufacture that its previous high price was gradually reduced to the present nominal cost, allowing it also to be used freely in many other arts and manufactures. The increased production of hydrochloric acid as a by-product, cheapened the cost of bleaching-powder and greatly benefited the cotton-bleaching and calico-printing industries. In short, it may be said that the indirect result of the French wars which led to Leblanc's discovery, was of more benefit to mankind than the direct benefit of all the wars and battles that have occurred since the dawn of civilization.

[Original in Popular Science News.]

THE ORES OF IRON.

BY W. J. CHASE.

Pure metallic iron is only to be found in the chemical laboratory, and, on account of the difficulty of its preparation, has no commercial value. In color, the chemically pure metal varies from a bluish gray to a silvery white, according to the method of its preparation, and has a specific gravity of about 7.85. Compare to pure iron, however, is sometimes found in nature in the form of meteoric iron, but the supply from this source is extremely small. When thus found, it is almost invariably accompanied by nickel.

The sources from which the great iron supply of the world is derived, are those ores in which the iron exists in combination with nonmetallic substances. These may be divided into three classes, viz., the sulphides, the carbonates, and the oxides, according to the proportion of sulphur, carbon, or oxygen present in the ore. Other substances also exist in these compounds, and on the varying proportions of this accompanying foreign matter depends the ore's value, which is by no means necessarily commensurate with the amount of actual iron present in them. The presence of certain impurities, notably phosphorus, in other than most trifling quantities, greatly lessens the value of the ores, and in like manner the admixture of other gangues by increasing the difficulty of working the ores decreases their value.

The sulphides, notably the pyrites, while an important source of oil of vitriol and sulphuric acid, furnish but little iron. The residue, however, left in the process of making this vitriol is an important aid in the working of iron in the puddling furnaces.

Of the carbonates, the only two forms of value to the iron smelter are the spathic ores and the clay iron stones or argillaceous iron ores. The spathic ores, so called from their foliated structure, contain the carbonate of iron in a crystallized form, and are competitively free from earthy matters. They generally contain magnesium and manganese, but, being usually very free from sulphur and phosphorus, are very valuable ores for smelting purposes. Their yield of metal is usually about 40 per cent. In the argillaceous ores the crystalline structure is not usually apparent, and a more or less large amount of clayey matter is present. Usually, too, the ferrous carbonate is accompanied by a large amount of calcium carbonate, rendering the ores "lean," but, on account of their self-fluxing property, valuable for mixing with other richer ores. Large deposits of clay iron stones are found in the coal measures in layers alternating with strata of coal, and on this account, as well as because of the black color given them by the excess of carbonaceous
matter they contain, these are then called blackband ores. They yield generally about 33 per cent. of metallic iron.

Of the oxides of iron, the most important are the magnetites, and the red and brown hematites.

Magnetite, so called from its magnetic property, which has also given it the name lodestone, is one of the richest of iron ores, and contains when purest, 72.41 per cent. of iron. It is generally found combined with a gangue of silica, lime, alumina, and sometimes, also, small quantities of sulphur and phosphorus. It is most often iron black in color, yielding a black streak, and occurs in granite, gneiss, clay slate, hornblende schist, and limestone, often in company with the hematites.

Red hematite is most commonly found in one of four forms which are so nearly similar as specular iron, micaceous iron, kidney ore, and red ochre. The specular is a crystalline variety of a steel gray color, often called from its long, hexagonal-shaped crystals, needle ore. The micaceous variety occurs in the form of thin sheets or scales of a reddish-brown color. Kidney ore occurs as dark brownish-red botryoidal and kidney-shaped concretions, often with smooth and lustrous surfaces. Red ochre is a soft, earthy, pellicle red, often overlapping the surface as a pigment, though used also in puddling furnaces.

A less common variety is known as fossiliferous ore, from the small fossil shells it contains, on account of the lime in which, it is self-fluxing.

The gangue of these ores consists largely of silica, and is comparatively free from sulphur and phosphorus. Their yield of metal is from 20 to 70 per cent.

There are usually found in the older geological formations, particularly the Trenton limestones.

Brown hematite, common forms of which are limonite, pot iron, and bog iron ore, yields about 60 per cent. of metallic iron when most pure, but these ores vary very much, both to the quantity of pure iron they contain, and as to the constituents of their gangues. Sulphur, phosphorus, manganese, and silica are usually present, but in no fixed proportions.

The brown hematite deposits are generally found in the clay above the subscurboniferous limestones, usually of a sedimentary character forming beds of ore, but sometimes, especially in the older formations, existing in veins.

The United States at present produces about one-fourth of the entire output of the world, which is about 12,000,000 tons. Of this, the Lake Superior region at present furnishes the most, chiefly red hematite and magnetite. Pennsylvania, with its soft magnetites and carbonates, is the next important source of supply. New Jersey and the Adiron-dack and Lake Champlain regions are also prolific sources of magnetites, and Missouri furnishes large quantities of red hematites, chiefly in the form of specular iron ore. In Virginia, North Carolina, Georgia, Alabama, Tennessee, and Kentucky, increasingly large quantities of ore are mined yearly, and of this, about 50 per cent. is red hematite, 25 per cent. brown hematite, and 5 per cent. magnetite. And it will probably not be many years before these States constituting the New South become the principal source of the world's iron supply.

STEEL RAILWAY TIES.

Experiment is being made by the Delaware and Hudson Railroad Company to test the adaptability and superiority of steel ties for railroad use. On a section of track south from Ballston for nearly half a mile, the wooden sleepers have been removed and the track reconstructed with the steel ties. So far they give good satisfaction. As trains pass rapidly over this piece of road, a peculiar buzzing noise is noticeable, also the vibration caused by the wheels upon the rails is observably greater; but it is also the smoothest and most pleasant riding piece of road between Troy and Saratoga. The test of the safety and adaptability of the steel ties is being made under the supervision of A. J. Swift, chief engineer of the road, and they will be adopted or rejected upon his recommendation.

So far he regards the steel ties as a success; but no more will be laid until those now in use have had the test of the winter to see in what manner, if any, they will stand up by ice, frost, and snow, and if they are equally safe from quicksand and quicksand and gravel. If they stand their tests, Mr. Swift has no doubt of the steel ties being specifically adopted for general use as the old wooden sleepers need to be replaced. The objection of their greatly increased first cost is fully met and overcome by their durability. Of their greater safety, if they stand the test, there can be no doubt, as by their use it is impossible for the rails to spread or in any other manner to become displaced. They also give to the track the perfect effect of a continual rail. The steel ties are in shape an inverted "T." They are seven feet long, seven inches wide, and are laid twenty-two inches apart from centers. At either end is one hole to cast into the socket, in which is laid a block of wood, four by five inches square and about sixteen inches long, and upon which the rail is laid and firmly held in place.—Scientific American.

INDUSTRIAL MEMORANDA.

TO SOLDER PIN-HOLES IN PLATINUM VESSELS.

A ready means is suggested by Mr. Platt in the Journal de Pharmacie et de Chirurgie for soldering the minute pin-holes which occur in old platinum vessels which have been heated. A few milligrams of chloride of gold are placed over the flaw, and warmed to fusion. The fused mass is then heated in the flame of an oxyhydrogen blowpipe, when the gold salt is reduced to the metallic state, leaving a neatly soldered spot.

A REMARKABLE ACCIDENT.—A man employed in the chlorate of potash department of Messrs. Muspratt's works, at Flint, Wales, was entering the premises when he struck a light against his trousers. The wearing apparel was so impregnated with chlorate of potash that the hand which held it was immediately enveloped in a mass of flame. A fellow-workman promptly threw him into a pool of water, but when extracted it was found that he had been so fearfully burnt that no hopes are entertained of saving his life.

GATLING'S CAST STEEL GUN.—Dr. Gatling has invented a new steel gun, which he claims will be far superior to the built-up gun, and can be made at half the cost. The patent consists of making guns cast from the highest grade of steel to shape around a central core. This central core is utilized for the purpose of cooling the casting from the interior while the exterior is still hot. The cooling process thus begins from the interior and works out, directly the reverse of the ordinary way. The metal is forced, as it were, from the interior outwardly, thereby avoiding the creation of a hard, resisting shell on the exterior of the casting, at which point the full intensity of the high-power force exerted by the exploding ingredients within the gun exerts itself. It makes the interior of the gun, where the greatest strain is felt, the toughest and hardest part, and the soft and spongier part the exterior, which thus acts somewhat after the manner of a cushion. This is directly the reverse of the old style guns, in which the spongier part is on the interior. Another important point is the method in which the metal is cast. A revolving motion is given it, which makes the grain spiral.

STEEL RAILWAY TIES.

The Out-Door World.

On the Shores of Lake Quinsigamond.

One of the best places in the world for a boy to spend the summer is at the Natural History Camp at Lake Quinsigamond. If any boy does not know where this lake is, and about all its beauty, it is because he isn't old enough to be interested in boating, for everybody knows that many a famous college race has been rowed on its beautiful and glistening waters. It is three miles from the city of Worcester, in Massachusetts, and is reached by a busy little narrow-gauge railway, over which open cars run merrily back and forth every hour—and I don't know but every half hour—in the day.

History of the Camp.

A few years ago, Dr. Raymond, of the Worcesters Society of Natural History, conceived the idea of establishing a natural history camp for boys on the shore of this lake. Other members of the society became interested, and also many gentlemen of Worcester and prominent educators and lovers of boys everywhere. Mr. E. W. Forbush is now President of the institution. Many persons shook their heads doubtfully at first, and began to talk about all the difficulties and dangers of the plan. Where would the money come from? Would they have care to go? Suppose they should be taken sick miles away from a physician? Could discipline be maintained? Would it be good for boys to study so hard in the summer? Wouldn't they get drowned? How would they be interested evenings? What about Sundays? Such were some of the questions raised by the croakers, and it seemed for a time as if they could actually invent two equally difficult conundrums while the favorers of the plan were solving one. But, fortunately, as each question arose it was answered so wisely that it staid answered, and by and by the doubters found it so hard to work in imagination any more evil possibilities that they got tired of trying, and admitted that after all it was a bold and a great success.

The President of the Agassiz Association was invited by Mr. Kelley, one of the managers of the camp, to go to Worcester and talk to the boys about local societies for the study of natural history. The invitation was accepted, and the time for the address was fixed for June 24, the day of the formal opening. At the appointed time the pretty pavilion by the lake was crowded by an earnest audience, composed of campers and their friends, who were all greatly interested to hear of the many enthusiastic bands of boys and girls who are engaged in studying natural science at their homes under the banner of the Agassiz Association. But the speaker was more interested in using his eyes and ears than his lips, for he had never before seen so good a solution of the question, "What shall we do with our boys in the summer?"

The Roa-dside Camp.

The narrow-gauge railroad, already mentioned, ends at a point on the lake about two miles from the camp. Here a pretty steam yacht was found, just ready to start for camp. Several handsome, vigorous boys and young men were stepping aboard. They were dressed in a dark blue uniform, and had on their caps the letters "N. H. C."

"So it seems you have a little military drill?"

"Oh, yes; just enough for regularity and exercise."

POPULAR SCIENCE NEWS. [October, 1850.
THE GIRLS' CAMP.

What have we here?

"This is our girls' camp,—an experiment as yet, as you see, destined to be successful!"

How many are there?

"What?—girls or camps?"

"Girls."

We have forty. This is the first year. We have more than a hundred boys in the camp over there on the other side, and shall probably have as many girls here next summer.

By this time the party on the wharf had skipped on board, and the boat was headed for the other shore.

"This is our opening day, and these girls are going over to attend the exercises."

Can they keep comfortable here in case of a storm?

Oh, yes. You see we have a "fly" over every tent, and a dry raised floor. It can't rain hard enough to wet through.

What's that square tent with a glass window?

"That is something new,—a canvas house,—that is absolutely luxurious."

THE BOYS' CAMP.

Here we are! and the boat grazed the side of a commodious wharf, and was secured by the hawser.

"We have half an hour before dinner; would you like to look around?"

"Certainly; I want to see everything."

This is the work-shop. Here, you see, are plenty of tools, all of the best grade. They can be drawn, something as books are drawn from a library. On this wall are the nails and hooks on which they are kept. You see under each come here is a picture of the tool, that belongs on it, "life-size," so that a glance shows where each belongs.

That's a good scheme.

"Yes; and here is the work-room, bench, and everything handy. This boat is about half finished. It will easily carry half a dozen persons. We build one boat every year. We have one of the most expert boat-builders in the country come here and make it. He does a little every day, and explains everything to the boys, who help as they may be able."

Several boys were busy in this room.

This next room is devoted to photography. Here are the chemicals; this is the dark-room. There is an half hour in attendance every day, so that all who wish can learn the art.

All who wish? Is everything here voluntary?

"Everything except the military drill and the swimming lesson."

Can you give me an idea of a day in camp?"
many instances, retained their native tribal habits, likes and dislikes, foods, etc. We had an old negro in our family for several years who had been captured and brought over by a slaver when he was quite a well-grown man. He had a great antipathy to Guinea negroes, and never missed an opportunity to show his contempt for "Ginny nigga," saying, among other things concerning them, that they were "wasser's po' backa," (worse than poor white trash). He always called the peanut "gooba," while to the negroes generally it was a "pinder" or "pinda."—Frank L. James, St. Louis, Mo.

266. A Half Hour With a Pair of White-Bellied Nuthatches.—I experienced a great deal of pleasure, one day in April, in watching the operations of a pair of nuthatches, notwithstanding the fact that there was a slight rain and cold wind. The pair were apparently in search of their dinner. The loving attention and diligence of the male bird were worthy of commendation and imitation. The birds were in an old apple orchard, and were running up and down the branches of the trees, looking in every nook and crevice, and under the pieces of loose bark, in search of insects or their larvae or pupa. After a diligent search on the trunk of the tree, the male found something which he thought worthy of his attention. The tact and skill which he exhibited in securing this choice viand was quite surprising. He drove his bill into the hard bark with great force and rapidity, frequently uttering its low, piping note, and changing its position in such a manner as to offer the lounging in the least advantage. After a few moments of diligent hammering he succeeded in getting the choice morsel, which must have been the chrysalis of some insect, as I found part of a cocoon fast to the tree, at the point where he had been at work. What do you suppose he did as soon as he had obtained this hard-eared bit of food? He flew directly to another branch of the tree, where his mate was at work, placed the morsel in her open bill, and started off in search of another. He worked in this way for the half hour that I watched them, and I know not how long before, bringing everything that he found and giving it to his companion. I saw him give her something five or six times; the last time I stood within ten or twelve feet of them. The gallant little fellow came from a neighboring tree with some food which he had found, and alighted beside his mate, who immedi-ately opened her mouth and received the food, and informed him that she had sufficient by sitting down upon the limb and trying to make herself comfortable. He seemed to understand her perfectly, for, instead of flying back to the tree from which he had come, he flew to another branch a few feet distant and seated himself, all the while piping his low notes, which seemed to express perfect enjoyment.

-L. O. P., Hickman, Ky.

[Written for "The Out-Door World."]

ABOUT GRASSES.

BY ALFRED H. PETRES.
Of the Agronomy Association.

[Concluded from September number.]

During the latter part of June flowers also the true blue grass, sometimes called wire grass, (Poa compressa), (Fig. 5). This grass is a native, and belongs to the same genus as June grass, though it is in habit entirely different. It is a small grass, found in patches, chiefly upon the dry hill-sides and sandy barrens of the Northern States. It appears to prefer a thin soil, and may be readily recognized by its flattened stalk and short, fine, deep-green blades, which, when seen in the dew on them, are actually blue. The stalks are seldom above a foot in height, and creep more or less from the root. They are flattened, unlike any other in the order, and are enclosed in heavy sheaths, the last one of which extends nearly up to the head. This protection, together with its creeping habit, keeps the stalk fresh and green during the whole season, making the grass much appreciated by cattle, which crop it short, both stalk and blade, wherever found. The flower-head is very small, and the blossom of a greenish-white color. So much darker is this grass than any other that one standing upon a pastured slope may, in the right light, distinguish its patches for rods away. Only its seediness prevents it from being the most valuable of all the pasture gras- ses.

The tall, rank-growing timothy,—called also "herb's-grass" and "cat-tail grass"—(Phleum pratense), (Fig. 6), is the best-known and most widely-cultivated grass in the United States. Its stout, erect stalks, from two to four feet in height, crowned by the familiar cylindrical spike, shoot up on all sides wherever in summer the sound of the mower is heard or red clover blossoms are seen. The abundance of its long, glaucous, or grayish-green blades, which grow not only from the base but from halfway up the stalk, makes this grass especially valuable for hay. It is sown for this purpose more than are all the rest of the grasses put together, and the seed is an important article of commerce. It blossoms in the North during the last week in June and the first week of July, with a flower varying from lavender to greenish-yellow. Timothy has a peculiar bullick-like root, different from all other of the common grasses, and is not, as some suppose, a native grass, but one very early naturalized from Europe.

Along with timothy appears "quick," "coch," or "quack" grass (Trisetum repens), (Fig. 7), from its underground creeping stems and domestic habits, a particular pest to gardeners. Although, like everything else, a nuisance when out of place, quick grass is not refused by cattle, either as pasture hay or hay. It is often seen in meadows and uplands, as well as in the garden, and on sandy slopes or along the beds of streams, and doubtless is used to hold the soil together by means of its multitudinous underground stems. It is a tall, coarse grass, of the same height and color as timothy, but in the shape of the blade and the flower-head more like the wheat-plant, to which it is own cousin. The flower is yellow. Quick grass comes to us abroad, and in England, from the way in which its stems work through the earth, is sometimes called "nimble will." The last to mature of the pasture grasses is the beautiful "red top," or "red bent" (Agrisipa vulgaris), (Fig. 8). This hardy native grass, found throughout all the older States, is called "bed's-grass" in some parts of the Union. The blades are long, narrow, sharply keeled, and of darker color than any other species save blue grass. The stalks are slender, and vary in height from one to three feet. By the first of July, in the North, the delicate, contractile flower-heads begin to shoot up amid other species, at first of a pale-green that, but when fully open, changing to purple. By the tenth of the month they are in full bloom, the flower being very small and of a whitish-yellow shade. The panicles, or flower-head, is the finest in texture and the most graceful of all the pasture grasses, becoming, after the flower is gone, of a brick-red color, whence the name. Red top is somewhat variable in habit, and is often mistaken for June grass, with which, however, it has little in common but the shape of its blades. It makes excellent hay, and is much esteemed for pasture, but does not appear to be relished by cattle like either June grass or blue grass.

The foregoing grasses are all perennial. Shade and condition of the soil will cause them to deviate somewhat from the prevailing type, but never so much as to make them unrecognizable. In number though a few only of the order, in quantity they are beyond estimate, and as animal food of the utmost importance. Our hay crop is of more value than our wheat crop, and both hay and pasture together more equal the value of our Indian corn. Our yards, woods, swamps, and stubbles contain numerous other species, some of which are quite common and others very rare. Several English grasses, like fox-tail, rye grass, etc., are also occasionally met with, but neither the one nor the other of these would as pasture or hay be missed this side the Mississippi.
Although we were unable to be present at the recent meeting of the American Association for the Advancement of Science, at Indianapolis, we learn from numerous correspondents that the meeting was an unusually successful one, and notable both in the large attendance and the character of the work done by the various sections. The citizens welcomed the members with true Western hospitality, and the occasion will long be remembered by those who were so fortunate as to be present. It should be understood that the Association is not composed entirely of professional scientists, but that all interested in science, whether especially devoted to any particular branch or not, are welcomed to membership, and are sure to find pleasure and profit in its meetings. We are sure that all readers of the Science News will be well repaid by attending the next summer's meeting of the Association.

Unforeseen circumstances prevented us from obtaining the summary of the more important papers read at the Indianapolis meeting which we hoped to lay before our readers, but special mention should be made of two papers read before the chemical section by Professors Morley, of Cleveland, and Noyes, of Terre Haute, upon the atomic weight of oxygen. Each has recently made many delicate experiments to determine this ratio of weight between oxygen and hydrogen, which is one of the most important of the unsolved problems of chemistry. The former made it 15.88, and the latter 15.9; but Professor Noyes admitted that Professor Morley's experiments had been superior to his own, and that Morley was, therefore, more nearly right. It will be noticed that these numbers are very slightly higher than those obtained by Professor Cooke and Lord Rayleigh, thus approximating more closely to the whole number required by Prout's hypothesis. There are, however, so many difficulties in the way of obtaining the exact relation of weight between oxygen and hydrogen, that it is, as yet, impossible to say with certainty what the relation is. Granting, however, that we are able to obtain hydrogen in a chemically pure state, the atomic weight of the latter is certainly much below 16, and probably less than 15.9.

An alleged chemist in Chicago has recently announced that he has discovered a process (carefully kept secret, of course) by which he can produce metallic aluminum at a cost of fifteen cents a pound. Such a claim is absurd upon the face of it to anyone acquainted with the chemical properties of this metal and its compounds. Every clay-bank is, it is true, a mine of aluminum ore; but the metal is so firmly united by the bonds of chemical affinity to the silicon and oxygen, that an amount of energy is required to separate it which costs many times more than the sum mentioned above. Aluminum cannot be produced by any process at present known to us for much less than two dollars a pound, and, although the cost will undoubtedly be further reduced, it is almost impossible that it should ever reach the extremely low figures quoted above.

The New York Legislature has again distinguished itself by passing a law which makes it a misdemeanor, punishable by fine, for any child actually or apparently under sixteen years of age to smoke or use tobacco in any form in any street or place of public resort. The law went into effect on the first of September, and we are pleased to learn that both the New York policemen and the small boys "actually or apparently under sixteen years of age" showed their superior good sense by entirely ignoring this preposterous piece of legislative idiocy. The craze for legislative interference with private affairs and personal liberty seems to be continually on the increase, and it is hard to say where it will end.

One of the recent triumphs of chemistry is the synthesis of dextrose (glucose) from its elements, by Professor Emil Fischer, as well as the similar sugars known as levulose, mannose, and sacrose. Professor Fischer has been engaged in the study of the sugars for some time, and has finally succeeded in producing from its elements and determining the chemical constitution of a substance which is chemically, physically, and optically identical with the ordinary dextrose that occurs in plants, and generally known as glucose, or grape sugar. Until Wohler, formed the comparatively simple organic substance urea from its elements, it was supposed that organic compounds could only be produced through the agency of the living organism, but since then a large number of such substances have been prepared directly from their inorganic elements. The synthesis of a substance with such a complex molecular formula as dextrose is certainly a remarkable feat, and only chemists can appreciate the amount of labor and perseverance involved in its accomplishment. We may add that this discovery is of no commercial importance, as dextrose prepared in this way would cost many hundred times as much as that formed in Nature's laboratory and obtained by the cheap and simple processes now in use.

GOLD.

Gold, has been known from the earliest time, and has always been considered the king of metals. Its beautiful color, its malleability and ductility, and its power of resistance to oxidation and other chemical changes, has given it a high order in the arts; while the same qualities, added to those of a limited but constant supply, and the high cost of mining, and extracting it from its ores, render it particularly well adapted for coinage, and to serve as a universal standard of value.

Gold is almost invariably found native, or in the metallic state, the few specimens of telluride of gold observed having only a scientific interest. It occurs either in the primitive rocks, or in the cellullous deposits formed from the destruction of these rocks, and washed down from higher to lower levels. A minute trace has been found in sea water from certain localities, but in too small quantity to pay for extraction. It has a very strong affinity for mercury, uniting with it to form a liquid amalgam, from which it can be separated by heating to the boiling-point of mercury, which passes off in vapor, leaving the pure gold behind. This process is very largely used in the separation

We are glad to insert, in another column, the letter of Mr. Hems giving the true history of the Ballhatchet family, which, it was alleged, had descended from an ancient Phoenician colony on the south coast of England. The item in question was obtained by us from an apparently reliable source, and the story was not, on the face, an improbable one. As our correspondent shows, however, it was only a sensational newspaper "yarn," and had no foundation in fact; so if there are any descendants of the pre-historic tin merchants still existing in England, they, as yet, remain unknown to fame.

As regards Dr. Waters's explanation of the alleged phenomena of "autographism," however, we must say that it does not seem to be a satisfactory one. The simple reddening of the skin by friction is a very different phenomenon from that described by Dr. Mesnet, who distinctly states that a comparatively slight irritation will bring about the peculiar reddening and swelling of the skin, and that it only occurs in the case of a very few persons of a distinctly hysterical temperament. Dr. Waters says that the phenomenon can be produced upon the skin of anyone, but we have been unable to produce it upon ourselves or upon anyone else. We are still inclined to think that "autographism" must be due to some abnormal condition of the skin, although, perhaps, susceptible of a more simple explanation than that advanced by Dr. Mesnet.
of minute particles of the metal from the rock in which it occurs.

Pure gold is so soft that it would soon be worn away by use, and it is always alloyed with a varying proportion of copper or silver, usually about one-tenth. Pure gold is said to be 24 carats. Thus, 18-carat gold contains 18 parts of the pure metal in 24, or, is three-quarters pure. Many cheap alloys of base metals can be made which very strongly resemble gold in color and lustre; but, in the absence of a complete chemical test, the high specific gravity of gold (19.3) is the best test of its purity, though this has been ingeniously imitated by covering the heavy but cheaper metal, platinum, with a layer of gold.

Iron pyrites and other yellowish minerals are constantly being mistaken for gold, by inexperienced persons, much to their disappointment, but a very simple test will show whether a doubtful specimen is really the true metal. Gold is very malleable, that is, it can be cut and shaved with a knife, like a piece of wood or horn; while pyrites and other worthless minerals will crumble under the knife-blade like a lump of sugar. If any reader of this article ever finds a yellowish mineral which can be cut without crumbling, it is worth a more thorough test; otherwise he may as well save himself unnecessary trouble and disappointment.

Very few chemicals have any effect on gold. Selenic acid will dissolve it, but few chemists have ever seen this very rare substance. A mixture of nitric and hydrochloric acids (aquar regia) will also dissolve it, forming a chlorid of gold; and so will a solution of chlorine gas in water. In both of these liquids a peculiarly active form of chlorine, known as nascent chlorine, is present, which probably unites directly with the metal.

Gold, like all the noble metals, is unchanged by heating in the air. Its oxides can be obtained by chemical reactions, but they are very unstable, and easily reduced back to the metal. The chlorid above referred to is the only salt of any practical importance, and is used to produce the beautiful Purple of Cassius, a compound of tin and gold of uncertain composition, but yielding a magnificent ruby color when melted into glass. A hundredth of a grain of gold will deeply color a cubic inch of glass. The most extensive use of the chlorid is, however, in photography, where it is used to "tone" or color prints on silvered paper. This darkening of the prints is due to the decomposition of the salt and the deposition in the picture of finely-divided metallic gold, which not only gives it the desired color but renders the image very permanent.

By heating between pieces of membrane, gold may be formed into leaves of such thinness that 262,000 of them will only make a pile one inch in height. A single ounce

verse that the human mind is unable to comprehend the number of years which would indicate its remoteness in time. [Specially Reported for Popular Science News]

INDIANA'S WELCOME TO THE AMERICAN ASSOCIATION.

WHEN Indianapolis was chosen for this year's meeting of the American Association for the Advancement of Science, there was a feeling—preluminarily—In the Eastern States—that the attendance would be but small, and limited to working scientists. "Those who go to Indianapolis," it was said, "will go there for science alone; what is there in Indiana to compensate a holiday-maker for the expense and fatigue of getting there?" The facts were overlooked that Indiana is distinguished for the number and efficiency of its scientific societies, and that it contains the almost unique feature of a supply of natural gas over a large district of its territory. Indianapolis—and Indiana, too—intended that this meeting should be a great success, and no trouble or expense was spared to secure that end. Indianapolis truly was in every way, and especially in the very direction in which failure seemed to threaten. So much was this the case that, although the work of the sections was of the average value,—in one or two instances even rising higher,—and the addresses of the president and vice presidents were of unusual interest, this Indianapolis meeting will be chiefly remembered for the excursions and social events incident to it.

The trip through the Indiana gas region, given to the members of the Association by the local committee, commanded universal admiration for the completeness of the arrangements, whereby the special train of eight cars was passed from one line of railroad to another, and nearly four hundred people were enabled to enjoy with ease and comfort sixteen hours of novel experiences. Leaving Indianapolis at 7 a.m., the train ran first to Noblesville, from which place Indianapolis largely draws its natural gas. Here a well was opened and the gas lighted. Burning with a large flame, the full pressure of 300 pounds to the inch was turned on, when the gas roared out as it used to roar from the great Pennsylvania "blowers," throwing up the flame to a height of seventy-five or eighty feet. Before the day was over the excursionists became almost bewildered with the repetition of this exhibition, as on the approach of the train every well within sight, large or small, roared and sent up a sheet of flame. While the visitors enjoyed this sight,—to many of them a novel one,—there were some among the scientists who deplored the waste involved, and lost no opportunity of suggesting that, though apparently unlimited, the supply of this precious fuel is, in reality, a fixed and definite quantity, which, when once exhausted, cannot be renewed.

From Noblesville the train ran to Kokomo, the pioneer natural gas city of Indiana, which, from being an ordinary county seat town of 5,000 inhabitants in 1856, when the drill first set free the screaming flames, has now become a manufacturing center of 12,000 people, with thirty-one industries, all dependent on the natural gas. Of these, because newest in this country, the most interesting to the members of the Association was the plate glass factory. Here they were permitted to witness the process of making the pots in which the material for the glass are melted. They then stood by while one of these pots, fresh from the furnace, was lifted and overturned over an iron table, its contents pouring out in a glowing, golden stream, soon to be rendered even and oblong by the passage over it
of a heavy iron roller. The table was then wheeled close up to the door of the annealing furnace, into which the red-hot, sparkling mass was transferred by a push so steady and skilful that it drew a round of applause from the spectators. The men and boys then turned the wheels of the machinery, which turned them from the scorching heat as best they can with leather shields. They work for six hours at a time, and are summoned when a batch of pots is ready to leave the furnaces. From these heated regions it was a relief to pass into the room where, with the help of sand, the rough surface is ground off the plates of glass, reducing the thickness by one-half. They are then transferred to the polishing disks to obtain an even gloss, and are then handed over to skilful workmen, who, by hand-work, remove every speck or blemish that may remain. The sheets of glass standing finished in the shop appeared to be of first-rate quality. One of them, destined for the World's Fair at Chicago, was fifteen feet by twelve.

Some idea of the quantity of glass employed in the manufactory of Kokomo may be formed from the fact that each of the sixty pots in use in the Diamond Plate Glass Works consumes about 70,000 feet per day—a total of about 4,000,000 feet every twenty-four hours. All this is supplied gratis.

In laying out the programme for the day, sufficient time had not been allowed for the serving of the excellent dinner provided by the hospitality of Kokomo. Consequently the time for the departure of the train had passed before everyone had dined, and then a further delay occurred before the track could be again secured. At Marlon, therefore, although a delegation headed by the Mayor welcomed the visitors, time only was allowed the president of the Association, Professor Goodale, for a brief response from the platform of the car. At Alexandria a delegation of citizens from Muncie joined the train, and, as had been done by Kokomo, presented each visitor with newspapers, souvenirs, and a badge representing a flame of gas shooting high above a derrick. Everything possible to make the visit to Muncie a success had been planned, and the visitors were to have been shown the various departments of the works, but for reasons which it has been impossible to avoid, Kokomo to a large part of the programme was omitted. The train, however, ran over a belt road to the pulp mill, where cord-wood was seen to be converted into paper; and an address, limited by order to ten minutes, was delivered by Dr. Phinney, on the geology of the gas field. The train then passed to the entrance of the base ball grounds, where the visitors, after being hospitably served with lemonade, claret-cup, and cigars, entered two trains of street cars drawn by mules, and were taken through the principal parts of the town to the station, where their own train awaited them.

It had been expected by Anderson that the scientists would arrive in time to see something of the city by daylight; consequently a large delegation of citizens was assembled at the station at the hour when the train was due. It was, however, 7 P.M. before the Association reached Anderson, and the visitors—much to their own regret as that of their hosts—took to forego the drive through the city and proceed at once to supper, each having received before leaving the train a basket containing a portion of that meal, naming the hotel which was to entertain him, and a free pass for the street cars. Supper was then served to about four hundred people without delay, and all were soon assembled in the lower room to witness a marvellous display of natural gas. A pipe from a neighboring well had been led under the river, and the gas lighted as it rose like a geyser through the water, covering it with a sheet of flame.

After this weird and beautiful scene, guests and hosts gathered in the Music Hall, for the exchange of speeches of welcome and thanks. At 10.30 P.M. the train was entered again, and a run of an hour brought the scientists back to Indianapolis, tired, but, as the principal, Miss Margaret Shaler, had said—"It had made the arrangements of the day, with the hospitality that had everywhere welcomed them, and with the instructive sights that they had seen.

Two other excursions there were which, though on a smaller scale, were equally satisfactory. On Friday the sections of physical and mechanical science were taken by a special train to Terre Haute, to hold their railway ride and a drive of seven miles to a ravine known as the "Shades of Death." Here they were permitted to rove at will, and, contrary to prohibitory notices, gather what they would of the flora it contained. The scenery was charming, and there was ample diversification. Some botanists struck immediately into the woods, and returned with many colored fungi, and the which, rooting at the apex of its elongated(palms) has obtained the name of the walking-leaf. At 6 P.M. a horn collected the party at the little hotel, where supper was found tastefully laid out on flower-bedecked tables, under the shade of the trees.

No small part of the success of the Indianapolis meeting is due to the fact that the sessions were all held in one building, the Capitol, an imposing structure of marble and brick, the halls and stately rooms of which the sections occupied the Senate Chamber, and the anthropologists the Hall of Representatives. The beauty and finish of the Capitol elicited admiration and praise at all times. Nevertheless, those who attended there the reception of the local committee will not soon forget the impressive surroundings in which General Lew Wallace welcomed the Association of Science, not only in the name of Indianapolis, but of the whole State of Indiana.

C. (Special Correspondence of Popular Science News.)

PARIS LETTER.

As usual, the summer season is the one during which the discoverers of new facts, as usual, the Association Francaise pour l'Avancement des Sciences has met in one of the provincial towns. This association, similar to the British Association, and to the American one, was founded in 1872, after the disasters of the Franco-Prussian war and of the Paris insurrection, by the efforts of a few energetic scientists, prominent among whom were Pasteur, de Quervaine, some others. The idea was to bring in close contact and in amicable relations the scientists scattered all over the French territory, and to give an impulse towards science generally. The plan was very successful from the beginning, and now the Association thrives exceedingly well. It meets each year in some different town, save Paris, where it meets only on exhibition years. The meeting lasting a week, and the society is divided into sections corresponding to the principal divisions of science. Every member may, of course, follow the meetings of any or all of the sections, and some general meetings are held for the purpose of hearing some interesting novelty or general interest, and many excursions are made to the seat of one of these latter.

This summer the Association met at Limoges, a renowned town and center for porcelain work, and the attendance was as numerous as ever. Some physicians were, however, absent from the meeting, as the Berlin International Medical Congress met at the same time, and some 150 or 200 of them were in Paris. For many it was a politeness in exchange for the one Germany had done France in sending some German official delegates to the Montpellier centenary ceremonies, prominent among which were the noted paleontologist, Zirkel, and the physiologist and physiologist of world-fame, Helmholtz; but to none it could be a pleasure. Twenty years have gone by and not altered one feeling of those who saw 1870, but felt that French science and French authority had nothing to gain by keeping aloof and shunning international gatherings. The French government, therefore, in answer to the German one, appointed a number—some 25 or 30—of French physicians and scientists, to be official delegates. Some very good names are on this list—such as Bouchard, Prof. Bouchard, Prof. Ch. Richet, and others;—but some names of no reputation at all were also entered, and this is to be much regretted. France could have sent a staff of good, well-known names, in lieu of some of the members; but, as usual, most of the delegation proceedings were conducted in the government offices without the advice of competent men. The Berlin meeting went very well, and you are perhaps aware, Prof. Koch announced that he had probably discovered the remedy of tuberculosis. This has decided Prof. Grancher, of Paris, to publish earlier than he had been willing to, the results of investigations conducted in the same line and tending to the same point. But more information is required before we can speak of Koch's method, for he gave no particulars. MM. Grancher and Richet have made their facts known, and they amount to this: The authors vaccinate against tuberculosis by inoculating attenuated tuberculosis cultures, attenuated in nine different degrees, and on the rabbit they have obtained a complete immunity against virulent cultures. But does this apply to man, and how far does it prove good for rabbits, no one knows yet, and time only can tell. At all events, the man who shall discover a method of anti-tuberculosis vaccination shall be one of the greatest benefactors of humanity, and his name shall stand with the highest. When one comes to think of the tremendous impulse given to many departments of science, to physiology, chemistry, medicine, and even agriculture, it is not the discoveries of Pasteur, nor the, but, however, that the great part of the glory of man is due to the great genius, who has brought into medicine a revolution—or evolution—equalled by none of those which have been effected in the past, recent or distant.

While an army of scientists is working in order to preserve human life, engineers are not less active in devising new models for destroying it. The Hungarian engineer, Dr. Pfund, has invented a carbide of carbonic acid. This sweet implement is able to shoot as much as one chooses, and the powder—liquid carbonic acid—costs only two cents for three hundred shots. But if it explodes, the happy possessor is—no extra price required—shot clean into eternity, and perhaps a part of him into the interplanetary space. To speak seriously, however,
this monstrous tool is creating much sensation. M. Giffard obtains 500 atmospheres pressure, [12,000 pounds to the inch], while in the United States, M. Zalinski is reported to obtain only 450. Only seems preposterous! Of course, no smoke, no trouble in cleaning the gun, and hardly more noise than the pop of a champagne bottle. But experience will speak its word, and up to the present it has had but little chance of having an occasion to speak. Pleasant times, these we are living in now.

Evolutionism, which does not approve of these methods, is gaining in France. The Librairie Universelle in Paris (Rue de Seine) is issuing a Bibliothèque Darwinienne. The authors intend to deal with all the aspects of the evolutionary theory, and perhaps more especially with the sociological problem. The first and only volume out is by M. Paul Combes, a talented writer on evolutionary topics, who contributes a work on animal civilization and societies. It is well written and full of information, gathered from authoritative writers, such as Reaumur, Hübner, Sir John Lubbock, Romans, Darwin, and others. The author's work calls for the issuance of others. It is the Bibliothèque Evolutioniste, published under the editorship of Mons. Henry de Varigny. This collection is intended to contain works on Darwinism and evolution, especially issued from the biological standpoint, and, to begin, will contain many works translated from the English especially. Wallace's Darwinism is to be the first volume; then will follow Gudger's Evolution of Sex. But it will contain also works by French authors, and it is intended to publish in some volume the leading memoirs or papers, recent or old, French or foreign, which are of much importance for evolution, and are contained in various periodicals of difficult access. The collection promises to be a very interesting one, and to give all the biological aspects of the matter.

A very interesting book to evolutionists has just been published by the well-known ethnologist, Gabriel de Mortillet, under the title, Origines de la Chasse, de la Pêche, et de l'Agirculture. The first half of the work is published, and deals with the origin of hunting and fishing. It gives a capital account of the methods used by our savage ancestors, and contains many excellent illustrations representing the implements formerly used, as they are collected in the Saint German Museums, and the way they were used, after the pre-historic art-specimens, which have come down to us. The book also deals with the domestication of animals, and this is also very interesting. The book is one which ought to be translated. Prince Tencheff, a Russian, has published at Masson's library a book on L'Activité des Animaux. It is a good account of the mental traits of many animals, and affords some hours of pleasant and instructive reading to the general reader.

PARIS, August 23, 1890.

A QUERY.

All plants depend much in the struggle for life upon the facilities with which they are endowed for the sowing of their seeds. But these facilities vary, of course, in many manners and for many reasons. Some seeds are eaten by animals; others are more delicate and require special conditions, etc. These varying degrees might be measured somewhat. To do this, one should, in forests and uncultivated lands, select from any species and measure approximately the area covered by each individual tree—taking for a basis, for instance, the smallest diameter of the tree afforded by the branches—and count how many small trees, probably some naturally, of the same species are growing underneath. It is preferable to do this for trees which are somewhat apart, some twenty or thirty yards distant, so that the seeds of the one cannot interfere with those of the other. It may, however, be useful to do this for small clusters of the same species. This work, a very easy one to perform, must be done only where man does not interfere with nature, by cultivating, and destroying or multiplying young plants. It is well to observe whether the earth is usually dry or moist, whether the soil is even or slanting, also whether enemies of any seed are particularly abundant or rare. Of course the species of the seeds must be stated, and the more abundant the species, the better. Some of the members of the Agassiz Association might try to study this in a manner beneficial to all, and more especially to your correspondent.

[An any information on the above point may be sent to the editor of Science News, who will see that it is properly forwarded.]

METEOROLOGY FOR AUGUST, 1890, WITH REVIEW OF THE SUMMER. TEMPERATURE.

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The lowest point reached by the mercury the last month, at the hours of observation, was 52°, on the 25th; the highest was 76°, on the 5th,—a range of 34°. The extremes on the 13th were 66° and 58°, and on the 28th were the coolest days, with a near average of 58°; while the 5th, 4th, and 6th were the warmest, averaging 77.6°. The first week was quite warm, averaging 74.3°; and the month was three-fourths of a degree below the mean of the last twenty Augusts, while the summer exceeded the average of the last twenty by the same amount. Extremes are shown in the table.

SKY.

The face of the sky, in 93 observations, gave 46 fair, 15 cloudy, 28 overcast, and 4 rainy,—a percentage of 49.5 fair. The average fair the last twenty Augusts has been 61.6, with extremes of 49.5 in 1890, and 75.3 in 1883,—showing the present August to have been the least fair in the last twenty years. The 23rd was noted unusually cloudy.

The average fair the present summer was 53 per cent, while the average for the last twenty summers has been 60.3, with extremes of 45.6 in 1889, and 71.4 in 1876. Only three summers have been more cloudy than the present.

PRECIPITATION.

The amount of rainfall the last month was 3.25 inches, usually in small quantities and well distributed. It fell on fourteen days, usually between observations, the largest amount being 1.08 inch, on the 27th. It was attended with lightning and thunder on the 10th, 14th, and 17th. The average amount the last twenty-two Augusts has been 4.05 inches, with extremes of .45 inch in 1873, and 10.03 inches in 1872. The amount since January has been 30.8i inches, while the average for the same months the last twenty-two years has been 32 inches,—showing a deficiency of 1.19 inches the present year.

The amount the past summer was only 6.42 inches, while the average for the last twenty-two summers has been 9.91 inches, with extremes of 4.39 in 1858, and 13.15 in 1872. Only three summers have had a less amount than the present, viz., in 1870, 1871, and 1873. The drought in July and June was severe.

PRESSURE.

The average pressure the past month was 28.980 inches, with extremes of 29.88 as the 27th, and 30.18 on the 16th,—a range of .60 inch. The average for the last seventeen Augusts has been 29.640 inches, with extremes of 29.800 and 30.04,—a range of .173 inch. The sum of the daily variations was 3.65 inches, an average daily movement of .148 inch, while this average for the last seventeen Augusts has been one.085, with extremes of .051 and .125. The largest daily movement was .51 on the 27th, in connection with the largest rainfall.

The average pressure the present summer was 29.973 inches for the last seventeen summers, 29.933. The average daily movement was 1.04 inch, and the last seventeen summers, .099 inch,—showing higher pressure and larger movements this summer than usual.

WINDS.

The average direction of the wind the last month was W. 24° N., (a full W. by N.), while the mean direction of the last twenty-one Augusts has been W. 13° 52° S. (a large W. by S.), with extremes of E. 78° 40° N. In 1873, and W. 81° 15° S. In 1874,—a range of 185° 35°, or nearly eleven and one half points of the compass.

The average direction of the last summer was W. 3° 19° N., while the average summer in twenty-one years has been W. 19° 28° S. The present is the only Summer in twenty-one years when the northerly winds have prevailed over the southerly. In general, it may be said that the present August was chiefly distinguished for its extreme cloudiness, high pressure, and northerly winds; the entire summer for its extreme drouth, cloudy sky, and northerly winds.

COMPARATIVE METEOROLOGY OF NEW ENGLAND FOR JULY, 1890.

The table below is gathered from the Bulletins of the New England Meteorological Society for July, 1890, exhibiting the mean temperature and precipitation, State by State, with that of New England combined; also the extreme localities, range, and number of reports combined.
The extremes of temperature were at Lawrence, Mass., and West Jonsensorp, Me.; the extremes of precipitation at New Haven, Conn., and Bar Harbor, Me. In both aspects the average July, 1890, in New England is below the average for a series of Junes of over ten years, as seen by comparing the two lower lines in the above table.

D. W.

NATICK, September 5, 1890.

[Specialty Computed for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR OCTOBER, 1890.

Mercury is a morning star during the month, having passed inferior conjunction at the end of September. It reaches its greatest western elongation from the sun at A. M. on the 14th of October, when its distance is 5°; but, as it is then about 10° north of the sun, the position is not very favorable for visibility. It may be seen in the morning twilight before sunrise, low down on the horizon, nearly due east. Venus is very conspicuous during the month. It is an evening star, and during the month approaches the sun, diminishing its distance about 5°. It attains its greatest brilliancy on the morning of October 25, and is probably bright enough to be seen in full sunlight at any time during the month. If one has reasonably good eye-sight and knows where to look for it, Venus is still visible in the western sky in the evening. It crosses the meridian about 5h. 30m. P. M., and sets about four and a half hours later. It passes quite close to the moon on the morning of October 20, and is occulted for some portions of the southern hemisphere. It is in the constellation Sagittarius, and moves eastward 2° during the month. Its brightness diminishes, the distance from the sun increases during the month. Jupiter is on the meridian at about 7h. 30m. on Oct. 1, and at 1 little before 6 P. M. on Oct. 13, and sets about five hours later. It is in the constellation Capricorn, and moves eastward about 5° during the month. At the end of the month it is about 8° east of Mars. It is in conjunction with the moon on the evening of Oct. 26. The following eclipses of its satellites are visible at one point or another in the United States. The phenomena all take place near the right limb of the planet, as seen in an inverting telescope. D. denotes disappearance; R., reappearance. Times are Eastern Standard.

I. R. October 2, 10h. 6m. P. M.
II. R. October 7, 9h. 33m. P. M.
III. R. October 20, 12h. 1m. A. M.
IV. R. October 21, 9h. 30m. P. M.
V. R. October 25, 11h. 10m. A. M.
VI. R. October 26, 15h. 25m. P. M.
VII. R. October 25, 10h. 21m. P. M.
VIII. R. October 26, 7h. 39m. P. M.

Saturn is a morning star, and is getting far enough away from the sun to be easily seen. It rises at about 5h. 30m. A. M. on October 1, and is about 2 A. M. on October 31. It moves eastward about 5° during the month, and is still in the constellation Leo, but is now 12° or 15° east of Regulus (Alpha Leonis), the bright star which was near the planet during the spring and early summer. Uranus is too near the sun for observation, and is in the constellation Virgo. Neptune is in Taurus, between the Pleiades and Iyades. It will be occulted by the moon on the morning of October 30.

The Constellations.—The positions given hold good for latitudes differing not much from 40° north, and for 10, 9, and 8 P. M. for the beginning, middle, and end of the month, respectively. The small constellation Lacerta is in the zenith. Pegasus is just below it, to the south, on both sides of the meridian. Aquarius is on the south meridian, about half way up, and below it is Pisces Australis. Cetus is low down in the southeast. Pisces follows Aquarius, and is just below Pegasus. Andromeda is high up, a little north of east; and below it are Arius, a little to the right, and Taurus, lower down, a little to the left. Persuus is about half way up, in the northeast, and Auriga is below it. Cassiopeia is coming to the meridian, between the zenith and the pole; and Ursa Major is on the north horizon, with the pointers on the meridian below the pole. Ursa Minor is mainly to the left of the pole star, and a little below; and Draco is to the left of Ursa Minor. Cygnus is to the left of the pole star, and a little below; and Pyx is to the left of Ursa Minor.

LAKE FOREST, ILL., September 5, 1890.

LITERARY NOTES.

A Treatise on Neuralgia, by E. P. Hurst, M. D. Published by George S. Davis, Detroit, Mich. Price, 23 cents in paper, 30 cents in cloth. This most excellent monograph of Dr. Hurst's, upon a disease which is not only extremely painful to the patient, but which often baffles all the efforts of medical science to relieve, can be read with profit by everyone engaged in the practice of medicine. The subject is very thoroughly treated, and the work forms a complete compendium of our present knowledge regarding this most distressing affection.


In preparing this volume the author has had in view the needs of a large class of students of analytical chemistry desirous of becoming acquainted with the methods of quantitative analysis by electrolysis; these are daily acquiring greater importance, and are being introduced and applied wherever possible. The plan adopted has been to give a brief introduction upon the behavior of the current toward different materials, a short description of the various sources of the electric energy, its control and measurement; after which follows an introduction of the current into chemical analysis, and sections relating to the determination and separation of metals, as well as the oxidations possible by means of the electric agent.

The same firm also publish No. 10 of the Qua's Compend! series, which is devoted to chemical subjects, including articles on subjects of every kind. It is from the pen of Dr. Henry Leffman, and will prove an invaluable assistant to students of chemistry and medicine in preparing examinations, as it affords them an opportunity to keep up with the lectures, and obviates the necessity of taking voluminous notes, in which serious errors are liable to occur.


This work is intended for use in the elementary schools, and will doubtless prove of great service in showing the formation of many words occurring in the English language, and the way in which they are derived from other preceding tongues. The plan of printing the stem, or radical part of the word, in a heavier type than that of the modifying letters or syllables, is a good one, and indicates at once to the eye much that would otherwise require full attention.

Another book of interest to philologists is Three Lessons on the Science of Language, by F. Max Muller, published by the Open Court Publishing Co., of Chicago, at 75 cents. Dr. Muller is well known as the author of several books of study, and, as the lectures were delivered before a popular and non-professional audience, they can be read with pleasure and profit by all.


MEDICINE AND PHARMACY.

To no class of professional men is the camera more useful than the physicians. In itself a most fascinating diversion and recreation, the practice of photography is of direct benefit to the practitioner of medicine in many ways, and the small cost at which a camera and outfit can now be obtained brings it into the means of the most impoverished member of the profession.

Every physician has met with unusual cases in his practice of which a permanent record would have been of great value. Peculiar eruptions on the skin or other external lesions can readily be caught on the sensitive plate and preserved indefinitely for future study and comparison. Fractures, dislocations, and, in fact, nearly all surgical cases or operations, are especially adapted to such a form of record, and the practical difficulty of taking a photograph in the poor light and other unfavorable conditions of a sick chamber, is readily overcome by the use of the flash-light, with which the time of exposure is practically instantaneous, even at night or in a darkened room.

Where there is liability or certainty of a suit for malpractice, a set of photographs of the case in its various stages might be of the utmost value to the physician, and save him many times the original cost of the apparatus. It is unfortunately true that in such cases, as in all similar suits, juries are only too likely to assess damages with sole reference to their prejudices, and with little regard to facts or justice; but an indisputable pictorial record of the progress of a case from beginning to end, would doubtless make some impression even upon the average jurymen, and would at least be of service in securing a favorable charge from the judge.

Cases have been recorded where a photograph of a person has shown the presence of pigmented changes in the skin, which were not visible to the eye, thus giving warning of the approach of some eruptive disease, before it became actually manifest. This result of the varying actinic power of different colors would, of course, be of no practical service, and is only mentioned as one of the curiosities of photography.

Every physician is likely to be called upon to testify in court, either as an expert or witness, in regard to matters relating to his profession; and with a small magic lantern and photographic transparencies, he can plainly illustrate to the judge and jury scientific facts and principles which could only be verbally explained to their satisfaction and comprehension with the greatest difficulty. To take a single instance only: the difference between the blood-corpuscles of a man and a bird would be at once apparent to the dullest
intellif if micro-photographs of the two fluids were thrown upon a screen, while the most thorough and painstaking explanation of their varying shape and size would make but little impression. Thousands of a millimetre are magnitudes which are almost incomprehensible to the average mind.

Although with the recent improvements introduced into the process, no particular knowledge of chemistry is necessary to practice the photographic art successfully, yet the physician, from his scientific education and his training in careful and delicate manipulation, is especially fitted to find pleasure and profit in it. A satisfactory and complete outfit may be obtained for about ten dollars, and from that upwards as high as one's inclination may lead or one's purse allow. And even if one finds but limited use for his camera in a professional line, it will certainly prove a most satisfactory investment as supplying a means of diversion from professional cares, of which no one stands more in need than the tired and often overworked physician.

[Original in Popular Science News.]

THE MEDICO-LEGAL EXAMINATION OF BLOOD AND BLOOD-STAINS.

The detection of blood and blood-stains for medico-legal and other purposes is a subject of great interest and importance to the physiological chemist and the general practitioner of medicine, for these are not infrequently called upon to state whether a given stain is one of blood or not, and to determine, as far as possible,—if it be found to be a blood-stain,—from what animal or creature the blood has been drawn. It may be well to mention, in the very outset of this discussion, that it is impossible to state positively that a given stain is one of human blood, or even that a given specimen of fluid blood has been drawn from man.

If a quantity of fluid be brought for examination, the chemist will first have to determine whether it is blood or not, by examining a portion under the microscope, when the corpuscles—if present—will identify the specimen as blood. Moreover, by means of the microscope we can determine whether the blood be that of a mammal or not, for the red blood-cells of all mammals have deepened centers and are non-nucleated, and all are circular discs, except in one tribe, viz., the camel family (Camelidae), in which the discs are oval instead of circular. In vertebrata lower than the mammalian scale there is a characteristic difference. Birds, reptiles, amphibia, fishes, etc., all—excepting that creature, lowest in the scale of fishes, whose blood is colorless,viz., the amphiurus—have red blood-corpuscles, but they will have a distinct nucleus, and all are oval, except in a low order of fishes which have rounded, nucleated discs.

Granted that we have demonstrated a given specimen of blood to be mammalian, we are now unable to tell from exactly what mammal it has been taken, on account of the varying size of the red corpuscles, upon which we must depend. The average diameter of human red blood-corpuscles is about .77 of the rabbit is 6.9 mm.; of the cat, .65 mm.; of the ox and pig, .60 mm.; of the horse, .54 mm.; of the sheep, .50 mm.; and of the goat, .41 mm. Thus we see that the determination of the kind of blood depends upon the form, size, etc., of the red corpuscles, and that even with fluid blood there cannot be positive evidence that a given specimen is human blood. But in these examinations greater practical difficulties than those already mentioned are usually met with, for a dried stain is usually presented, and not fluid blood; and, moreover, oftentimes the article containing the stain has been subjected to washing or to other processes of time and exposure; and yet, with all these difficulties, we may still be able to say that a stain is or is not blood.

In the first place, let us suppose that an ordinary, quite recent, dried stain is submitted. In this case we can cause the red corpuscles—if it be a blood-stain—to absorb fluids and a same their original form and average shape, and average diameter. But when they imbibe the fluids we have no means of determining the size of the corpuscles or the animals that have lost in drying; and so assume exactly the same size as before; but we can say positively whether the stain is one of mammalian blood or not, since even the red corpuscles in dried mammalian blood will, under the circumstances just described, again assume their rounded, or circular, form, and will never show a nucleus.

The most direct command for determining whether a given stain is or is not blood; is the spectroscope. In virtue of the red coloring matter of the red corpuscles,—the haemoglobin,—the spectroscope will identify a blood-stain with accuracy, even when the stain is years old. Both reduced and oxy-haemoglobin give characteristic absorption spectra. Haemoglobin spectra, however, are the same whether the blood be obtained from a mammal or not.

Let us now suppose that we have an old stain on an old garment, which we wish to examine to determine whether it be a blood-stain or not. We scrape off some of the fabric marked by the stain,—never using it all,—and prepare a watery solution of the coloring pigment, which, if the stain be blood, will give the characteristic absorption spectrum of haemo globin. This spectrum is of greatest importance.

The direct-vision spectroscope is well adapted to this work, and especially that form which is so arranged that two specimens may be studied at the same time. In order to obtain the characteristic spectra of haemoglobin for study and for comparison with spectra which we are examining, a standard solution is made by dissolving one volume of blood in one hundred volumes of water, and this is viewed through a layer one centimetre thick. Any glass vessel with parallel sides of the proper width apart will answer for holding the solution. These vessels are sold by dealers under the name of haematometric jars, and we also have the very convenient haemato scope for the same purpose. The light employed may be either the spectrum of the air, or an artificial; in the former case with ordinary directvision spectroscope, a well-illuminated white wall usually furnishes very good illumination.

Solutions of pure haemoglobin, as well as the red corpuscles themselves, or diluted mixtures of blood and water, in the aerated condition, exhibit the well-marked and peculiar spectrum of oxy-haemoglobin. This spectrum is distinguished by the existence of two absorption bands between the lines (Fraunhofer's) D and E, and situated the one in the yellow and the other at the commencement of the green. The first of these absorption bands is comparatively narrow, well defined, and dark, and is placed at about one-fifth the distance from D to E. The second is double the width of the first, but is less dark, and is not so well defined, and occupies nearly the last half of the space between D and E. Beyond the second band the light of the spectrum gradually diminishes, and ceases altogether the termination of the blue, midway between F and G. As the strength of the solution is increased, the bands become broader and darker, and both ends of the spectrum are absorbed; and if now the strength of the solution be still further increased, the two bands above described unite to form one very broad band.

If an aqueous solution of oxy-haemoglobin be exposed to the air for some time—ordinary blood being such a solution—its spectrum undergoes a change, the two oxy-haemoglobin bands between D and E become faint, and a new band appears in the red near C. The solution, it will be observed, has lost its blood-red color, assumed a brownish tinge, presents an acid reaction, and is precipitable by basic lead acetate. This change is due to the decomposition of haemoglobin and the production of methaemoglobin, and since, by the action of the air, we may assume the solution to be Oxy-haemoglobin, the spectrum just described is that which is generally given by old stains. When in the analysis this spectrum is given we add a reducing agent,—usually ammonium sulphide,—when reduced haemoglobin is produced, which gives its characteristic spectrum.

Then, by shakng up this reduced haemoglobin with air, we obtain oxy-haemoglobin, which gives us its spectrum.

The spectrum of reduced (or deoxidized) haemoglobin is entirely different from that of oxy-haemoglobin. Instead of the two bands between D and E, there is a single band, the darkest portion of which occupies the space which intervened between the two bands of dilute oxy-haemoglobin. The entire band is not well defined, but usually covers about three-fourths of the distance from D to E, and is shifted further to the left than were the two bands of oxy-haemoglobin. Solutions of oxy-haemoglobin may be reduced by means of the air-pump, by passing hydrogen or nitrogen gas through them, and by reducing agents, of which Stoke's fluid is very convenient. This latter is a solution of ferrous tartrate. When the reduced haemoglobin spectrum is examined through the air, and the oxy-haemoglobin spectrum should be given upon further examination with the spectroscope.

By the action of heat, or of acids or alkalis in the presence of oxygen, haemoglobin is split up into a substance known as haematin and a proteid residue. If no oxygen be present, the haematin, haemochromogen (reduced haematin) is produced, which, however, speedily undergoes oxidation into haematin. Both haematin and reduced haematin give 'spectral spectra.' So in analyzing a given specimen we should make haematin by adding to the solution of haemoglobin a small quantity of acetic acid, when the liquid will be observed to change, in the alkaline hydroxyl, into haematin or haemochromogen, a process which reveals a distinct absorption band in the red between C and D; this is the spectrum of haematin in acid solution. If we render the liquid alkaline by the addition of ammonium, a single absorption band is seen also between C and D, but differs from that of acid haematin. In that latter it is placed very near to C, while in the alkaline haematin the band is very near the line D, and there is almost impossible to say whether or not it is a marked shading of the blue end of the spectrum in addition. If, now, a reducing solution—as Stoke's reagent—be added to the liquid, the two absorption bands of reduced haematin are obtained, which resemble those of oxy-haemoglobin, but need not be mistaken for those of the latter, as they are...
nearer the blue—lying between E and F.

When all these various characteristic spectra are given, the presence of hemoglobin and its derivates, and hence of blood, is proven beyond question. Thus we see that the spectroscope tells us whether a given stain is or is not blood, but it will not differentiate between the blood of the various animals, or between the blood of these and that of man. But by means of the microscope we can tell by the red corpuscles whether the blood is that of a man or not, and also what portion and fish or bird which he has been cleaning or otherwise come in contact with, it may, perhaps, be shown by means of the microscope that the man has lied,—if it be a stain from the blood of man or other mammal,—and, while such a circumstance could not convict of murder, etc., still, it would convict of falsehood, which in such a case would have some burden of evidence.

When garments containing blood-stains have been boiled, the hemoglobin is broken up, and a stain may remain which is insoluble in water, alcohol, or ether; and yet it is possible for such a stain to be shown to have been caused by blood, by the stain remaining a little of the stained fabric and place it on a glass slide, together with a few crystals of common salt; cover these with a cover-glass and apply glacial acetic acid under. Heat the slide and carefully evaporate the acid mixture to dryness, after it has boiled. If the stain has been blood, a number of small, dark-red, rhombic crystals may be seen; with the microscope, to have been produced. Hematin crystals are characteristic, and when obtained are sufficient to identify a stain as blood. This is a most certain and delicate test for the determination of the presence of blood. Hemin crystals may be obtained in large numbers for examination and study by substituting a drop of blood for the stained fabric in the test just described.

THE TENTH INTERNATIONAL MEDICAL CONGRESS.

The Ninth International Congress, held at Washington, three years ago, the News gave an extended account prepared on the spot by a special correspondent. For a report of the Tenth, held at Berlin from August 4 until August 9, it must depend largely upon a paper various sources of information to the Congress, although not as actual members. Berlin opened its doors to this large assemblage of strangers, and the citizens received into their homes those whom the hotels could not admit. Of the foreign members of the Congress, the largest number, 699, came from the United States; 429 were from Russia, 358 from Great Britain, and 142 from France. It was feared, until the last moment, that the French would find it impossible to so far forget national strifes as to join in the amicable pursuit of science.

The president of the Congress was Prof. Rudolf Virchow, among the foremost medical men of the world, perhaps the foremost living pathologist. He delivered in various halls an address of welcome, in which he referred to American physicians as follows: "We, in Germany, have great admiration for the American medical world, which today excels in surgery, midwifery, and dentistry. I can say for myself and colleagues, that the American contingent will be honored and heartily welcomed. We admire their scientific zeal, and beguile them their extra-ordinary skill, and shall try to imitate their push and energy. I find these latter virtues in the American student as well as in the finished scientist. My German students generally spend a few semesters deciding what line of medicine they shall follow, while the American student walks into the arena with a fixed purpose, and an indomitable determination.

A great number of papers were read in the various sections, some few being of considerable interest. The section meetings were, for the most part, held in the Exhibition building, where ventilation was defective and much suffering was caused by the heat. The halls opened one into another, and much confusion was created by the passing of persons to and fro through the building, the noise sometimes being so great that it was impossible to hear the speaker when sitting at a little distance.

Unfavorable comment was made by some that papers in the German language only were listened to with attention. During the reading in French only, the German members might be heard walking and talking, thus causing great annoyance to the speaker and to those who desired to listen. In one section the member appointed to read a paper in English refused, saying it would not be listened to, and he did not wish to waste his time.

On Thursday evening balls were given in honor of the Congress. On account of the large number of guests it was found impossible to entertain all in one place, so five different balls were given, in the Central Hotel, Kaiserhof, Imperial Hotel, the Philharmonic and the Zoological Garden, all being well attended.

Friday afternoon there was a court reception given to about 500 selected guests, and several sections made excursions to Potsdam and the lakes of Havel. Friday evening, as also every evening during the week, various private dinners and receptions were given by Berlin physicians to specially invited guests. Many sections were also entertained by resident chairmen or special medical societies of Berlin.

The Empress Frederick visited the Exhibition. Sunday morning, accompanied by a maid of honor, and was escorted through by the committee.

It is well understood, of course, by men conversant with such things, that mere size does not mean success, more likely sound. To all gatherings of this sort are drawn scientific adventurers, men who have axes to grind and trumpets to blow, human curiosity in addition to the vast array of ordinary men and the far smaller number of able ones. It is, perhaps, only in the way of the cultivation of a spirit of kinship and cordiality that much is accomplished by monster conventions of this kind. Still there were certain notable papers read, among which was one by the world-famous Dr. Koch, the discoverer of the bacillus tuberculosi.

He stated, among other things, that he that had been able, by appropriate treatment, to prevent the death of guinea-pigs and rabbits after inoculating them with pure cultures of tubercle bacilli. He gave no detailed statement of the nature of his experiments or of the medicines employed, as his work was not entirely completed; but it is whispered that the drug that he has found so efficient is a salt of cobalt.

When it is considered that guinea-pigs, are, perhaps, the most susceptible of all animals to the ravages of the bacillus tuberculosis, and that Koch is one of the most cautious of all investigators,—one who may be said to have never made a mistake nor been obliged to retract a word of his statements,—the significance of this preliminary communication may be appreciated. If there are germicide agents capable of destroying tuberculosis in dumb animals, there is, of course, some reason to hope for the discovery of the means of arresting or preventing tuberculosis in man, which may fairly be said to be the one lower-shadowing medical desideratum of the present time.

In spite of this, perhaps, too much has been expected if not the discoverer of so-called Listerism, or antiseptic surgery, delivered an address upon the present position of antiseptic surgery. He dwelt at some length upon the theories of immunity developed from results of bacteriological studies, referring especially to Metchnikoff's hypothesis that pathogenic micro-organisms are destroyed by certain cells called phagocytes. He then gave a review of the origin and development of antiseptic surgery, taking occasion to declare himself a firm upholder of antiseptic in contrast to aseptic methods, although the latter were not without their uses. He maintained, however, that strict asepsis, as insisted upon by Lawson Tait, and the use of boiled water were really antiseptic measures. The speaker had modified largely the methods which his original methods, the latter had wholly abandoned the spray, and felt ashamed that he had tried, and advised others to try, to destroy the microbes in the air. He was a believer in the efficacy of sublimates and used them in strength ranging, according to circumstances, from one in five hundred to one in ten thousand. He then referred to special indications in the antiseptic treatment of thoracic fistulas, contused wounds, joint injuries, etc., and closed with the reaffirmation of his belief in the necessity of antiseptic as opposed to so-called aseptic surgery.

Another important paper was that read by Dr. H. C. Wood, of Philadelphia, upon anesthesia, doubly important for its delivery upon the Continent, where chloroform still is the favorite surgical anesthetic. Prof. Wood claimed that the following facts in regard to anesthesia must be regarded as established; First, the use of any anesthetic is attended with appreciable risk, and no care will prevent occasional loss of life; second, chloroform acts much more promptly and powerfully than ether, both upon the respiratory center and upon the heart; third, the chloroform is considerably more permanent than that of ether; fourth, chloroform is considerably less commonly either respiration or cardiac action, but usually abolishes both functions at about the same time; fifth, ether usually acts more powerfully upon the respiration than upon the circulation, but occasionally is a cardiac paralyzant, and may cause death by cardiac arrest while yet respirations are faintly indicated.

The most remarkable surgical performance shown in the whole Congress was that of Prof. Gluck, of Berlin, who presented several patients whose knee and elbow he had excised, and thereafter substituted ivory joints instead. The patient upon whom this singular essay had been longest under trial was one upon whom the operation dated three years. In this case, the patient had succeeded in giving the patients moderately movable joints, but in no case were the wounds fully healed and free from suppuration. And in one from whom he had subsequently removed one of his ivory joints after it had been worn for some time, on account of local trouble to which it gave rise, the ivory was seen to be partly eroded, as though beginning to be absorbed. This surgical experiment was viewed with decided scepticism as to its ultimate success by the majority of those who saw it, while, nevertheless, they appreciated the cleverness of the feat.
POPULAR SCIENCE NEWS.

[October, 1850.]

The Popular Science News,

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Manager.

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Familiar Science.

HOW THE SPIDER SPINS HER WEB.

The more one studies the habits of that unpopular, but interesting animal, the spider, the more wonderful its structure and habits appear. It possesses the mysterious faculty which we call instinct—for want of a better name—in the highest degree, being scarcely exceeded by the wasps and bees, and in the construction of its webs it evinces the possession of geometrical knowledge superior to that of most men.

In the world of spiders the principle of "woman's rights" is fully established. The female spins the web and manages all the domestic arrangements, while the unfortunate masculine spiders, small in body and weak in mind, are only tolerated in the arachnoid household for a while, and are often mercilessly killed by their better halves as soon as they become tired of their society.

The web of the spider is secreted by certain glands as a thick, viscous liquid, and passes into the air through organs known as spinnerets, several groups of which are situated on the under side of the abdomen. These spinnerets are grouped together in different forms—sometimes in sheaf-like bunches (Fig. 1), or finger-shaped (2), or in the shape of a rosette (3). Each of these spinnerets is pierced with innumerable holes, like the nose of a watering-pot, from each of which a stream of the web-making fluid flows, as shown, many times magnified, in 4.

As soon as the fluid reaches the air it hardens at once, the many different streams of fluid uniting to form a single thread; so that, fine as is the thread spun by the spider, it is really a cable, composed of many hundred still finer fibres.

Another curious fact in regard to the web is, that the different spinnerets produce threads of different kinds, varying in fineness, strength, elasticity, and adhesiveness. It is as if a single cow could give two or more kinds of milk, with varying proportions of butter or casein.

The spider not only spins, but weaves. Her claws (Fig. 2) are miniature combs of different degrees of fineness, and by their aid she smooths and arranges the threads as they are formed, as easily as a lady would comb her hair. The different species weave their webs in many different forms, but perhaps the most beautiful of all is that of the geometrical spider, whose web is a very common ornament of our gardens in the early part of the year.

The foundation cords of this web are put in place by the aid of the wind. The spider stands in the proper position on the branch of a tree or bush, and spins a thread, the end of which floats freely in the air, and is carried by the slightest breeze to some neighboring branch, to which it attaches itself. The spider then makes a pathway for herself, which she quickly traverses, and repeats the operation until the outlines of the web are formed. Then, passing from one part of the web to another, she puts in place the threads which radiate from the center like the spokes of a wheel, and fills in the whole with the cross threads, until a light, elastic, but wonderfully strong net is formed, ready to hold the early-rising fly or other insect in its meshes until she can seize it and quiet its struggles with a minute drop of paralyzing poison, after which she drags the unfortunate insect to her den in the center of the web, and feasts upon it at her leisure.

The above are only a very few out of many wonderful facts connected with the history and habits of these common and despised animals; and for those who find pleasure in the pursuit of natural history, we can recommend their study as interesting and profitable in the highest degree, while the "material" for such investigations is abundant and unending.

CURIous MOVEMENTS OF THE AMARYLLIS.

A correspondent of La Nature describes a curious observation, made the past spring, upon an amaryllis (Lycoris) growing in the central part of France.

The spider in that region opened unusually early, and by the last of February one of these little plants had blossomed in the garden of the writer. But on the first of March a "cold wave" passed over the country, and the thermometer fell in the night to 12° F. The next morning the flower was found bent over to the earth, as shown in the illustration, and apparently dead. But, strangely enough, as the sun rose higher in the heavens and the temperature reached 50°, the amaryllis arose from the earth, assuming its usual upright position, and was apparently none the worse for its untimely refrigeration.

The following night was again extremely cold; the same movement was repeated, and a closer examination of the flower showed that it was, undoubtedly, a measure
of self-protection. The bell-shaped corolla touched the earth lightly, but closely, and was cemented to the soil by the frozen moisture around its rim, thus enclosing the stamens and other important organs of the flowers in a temporary tent, as it were, and protecting them from the outside cold. This movement was repeated for four successive cold nights. On the fifth night the temperature moderated, and, although snow fell, the flower and stalk remained in their usual upright position; and in due time the blossom withered and produced seed as usual.

These remarkable spontaneous movements of the plant seem to be almost allied to those of certain low forms of animal life, and are extremely difficult to explain, as is also the remarkable resistance to low temperatures of many other early flowers, such as the snow-drop and crocus. We would suggest to the members of the Agassiz Association that this observation will be an excellent one to repeat the coming spring, especially as our climate is excelled by that of no other country in the production of sudden and marked changes of temperature, particularly in the early spring months.

[Original in Popular Science News.]

GEOLOGICAL DEVELOPMENT—PETRIFICATION AND FOSSILS.

BY JOSEPH WALLACE.

In this article we reach the period of geological development which treats of petrifications and fossils. The name petrification, as formerly in use, does not apply to those organic bodies which have been preserved entire with the original proportions of their elementary parts—such as insects and parts of plants which have been inclosed in amber or rock salt, and bodies of mammoths which have been dug out of Siberian ice in a preserved condition. Generally the softer parts of the bodies of animals and plants which were inclosed in the hardening masses of the strata were dissolved, destroyed, or decayed, and, as a rule, only the firmer and harder parts of the organism have been well preserved. This is especially the case with stems, branches, hard fruits of plants, bones, teeth, shells, scales, and horns of animals.

Many organic bodies, especially those of plants, have become carbonized and changed into pet and coal; others, particularly the bodies of animals, have become lithified and disintegrated, that is, they have lost their gelatinous and other animal substances by gradual destruction and lithivation. In this altered and calcined state, these hard-quired bodies, and weight have more or less disappeared. Other organic bodies have been covered, surrounded, or encrusted, as it is technically called, with substances, as, for instance, calcareous tufa, which were originally fluid and then hardened. But the real petrifaction occurs when an organic body is entirely changed into a mineral substance and still retains its original form. The solid parts of an organic body are porous. The pores are filled up by the minerals, which are dissolved in water, and the substance of the organic body is by degrees chemically removed; the mineral substance replaces it and gradually hardens, so that at last the organic substances have made way for mineral substances without producing an important change in the original form.

ichnoites.—Sometimes an organic body, after being entirely dissolved and washed away, has left the impression of its outward form on the surrounding mineral rocks; stems of trees, for instance, inclosed in some rock, having decayed in this manner, and their component parts entirely carried away, in their place hollow spots have been left, which have been filled up by some mineral substance, and this has taken the form of the original tree.

Huxley, in his work, _On Our Knowledge of the Causes of Phenomena of Organic Nature_, p. 45, cites an instance which came under his observation: "Some years ago I had to make inquiry into the nature of some very curious fossils sent to me from the North of Scotland, which had recently been discovered, bound up in pieces of rock, and nothing more. These holes, however, had a certain definite shape about them; and when I got a skilful workman to make castings of the interior of these holes, I found that they were the impressions of the joints of a back-bone, and of the armor of a great reptile, twelve or more feet long. This great beast had died and got buried in the sand; the sand had gradually hardened into bones, but remained porous. Water had trickled through it, and that water being probably charged with a superfluity of carbonic acid, had dissolved all the phosphate and carbonate of lime, and the bones themselves had thus decayed and entirely disappeared; but, as the sandstone happened to have consolidated by that time, the precise shape of the bones was retained."

The fossil footprints, or ichnoites, belong to this class. These are impressions originally made by animals in clay or sand, and preserved in the sandstone rock resulting from the solidification of those materials. Under these names have been included markings of various kinds in rocks of very different periods; the first observed by a Scotch gentleman, Dr. Duncan, and since then they have been frequently found. The animal to which these footprints have been ascribed has been named _Cheirocraterium_, or hand animal, because the impressions were really made by animals and did not originate in any other way. They have been found, too, in pages one behind the other, so that the size of the step can be ascertained.

and in four-footed animals, the print of the hind feet can be distinguished from that of the fore feet.

Another class of such impressions, called fossil rain-drops, do not seem to be authentic. Small, rounded impressions are sometimes found in sandstone strata and overlying stratum, and corresponding rounded formations in relief. It was once thought these impressions were produced by falling rain-drops, that is, from rain which fell in primitive times when the sandstone was beginning to harden. In one case it was thought the direction from which the rain came could be discovered, because the sides of the impressions are rather elevated on one side, just as would be the case if rain was driven sideways and fell on one of our sandy shores. But Vogt says: "The impressions have been recently much more explained by the action of the atmosphere on the cement of the sandstone, or by air bubbles left on the surface of the sand, which was covered with the waves. This superficial change takes place sooner or later in most sandstones, according to the quality of the cement."

Fossils.—From very remote times men had observed these objects in the rocky strata far above the level of the ocean. Pythagoras, Plato, Aristotle, Strabo, Seneca, and Pliny allude to the existence of marine shells at a long distance from the sea.

All the ancients attributed their occurrence to changes of the earth's surface, and considered them conclusive evidence of the rocks containing them having been submerged beneath the ocean. In the beginning of the sixteenth century, when the learned of Europe turned their attention to geological phenomena, fanciful opinions were promulgated, attributing these forms to _laws nature_,—"sports of nature,"—the plastic force of nature, which effected these resemblances; or that, dating from the first creation, they were produced at the time of the formation of crystals or the mountains themselves. More than a century was necessary to disprove this theory, and an additional century and a half to explode the hypothesis that organized bodies had all been buried in the solid strata by our barbarous ancestors. But, however, there was not wanting those who maintained more rational opinions. In the early part of the sixteenth century, Leonardo da Vinci, having observed and studied some canals in the North of Italy, opposed these views, asserting that the mud of rivers flowing into the sea had carried and penetrated into the interior of the shells when they were still at the bottom, and thus could not have been melted and dissolved by the water. S convince after this, Fracastorius, on the occasion of some excavations made about the city of Verona, declared his opinion that fossil shells had all belonged to living animals, which existed and multiplied in the positions where the remains were now found.

After it had been generally acknowledged that fossils were the remains of animals and plants which had formerly existed on the earth, the question arose as to how they had come to be inclosed in the strata. The Deluge was first thought of; the animals had probably been killed in the floods, their remains and the plants had been inclosed in the deposits made by the waters, which deposits had been subsequently hardened. This theory was supported by certain facts, directed against by the learned: Schleicher, the latter a Swiss physician, who published a large work with drawings, wherein he spiritually defended the theory of fossils as being the remains of the Flood. He even believed he had found a fossil man, which he called _Homo diluvii testis_, that had perished in the Deluge. Through this theory the public interest became more interested and searching, and they began to make...
a systematic study of the fossils, which were thus far looked upon as a burden to the mineralogist.
It soon became evident that the Deluge had nothing in common with these fossils. The latter were found at a depth where the water could not have penetrated, as, according to sacred history, the Deluge touched only the surface of the earth. It was also observed that the perforated animals and plants which floated together were not mixed, as might be expected, but rather in quite a determined distribution. Frequently in one layer plants and remains of animals were well preserved; in the other, one might discover with the greatest difficulty few and hardly recognizable traces of organic life. Here, an exuberant flora arose; there, a numerous fauna. In those layers were prominent bones of land and mammals, in which the denizens of the deep were vastly more numerous. Finally, Cuvier gave a death blow to Schleicher's theory, and also to his home diluvii testis, by proving that it was nothing else but a three-and-a-half-foot salamanter skeleton.

**The Way of the Lightning.**

BY A. BOOTHY.

About 3-100 years ago, a very rich and God-fearing man of the East, the patriarch Job,—who, by the by, had no meteorologists of ability,—asked this weighty question: *Who hath divided a way for the lightning of the thunder?* That ancient scientist, with whose surroundings we are not now familiar, wrote about as wisely concerning lightning and its real essence as any modern scholar has dared to do.

Lightning is apparently freaky, and sometimes behaves in a capricious manner. Its diverse ways are not fully known to man; and yet there are a few rules that even this fickle agent does obey—a few regulations, now sought out by observation and study, that do positively somewhat control its seeming irregularities.

The great principles of electricity have in no wise changed in all these thousands of years, nor has its force, or the present knowledge, either increased or diminished since Franklin's celebrated kite experiment in 1752. The universal law of atmospheric electricity, like other electrics, is this today: that unlike electricities, positive and negative, attract, and that like electricities, positive and positive, or negative and negative, repel each other.

The lightnings of today are no more destructive, the winds no more cyclonic, the effects no more terrific—according to the surroundings—than in those olden times. Then, as now, showers accompanied by hail and whirling winds prevailed, fearful lightnings darted hither and thither about the heavens, and alarming execution was done in regions known and unknown to man.

The following account belongs to every thunder-cloud: The lower surface—the surface next to the earth—is exceedingly uneven, and generally charged with positive electricity. Some parts of the cloud are much nearer the earth than others. Electricity gathers in the largest measure at the lowest point, or is said to have at its lowest point the highest electrical tension. A highly-electrified water-cloud, which is full of flies, usually exceeds in height a quarter of a mile (1,500 ft.). When the electrical tension is sufficiently high, the electricity passes across the intervening atmosphere to the highest point—usually negative, but opposite to that of the cloud—on the earth, directly under the cloud. This passage is called a thunderbolt. During a severe storm, if the air be very dry, then the lightnings are more zigzag and the thunders more deafening. If the lowest electrified cloud be directly over a short object in the immediate vicinity of a tall one, the short object—it matters but little of what kind—will be "struck." This fact, that the way of the lightning from a cloud to earth is usually as direct as possible, will greatly help to a better understanding of some of the mysteries of lightning. So that it is not always the highest object in the region of a prevailing thunder-shower that is struck, but that object which is directly under the lowest hanging cloud. It not unfrequently happens that a corner of a dwelling-house is struck sooner than the rest of the edifice, though a good part of it was directly under the lowest part of the electrified cloud. Repeated and close observation will verify the truth of these sayings.

About 4 o'clock, Tuesday afternoon, August 5, 189s, during the prevalence of a thunder-storm in the vicinity of Willard State Hospital, directly in front of the main building, yet a short distance out on the then gently-ruffled surface of Seneca Lake, a most fearful, very zig-zag, and blinding thunderbolt, followed by unusually terrific thunder, struck the waters of the lake directly under the cloud, causing a hissing sound not unlike the fall of a red-hot body into water. In this instance, the electrified cloud hung over a portion of the earth's surface upon which there was no remarkable elevation, thus corroborating the idea advanced in this writing.

**A Natural Ice-House.**

BY GEORGE T. BINGAY.

When living in Annapolis, I heard a story that ice could be dug out of the ground in a ravine of the "Great Nanny"—as the hills some three or four hundred feet high which protect the Annapolis valley on the north are called. Being rather skeptical, I set out one hot day in July on a tour of inspection. I selected the north side as being probably the coolest; and an old inhabitant telling me that if I found a certain kind of pebbly-road, and followed it, I could not fail to find the place, I started into the woods, but—no such a broiling hot day—with little expectation of finding anything as cool as ice. The road soon began to be crossed by numerous little streams from springs, as it gradually ascended the hill, and walking was rendered extremely bad by the black mud, which was often one or two feet deep. Quite a brook was made along this way, and it meandered through many hundred yards to the right and below me, where it widened into miniature pools that abounded in trout, which were probably cool if I was not. Going two miles up the ravine, I found a lot of pits, made by throwing out the small stones, and, concluding that they were the ice wells, I threw out the stones, twigs, leaves, etc., as those had done that which they were made of. One day, I measured down, 5, or 2 pounds. This did not at all come up to my expectations, so I crossed the brook to examine the other side. Here I found the side hill as steep as the roof of a house, and made up entirely of loose stones, weighing from a ton or so downwards, but perfectly dry; the springs were not to be seen. Poor chance for ice, thought I, as I clambered over the sharp rocks. But then, to my utter surprise, I came directly upon a mass of ice and snow, perhaps weighing a ton. The sun was shining full upon it. The top of coarse snow, some inches thick, covered clear, solid ice, which extended under the rocks as far as I could see. But the strangest part was that no water was near it, nor could there ever have been any; it was merely a hole in the rocks, considerably larger than the rest, and would no more hold water than a cobweb. It was an ice-house; but it was also something more—it was an ice-making machine as well.

I account for the presence of the ice in this way: The snow drifts and accumulates in this gorge, to the depth of ten or fifteen feet, and the loose stones of which the whole hill is composed, under your feet and all around you, allow of enough evaporation to cool the air to a very low point, thus preserving the snow till it gradually changes to solid ice; the coarse snow was in a transition stage. Ice keeps here the year round. There is never a drop of water nearer than the brook, about thirty yards from it, and at a considerably lower level, deriving its water entirely from the spring on the other side. All the crevices are in this way filled with ice, which soon melts; but in the big hole it remains until the fall rains dissolve it out. Strange to say, the great dampness on the north side does not tend to preserve the ice; rather the reverse. It is only in this comparatively dry place that it is well kept. It is literally true that the sun shines upon it all through the middle of the day. The rock is trap. In some way it has been broken up into lumps and slabs, and they are piled loosely together, forming a wall that would measure on its slope five hundred feet or more. There is no earth, and the mass only serves to make a better and more extensive evaporating surface and a lower temperature.

At the very head of the mine there is found a hole about the size of a barrel. In it I lost a valuable cane, and almost myself. Next day I went back, provided with cord and a lantern, which I lowered some thirty yards, revealing a long, wide fissure, where a mass of the rock had split off and moved away several feet from the main body. Indeed, the face of the mountain is just here full of cracks and crevices, affording a favorite resting place for foxes and racoons. It is admirably adapted to keep up a copious evaporation, making ice on the same principle as is used by ice-machine makers.

**Anchors, Ice, or Ground Ice.**

BY S. C. GRIGGS.

The formation of anchor ice depends upon two properties of water: 1st. Water can be cooled in a quiescent state down as low as 21°F. without congealing; but, as soon as it is disturbed, part of the water becomes ice, and the rest of the water goes up to 32°F. 2d. The greatest density of water is about 39°F. after reaching that point, in cooling, it grows lighter on further reduction of temperature.

The conditions for producing anchor ice are: 1st. A long stretch of still water in a river; then the water running over a pebbly bottom in a descent of the river. 2d. An intensely cold day, with the river free from ice. This latter condition often occurs.
water would run till the river was frozen over, and thus protected the water from the intense cold.

I write this because I saw in my paper a question as to how anchor ice is formed, and no explanation given. I have never seen the true explanation in books, but it must be in some of the modern chemistries, as I once examined a class of young ladies, and they had the right explanation.

Brooklyn, N. Y.

GLACIERS: THEIR FORMATION AND THEIR MARCH.

In high valleys, among the mountains whose tops are covered with perpetual snow, are often found seas of ice, called "glaciers." They are formed thus: Snow that falls upon lofty mountains melts very little even in summer. So in valleys high up among the mountains it gathers to a great depth, and, from the weight of the snow lying above, the lower layers become icy, as a snowball does when squeezed. The upper crust melts a little during the heat of the day, and the water sinks down through the snow, and then freezes at night. From this melting and freezing the mass of snow is soon changed into a sea of ice.

In travelling down valleys those ancient glaciers left behind them the ice Bergs. Over all the places where the ice-seas passed, the rocks are rounded and highly polished. A field of these rounded rocks, when seen from a distance, looks like a field filled with snow on the ground, and Swiss geologists have called them roches moutonées—"sheep-like rocks." In a valley along the summit of the Rocky Mountains, near the "Mountain of the Holy Cross," there is a beautiful display of these polished rounded rocks.

As the glaciers moved down the valleys, great rocks, frozen fast in the ice on the sides and at the bottom, were carried along. Sometimes these scours are very broad and deep, for the immense rocks the glaciers carried were like strong, powerful tools in the grasp of a mighty engine; sometimes the seas are as fine as those of a finely grained sand. They usually run all one way, and, by looking at the direction in which the lines run, one can tell the direction in which the glacier moved. In the sandstone west of New Haven, Connecticut, the deep, broad scours can be plainly seen, running toward the southeast. The height at which these scours occur is a measure of the depth of the ice. Markings in the White Mountains indicate that the ice was more than a mile deep over the region now known as northern New England.

Wherever the glaciers melted, they left an immense amount of "drift," that is, sand, gravel, and stones of all sorts, which had been frozen in the ice when the glaciers were forming. The stones of this drift are of all sizes. Some are as small as pebbles, others as large as small houses. There is one at Bradford, Massachusetts, which measures thirty feet each way, and weighs four and a half million pounds. There is another on a ledge in Vermont which is even larger than that, and which must have been carried by the ice across a valley lying five hundred feet below the ledge where the stone now rests, showing that the ice was five hundred feet thick.

Great boulders of trap rock extend through Connecticut on a line running to Long Island Sound; and, as some of the same kind are found in Long Island, the glacier is believed to have crossed the Sound, carrying these rocks with it. An immense statue of Peter the Great, in St. Petersburg, stands on one of these glacier boulders of solid granite, which weighs three million pounds. One of the largest boulders in America is in the Indian village of Mohegan, near Montville, Connecticut. The Indians call the rock "Shehegan." Its top, which is flat and as large as the floor of a good-sized room, is reached by a ladder.

Sometimes these boulders are found perched upon barren ledges of rock, so nicely balanced that, though of great weight, they may be rocked by the hand. They are called "rocking-stones." Near the Little Connecticut village of Nauck, on Long Island Sound, there is an immense boulder called by the people there "Jimmy's Puft." It was formerly a rocking-stone, but the rock has worn away below it and it cannot longer be moved. —Teressa C. Crop-ton, in St. Nicholas.

Scientific Brevities.

Lake Champlain.—The greatest depth of Lake Champlain is 402 feet, and consequently parts of the bottom of this lake descend 300 feet below the level of the Atlantic Ocean. The lake is highest in May, when it is 2.18 feet above the mean, and lowest in September, when it is 0.66 feet below it; it is about the same level as in the months of March, April, and June.

The Alterations in the Conductivity of pure copper, aluminium, and magnesium, and of commercial zinc and German silver, after a lengthened exposure to a high temperature, has recently been investigated by J. Bergmann. Discs, seventy millimetres in diameter, were heated to 300° C, and, after one hour's exposure, were then allowed to cool slowly. The conductivity of copper was increased by something like 2.4 per cent. by this process; that of aluminium, magnesium, and zinc being increased, respectively, 5.6, 8.5, and 2.4 per cent. The conductivity of the alloy was, on the other hand, diminished by about 2 per cent.

The Motions upon the Surface of Water of small particles of camphor, are supposed to be due to the diminished surface tension of water impregnated with that body. In order that the motions may be lively, the utmost cleanliness is imperative, and the most minute quantity of oil is known to be sufficient to impede these gyrations.

In view of the great interest which attaches to the determination of molecular magnitudes, Lord Rayleigh has thought it worth while to measure the quantity of gas which counteracts the movements of the camphor. Every care was taken to measure the oil accurately, and to exclude the possibility of any grease but such as was applied reaching the water. It was found that the minute quantity of 0.81 milligram of oil was sufficient to stop the movements, the surface over which this volume was spread being 54 square centimetres, so that the thickness of the oil film, calculated as if its density was the same as in the more normal state of aggregation, was 1.63 micro-millimetres.

Mexican Onyx.—Mexican onyx, says the Jeweler’s Weekly, is a form of stalagmite, and its colors are formed by oxides of metals in the earth over the caves through which calcareous water passes. Gold is represented by purple, silver by yellow, iron by red, copper by green, and arsenic and zinc by white. Volcanic eruptions and earthquakes have melted the rocks from which the onyx is taken, and the native Indians who mine it have to cut through masses of ruins. Blocks of the material are quarried in a primitive way, in order not to shatter the substance. Deep round holes are drilled by hand on a line. In each hole is inserted a snuggly fitting piece of wood, which has been grooved from end to end. Hot water is poured into the grooves at night. This swells the wood and the block is split along the line without damage. The natives then saw the blocks into slabs and polish the surface by hand. Each piece is semi-transparent, and, when placed between the eye and a strong light, presents a remarkably beautiful effect in form and color.

Questions and Answers.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

E. T. A., Mass.—The German play of William Tell speaks of a rainbow in the night. Does such a phenomenon exist?

Answer.—Rainbow的现象 are occasionally observed under favorable conditions, but they are very uncommon. The reference in the play is probably to the lunar halos, or circles surrounding the moon, which are familiar to everyone. They indicate the presence of moisture in the upper air, and usually justify their reputation as prophets of rainy weather.

L. P. H., Plymouth.—Does the top of a wheel move faster than the bottom?

Answer.—The top of a carriage wheel moves slower, while the bottom moves faster. The cause of this is, first, because, in addition to its motion of rotation, it has the direct forward movement of the carriage; second, the wheel moves in an opposite direction to that of the wheel itself, and, as the two motions partially neutralize each other, it follows that the part of the observer more slowly than the top. instantaneous photographs of moving carriages often show the case of a fixed wheel—a pulley on a shaft, for instance,—all parts would move with the same speed.

F. M. W., Indiana.—Vulcanized rubber will, after a while, undergo a sort of spontaneous decomposition, becoming hard and brittle. It is said that this is due to the softening of the material, but we doubt if there is any really effective way to do it. The best way is to buy only freshly-made rubber tubing, etc., and use it as much as possible within its life.

R. M. S., New Jersey.—What can I use to prevent grass and weeds growing in gravel walks and driveways?

Answer.—A liberal mixture of common salt with the gravel is about as effective as anything, but if there are grass borders or flower-beds near by, care should be taken that the rains do not wash the salt away.

M. B. E., Detroit.—The specific gravity of the solid metals is only approximately proportional to their atomic weights. Lithium, the lightest solid element, has a specific gravity of 0.534; gold, with an atomic weight of 197, has an atomic specific gravity of 19.3; and uranium, with an atomic weight of 238.4, has an atomic specific gravity of 19.4.

J. D. C., Boston.—Tellurium is an element closely related chemically to selenium and sulphur. It is a member of the sulfur group but has recently been found in Colorado in mass in considerable siles, some weighing as much as twenty-five pounds. No practical use has ever been made of it.

N. P. B., Allnago.—Is the universe believed to be indefinite in size, limited only to the Milky Way as we know it, or is it limited in size to the myriad of stars which we look out upon from the earth?

Answer.—It cannot be proved that, unless light is extinguished in passing through space, there must be a limit to the universe, and so the entire sky would be a blaze of light. We must, therefore, believe either that our universe contains only a certain number of self-luminous bodies, or else that, in some way, light is absolutely extinguished in passing to us through the celestial spaces. Either theory is not enough, but the question still remains an open one.
SOME NEW LABORATORY DEVICES.

The following simple, but useful forms of laboratory apparatus are described and illustrated in the American Druggist, which journal has collected them from their original sources. Practical chemists will find them exceedingly useful for the purposes for which they are designed.

A MODIFIED FORM OF PINCHOCK.—As is shown in the cut, the modification consists in making a side bend in one of the limbs and omitting the double wire which serves as a guide in the ordinary form. The pinchock can be opened by springing the limbs apart, and thus readily put on a tube connected at both ends without breaking connections, and, when placed so that the tube lies in the side bend, leaves the tube open while retaining its place.—J. T. STODDART.

A SELF-SUPPORTING ABSORPTION TUBE.—Stolba uses absorption tubes (for drying gases, etc.) of the shape shown in the cut. A portion of the tube is bent into a flat spiral, upon which it rests when placed on the laboratory table. The two tubes passing through the stoppers are closed at the inner orifice, but have an aperture a short distance above the end. It is only necessary to draw up either tube so that the aperture is within the stopper, when the current of gas will cease to pass.

A NEW TEST-TUBE HOLDER.—The annoyance experienced in using the common wooden test-tube holders led me some years ago to attempt to devise a holder which should serve its purpose more perfectly. The wooden holder is clumsy, its rubber band rotts and is liable to give way at awkward moments, the peg becomes unglued and drops out, and even in its best estate it holds securely only medium-sized test-tubes. Tubes of more than 2 cm. cannot be inserted sideways, larger ones are not taken at all, and a separate holder must be used for small test-tubes and ignition-tubes. The new holder is made of brass wire, and opens by pressure on the straight sides of the handle. Its jaws open to the width of 5 cm., and it holds firmly any tube from 5 mm. up. It thus serves for ignition-tubes as well as for all sizes of test-tubes. I have recently had a larger size made of stiffer wire for the purpose of holding flasks, etc. It proves very convenient as a holder of wash-bottles when one is washing with boiling water, and also for holding beakers when decanting hot solutions.—J. T. STODDART.

A NEW VALVE FOR WASH-BOTTLES.—In view of the fact that metallurgical and technical chemists have daily occasion to use hot acids, ammonia, and other fuming liquids in the washing of precipitates, a wash-bottle which will automatically throw a prolonged stream of liquid and retain all disagreeable gases will be appreciated by the fraternity. A strong objection to the use of a rubber bulb attached to the wash-bottle is the fact that a slight rise in the temperature of the room will force the liquid out of the bottle; while the ordinary rubber valve, as described by Binir in the "Analysis of Iron," will swell and become useless in a short time when exposed to the fumes of hot acids. A very simple apparatus can be made in a few minutes which obviates both these difficulties. A rubber stopper, doubly perforated, and of such size that it will project about a quarter inch above the neck of the wash-bottle, is chosen, a lead pencil or penholder passed into one of the holes, and a small hole drilled through the side of the stopper till the borer meets the wooden plug. A wedge-shaped channel is then cut in the side of the stopper from this side hole to its lower end. A piece of glass tubing is now closed at one end, and a small opening about the size of a pin's head made in the glass an inch from the closed end. This can be easily done by a small flame directed upon the surface of the glass, while air is blown into the tube. This small opening is made level with the rest of the tube, and the glass is bent at the regulation angle about two inches above this opening. This is then placed in the rubber stopper so that the hole in the glass tube and that in the stopper will coincide. An exit tube for the escape of the liquid is made as usual, and the tubes and stopper placed in the neck of the wash-bottle in such a way that, when air is blown in, it passes through the side hole in the stopper, down the wedge-shaped groove, and forces the liquid up the exit tube. A very slight rotation of the inlet tube, after the liquid has begun to flow, will close the valve, and the pressure of the enclosed air will maintain the stream, which can instantly be stopped by reversing the rotation. If the apparatus is well made, the angle of rotation of the inlet tube is very slight—not over twenty degrees. I have had this apparatus in use for several months, and find that it does not get out of order, is much easier to handle, and saves more labor in the washing of precipitates than any other form of wash-bottle. The inlet tube is so small that no appreciable evaporation of ammonia occurs, nor does a rise in the temperature of the laboratory result in an undesirable washing of the working benches.—DAVID H. BROWNE.

ORDINARY ACTIONS OF OXYGEN.

BY GEORGE L. BURDITT.

In the year 1774, philosophers all over the civilized world were astonished by Dr. Priestley's discovery of oxygen. It has rightly been called the most important discovery of that century, and we called Newton's discovery of gravitation in the preceding century. Besides forming an epoch in the progress of learning, it put an end to old chemical theories, and at the same time laid the foundation of modern chemistry, furnishing a key to many of Nature's secrets. But, while Newton's discovery is unsurpassed in grandeur, Priestley's is more closely connected with earthly affairs.

Oxygen is the most abundant of all the elements. It composes at least one-third of the earth, one-fifth of the atmosphere, and eight-ninths by weight of all the water on the globe. It is also a very important constituent of all minerals, animals, and vegetables. Oxygen may be prepared in a variety of ways. One way is to heat mercuric oxide in a tube or retort. Mercury is soon condensed in the coolest part of the retort, and a gas is liberated, which may be collected over water: 2HgO = 2Hg + O2. It was by this method that Dr. Priestley discovered the gas. A supply of very pure oxygen may be obtained by the action of heat upon potassic chlorate. A flask may be used to hold the chlorate, and the gas may be collected in jars over water. When the quantity of chlorate is large, the heat required is apt to soften the glass of the flask in which the chlorate is decomposed. It has been found that metallic oxides, if mixed in a fine powder with the pulverized chlorate in the proper proportions, cause the expulsion of the gas at a much lower temperature, although such oxides do not appear to have experienced any change during the operation. Black oxide of copper or oxide of manganese are the oxides generally used, but the resulting oxygen always contains traces of chlorine. These are the simplest ways of getting oxygen for experiments, although many others exist.

Oxygen is a colorless, tasteless, and scentless gas, a little heavier than air, (specific gravity 1.1036), and only slightly soluble in water. It was first condensed to a liquid by Pfund and Callielet, but the operation was quite difficult. It retracts light the least of any known substance. At ordinary temperatures it possesses weak magnetic properties, but its susceptibility to magnetization is diminished, and sometimes disappears temporarily, at 35°. Oxygen has a strong attraction for other elements, excepting fluorine, and enters into combination with them, forming a great variety of compounds. With some elements it forms gases; with others, liquids; with others, solids. Some of these compounds give up their oxygen with great ease, while others do not. With one set of substances it forms neutral compounds; with others, alkalies; with still others, acids. With some elements it forms nourishing food; with others, deadly poisons. Mingled with one gas, nitrogen, it forms the air we breathe; combined with another gas, hydrogen, it forms the water we drink. It is necessary to the support of all animal life, and hence was called by...
the old chemists "vital air;" but its action upon the lungs is very violent if breathed undiluted for any considerable time.

The distinguishing feature of oxygen is its great power of supporting combustion. When, by any rapid chemical action, light and heat are produced, combustion is said to have taken place. Heat is usually necessary to start the process, but afterward the heat given out during the process is more than enough to carry it on. In regard to combustion, all bodies may be included in one of three classes:

1. Supporters of combustion; those which, like oxygen, allow bodies to burn freely in them, but do not burn themselves.

2. Combustibles; those substances which, like charcoal, actually burn in a gas of the first class, when raised to the proper temperature.

3. Those bodies which, like sand, iron-rust, or earthy bodies in general, neither burn themselves nor support the combustion of other bodies; they may be made red-hot, but they do not burn.

The terms "combustible" and "supporter of combustion" are, however, merely relative; for, although hydrogen is ordinarily a combustible, and oxygen and chlorine supporters of combustion, yet these two last mentioned gases are quite capable of burning when compassed about by an atmosphere of hydrogen. All substances which burn in air burn in pure oxygen with greater brilliancy. If a glowing splinter is put into a jar of oxygen, it is lighted and burns with a very bright light. Substances usually considered combustible may burn violently in oxygen. For instance, take a steel watch-spring, coil it into a spiral, tip one end with sulphur and light it, and put the spring into a jar of oxygen. The spring burns with a dazzling light, and scintillates beautifully. The combination of oxygen with other elements is called oxidation, and the products are called oxides. Combustion is the combination of oxygen with another substance; so that oxidation is really combustion, and vice versa.

The cases considered above are cases of rapid combustion. At ordinary temperatures oxygen often enters into combination so slowly that the heat liberated is not perceptible (for oxidation always causes heat). This is the case when iron rusts in the air. This is called slow combustion; but this slow combustion is always accompanied by heat. A pound of iron will produce the same amount of heat as is produced in the case of a pound of lamp-black, or in an ordinary fire. But in the first case it may take years to develop this amount of heat, and in the second only a few minutes. Under favorable circumstances oxidation may become so rapid as to raise the temperature of a body to its ignition, when it bursts into flame, producing what is known as spontaneous combustion. This is especially the case in flammable materials, such as corn, hay, or thin paper, which, when wet, are easily ignited by the heat of respiring life. The term spontaneous combustion, in this sense, means the decay of organic bodies, leaving only traces of ash. However, it may be shown that there is no actual destruction of the candle's components, but that they have combined with a certain proportion of oxygen, forming carbonic anhydride and aqueous vapor; and these, although invisible, really weigh more than the original candle, the gain in weight representing the amount of oxygen necessary to produce the change. Metals oxidize more rapidly in a moist than in a dry atmosphere. In the case of iron, the oxidation goes through the entire mass; but with other substances, like lead and zinc, only a coating is formed on the surface, which protects the parts beneath from oxidation.

Slow oxidation is constantly going on around us, although in such a quiet way as to be unnoticed in most cases. Oxygen, existing free in the atmosphere, pervades everything, and shows an irresistible desire to possess everything. The decay of animal and vegetable matter is due to oxygen, which, by its combination with them, breaks them up into simpler substances. It is this slow oxidation which rids the earth, the air, and the sea of their impurities—a sort of smoldering fire which consumes all waste matter. Its slight solubility in water enables it to remove impurities from below the surface of lakes, rivers, etc., thus keeping the water pure. The part played by oxygen in nature is of the greatest importance. It is a sort of keystone in the solid crust of the earth, holding them in their proper places by the vast number of combinations it makes with them.

Of the practical consequences of Dr. Priestley's discovery, Prof. Liebig observes: "Since the discovery of oxygen, the civilized world has undergone a revolution in manners and customs. The knowledge of the composition of the atmosphere, of the solid crust of the earth, of water, and of their influence upon the life of plants and animals, was linked with that discovery. The successful pursuit of innumerable trades and manufactures, the profitable separation of metals from their ores, also stand in the closest connection therewith. It may well be said that the material prosperity of empires has increased manifold since the time oxygen became known, and that, therefore, every individual has been augmented in proportion."

**INDUSTRIAL MEMORANDA.**

**PAPER PULLEYS.**—According to Le Genie Civil, a French machine tool builder, M. Burrot, of Angouleme, is turning out paper pulleys for power transmission, based on the principle of the paper car-wheel. The pulleys have metal hubs and arms on which the soft paper mass is mounted and then pressed and dried. If the paper, after being treated in a bath of linseed oil and resin to give it greater resistance against the influence of moisture, the pulleys are said to be very light and of low price, and to have given excellent results in practice.

**TARRED PIPES.**—A simple and economical way of tarring sheet-iron pipes to keep them from rusting is as follows: The sections as made should be coated with coal tar and then filled with light wood shavings, and the latter set on fire. It is declared that the effect of this treatment will be to render the iron practically proof against rust for an indefinite period, rendering future painting unnecessary. It is important that the iron should not be made too hot, or kept hot for too long a time, lest the tar should be burned off. Hence the direction for the use of light shavings instead of any other means of heating.

**BRICK ESTIMATES.**—Ordinary bricks are about eight inches in length, and, with the mortar 1/4 inch deep, each brick on the wall that will give a horizontal surface of about 32 square inches, or 45 bricks will cover a square foot. As ordinarily laid, there are nine courses to every 24 inches, or 45 to the foot. Four and a half courses with 45 bricks to the course, will go 204 bricks to the cubic foot. Waste, cutting, and closer joints will easily require an allowance of 11 bricks per cubic foot, which will be found a very convenient figure for estimating the number of bricks required for a wall of given height and thickness, as it thus becomes unnecessary to find the cubic contents of the wall, but merely to multiply its face area, or the product of its length and height in feet, by seven-fourths of its thickness in inches, which, as the thickness is always some multiple of the four inches, is a very simple process.

**An Honest Gas Meter.**—In view of the difficulty experienced by the general run of gas consumers in checking their gas bills against their meter register, an English inventor has devised a cash value indicator for gas meters. This consists of a dial placed on the front of the meter, and having around its edge figures, each representing 100 cubic feet of gas, from zero to 1,000. Under each of these figures is the cost of the amount of gas represented by the figures at a stated price per 1,000 feet. The quantity consumed is indicated by a pointer, which is worked from the ordinary indicator of the meter, and after 1,000 feet of gas have been used this is indicated on another dial within the priced one; the pointer then goes on to indicate a second 1,000, and so on.

The dial is made of cardboard, and the price of gas vary, the dial will have to be removed and replaced by one showing the altered price. It is conceived that this arrangement will lead to the use of gas by many small consumers who distrust gas meters because they cannot understand them, and who doubt the correctness of gas bills because they cannot check them.

**WHITE LEAD BY A WET PROCESS.**—The older methods of producing white lead by the vinegar and fermentation process occupy a long period, and several methods have been in vogue to produce it in shorter periods. Recently Professor Maclvor has devised a method which has been developing gradually into larger proportions, and proves a success, not only as to product, but also as to producing it on a commercial scale. It is being so reasonable as to permit it to come into active competition upon price as well as quality. The process is as follows: Washed litharge is placed in a suitable tank, to which a solution of ammonium acetate is added, with constant stirring for six hours, and then allowed to settle; after which the liquor is transferred to a second tank, where it is treated with carbolic acid gas. The pulp of lead acetate, or the members of the liquor extracted, is then treated with washing until freed from all traces of ammonium acetate, when it is dried and ground. The product is said to be perfectly white, a pure carbonate of fine texture, while economy of time is great, the entire process occupying but a few hours. The ammonium acetate is recovered and is repeatedly used.

**PRACTICAL RECIPES.**

**STENCIL INK.**—Use shellac 2 oz., borax 2 oz., water 25 oz., gum arable 2 oz. Color with fine lamp-black, to desired consistency. You may use turpentine and lamp-black with a little linseed oil, or even glue and water with lamp-black.

**A GOOD PAINT for shingle roofs, that can be applied cold and dries quickly, can be made as follows: One barrel of coal tar, ten pounds of asphaltenes, and slate dust, by the aid of heat and add two gallons of deal oil.

**PHOTOGRAPHIC FILMS.**—The composition of the films now so popularly used is said to be 4,500 grains of soluble cotton, 5,400 grains of camphor in 112 ounces of methyl-alcohol, 28 ounces of fuel oil, and 7 ounces of ammoniacetate. This solution is spread upon a "coated table" (a table which has had a solution of oxalate of bichromate poured over it and the latter evaporated) by means of a soft brush; the film should not be over 3/1000 to 5/1000 inch thick. After washing the film with a weak solution of sodium or potassium siliicate it is dried and then coated with emulsion.
made one of the finest archaeological collections in the State, he proposes to present it to the Historical Society of his county, and, moreover, that he is going to erect a fine building, one floor of which he will freely give to this society for its meetings, library, and museum. And yet this young student is not quite “of age.” He promises to contribute several thousand dollars towards a fund for the Agassiz Association, as soon as he shall become twenty-one and the controller of his own estate. Thus our Association, like a mother having “nourished and brought up children,” may hope, in her turn, to receive from them a large measure of filial gratitude, affection, and care.

In connection with this subject, it may not be out of place to state that the Agassiz Association has never yet, during its fifteen years of life, received so much as five dollars, either as a gift or bequest. It will continue to live and work in the future, as in the past, with no assistance from without, if need be; but it often seems not wholly unreasonable to hope that its quiet, but wide-reaching influence for good, and its manifest power in educating and inspiring young men and women, may attract the attention of some man or woman desirous of linking his or her name with a beneficent institution, and that from some unexpected source a liberal endowment may be received, which will relieve the society from the embarrassment, and especially from the limitations, which attend an empty treasury. It is a significant fact that the Agassiz Association has never had a treasurer. This paragraph is thrown up upon the waters plowed by the keel of Popular Science News, with the hope that it may return after a few days!

But the question of endowment may safely be left to take care of itself. There will always be generous men who will give of their abundance to such institutions as seem to them most worthy. One selects some distant missionary field; another gives to some poverty-stricken or to some very wealthy college; another, to a society for the prevention of docking horses’ tails; and when the Agassiz Association shall have proved that by the training of young men and women in habits of intelligent observation, patient, thorough work, and manly thinking, it deserves a place among the beneficent institutions of the land, it will undoubtedly receive its due share of recognition at the hands of philanthropists and at the pens of testators. We wish now simply to invite all those who are interested in any bright young people, or in any department of natural science on their own account, to join the Agassiz Association and induce their friends to join, and test its methods and prove its advantages for themselves. It costs nothing to make the experiment.

AWARD OF THE PRIZE.

As previously announced in this journal, the editor of the Popular Science News, appreciating the good work of the Agassiz Association, and desiring to emphasize the importance of its plan of leading all its members to use their own eyes and fingers, offered a fine Bausch & Lomb microscope as a prize for the best set of "Notes of Personal Observations" made during the summer now closed.

The papers sent in competition have surpassed all expectation in the matter of excellence, and the task of deciding which one is, on the whole, the best, has been one of unusual difficulty. It is always hard to award a prize, and the statement that a "decision has been made after great hesitation," etc., is as threadbare as a boy’s knees in marble-time. Yet it usually happens in contests of this kind that two or three papers stand out at once from the mass, marked by evident tokens of superiority. The difficulty usually comes in deciding between two or three. But in this case, no less than half a dozen papers are so nearly equal in merit, and at the same time so utterly different in topic and method, that no committee has ever been more grievously perplexed.

With this premise, the microscope is hereby awarded to Mr. J. E. Walter, Secretary of Chapter 834, Peru, Indiana. Honorable mention is awarded to each of the following: Theodore G. White, Secretary Chapter 949, New York, N. Y., (Z); Amadeus Grabau, Secretary Chapter 551, (Corresponding Geological Chapter), Buffalo, N. Y., (E); Dr. Mary D. Hessey, Chapter 652, East Orange, N. J., (C); Mrs. Sarah F. Fuller, Chapter 27, Boston, (B); Mrs. A. C. Whitcomb, Milwaukee, Wis. ; Mary E. Cherington, Chapter 591, Boston ; and Willard N. Clute, Binghamton, N. Y.

We shall give selections from nearly all the papers entered in competition for the prize, and this month present the following from the note-books of Messrs. Grabau and Clute, intending to give the whole or a part of the winning paper in some later issue.

GEOLOGICAL OBSERVATIONS—SUMMER OF 1890.

BY AMADEUS W. GRABAU.

BUFFALO, N. Y.

AN UNDERGROUND WATER-COURSE.—Although I had often heard of streams which follow their beds for some distance and then suddenly disappear, I never had an opportunity to examine one of these streams myself, until recently I came upon one quite unexpectedly. While out on a botanical excursion in the northern part of Buffalo, searching for the rare Epipactis, along the banks of Skajaquada (or Conjoined) Creek, my attention was called to the stream, which, shortly after entering Forest Lawn Cemetery, disappeared in a crevice in the rocky bed. Upon closer examination, the following interesting facts were disclosed: The bed of the stream is
composed of the limestone of the water line group (in this locality the highest group of the Silurians). The rock is crossed by two sets of vertical seams, or joints, crossing each other at right angles. The planes of these fissures are from a quarter of an inch to half a foot or more apart, the fissures being usually filled by sand or other loose material. Into one of these cracks, falling like the bed of the creek, for nearly a quarter of a mile from here, is completely dry, save for a few pools of stagnant water. The creek makes a circuitous bend to the right, but the water takes a shorter underground course. On examination of the bed further down, we found it again filled with water, and a closer examination disclosed a current in the bed. The water was not the same as that from the spring floods—but where did the current come from? This question we determined to solve. Cautiously making our way up stream, and closely inspecting the banks, we soon found its origin. From the right bank, and out of the crevices on the right side, the water issued, spring-like, in great quantity. At every step, springing issued, flowing like a bank; and welling up out of the crevices with such force that everything placed into them was again brought up by the water. These springs we traced nearly to the bend of the stream. Examining the left bank, we found it completely dry, and no water issued from the crevices on this side. This clearly proves that the water, after disappearing near the bridge, five miles away upstream, saturating the rock down to the impervious shale, and issuing again, at a lower level, from the rock, filling its bed anew. The water does not follow the course of its former channel, but takes a more direct course. It does not all appear again; some of it continues its underground course, and probably issues with the drain of the surrounding country, at the foot of the terrace, across the valley.

FORMATION OF THE UPPER FALLS OF THE GENESEE RIVER AT PORTAGE. (A vacation study.Usu.)—Probably no portion of the Genesee River is more interesting to the geologist than the dry gorge extending from Portage to Mt. Morris, in which are situated the three celebrated Portage falls. Attempting to trace the history of this gorge, we must go back to the Ice Age, when the world was locked in a common glacial ice, which descended the rock down to the impervious shale, and issuing again, at a lower level, from the rock, filling its bed anew. The water does not follow the course of its former channel, but takes a more direct course. It does not all appear again; some of it continues its underground course, and probably issues with the drain of the surrounding country, at the foot of the terrace, across the valley.

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In the September issue of the *Science News* we made answer to a correspondent regarding the so-called horse-hair snake, or *Gordius*, which, according to a common belief, is formed from a horse-hair when immersed for some time in water. Of course a *Gordius* could no more be generated by soaking a horse-hair in water than could another horse, and we supposed that this childish superstition was beneath the consideration of anyone; but we were both surprised and interested to receive a letter from a reader of the *Science News*, evidently a person of superior intelligence, which stated that the writer had personally observed this change, and referred also to two other persons who were prepared to testify to the truth of this wonderful transformation. The writer says:

A portion of the tail of a horse which was cut off was cast into a pond. In due time someone, from motives of curiosity or otherwise, was led to examine it, and to his astonishment, although the hairs retained their original connection, they each one became a snake. It attracted considerable attention at the time. The hairs I used to experiment with seemed to be covered with a kind of gelatinous substance by the time they assumed motion, which, however, was easily scraped off, and the hairs assumed its original appearance. I think the transformation would not take place in running water, but am not sure, as my experiments were confined to a frog-pond.

This letter is a good illustration of the vitality of many old superstitions which have come down to us through an unknown number of generations, and also of the defective and misleading observations likely to be made by those not particularly trained to such work. The *Gordius* resembles a horse-hair; what could be more natural, they reason, than that it really is a horse-hair endowed with life by immersion in water? A horse-hair immersed in a frog-pond for a considerable time would undoubtedly become covered with a "gelatinous substance," and it is, perhaps, not impossible—though very improbable—that certain small animals might also become attached to it in sufficient numbers to cause it to move in the water; but five minutes of careful observation would have shown that this was the case, and the friends of our correspondent might have been spared the strain upon their credulity necessary to the acceptance of such a modern miracle. If any readers of the *Science News* still believe such a transformation to be possible, we recommend them to try the experiment for themselves under test conditions, and if they can bring forward absolute proof of the direct change of a horse-hair into a *Gordius*, they may be sure that we shall only be too happy to publish the fact, and recompense them liberally for their trouble.

The above is also a good illustration of the defective training given by our modern systems of education. How is it possible for persons who have spent years in the training of their intellectual faculties, to fail so conspicuously in the comprehension of one of the simplest occurrences in nature? The trouble seems to be that little or no attention is given in our schools to teaching the pupils to observe accurately, or reason correctly upon the observations which they have made. Their minds are fed, or rather stuffed, with as many statements and facts from textbooks as they can be made to retain, all of which must be taken for granted, with the sole intention of their reaching a certain "percentage" or passing that relic of mediæval barbarism, an "examination." If the pupils of our schools were encouraged in an independent habit of thought, and taught to observe and reason correctly before everything else, they would be much better fitted for the succeeding years of their life, and could afterwards pursue such special branches of knowledge as they should find necessary or agreeable, to much better advantage. It is in this direction that the *Agassiz Association* does its best work, particularly as there is no better way possible for the development of the qualities referred to above than by the study of Nature.

At the meeting of the Iron and Steel Institute of Great Britain recently held at Pittsburgh, Pa., Sir Nathaniel Barnaby described a new type of steamship, which, if it ever comes into general use, will bring about a revolution in the freight carrying trade. Briefly stated, it is proposed to build an immense vessel, or rather floating island, of steel, 1,000 feet long, 300 feet wide, and 36 feet in draught. The size, however, is not the greatest departure from ordinary vessels, but the proposed method of stowing the cargo, which is, to say the least, unique. As so large a vessel could not be brought up to any wharf to receive a cargo, it is proposed to place it on lighters, or scows, and float them out to the boat as it lies in the harbor; but, instead of transshipping the cargo in midstream, certain compartments of the steamboat are to be flooded with water, and lighters, cargo, and all are to be simply floated on board and carried to their destination without breaking bulk. The new pattern of steamship will be, in fact, a locomotive dry-dock, and, if it proves practicable, will doubtless effect a great saving in the expense of re-handling freight; but, except for the high authority which has given its approval to this remarkable departure from the ordinary type of vessels, we should have many doubts of its success.

"Low water" is not infrequently given as the cause for certain steam-boiler explosions, the usual theory being that when the water in a boiler is allowed to fall below the proper level, and the plates or crown-sheet become overheated, the admission of cold feed-water into such an overheated boiler causes so great and sudden a development of steam that the boiler is unable to withstand the strain. Certain experiments recently made in England seem to show that these views are incorrect. These experiments were made directly upon a working boiler, the investigators being sheltered in a bomb-proof structure near by. It was found that the sudden introduction of cold water into an overheated boiler did not cause a sudden rise of pressure, and although in some cases the pressure was slightly raised at first, it always fell immediately afterwards, and often the pressure was lowered at once upon the admission of the cold water. The writers of the report even think that it might be advantageous in cases where the water has been allowed to get very low, and the furnace crowns to become heated, to turn on the feed, though they hesitate, in the present state of knowledge on the subject, to recommend such a proceeding. The safest plan, however, is not to let the water get below the proper level, and thus avoid the necessity of repeating the English experiments with possibly different results.

There is really nothing mysterious about most boiler explosions. Given a pressure of steam greater than the weakest part of the boiler can withstand, and no other conditions are necessary to produce the brilliant, but unsatisfactory phenomena of an explosion, and it is unnecessary to call in the aid of low water, the spherical state, electricity, chemical decomposition, or any other doubtful cause. The temptation to overload the safety-valve is a strong one with many engineers, and will account for many of these occurrences. We have heard of a locomotive engineer who chained down the safety-valve of his engine, because the noise of the escaping steam annoyed him while at dinner; and in our own experience we once found the man in charge of a stationary boiler vainly trying to stop the escape of superfluous steam by opening the "blow-out" cock, after an unsuccessful attempt to take out the check-valve in the feed-pipe. Many boiler explosions would cease to be "mysterious" if there were any means of opening up communication with the ghost of the former engineer.

It was for many years an accepted belief of ethnologists that the Aryan race, the pro-
Popular Science News.

[November, 1890.]

Genitors of the modern inhabitants of Europe, originated in the highlands of Central Asia, thence emigrating in successive waves to the countries lying to the westward. Since the discovery of the connection between the language of the Finns and the ancient Sanskrit tongue, this belief has been greatly shaken, and numerous theories have been advanced concerning the origin of our race, the last one being that our "old homestead" was situated in the southern part of what is now Russia. The question is a difficult one to settle, and it seems as if we must finally admit that the beginning of our race was so far back in the pre-historic ages that it is impossible to discover its source. We know that man has existed for tens, if not hundreds of thousands of years,—a period compared with which our oldest records are but as yesterday. Constant movements of population must have been going on during the greater part of that time, and, instead of accepting the ancient Aryan as the founders of our race, we should take pride in possessing a pedigree so long that its beginning is lost in the fogs and mists which accompanied the close of the glacial period.

The Measurement of Minute Forces.

With the increased attention now being given to the study of physics, the measurement of the most minute natural forces has become an important matter. The weakest currents of electricity—even those developed by the beating of the heart—can be transformed into mechanical movements, and their existence made evident to the senses. Even the infinitesimal difference in the force of attraction of gravitation between an empty hall and one with an audience assembled therein, can be made perfectly visible to the audience itself.

The general principle upon which all these measurements depend is that of the torsion, or twisting, of a fine thread or fibre, to which a small mirror is suspended. A ray of light is thrown upon the mirror, which reflects it upon a screen. Any force, therefore, which moves the mirror in the slightest, is at once shown in a greatly magnified degree by the movement of the spot of light upon the screen. It is like applying power to the short end of a lever, only in such a case our lever is a ray of light, without inertia or weight, and moving without friction.

It is evident that the finer the thread by which the mirror is suspended, the more sensitive it will be to the action of forces tending to twist it, and a perfect means of suspension for the mirror has long been sought after by physicists. Fine hairs were at first used, but even they were too large, and offered too much resistance to the forces under investigation. Fine metallic wires were tried, and the much finer thread spun by the silkworm. Glass was drawn out into microscopically fine threads, which served a good purpose, the principal objection being their somewhat imperfect elasticity, which prevented them when once twisted from returning to their original position. A comparison of these different fibres with the quartz threads referred to below is shown in the engraving. They are, of course, greatly magnified, each of the smaller divisions on the scale representing a hundredth of a millimetre, or 1-2500 of an inch.

In the threads of quartz, first produced by Mr. Vernon Boys, we have a substance which is not only perfectly elastic, but is unaffected by atmospheric changes, and is strong enough to support a considerable weight, while the threads can be made much finer than anything formerly produced. They are made by shooting from a little bow an arrow consisting of a straw, which has been previously attached to a small cylinder of quartz, one end of which is fused by the oxyhydrogen blowpipe just before shooting off the arrow. As the arrow flies through the air it draws out a thread of quartz of an inconceivable fineness, and so light that it will float in the air. Some of these fibres have been estimated to be less than one millionth of an inch in diameter, or, to give an idea of their fineness, if a cubic inch of quartz was drawn out into such a thread, it would reach 653 times around the world.

The size of thread, however, most used in actual work is about 10,000 of an inch in diameter, and is ten thousand times more sensitive to a force of torsion than the finest glass threads ever made. With such a quartz thread, Mr. Boys has shown directly to a large audience the attraction of gravitation exerted by spheres of lead of two pounds in weight upon smaller spheres weighing fifteen grains. This attractive force is calculated to be less than a thousand millionth of a grain, and it is believed that it will be possible to measure a force two thousand times more feeble than this.

These figures, although incomprehensible, are real, and, like the wave lengths of light, or the chemical molecules and atoms, stand for actual and definite mathematical relations. Their contrast with the magnitudes of the celestial bodies and spaces, which are the study of the astronomer, is most marked, and leads us not only to admiration and wonder at the construction of the universe, but also at the capabilities of the human mind which can conceive, and even, perhaps, imperfectly comprehend, such extreme manifestations of weight, mass, and energy.

The Highest Scientific Station in Europe.

The accompanying illustration (from La Nature) gives a view of a cabin, erected during the past summer, at a point near the summit of Mont Blanc, at an elevation of 13,300 feet above the sea. It is divided into two rooms, one of which is intended for the use of parties on their way to the summit, while the other is a well-equipped meteorological observatory, supplied entirely with self-registering instruments, which only need attention once every fifteen days; and it is intended to visit the observatory at such an interval during the summer months. Of course, in the winter the cabin is inaccessible to everyone.

In point of altitude, the Mont Blanc observatory is slightly less than that of the signal station on Pike's Peak, Colorado, (14,147 feet), and the latter possesses the great advantage of being occupied all the year round. Owing to the favorable climatic conditions, the ascent of Pike's Peak is extremely safe and easy, and a matter of daily occurrence, while, as is well known, only the most expert mountaineers can gain the summit of Mont Blanc, and even then at a considerable risk of danger to life or limb.

This cabin was erected under the auspices of M. J. Vallot, of the French Alpine Club, and was accomplished in the face of almost insurmountable difficulties. Everything connected with the building had to be carried on the backs of men from the village of Chamoux in the valley below. The boards and other materials for the construction of the cabin made up one hundred and twelve loads, while the furniture, instruments, etc., required ninety additional journeys to transport up the mountain. Six weeks were required to deliver the materials, and on the 25th of July M. Vallot, with five carpenters and two guides, went into camp in the snow on the mountain and commenced work.

Notwithstanding the great cold, satisfactory
progress was made. In two days the foundation was laid, and the next day the frame was raised and the boards nailed on. Unfortunately, three of the workmen had already succumbed to the “mountain sickness” and returned to the valley, while a threatened storm rendered it necessary for the whole party to follow them. M. Vallot had brought with him a bag of oxygen gas, and it was found that inhalations of this were of great service in overcoming the weakness and prostration due to the rarefied air of the high altitude. One of the workmen was so completely overborne that he was unable to move, and would, perhaps, have perished but for the aid given by this stimulating element.

On the 31st of July, the storm having passed, the party, accompanied by Mr. Lawrence Rotch, of the Blue Hill Observatory, near Boston, returned to the mountain, and completed the building, by covering the planks with tarred felt, erecting a lightning-rod, and strengthening the walls by heaping stones around them. On the 2d of August the work was completed, and the next day the party descended to Chamonix, where they received a most enthusiastic ovation.

On the 17th of August, M. Vallot, with MM. Jansen and Durier, spent three days in the observatory, where they were detained by a terrible storm, which the building withstood without injury. The wind was estimated to blow at the rate of over 200 miles an hour. The barometer varied a quarter of an inch within two minutes, and everything in the camp outside—including two camp bedsteads and a can of oil—was blown completely off the mountain and carried to great distances.

Both mountain-climbers and scientists owe a debt of gratitude to M. Vallot, through whose enterprise this station has been erected, which will not only add much to the safety and comfort of future visitors to the summit, but will undoubtedly greatly increase our knowledge of the meteorological conditions of these elevated and often inaccessible regions.

The sun’s distance, as stated by Prof. Harkness, an American member of the Transit of Venus Commission, is 92,455,000 miles from the earth, with a probable error of 123,400 miles.
of heart—situated in the dorsal part of the body, having both auricle and ventricle—arteries, and veins. The article receives venous blood from the tissues of the kidney, and the ventricle propels it to the lungs to be aerated. Thence the blood, now rendered arterial, passes to the tissues. The color of the blood is white, its physical constituents being a fluid plasma and amorphobium white corpuscles.

The nervous system consists of three masses of ganglia which act as nerve-centers, of commissures which link them, and of ganglia on the cords that pass from the centers to the several parts and organs of the body. One of the nerve-centers—that in the head region of the body—has already been noticed. The other two are situated, one in the foot, supplying nerves to the creeping-disc, and the other in the visceral region of the body, giving off nerves to the digestive organs, to the heart, etc. This structure of the foot is the first in his "Opusculum." It is characteristic of all members of the sub-kingdom Mollusca.

Union College, Schenectady, N. Y.

[Original in Popular Science News.]

ANIMAL INTELLIGENCE.

Fontenelle and Malebranche, two renowned French philosophers, walking one day together, came across a dog, which remained lying in the path, instead of politely getting up and making room for the two scientists. Malebranche gave it a kick, and sent the beast howling into a corner. Fontenelle was much struck at the beha
tility of the proceeding, but Malebranche, in true Cartesian fashion,—he was one of Descartes' disciples,—answered lightly: "No matter; they don't feel."

Since Descartes, and his theory that animals are pure automatic machineries, the opinion of all has been considerably altered, and many feel inclined to reckon the mental power of animals very high, and if the reader reverted to the recent books of Romane, for instance, he will perceive that animals are not only considered as complex, sentient, intelligent, and reasoning creatures, but as presenting in embryonic form all those mental faculties of the highest order which have been believed to belong to man only. Animals, mentally considered, seem to be the same as ourselves, if we exclude what has been attributed to them, under a very elementary form, and no difference of kind being recognized between them—only difference of nature. This is the Darwinian teaching, of course,—the evolutionary view,—and a very interesting one it is. But opponents are not wanting. M. St. George Nivart and A. R. Wallace are among the principal. They go so far as to say that the very beast, having been endowed with the faculty of reason, has assumed the characters of the human mind. It is useless to do more than mention the fact that brute possession memory, imagination, and association of ideas. It is because they are endowed that animal intelligence does, in many individual cases, effect considerable progress, and that animals have a personality of their own. And surely it is not by this method of communication—austrine language, or other, that if they were not endowed with really superior forms of intelligence, they would not unite their efforts in play, or in hunting; they could not display their peculiar notions of justice, their industries, etc.

Considered from the emotional point of view, animals experience pleasure and pain, they possess emotions as well as the experience emotions of many sorts; and if any number of the same species are carefully studied it will be seen that no two are alike, that some are superior to others in various ways, and that uniformity is not the law. Their mental aptitudes differ, sometimes very greatly, and if they might be weighed or measured in some manner, one would certainly say that they differ from each other as much as any ten or twenty men taken at random in a street, as regards mental bias, aptitudes, development, and tendencies.

Animals are possessed with feeling,—this no one will deny,—and their senses are in many cases very acute. They also have smell, they are highly general or particular, abstract or concrete. For instance, as an example of abstract ideas, many dogs are especially attached to troops, and they do not really care about the individuals. They greet with joy every man wearing a given uniform—and no others; of the uniform they certainly have a general and abstract idea. No one will question the truth of the assertion, that dogs can perceive the cat waiting for the mouse; the attitude of the hare when frightened by a noise; that of the senti
nels of a troop or colony of herons when alarmed by any unusual occurrence, are familiar examples. Can animals reflect, or think, over matters? Certainly; since they alter their ways according to their personal experience. The wild animals of a newly-discovered country become timid and fearful as soon as they are aware that the vicinity of man is dangerous. They compare, also, and know that small foes are less dangerous than large ones. They are able to judge of distance, of the proximity of danger, of the intentions of a mere passer-by distinguished from those of the hunter, of the possibility or impossibility of crossing a stream, etc.

Malebranche adds that, though they are not able to adapt their ways to circumstances, and to alter the first as the last require, etc. Breuer tells us of a monkey which, having been scratched by a cat, caught the unfortunate animal and bit off all its claws. Was this not reasoning, and sound reasoning, too? And when Frederic Cuvier's monkey untied three knots in his rope, to lengthen it, did it not exhibit proof of reasoning? Bomboncle, the lion hunter, once saw a singular performance. A jackal came to visit a watermelon, and wanted to take it away, and began pushing it forward with its nose. But the garden was steep, and the watermelons rolled down. Nothing daunted, the beast howled for a friend, which came immediately to help. But of no avail; again the watermelon, obedient to Newton's law, rolled back. Then one of the two thieves laid down on his back, clasping the fruit on his stomach, and the other, catching hold of him by the mouth, dragged him up hill. This maneuver was perfectly successful, and the two ingenious thieves were allowed to escape with their well-earned booty.

But such examples are so numerous in M. Alex.'s work that we can only refer the reader to the two hundred pages which are devoted to the consideration of the matter. It is useless to do more than mention the fact that brutes possess memory, imagination, and association of ideas. It is because they are endowed that animal intelligence does, in many individual cases, effect considerable progress, and that animals have a personality of their own. And surely it is not by this method of communication—austrine language, or other, if they were not endowed with really superior forms of intelligence, they would not unite their efforts in play, or in hunting; they could not display their peculiar notions of justice, their industries, etc.

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M. Alex.'s work certainly deserves to be known, and some translator ought to undertake the task of clothimg it in an Anglo-Saxon garment. To give an idea of its country quite much more, and the task of selecting the examples would be a difficult one. M. Alex has not fallen into the error of republishing for the twentieth or thirtieth time anecdotes that are familiar to all; he gives much personal information, or quotes facts that are but little known. This gives to his work a very special feature, and makes it a very valuable contribution to one of the most interesting departments of natural history.

PARIS, October 1, 1890.

[[Specially Observed for Popular Science News.]]

METEOROLOGY FOR SEPTEMBER, 1890. TEMPERATURE.


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The lowest point reached by the mercury the last month was 39° on the 25th; the highest point was 79°, on the 5th,—a monthly range of 40°. The coolest day was 48.6°, on the 29th; the warmest, 74.3°, on the 13th; the 4th and 12th were 3° and 5° cooler. The whole month was a full half degree warmer than the average for the last twenty Septembers. There were no great and sudden changes, except in two instances of 1° in seven hours on the warm 5th, and another of 2° in seven hours on the cool 25th,—both rising temperatures. The first and only frost of the season—and that very slight—was on the 25th. The temperature of the past nine months has been 44° in excess of the average of the same period for twenty years—equivalent to 1.625° daily.

SKY.

The face of the sky, in 90 observations, gave 39 fine, 17 cloudy, 22 overcast, and 12 rainy,—a percentage of 43.3. The change for the last twenty Septembers has been 57.6, with extremes of 35.5 in 1882, and 77.7 in 1871. Only three Septembers have been less fair than the present. From the 5th to the 18th only six fair observations occurred, equal to two days in the fourteen. It was, indeed, a cloudy, rainy, gloomy period, the sun scarcely being seen except on those days. The mornings of the 4th, 16th, and 21st were foggy.

PRECIPITATION.

The amount of rainfall the past month was 56 inches, all of which fell on those fourteen gloomy days, except .24 inch on the 26th. The average amount the last twenty-two Septembers has been 3.04 inches, with extremes of .45 inch in 1877, and .98 inches in 1888. The rainfall has been greater than the present in September only three times in twenty-two years. The amount since January 1 has been 35.87 inches. The average for these nine months has been 35.0,—showing an excess of .83 inch.

PRESSURE.

The average pressure the past month was 30.086 inches, with extremes of 29.75 on the 17th, and 30.30 on the 11th,—a range of .53 inch. The average for the last seventeen Septembers has been 30.082 inches, with extremes of 29.915 in 1876, and 30.110 in 1887; this being still the banner month for high pressure. The sum of the daily variations
was 3.52 inches, giving an average daily movement of 0.117 inch. This average for the last seventeen Septembers has been 0.125 inch, with extremes of 0.074 and 0.166. The largest daily movements were 0.38 on the 24th, and 0.23 on the 1st and 18th, with .22 on the 27th. The high pressure continued through all that rainy fortnight, with only four observations below 30 inches.

WINDS.

The average direction of the wind the last month was W. 23° 12' N., (or nearly W. N. W.), four points more northerly than last August. The average direction the last twenty-one Septembers has been W. 5° 27'. (or half a point N. of W.), with extremes of W. 10° 27' S. in 1874 and 1875, and W. 50° 27' N. in 1853,—a range of 60° 27', or nearly five and a half points of the compass.

COMPARATIVE METEOROLOGY OF NEW ENGLAND FOR AUGUST, 1890, WITH REVIEW OF THE SUMMER.

The table below is gathered from the Bulletins of the New England Meteorological Society for June, July, and August, 1890, exhibiting the mean temperature and precipitation, State by State, with that of New England combined; also the combined number of reports, with the extremes and range in each division. The upper line of figures against each State presents the statistics for August, and the line beneath those for the entire summer. The lowest space in the table gives the New England average for August and the summer, from records kept over ten years, with the number of reports combined.

In review, it appears that the last September was warmer than usual, had a remarkably cloudy, rainy spell, high pressure, and unusual freedom from frosts; while in New England, as represented in the table, the August and summer were cooler than usual, and the rainfall was larger in August and less in the summer.

D. W. NATEC], Oct. 6, 1890.

[Specially Competed from Popular Science News.]

ASTRONOMICAL PHENOMENA FOR NOVEMBER, 1890.

Mercury is quite near the sun throughout the month—too near to be seen without a telescope. It is a morning star at the beginning of the month, passes superior conjunction on November 16, and becomes an evening star, but does not get far enough away to be seen easily. Venus is very bright at the beginning of the month, having been at its greatest brilliancy only a day or two before, and will probably be visible to the naked eye during the first part of the month in full daylight. It is still an evening star, setting rather more than two hours after the sun on November 1; but the sun is rapidly overtaking it, and by the end of the month it is only about 2° distant, and it probably cannot then be seen at all after sunset unless the sky is very clear. On November 29 there is a very close conjunction between Mercury and Venus, the latter passing about one-third of the moon's diameter to the south. The time of nearest approach is about two days later. Mars is getting farther away from us and fainter; at the end of the month its distance is about 125,000,000 miles. It is moving eastward among the stars, but not quite as rapidly as the sun, and it sets a little before 10 P. M. during the month. On November 13, at about 6 P. M., it is in conjunction with Jupiter. Mars being south of it, one might expect this conjunction in the evening sky, setting about 10.30 P. M. on November 1, and at 9.30 P. M. on November 30. It is moving eastward among the stars, and changes its position about 4° during the month. The following eclipses of its satellites will be visible at one point or another of the United States—not all at any one place, however. The phenomena all take place near the apogee and perigee of its orbit, which is only visible in an inverting telescope. D. denotes disappearance; R., reappearance. Times are Eastern Standard.

1. R. November 1, 5th, 46°. P. M.
2. R. November 2, 12th, 16°. A. M.
3. D. November 2, 10th, 27°. P. M.
4. I. November 3, 6th, 45°. P. M.
5. R. November 8, 5th, 24°. P. M.
6. R. November 10, 10th, 39°. P. M.
7. R. November 15, 11th, 22°. P. M.
8. R. November 17, 10th, 32°. P. M.
9. R. November 26, 6th, 59°. P. M.
10. D. November 30, 11th, 22°. P. M.

Sun is in the eastern part of the constellation Leo, and is moving slowly eastward—about 2° during the month. It rises a little after 2 A. M. on November 1, and at midnight on November 30. Uranus is a morning star, in the constellation Virgo, rising about three hours before the sun on November 30. Neptune is in the constellation Taurus, and comes to opposition with the sun on November 27.

The Constellations.—The positions given hold good for latitudes differing not much from 40° north, and for 10, 9, and 8 P. M. for the beginning, middle, and end of the month, respectively. Anstroma is in the zenith. Piscis is to the south, high in the sky, and Aquarius is nearly overhead.

LITERARY NOTES.


To use a very hackneyed phrase, this little book seems to fill a "long felt want." It is exactly adapted to the requirements of beginners in chemistry, for use in connection with some good work giving the theoretical principles of the science. The present work, as its name implies, is entirely devoted to the practical part of the chemical work, and contains full directions for performing the hundreds of experiments, many of them new, and all of them easy and simple, with a brief explanation of the results and the use of the apparatus necessary for their production. M. W. J. Mathews, in his "Elementary Chemistry," and all others interested in the study of chemistry will find this work extremely useful and helpful.

Sugar Analysis, by Ferdinand G. Wiechmann, Ph. D. Published by John Wiley & Sons, New York.

Within the past few years numerous changes have been made in the older methods of sugar analysis, new methods have been devised, and many researches of importance to sugar chemistry have been accomplished. In this work the writer has endeavored to present a new and more accurate analysis that should prove of service to the practicing chemist as well as to the student of this branch of the physical chemistry. It is recommended to all interested in the subject.

The Tornado, by H. A. Hazen. Published by N. D. Hodges, 47 Lafayette place, New York.

It is not likely that any stormy weather occurs now than in former years, but, as the country becomes more thickly settled, many more are observed, and the damage done thereby is much greater. To meet the popular interest in the subject, Professor Hazen of the government signal service has prepared this interesting little work, which presents the various physical and meteorological securities bearing on the subject of tornadoes, and many facts which have been collected from year to year, which constituted and only by scores of volumes. The author has endeavored throughout to be absolutely unprejudiced, and to give impartially all the observations, researches, and theories that have seemed of importance.

Health for Little Folks, published by the American Book Company, 938 Broadway, New York, is a admirable little work which, in the hands of children, will prove very valuable.

The primary course of studies already contain too many useless branches, and it is not only useless but foolish to waste the pupils' time over puerilities about the harmfulness of alcohol and tobacco, which will be of no use to them before the age of discretion. We notice that the author of this "physiology" does not publish his manuscript to the medical men, thereby showing his wisdom in one respect at least.

The same firm also publish An Easy Method for Beginners in Latin, by Albert Harkness, Ph. D., which is a most excellent work and well adapted to students of the Latin text book, as any Latin text book must be coming from the pen of such a standard authority as Professor Harkness.

Pamphlets, etc., received: Medical Reform, or, Why Do People Drink Alcoholic Liquors? (20 cents), by H. G. Collins, 15 Milton place, Boston, Mass.; The Relation of Symptom to Cause in General Medicine, by George M. Gould, M. D., Philadelphia; The Use of Commercial Milk Sugars in Infant Feeding, by E. F. Brush, M. D., M. Vernon, N. Y.; A Synopsis of a Course in Microscopy for Pharmacists, by Dr. H. M. Whippley, St. Louis, Mo.; Sanitary Science, by Prof. Delos Fall, Albion College, Michigan; and Recent Advances, by Douglas Graham, M. D., Boston, Mass.
Medicine and Pharmacy.

SPECIALISM IN MEDICINE.

The medical specialist is a person of great antiquity. In the days of the Greeks and Romans, persons who performed operations for the removal of calculi from the bladder formed a distinct class, and met with remarkable success, considering the almost barbarous state of medical science at that period, although they doubtless followed a custom not entirely unknown at the present day, of making little account of the unsuccessful operations. The greatest development of specialists—that is, physicians who limit their practice to the treatment of a certain class of diseases only—has occurred in quite modern times, and the process of subdivision seems to be constantly on the increase.

The practice of dentistry has long been recognized as a distinct branch of minor surgery, and the treatment of those important organs, the eye and ear, requires an amount of special knowledge and skill which the general practitioner has usually neither time to acquire nor opportunity to make use of. The recent advances in gynaecology and abdominal surgery have called into existence a class of men who have almost performed miracles in restoring those to health and comfort who would otherwise have welcomed death as a relief from suffering; and specially trained experts in affections of the throat, lungs, heart, brain, and, in fact, nearly every organ of the body, can be found in every large city, to say nothing of the numerous quacks, who assume the name of specialist, and conceal their ignorance of all diseases by only attempting the treatment of one.

While the tendency to specialization has been deplored by many, it seems to be a legitimate result of modern conditions. Our knowledge of the various organs of the body and their physiological and pathological conditions, has increased so greatly that no one individual could possibly fit himself to treat every disease demanding exceptional skill in the best possible manner, and so few cases of this sort would occur in general practice that the important element of experience in a variety of differing cases would also be lacking.

The obvious danger of specialization is, of course, its tendency towards narrowness, and an inclination on the part of the specialist to refer all symptoms of disease to affections of those organs in which he is most interested. This is best counterbalanced by the wider, if less thorough experience of the general practitioner, who in his turn will find in the minute and particular knowledge of the specialist an invaluable aid. There is room in the profession for both the general and special practitioner, and the best interests of their patients will be assured by their mutual co-operation.

STATE REGULATION OF MEDICINE.

The Popular Science News has always held the opinion that the attempts at so-called "regulation of medical practice" by many States were not only a direct violation of natural and constitutional rights, but an utterly inefficient means of protection to the citizens as well. In our August issue we gave our views on this subject, in connection with an extract from the Popular Science Monthly advancing similar ideas, and also referred to an outrageous abuse of power which occurred in New York City under cover of the medical law of that State. Such abuses are constantly occurring, and, as showing to what lengths State regulation may be carried, we publish a letter recently received from a prominent lawyer in Northern New York, which gives a good idea of the possibilities of government in a "land of the free."

Gentlemen: I read with interest the article in the recent number of your paper on the subject of the absurdity of laws to boost up the medical profession, and I heartily agree with you. I suppose I have a case on hand now, although I am inclined to think it is so absurd that the authorities will not press it. A certain Dr. T. is a regularly licensed physician, registered—as he tells me—at Brooklyn, was here on other business, and someone who had heard that he was skilled as a physician, asked him to examine his wife, which he did, and advised her to use lithia water. He administered no medicine, but I believe he received a small gratuity from the man for his time. The matter came to the knowledge of the medical society, and the medical society, through Dr. Spitzka, who is an experienced physician, arrested him and gave him a ball for his appearance at the next term of the grand jury. Of course, in this case there is not only the question whether such an examination and prescription is a violation of the laws, but the further question whether it has any benefit for the patient. It is true that a physician who is duly licensed and registered at his home, who makes an examination and gives advice only, in some other locality when on business. Of course, if that is the proper construction of the law, then no physician could be called in from an adjoining county, even to consult with a resident physician, without the filing of the required papers. In the county clerk's office of the county where the council was to be held, and that, altogether regardless of the fact whether or not the sick man might not in the meantime be on his way to seek a prescription from the ghost of Asclepius. As learning advance, man becomes more liberal in everything; even the clergy have felt the effect of it, and no doubt the doctors will soon.

Yours very truly,

[Later advices state that the prosecutors will insist on bringing this case to trial.—Ed.]

We notice that a recent law of New Jersey prohibits physicians from other States practicing their profession within its boundaries. A large number of New York physicians have thus been cut off from their profitable practice at the various summer resorts along the coast, and are complaining bitterly at this illiberal treatment. While their complaint is certainly a just one, we find it difficult to sympathize very much with them, in view of the circumstances related above, and cannot see why a law which they consider just and proper in the Empire State, should not be equally justifiable when enforced by the citizens of New Jersey.

EXECUTION BY ELECTRICITY.

The following statement by Dr. E. C. Spitzka, of New York, who was present at the recent execution of Kemmler, should set at rest all question as to the instantaneousness of the death produced by the electric current. It is not probable that Kemmler suffered the slightest pain, or, in fact, any sensation whatever, after the application of the current, and a clear, scientific opinion, like that of Dr. Spitzka, is of much more value than all the columns of sensational rubbish printed in the daily papers in connection with the affair. The full report is published in the Atlanta Medical and Surgical Journal, from which we copy the extract given below.

William Kemmler, executed by means of a Westinghouse dynamo, was apparently dead, in the usual sense of the word, after the first passage of the current. All contrary statements, which, unfortunately, are sustained by the majority of the physicians present, rest upon a truly fearful ignorance of the most rudimentary physiology, and the usual symptoms of death. When the current was suspended Kemmler remained stationary—without a pulse, that is, he received a small current through the skin and a bit of a muscular contraction released, and collapse of the thorax led to the escape of air through the mucus, quite thickly collected in the larynx. Careful observation showed that the so-called appearance of respiration was nothing other than collapse of the air vessels. Pulse was not present. That places offered pulse through pressure again became red could be established an hour after the brain, cord and contents of the thorax and abdomen had been immolated. That blood flowed from the heart, injured through spasmodic contraction, and pressure of the nails, is true. So flowed blood from every place selected for section, as it indeed possessed the noteworthy fluid character, which is also observed in cases of accidental death from the electric current.

To the above authoritative opinion we add the decisive testimony given in the American Microscopical Journal by Dr. George E. Fell, of Buffalo, who planned the death chair, and personally adjusted and afterwards examined the contacts of the electrodes, with other details of the process and result.

Within twenty seconds after the first application of the current, I could detect no pulse at the wrist. Shortly afterward two or three slight movements of the chest took place. As to their import, see Dr. Tatum's results on dogs, viz.: "In twenty-one out of twenty-three dogs killed by the application of electricity, effective respiration survived the final heart arrest. Fair inspirations were recorded in several cases as long as four or five minutes after the dose, which lasted only one second, but after which the heart had not executed a single beat that could be detected." My own demonstrations prove
it to be so—as in the second dog operated on the heart ceased beating instantly, but attempts at resuscitation were made. This is why I disagree with Dr. Shrap as to the possibility of resuscitation of Kemmler at that time. There is plenty of evidence to show that respiration following heart arrest has been kept up for some time in individuals subjected to powerful electric stroke, where resuscitation was impossible and the heart had ceased to beat. As might be expected, when its influence reached the muscular coats of the stomach, a contraction took place, causing a small amount of mucus to ooze forth from the mouth (not fly all over the room, as one paper put it). This is a good indication of death also. Kemmler was dead at the first application of the current, and with not one iota of feeling. This first electro-execution has demonstrated the positive truthfulness of all that has been claimed by its advocates. Under a voltage much below that recommended, the culprit has been instantly ushered into eternity.

THE NEW YORK PASTEUR INSTITUTE

Our readers are probably aware that a laboratory has recently been established in New York City, under the direction of Dr. Paul Gibier, for the preventive treatment of hydrophobia by Pasteur's method of inoculation, and for the general study of contagious diseases. We have received a report of the work of the Institute since its opening in February last, and think the facts therein contained may be of interest.

To date 610 persons, having been bitten by dogs or cats, came to be treated. These patients may be divided in two categories:

For 480 of these persons it was demonstrated that the animals which attacked them were not mad. Consequently the patients were sent back after having had their wounds attended, during the proper length of time, when it was necessary. Four hundred patients of this series were consulted or treated gratis.

In 130 cases the anti-hydrophobic treatment was applied, hydrophobia having been demonstrated by veterinary examination of the animals which inflicted bites, or by the inoculation in the laboratory, and in many cases by the death of some other persons or animals bitten by the same dogs. All these persons are today enjoying good health. In 80 cases the patients received the treatment free of charge.

Among the persons treated were 64 from New York, 12 from New Jersey, 12 from Massachusetts, 8 from Connecticut, and 1 from Illinois. The remainder of the patients were mainly from Western and Southern States, including nearly every section of the country.

Although we think the theories of Pasteur can hardly be said to be absolutely proved, yet they are strongly confirmed by the above statistics and those of the Paris Institute, and there seems to be a very good prospect that the terrible disease of hydrophobia may be brought as fully under control as is the small-pox at the present time.

Surgical Geniuses.—Prof. Hefra, of Vienna, used often to express himself in this wise: "It is necessary that there should be surgical geniuses, but don't ever let a surgical genius operate on you."
porcelain crucible, and injected into the subdural space of a healthy rabbit. The animal remained perfectly well for 12 days, and then developed the characteristic paralysis of hydrophobia, commencing in the posterior extremities and rapidly progressing, until death occurred from paralysis of the muscles of respiration. A second inoculated rabbit died in the same manner after retaining perfectly well for twenty-three days. The classical course of the disease in the rabbits proved conclusively that they died from the virus of hydrophobia.

BACTERIA IN HAILSTONES.—The Johns Hopkins Hospital Bulletin for May, 1890, records some observations by A. C. Abbott upon the bacteria found in the interior of large hailstones which fell during the storm of April 26, 1890. Care was taken to exclude all hailstones except those brought down from the altitude where the hail was formed. The number of organisms observed ranged from 400 to 700 to the cubic centimetre. The majority represented only a single species,—a short, thin, oval bacillus,—though several other undetermined species were observed. These observations suggest possibilities. Medical men are often asked to account for the origin of sporadic cases of a disease well known to be contagious,—scarlatina, for example,—where the source of infection is impossible to trace. A cyclone may have swept through an infected region; clouds of dust containing the bacillus of the disease in question may have been carried to a height, borne along for hundreds of miles, encapsulated in hailstones or rain-drops, and brought again to earth in hailstones or raindrops to favor their growth. —Am. Microscopical Journal.

HEART DISEASE Caused by FRIGHT.—Dr. Lee reports (Lancet) a case of heart disease resulting from emotional cause. The patient was a nurse. One day, when sitting in the nursery with the children, their father came into the room in a state of mental derangement, and seized the youngest child with the apparent intention of throwing it out of the window. The nurse was so frightened that she could not move or speak, and immediately after this her heart troubles began. The case resembled one of Grave's disease so far as the cardiac symptoms were concerned. She could not walk without distress from shortness of breath. Her pulse was generally high and the patient was subject to frequent colds. Digitalis had no effect, but opium had a slight effect in quieting the heart. The case was considered incurable.

An Unusual Case of Atrophy of the Skin is the title of a paper (Athen. and Natu.) by Dr. Ohrmann-Dumesnil. The patient was a child who had some years previously sustained a severe burn on the anterior aspect of the right wrist. The right arm presented atrophic spots situated on the anterior surface of the arm and forearm, and over the brachial and radial nerves. These spots were five in number, distinctly depressed, and were paler than the normal skin surrounding them. The skin of these spots was more than thinner than in the healthy parts. There was also marked atrophy of the muscles of the arm and hand. The doctor attributes the atrophy of the skin to the injury to the radial nerve produced by the burn.

PUSHING EXTRAORDINARY.—Under this heading the British and Colonial Drugist has the following interesting paragraph: “Passing a chemist's window a few days ago, which was tastefully 'set out,' I observed a little notice to the following effect: "Teeth skillfully extracted—6d. each, or three for 1s. 3d. This is 'pushing' with a vengeance."

POPULAR SCIENCE NEWS.


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SETH C. BASSETT, Manager.

Publishers' Column.

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Physicians and druggists should read the advertisement of the Type rubber Co. in this number. In addition to the very useful and convenient syringes of which they make a specialty, they manufacture a full line of rubber goods, both for medicinal and general use.

It is not yet too late to put in a heating apparatus for the coming winter. Messrs. LeBoeuf Bros., can furnish superior apparatus for both the steam and hot-water systems of heating, as well as the improved form of oil-tair furnace invented some years ago by the former editor of this journal, Dr. J. H. Nichols.

An artificial ice machine has recently been set up in a western city on the banks of the Mississippi River, and the cooperation of the process is so great that the proprietors intend to compete with the companies cutting the natural ice directly from the river. The machines supplied by David Boyle, of Chicago, are the best, cheapest, and most economical.

The latest edition of Webster's Dictionary—the International—is an entirely new work in every respect, and has been brought fully up to date in every particular. Over one hundred writers have been engaged in the work of revision for the past ten years, and the result of their labours has been a work of remarkable comprehensiveness and utility.

There can be no doubt that many valuable nutritive ingredients of the wheat grain are lost in the process of bolting. Fine flour is largely composed of starch, the mineral ingredients being almost entirely removed. The old-fashioned jogging flour is distasteful to many, and usually unsatisfactory and inferior in quality. The Arlington Wheat Meal is a true whole wheat flour, ground from the choicest grades of wheat, and containing all the chemical substances necessary to the nourishment of the human body. The advertisement on page 3 contains many interesting facts, and we would recommend its perusal, which will almost certainly lead to a trial of this most excellent flour.

PROFESSORSHIPS VACANT:

The positions of Dean, Professors in Chemistry, Pharmacy, Botany, Matéria Medica, and Microscopy, in the Ontario College of Pharmacy, Toronto, Canada. The present Dean fills the two first positions and gets $1,800, and another the other positions and $1,000 per year. The positions and salaries may be varied. There are two courses—Junior from October to December, Senior from January to May 5, each year. Services to begin August, 1891. A college announcement may be seen at the office of this journal. Address communications to JOHN J. HALL, Vice President, Woodstock, Ontario, Canada.

Club-List, 1891.

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Familiar Science.

TWO REMARKABLE SPIDERS.

The Mygalidæ, or trap-door spiders, are a widely-scattered species, and are particularly remarkable for the wonderful nests which they build instead of spinning a web. The Cteniza Califorica, popularly known as the tarantula, digs a hole in the ground, about an inch in diameter, and from two inches to a foot in depth. It is lined on the inside with a fine, soft silk, spun by the spider, and the mouth, which is slightly enlarged, is closed by a cover which moves on a silken hinge, and fits so closely to the opening when closed, that not even a knife-blade can be inserted between it and the sides of the tube. This cover is made of dirt fastened together with threads, and, although lined with the silk on the inside, is covered on the outside with sand, dirt, moss, etc., so that it exactly resembles the surrounding soil and is almost impossible to discover. In addition, the under side of the cover is provided with small holes, into which the spider inserts her claws, and by which she can hold it down so firmly that it is impossible to raise it without taring. In these nests the spiders live, only coming out in search of prey. The eggs are laid and hatched in the nest, which serves as a nursery for the young spiders till they are old enough to go out and dig for themselves.

The shape and construction of these nests varies greatly with different species. The genus Atrypus extends the silken lining of the tube several inches outside the ground, where it rests among the stones and plants; other spiders make a second door, halfway down the nest; others build the nest with a branch, or chamber, into which they can retreat if an enemy succeeds in forcing the outer entrance. This chamber is sometimes closed by another trap-door, and sometimes communicates with the air by a concealed opening. The Mygalidæ are certainly most remarkable animals, and their constructive skill—which exceeds that of many men—is hard to account for. The idea of "instinct" explains nothing, but is simply equivalent to saying that we don't know; and the source of their wonderful knowledge must be left for future investigators to discover.

The Argyronetes, or water-spiders, are even more extraordinary in their habits than their earth-dwelling cousins. Although they are true air-breathing animals like other spiders, for some unaccountable reason they prefer to live under the water among the fishes, where they spin a web in the shape of a bag, with the opening on the under side, just like a diving-bell, and, having filled it with air, they lay their eggs and bring up their young in their cosy subaqueous home, finding plenty of food in the insects which live among the aquatic plants. The body of these spiders is covered with fine hairs, which prevent the water from touching the body, and, by their total reflection of light, give them a silvery appearance when in the water—whence their name.

The manner in which this spider fills her nest with air is most curious. After spinning the threads, the spider goes to the surface of the water, and, by a quick movement of the hind legs, catches a small bubble of air between them and the abdomen, with which she descends to the nest, into which it is liberated. After this process has been patiently repeated many times, the nest becomes full of air, and is ready for occupancy. The illustration (Fig. 2) shows two of these nests completed, and the spiders in various positions above and below the water.

It must not be supposed that these nests as constructed are perfectly air-tight. The small meshes are quite sufficient to retain the air-
bubbles and prevent it from rising to the surface. This phenomenon is due to the peculiar and complex principle of surface tension, by which the thin film at the surface of a liquid acts, in a certain sense, like a solid covering. By an application of the same principle, a cylinder of wire gauze, or even a fine sieve, may be filled with water, and needles, or a steel pen, be made to float, if carefully placed upon its surface. These insects which walk so easily over the surface of ponds and streams are indebted to this same principle for their support, and not to the inherent buoyancy of their bodies.

The accompanying illustrations are reproduced from *La Nature*.

AN ANCIENT GALLO-ROMAN SEPULCHRE.

An interesting archaeological discovery was made last July in the Capuchin cemetery of Beaunais, near Paris, of a sarcophagus and coffin, dating, probably, from the Gallo-Roman period of history. While digging a modern grave, the workmen came upon a heavy stone block, which proved to be the top of the sarcophagus, and which, from its great weight, was removed with considerable difficulty.

![Fig. 1](image1.png)

Inside the stone sarcophagus was found a coffin made from sheet lead about one-quarter of an inch thick, and this enclosed the body of the ancient Roman or Gaul, little of which remained except two teeth and the fragments of a few bones. The size of these relics indicated that the remains were those of a man, and their position that, contrary to the usual custom, the corpse had been placed with its head to the east. The stone sarcophagus was seven feet long, three feet wide, and two feet deep, and was estimated to weigh about eight thousand pounds. The top was bevelled (Fig. 1), but in the center a square base was left, evidently as a support for a monument, of which no trace was found.

One of the most interesting finds in connection with this discovery was the articles of glass, represented in Fig. 2, which were placed in the lead coffin at the head and feet of the body. Four of the pieces were perfectly unbroken, and the glass had the peculiar iridescence which is only formed when it has long been buried or exposed to the action of the elements. The two large pitchers still contained a brownish liquid of faint odor—doubtless some ancient perfume left with the dead. This substance is to be submitted to a chemical examination. The sarcophagus, coffin, and their contents have been carefully preserved, and will doubtless find a place in one of the many museums of Paris.

The fact that the locality has been so long in use as a cemetery is an interesting one, and indicates a greater uniformity in the life of the people than one would believe possible in a country troubled by so many wars as France; but we think that such is always the case to a greater degree than is generally supposed. Armies may be raised, battles fought, and dynasties change, but the great mass of the people must always live out their lives as usual, notwithstanding the struggles of containing forces; and the many wars and political changes are more important from a historical point of view than in their actual effect upon the progress towards civilization of the people themselves. Curiously enough, two modern burials have already been made directly over this ancient sarcophagus,—after the cheerful French custom of temporary sepulture,—and it is not improbable that for hundreds of years to come the cemetery of Beaunais may remain the last resting place of many future generations of the inhabitants of the locality.

The illustrations are reproduced from *La Nature*.

A SINGLE sunflower will produce from 4,000 to 12,000 seeds in one summer; the poppy will produce 32,000.

[**SPECTROSCOPIC MEASURES OF STELLAR MOTIONS.**

BY PROF. C. A. YOUNG.

Everyone knows that the so-called "fixed stars" are not really fixed at all, but are moving very swiftly. So remote, however, are even the nearest of them that it takes centuries to make their drift perceptible, and for all but a very few the displacement in an entire century is so slight that it can be detected only by the most careful observations. Obviously, too, if a star happens to be moving "head on," so to speak,—i.e., either directly towards or from us,—it will not change its apparent place in the sky, and its motion cannot be ascertained by any comparison of ancient observations with modern. One might, perhaps, think that such a motion could be detected by the change in the star's apparent brightness; but a very short calculation will show that even our nearest neighbor (Alpha Centauri), if it were rushing towards us at the rate of one hundred miles a second, would increase its brightness only about two and a half per cent. in a century, and in the case of remotest stars the change would be correspondingly less; so that the method is practically useless.

But there is a way in which such a motion can not only be detected, but measured with some approach to accuracy; a method which is not affected by the distance of the object observed, except in so far as remoteness dims its light. The instrument used is the spectroscope, and the principle involved is that when the distance between us and a star is changing with any considerable rapidity, all the lines and markings in its spectrum are shifted in position as compared with the spectrum of a similar body at rest. The reason is that light consists of pulsations, or waves, coming to us at regular intervals of time, and regularly spaced in distance, each colored ray having its own place in the spectrum according to its wave-length, or "pitch," so to speak. Now if a star is coming nearer, then the waves due, say to the hydrogen in the spectrum of its atmosphere, are encountered with greater frequency than if it were at rest, and so are virtually raised in pitch, and shifted towards the violet end of the spectrum, where the waves are shortest; and vice versa, of course, if the star is receding.

A good illustration is what would happen if we were in a boat anchored in a stream flowing steadily at the rate of, say ten feet a second, while another person is in a second boat a little way up stream, throwing a cork into the water each second. So long as both boats are at rest, the corks will pass one a second, at equal intervals of ten feet; but if the cork thrower has his boat rowed upstream at the rate of two feet a second, his corks will strike the water twelve feet apart instead of ten, and will reach us with twelve feet spaces between them, and at intervals of one and one-fifth seconds. If, on the other hand, he lets his boat drop slowly down stream at the same rate, the spaces between the corks will be reduced to eight feet, and the time interval to four-fifths of a second. If our own boat is put in motion, it is easy to see that the effect will be similar.

Speaking generally, we may say that whenever the distance between the observer and any source of regularly produced pulsations is diminishing their interval will be lessened, and vice versa if the distance is increasing. All that is necessary, then, in order to ascertain the speed with which a star is approaching or receding, is to form its spectrum, and then to confront it with the spectrum of a so-called "Geissler tube," giving the bright lines...
of hydrogen, or some other substance known to be present in the sun's atmosphere. If the lines in the star spectrum fall to coincide with the lines in the spectrum of the Geissler tube, we infer that the star is changing its distance from us, and we can determine its speed by measuring the amount of displacement in the lines of the star spectrum.

We hasten to say, however, that while the operation is easy to describe and understand, it is by no means easy to acquire any sure knowledge of the whole range of practical astronomy more delicate. The amount by which the lines in the spectrum are shifted is always minute, depending as it does on the ratio between the star's velocity and that of light. Now light moves so swiftly—over 186,000 miles a second—that in comparison with this a velocity of even ten or twenty miles a second is almost insignificant, and produces a displacement of the lines so slight that it can be detected only by using a very high "disperser," i.e., by making the spectrum of the star very long—and that means making it very faint. A large telescope is therefore necessary to collect the requisite quantity of light, the spectroscopic must be powerful, and the most scrupulous precautions are necessary in the selection and mounting of the instrument. If the observation is made with the eye, the observer must have keen and unerring vision, and skill in the most delicate measurement. If, as is now beginning to be common, a photographic process is used, the most sensitive plates must be employed, with continual vigilance to keep the image of the star exactly on the slit of the spectroscopic and to maintain the adjustments of the instrument in absolutely unchanged, sometimes for hours together.

Dr. Huggins, the father of astronomical spectroscopy, was the first to make an actual observation of this kind, in 1868, when he ascertained in this way that Sirius was then receding from us at the rate of about nineteen miles a second—a motion which appears to have been reversed since, and probably in consequence of the orbital connection of Sirius with its small companion. He also made similar observations upon a number of the brighter stars; but it soon became obvious that the means at his command would not enable him to attain satisfactory accuracy. Since then the Green which observatories have been following up the same line of work, but not with very much greater success and the published measures have shown discords that are rather disheartening, and indicate that the results can be accepted only as provisional approximations to the truth.

Very recently, however, the matter has assumed a new aspect through the work of Vogel in Germany and Pickering in this country. The former has applied photography with success to a spectroscopic experiment of a very sensitive form, i.e., with the assistance of a collimator. The instrument is so constructed that it is limited in range to a very small portion of the spectrum near the line known as G (where, however, there are numerous identified lines, some of which are sure to be found in the spectrum of every star); but within this range the instrument is extremely powerful. After long exposures it is possible to photograph spectra that the eye cannot see at all, and Vogel has thus been able to secure negatives upon which, in favorable cases, a stellar velocity of a single mile a second produces a measurable shift of the lines. With this apparatus the "head on" motion of nearly sixty stars has already been determined at Potsdam with reasonable accuracy.

Vogel's most interesting results are those relating to the stars Algod and Spica Virginis. The former is a variable star, which acts as if it were partially eclipsed at regular intervals of 68.5 hours by a dark companion large enough to cut off nearly five-sixths of its light. Now the observations show that about seventeen hours after the minimum, Algod is receding at the rate of 24 miles a second, while seventeen hours after the minimum it is approaching with a speed of 28.6 miles. From this it follows that the "system" composed of the two stars is approaching the observer at this rate, and means that the bright star is moving in a nearly circular orbit about the common center of gravity between it and its dusky acolyte with a velocity of 26.5 miles. We have not the space to explain how, from the known data, Vogel is able to show that the smaller star must be moving more than twice as fast, that the distance between the two stars must be about 3,200,000 miles, and that their diameters are about 1,000,000 and $41,000$ miles, the smaller star being nearly as large as the sun. These are fair inferences, however. It appears further that the larger star has a mass about four-ninths that of the sun, the smaller one being but half as large; so that their density must be less than one-fourth that of the sun—hardly exceeding that of cork.

Just this phenomenon of doubled lines has actually been detected at Cambridge (U. S.), in examining the spectrum produced by the "dazzling spectroscope" of the Draper Memorial. With this instrument it is not possible to compare the spectrum of a star with that of a Geissler tube in such a way as to determine the star's absolute motion; but when two stars, both reasonably bright, are so near each other that the telescope cannot separate their images, then, if they have an orbital motion, it will reveal itself by a periodic alternation of the lines in their common spectrum. The nephew of Dr. Draper's, who is engaged at Cambridge in examining the photographs of star spectra, first noticed this doubling of the lines in the spectrum of the well-known star Mizar, the one at the bend in the "dipper handle." The doubling is found to recur at regular intervals of fifty-two days, showing that the stars are a pair connected by an orbit that revolves around each other at a distance of some 200,000 miles in three and a half months, with a velocity of nearly a hundred miles a second, the two stars united being fully forty times as heavy as the sun.

The interest of the system is increased by the fact that a third star, long known, and visible in even a small telescope, revolves around the whirling pair in a period of centuries not yet determined.

The star Beta Aurigae presents a similar doubling of its lines, but the relative velocity rises to one hundred and fifty miles a second, and the system closely resembles that of Spica, the distance between the components being about 8,000,000 miles, and the period four days. The two stars of this pair, however, are nearly equal in brightness.

Other stars are under surveillance, and it is probable that our knowledge of the stellar motions will soon be greatly extended. It is already abundantly evident that the ordinary speed of these motions—much exceeds anything that we find in the proper motions of the planets around the sun. It makes one almost dizzy to think of the swiftness with which the stars are flying.

We have space only for the merest mention of the latest achievement of the spectroscopist, Mr. Keeler, of the Lick Observatory, has just succeeded in extending this method of observation to the nebulae, and with very interesting results. His spectroscopic construction of the Great Nebula, improved by the use of plates, is now being studied by a photographic method, and it may be very soon that we shall be able to detect a great deal of motion in the nebulae, which so far has been worked with the eye and not by photography. It appears that the nebula are moving as swiftly as the stars.

Princeton, N. J., November 1840.
GLYCERINE.

Many years ago, in an obscure mining village in Sweden, the apothecary, while making lead plaster in the ordinary way by heating olive-oil with litharge and water, chanced to notice that the liquid which was mingled with the pasty lead compound had a strangely sweet taste. On further investigation he found that the sweet taste was caused by the presence of an oily liquid which was dissolved in the water. No such substance was described in the books of the day. Evidently a discovery had been made. The discoverer, although poor and with slight advantages of education, was a man of more than ordinary ability. Already he had attracted the attention of the learned men of the day by publishing his quaint chemical theories of combustion (\textit{Uber die Luft und das Feuer}) ; nor was this his first discovery of a substance hitherto unknown to science.

We can easily imagine, then, with what enthusiasm Scheele—for that was his name—plunged into the study of the strange liquid in the occasional respite that was granted him from the pestle and the dispensing counter. He soon found that the sweet substance was not the product of olive-oil alone, but that other oils and fats would yield it under the same treatment. So he named it the "sweet principle of fats," or "oil-sugar." Soon after, his work was cut short by death.

More than a century has passed since Scheele's discovery, yet it is scarcely fifty years since "oil-sugar" was found to be of practical value, except, perhaps, for a limited use in medicine. Many famous chemists have taught the world much as to its nature and production, had given it the more formal name of glycerine, derived from a Greek word meaning \textit{sweet}, but to the everyday world the substance remained only a curiosity. Nowadays, everyone is familiar with the clear, thick liquid so commonly used for toilet purposes. Its soothing and softening effect on dry or inflamed skin is the quality by which it is best known in most households; but few people have any idea of the variety of purposes for which glycerine is used. This will not seem strange when we find how many valuable properties are possessed by this remarkable liquid. Among the most striking of these are its great solvent power, its chemical stability, and its sweetness. Besides these, it is not indigestible, will not evaporate, and, owing to this and its hygroscopic qualities, will prevent drying and hardening of materials with which it is mixed.

These peculiar qualities make it most valuable in the preparation of medicines, and various food-products, as preserves and mustards; likewise in beer, wines, and other bottled goods, where it is said to act as a preservative. The fact that strong solutions of glycerine and water will not freeze in the lowest winter temperatures has caused its use in our "wet" gas-meters. In short, the list of purposes to which this most useful liquid is put is almost exhaustive. Among the more important industries in which it is used are vulcanizing india-rubber, silvering and gilding glass, dressing leather for kid gloves, preserving anatomical and botanical specimens, and the manufacture of what is, perhaps, the most powerful explosive known to science, without whose aid some of the grandest triumphs of modern engineering would have been impossibilities—nitro-glycerine.

Scientifically considered, glycerine is most interesting. Mention has already been made of many of its physical characteristics. In the pure state glycerine is somewhat more than a fourth heavier than water (1.25). After long exposure to a freezing temperature it will deposit rhombic crystals resembling those of sugar-candy. Strangely enough, when quickly cooled to very low temperature (−40° F.) it forms a gummy mass which will not harden nor crystallize. Indeed, it was not till 1867 that it was thought possible to crystallize it. The boiling-point of glycerine is about 490° F. At this point it decomposes slightly. As already stated, glycerine will not evaporate at ordinary temperatures, but at the boiling-point of water (212° F.) there is a perceptible loss.

Pure glycerine will burn readily, if first heated to about 300° F., giving a pale-blue flame, similar to that of alcohol. Heated intensively it decomposes into acrolein, a most pungent-smelling compound, one whiff of which is usually sufficient to fix it indelibly on the memory.

To the chemist glycerine is an alcohol, being, like other alcohols, a hydrate of an "organic radical," that is to say, the hydrate of a combination of carbon and hydrogen which forms salts as if it were a metallic element. From its chemical behavior, glycerine can be considered a "tri-atomic alcohol," or tri-hydrate, with the formula $C_3H_5(OH)_3$, on the same analogy as sodic hydrate, $NaOH$, or calicic hydrate, $Ca(OH)_2$; the group represented by the formula $C_3H_5$ acting as a base and known chemically as glyceryl or propenyl. Just as we can make salts of a metal from the hydrate, so can we make salts of glycerine in essentially the same way, although the methods employed are different. Nitro-glycerine, so-called, is one of these salts of glycerine, being an impure tri-nitrate ($C_3H_5(N_2O_3)_3$). By far the most important salts of glycerine are oils and fats. The majority of these are salts of glycerol and organic acids. The principal of these acids, out of many which are present in our common fats, are stearic, oleic and palmitic acids. We now understand how it was that Scheele made his glycerine. We remember that olive-oil was the basis of his lead plaster. This oil is, in the main, glycerol oleate ($C_{18}H_{34}(O)_{3}$). Hence the reaction between the lead and the oil and water can be expressed by the following equations:

$$2 \text{Ca}(\text{OH})_2 + 3 \text{PbO} + 3 \text{H}_2 \text{O}$$
$$\rightarrow 2 \text{Ca}_3(\text{OH})_2(\text{PO}_4)_4 + 3 \text{glycerol} \text{ oleate.}$$

For many years this reaction was the basis of the manufacture of glycerine. Cheaper fats than olive oil, of course, were used, while traces of lead in solution were removed by sulphuric acid.

As the use of glycerine became more extensive, there arose the necessity for a cheaper method of production. Attention naturally was directed to the spent lye of the soap manufacturer, for soaps are sodium or potassium salts, principally of stearic acid, made by a reaction similar to that used in making lead plaster, but substituting caustic alkalis for litharge. By the method of soap manufacture, however, the liquors containing the glycerine are so contaminated by alkalis and salt, and are so diluted, that until recently it has not paid to recover the glycerine.

A process, which has proved most profitable, has been invented to decompose animal fat directly into stearic acid and glycerine, by subjecting it to the action of super-heated steam, at a temperature of about 300° F. The resulting glycerine is concentrated, and purified by steam distillation, while the stearic acid, which much resembles wax, and in no way answers to our ordinary conception of an acid, is in great demand for candles.

In this way thousands of tons of glycerine are made yearly, not to mention the immense number of excellent candles which are also products of the process.

SILVER.

Silver has always ranked next to gold among the common precious metals. Like gold, it is a "noble" metal in that it does not oxidize when heated in the air; and although it forms more stable compounds with other elements than gold, yet it is readily reduced to the metallic state by comparatively weak reducing agents. This quality, together with its beautiful appearance and its great malleability and ductility, renders it particularly adapted for its manifold ornamental uses, while its wide diffusion, in comparatively small amounts, formerly rendered it an excellent material as a standard of monetary value; but of late years the greatly increased supply from the Western mines has made it value much more variable, and unfitted it for purposes of coinage.

Silver is found native, or in the metallic...
The "tarnish" which articles of silver take on when exposed to the air is due to the formation of a thin film of sulphide, from the traces of sulphur compounds usually present in the air. The discoloration of a silver spoon with which an egg has been eaten is a familiar example, and has led to the manufacture by enterprising jewelers of platinum egg-spoons, which are unaffected by the sulphur compounds present in this popular breakfast dish. Everyone who has carried matches and silver coins in the same pocket must also have noticed this undesirable combination.

The most remarkable chemical property of silver, however, is found in its relation to light. It does not stand alone in this respect, for compounds of iron, chromium, and many other substances have their composition modified by this mysterious form of energy of the light beam; but silver is pre-eminent in this respect, and the wonderful change which is caused by this means in a film of chlorode, bromide, or iodide of silver is the basis of the most beautiful modern art of photography. Many years ago it was noticed that chloride of silver blackened when exposed to the sun's rays, and from this simple observation the labors of Daguerre, Niepce, Draper, and their many successors have led to the present remarkable development of an art which produces pictures, superior to the works of the best artists, at a nominal price, and by a process so simple that it is successfully practiced by thousands of amateurs, with no special scientific knowledge, as a recreation and amusement.

This action of light upon certain salts of silver is especially remarkable as showing the connection between matter and energy, or, more strictly, between those forms of energy known as chemical affinity and actionism. The molecules of bromide of silver in the sensitive film are held together by some attractive force which we know little about, but call chemical affinity. Something—some force, or energy—comes to us in the sunbeam which enters into these molecules and forces them apart, into other combinations; but just what it is or how it is accomplished is something which we cannot explain. In the case of the element selenium, its electrical relations are similarly modified by the disturbing influence of the solar radiant energy, thus showing an intimate connection between them; and, although it has long been known that light, heat, power, actionism, electricity, and chemical affinity were but different manifestations of a single form of energy, the results of modern investigations tend to show that the connection between them is much closer than has ever been suspected, and that we are, perhaps, on the eve of discoveries in regard to the nature and properties of matter and energy which will revolutionize the theories formulated from the facts at present known to us.

INDUSTRIAL MEMORANDA.

Professor Scheibler has invented a machine for producing artificial smoke on a battlefield, which, it is believed, will be of great value to counteract on some occasions the introduction of smokeless powder.

A New Application of the Telephone for military purposes is shortly to be introduced into the Italian fortress artillery. It consists of a so-called telephonic bonnet, to be worn by each officer in charge of a gun, which will enable him to receive the instructions of the commander-in-chief or other in the quickest possible time.

RUBBER PAVEMENTS.—A portion of the Boulevard Anspach, Brussels, is being laid with a new paving called "caoutchouc macadam." It is a mixture of India-rubber and certain stones ground together and converted into a soft paste by heat. The new material is not slippery, and is said to withstand the heat of summer or the cold of winter, while being very durable.

Cement for Pestle Handles.—A good cement for fastening porcelain or wedgewood pestles to the handle of a pestle is made by the addition of glycine to litharge. This should be applied to the wooden handle, and care taken that a close joint be made at the point of union, so that all danger of contaminating substances in the mortar may be avoided.

Waterproofing Cloth.—I'lline and Noad use for waterproofing textile fabrics a solution of cotton, or other vegetable fibre, in an ammoniacal copper solution containing four parts of copper. From this solution the copper is precipitated with zinc, when a colorless, viscid solution of ammonium zinicate and vegetable matter is obtained, in which the tissue is immersed to impregnation, pressed, dried, and wet-calendered.

Case Hardening by Electricity.—Professor Elihu Thomson has recently devised a method of case hardening iron or steel by means of the heat produced by the passage of an electric current. His process consists essentially in heating the object electrically, and then applying to the metal so heated a surrounding envelope—either gaseous, when a colorless, viscid solution of ammonium zinicate and vegetable matter is obtained, or an oil, according to the special end to be attained.

Firing Boilers.—One of the highest aims of an expert fireman should be to keep the largest possible portion of his grate area in a condition to give great radiant heat the largest possible part of a day; when using anthracite coal, by firing light, quick, and often, not covering all of the incandescent coals; when using bituminous coal, byoking it very near the dead plate, allowing some air to go through openings in the doors, and by pushing toward the bridge wall only live coals; when slidding, to open the door far enough to work the bar.

A Big Blast was exploded at the Dinorwig Quarries, Carnarvonshire, lately, by which about a quarter of a million tons of rock were removed. The part to be removed was an obstructive rock which prevented the quarriers from carrying on their work. About 7,000 pounds of galena, equal in strength to twenty tons of gunpowder, was used in the blast, which was the greatest ever attempted in North Wales, the cost of the explosive being about $3,000, and the quantity of rock displaced being so enormous that it will take some hundreds of men nine months to remove it.
The Out-Door World.

POPULAR SCIENCE NEWS.

[December, 1890.]

A RETROSPECT AND A PROSPECT.

The year 1890 has been a prosperous one for the Agassiz Association. The work of the Chapters and individual members has been carried on with enthusiasm and success, as our monthly reports have abundantly shown. Many strong Chapters have been organized and admitted to honorable places in our ranks.

Three courses of study have been maintained with a full measure of success—one in botany, under Mr. Wight, of Framingham, Mass.; one in chemistry, under Professor Cassidy, of Norfolk, Va., and one in mineralogy, under Professor G. Gutenberg, of Pittsburgh, Pa.

The only serious misfortune of the year has been the failure of Santa Claus, in which we had a department devoted to the interests of our younger members. This loss, however, is largely counterbalanced by the invitation of the publishers of Popular Science News to use this journal as our official organ. There will be advantages in a concentration of all our interests in one paper. The publishers have generously offered us three pages a month instead of two, and have given us permission to use one column for the benefit of our younger members.

This arrangement is made for 1891 only, and its continuance after that date will depend upon the manner in which all our Chapters and members rally to the support of our new journal; for, unless objection is made, we will hereafter consider Popular Science News as the official organ of the Agassiz Association.

No friend of the Association can do it better service than by helping extend the circulation of this paper.

We publish this month extracts from the note-book of Mr. J. S. Walter, of Peru, Ind., whose careful observations and beautiful drawings won the microscope offered last spring. Mr. Walter writes under date of October 21: "I have received the microscope awarded me by Dr. Nichols. The instrument is a beauty and in every respect all that was promised. Besides the microscope I received a pretty and convenient case in which to keep it, and also a valuable book or manual of instruction in the use of the microscope. I could not have received a prize that would have pleased me more."

ASTRONOMICAL SOCIETY OF THE PACIFIC.

We reprint with pleasure the following circular, which contains a special invitation to members of the Agassiz Association to avail themselves under easy conditions of the unsurpassed advantages for astronomical study afforded by the two great observatories of the West:

The Astronomical Society of the Pacific was founded February 7, 1889, as a result of the cordial co-operation of amateur and professional astronomers in successfully observing the total solar eclipse of the preceding New Year's Day. It seeks to continue that association both as a scientific and as a social force. The new society is designed to be popular in the best sense of the term. Boys and girls of the Agassiz Association are welcome. Any person who takes a genuine interest in astronomy is invited to join its membership, whether he has made special studies in this direction or not. It is believed that every such person will get, and will feel that he gets, a full return from the society through its meetings, or through its publications.

Three meetings a year (March, November, January) are held in San Francisco, at the rooms of the society, 408 California street; and three meetings (May, July, September) are held at Mount Hamilton, where an opportunity is afforded to the members to see and use the instruments of the Lick Observatory. The publications are printed in octavo form at irregular intervals; two hundred or more pages a year may be expected. The publications contain papers read before the society (either in full or in abstract), plates, etc., the minutes of the meetings; and also Notices from the Lick Observatory, which are brief and popular accounts of the current work of that establishment, prepared by members of the observatory staff. Such notices have previously been printed in various astronomical journals; but, in future, they can be found in full only in the publications. The publications of the society are sent (in exchange) to about one hundred observatories and academies of science. They can be obtained also by joining the society (dues $5 for each calendar year, no initiation fee). A diploma is issued to members. Correspondence should be addressed to either of the Secretaries as below:

CHARLES BURCKHALTER,
Chabot Observatory, Oakland.
J. M. SCHAEBERLE,
Lick Observatory, San Jose.

The membership is now about three hundred.

A CARD OF INTRODUCTION.

The Y. M. C. A. and other extended societies issue to their members cards of introduction, which are in effect little certificates of good standing in the society. These are very convenient in travelling, as they secure at once confidence and a friendly reception. At the suggestion and under the direction of Mr. H. E. Deats, of Flemington, N. J., for years one of our most faithful members, a similar card has been designed and engraved for our Agassiz Association. It is finely engraved on heavy bristol-board, and is not devoid of artistic merit. Mr. Deats has most generously met the expense of the plate for this beautiful card, and owing to his kindness they can be furnished at the bare cost of the cardboard and printing. They will be sent to Chapters for twenty-five cents a dozen, single cards three cents each. Address all orders to the President of the A. A.

A BRAVE DEED.

Master Ralph Ballard, of Niles, Mich., a corresponding member of the A. A., has recently passed through a great trial in the sudden and very unusual death of his elder brother. This calamity was due to gas accumulated in a silo, and supposed to come partly from the heated corn and partly from the tar with which the inside was painted. Ralph's heroism in saving one brother and attempting to rescue the other at the risk of his own life is thus recounted by the Niles Daily Star of September 5:

Edward M. Ballard met with a sudden and un-
little, and when looking after birds cannot help keeping half an eye on the ground. A street we often travel cuts through a bank containing many nodules, which we often turn over, hoping to find a fossil. At last we have succeeded. Broken through the middle, it lay halfway up the bank, and there on both parts was the impress of a fern. It is about three inches long, and stands out on one place. In relief, with the other is compressed. One of our members is deep in the study of electricity, and is experimenting with batteries, motors, and galvanometers in all his spare time.—May Walter, Sec.

614. New Orleans, La., [C]. (Henry H. Straight Memorial Chapter).—The year has meant a great deal to us, and I am really proud of the two year's growth. The young people are learning to depend more and more on themselves, and the Chapter is making a reputation for earnest, hard work. The Chapter is a great aid in the regular school work, and I am most grateful to you for originating the A.A. As I am sure hundreds of other teachers must be, I am especially delighted with one boy's progress. "The Agassiz" has made him! I never before saw so wonderful a growth in two years, and yet a quite natural growth;—nothing startling, for he is of the plodding sort. His growth would make your heart glad, and be a crumb of compensation for all the labor and anxiety that must have come to you as President of the A.A. With many good wishes from Chapter 614, very cordially yours, Eliza A. Cheyney, Sec.

622. Utica, N. Y., [B].—We have ten active and four honorary members. We study chemistry in winter and botany in summer. We have held during the past year four meetings and three field-days, besides several evening tramps, which have been a delightful feature of our work. During the long days from June to September we met once a week and walked from 3 to 6 p.m., taking a different country road each time.—Walter S. Crocker, Sec.

652. East Orange, N. J., [C].—We have entered upon our fourth year with undiminished interest in our pursuit of "a knowledge of natural science by personal observation." We now have eleven active members, the last one to join us being a grand-mother who is devoted to botany. We have held our meetings regularly every other Monday afternoon, excepting for two months in the summer. Botany is still our favorite study, but many of us are also interested in birds, and a few of us in insects and rocks, and our collections in all are increasing steadily. Two members of the geological section met regularly all winter, and completed the study of the minerals of the second grade in Professor Gutenberg's course. Last summer our former President, who is now an honorary member, mounted our botanical specimens, so that we now have an herbarium of nearly 200 plants, which we found a great help in our winter meetings. Papers have been read by members on dragon-flies, owls, orchids, and bats, and many specimens of each were also shown. The "personal observations" of members reported at each meeting have become more and more interesting. We have been represented at the meetings of the New Jersey Assembly, and some of us have gone on most of the Hill and Duke Club excursions. As the latter has had so many excursions, our Chapter has only made two: one up to Pawpaw Rock in a naphtha launch, and the other to Short Hills. One member had her class in school celebrate Agassiz's birthday, and one has joined the Wilson Ornithological Chapter.—Dr. Mary D. Hussey, Sec.

699. Odin, Pa., [A].—This Chapter is much scoured at present. One member being in college, and the Chairman and Secretary being nine miles apart, of course regular meetings are nearly impossible. We have done a fair amount of work. I inclose a list of the flowers observed by our younger members.—Mrs. Emma H. Beebe, Sec.

It gives us pleasure to announce that Professor Gutenberg is now issuing the leaflets and specimens for the third grade of his course in mineralogy. Perhaps we cannot better notice this most excellent course than by reproducing the professor's latest circular.

**COURSE OF MINERALOGY FOR YOUNG PEOPLE.** (Agassiz Association Course.)

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**PLAN OF THE COURSE.**

The student receives a book and a handsome partitioned box containing twenty-five minerals; the minerals are numbered, but not labeled; the student determines the minerals by means of the directions given in the book, draws up a report and sends it to the Author; if done correctly, the student can take a higher and more difficult grade if he so desires. There are four grades in all.

**PRICE FOR BOOK AND COLLECTION (FIRST GRADE) ONE DOLLAR. POSTAGE 25 CENTS.**

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1. In the First Grade, the student learns to determine minerals by examining their hardness, lustre, color, transparency, streak, taste, and odor; all he needs for this is a streak and scratch plate, which is furnished with the collection, and a pocket-knife. The collection for this grade has been selected with a view of enabling even those who do not care to go further in the course, to determine most of the common stones and to get an idea of the relations and differences that exist between them.

2. In the Second Grade, the easier chemical tests are introduced, such as tests with acids, flame tests, heat tests with the open and closed tube. Part of the necessary tools are furnished with the collection.

3. In the Third Grade, the student is initiated in the art of using the blow-pipe, and of determining the ores of the useful metals. The collection contains the necessary minerals for these lessons.

4. In the Fourth Grade, the student learns to distinguish crystals, and the collection for this grade consists principally of specimens showing characteristic crystal forms.

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**CHAPTER ADDRESSES, NEW AND REVISED.**

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**REPORTS OF CHAPTERS 1-100 should reach the President by January 1.**

The Agassiz Association is a society composed of members of all ages, who are interested in natural science, and who are willing to study by the modern approved methods of personal observation and laboratory work, instead of by the old rule methods of reading and committing to memory lessons from books. All are cordially invited to join. Full particulars and illustrated circulars free. Address, Mr. H. H. BALLARD, President A. A., 50 South Street, Pittsfield, Mass.

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**OBSERVATIONS IN NATURAL HISTORY—SUMMER OF 1890.**

By J. E. WALTER, Peru, Ind.

[Selection from Prize Essay.]

[Mr. Walter's complete notes would nearly fill an entire number of the *Science News*, and are profusely illustrated with beautiful pen and ink drawings of which we reproduce a few of the best examples.—Ed.]

ARISENA TRIPHYLLUM.

So well known is Jack-in-the-pulpit that a description is almost out of place here. However, a few remarks may be appropriate. Fig. 1 represents a young plant just coming up, May 6, 1888, and Fig. 2 another plant, May 20, 1888. In the summer of 1889 I saw a very large plant, a leaf of which was thirteen inches long and nine inches broad. I have noticed some variations in the color of the spathe. The most of them are green, striped with light green; but I have noticed some plants where the spathe was nearly black, with light stripes.

I will now mention some abnormal growths I have observed of the Indian turnip, this being the principal reason of my speaking of this plant. June 3, 1888, I met with the plants represented by sketch No. 3. The larger is the one particularly noted. It consisted of a single stem, which, instead of being solid as it is in a perfect plant, was hollow, as shown by Fig. 4. A is a vertical section of the stem, and shows the hollow running from the tuberous root nearly to the top, where it ends almost at the surface. B is a cross section one inch above the root. Fig. 5 shows cross sections of the stem of a normal plant in comparison with the one just named. The leaf of this plant was trifoliate,
but two of the parts were again divided into two lobes each. The smaller plant near by was a distinct plant, having no connection with the larger.

May 19, 1889, I saw another plant consisting of only a single stem and a trifoliate leaf, as shown by Fig. 6. The leaves, I believe, were broader than those of the plants previously observed.

June 8, 1890, I observed another plant (Fig. 7) differently deformed. It was a perfect plant in the matter of having the full number of leaves, etc., but in addition had a stalk by the side of the true scape, bearing four leaves—or rather one leaf—divided into four parts. Two of the parts grew in such a way that they under sides clasped against each other. These leaves were long and narrow compared with the normal leaves of the plant. The spathe was dead and withered, and the green fruit had already made its appearance. The plant was very thrifty.

One of the large normal leaves measured seven by ten inches, and another was eleven inches long. August 16 I again observed this plant. The leaves were wilted down, and I saw that the scape was sheathed with the inner petiole; the abnormal stem grew alongside this, and both were sheathed with the outer petiole. The topmost berry of the fruit was just a little tinged with red, as though beginning to get ripe.

**ALLIUM TRICOCUM.**

Quite a difference of appearance exists between the onion of our garden and its wild relative which I have observed. For some time I did not in the least suspect that it belonged to the onion family, until I accidentally crushed some of the leaves and recognized it by the smell. The leaves are flat and lanceolate in shape,—entirely unlike those of the cultivated onion,—hence I was much surprised, and at once commenced digging to examine the root. Sure enough, I found it a real onion in shape and taste, although not quite so strong as the common onion, being more of a mawkish taste. The bulb was about four inches below the surface. The plant has three leaves, which remain only until some time in June.

I observed the first plant April 14, 1889. It was then about four inches high. Three weeks later (May 5) the scape had appeared, but the leaves still remained. June 23 before blooming, it was about five inches high, and the leaves were gone. The plant was in bloom July 7. The flower consisted of a six-parted perianth with three pistils. July 28 I noticed that the seed was not yet ripe. August 25 I visited the plant and found nothing remaining but the dried umbel. The seed had ripened and was gone. The next year I had better luck, as I obtained ripe seed of the plant. This was August 16, 1890, and had I been a day or two later they would have been gone. I think the plant is rather rare here, as I have only seen it in about three localities. It grows in woods and thickets.

**ARISTOLOCHIA SERPENTARIA.**

June 25, 1890, I found one of these plants. I was pretty sure it was snakeroot, because of the shape of the leaves, although I had never studied the plant, had never seen the flowers, and did not even know to what order it belonged. I made a sketch of the plant on account of the peculiar shape of the leaves and stem. I took particular notice of the peculiar termination of the stem. Otherwise I did not closely observe the plant, for I failed to discover the flowers, which were concealed by the lower leaves and the dead forest leaves which lay about the stems of the plant. After returning home with the sketch I consulted reading matter on the subject of this plant, and on learning that "the flowers are on stalks which rise from the roots," my curiosity was aroused, and the next day I examined the plant more closely. I was rewarded by finding three or four flowers. From what I had read I was led to believe that the peduncle grew from the root, but I found that they do not grow direct from the root, but from the main stems a short distance above the ground. The peduncles have many bracts. The fruit is a six-celled capsule or berry. It is oval in shape, and on the outside has six prominent ridges or ribs. It is of a dull purple. The part of the flower next to the capsule was of a light color, while the other was a dark purple. The leaves of the plant were five inches long and two and one-half inches broad.

**THE EXPERIMENTS WITH A PENDULUM.**

To visibly demonstrate the motion of the earth, formerly made by Foucault under the cupola of the Pantheon, are about to be renewed on an even larger scale. The new gigantic pendulum has just been suspended from the center of the second platform of the Eiffel Tower. It consists of a bronze wire 350 feet long, with a steel globe weighing 180 pounds at the end.
The Popular Science News.

BOSTON, DECEMBER 1, 1890.

AUSTIN P. NICHOLS, S.B. . . . . . . Editor.
WILLIAM J. HOLT, Litt.D. . . . Associate Editor.

The close of another year finds the Popular Science News with an increased subscription list and advertising patronage, and a general condition of well-being, for which the proprietors heartily thank all those who have aided and encouraged them by word or deed. They hope to greatly improve the paper during the coming year, with the aid of an increased staff of contributors, which, as heretofore, will include some of the most prominent scientists in the country. The Popular Science News holds a unique position as a low-priced journal of popular science, in which the standard is always kept up to the highest point; and if, by its influence, a love for the study of Nature is fostered, and the progress of Science advanced, even in a small degree, their ambitions in that direction will be fully satisfied.

There is, however, a practical side of the matter to be considered, which relates to the necessary expenses of printing and publishing a journal of this class; and they therefore request an early attention to the bills for $51 enclosed in the present issue, which, although small in amount, represent in the aggregate a sum which is absolutely necessary to the publishers in their business of managing, printing, and distributing the paper.

The connection of the Science News with the Agassiz Association during the past year has been a very successful experiment. A wide-spread interest has been created in a most useful and enterprising institution among our readers who are not directly connected with it, and the members of the Association have, on their part, added so much of interest and variety in their communications to our columns that we have concluded to devote another page to such matter during the coming year, confident that it will be of equal interest to all, whether members of the Association or not. The fact that the Science News is now the only "official" organ of the Association will allow of the concentration of the best work of its members in its columns, and will doubtless prove of great advantage to all concerned.

Among the other special articles in this number, attention should be called to the one from the pen of Professor Young, of Princeton, who is one of the highest authorities on astronomy and stellar spectroscopy in the world. The discoveries therein described almost surpass belief; and yet they are probably but the beginning of what the modern science of spectroscopic analysis has yet in store for us.

Amid the general devastation created by the McKinley tariff bill, scientists may find a crumb of comfort in the fact that books printed in any other language than English may now be imported free of duty, thus greatly facilitating the study of the valuable work accomplished by the French and German scientists. Books printed in English are still taxed at the rate of 25 per cent. Users of chemical glassware, and lenses—photographic, microscopic, etc.—must pay 45 per cent., although chemical apparatus of platinum is, as formerly, admitted free of duty. A most uncalled-for advance has been made in the rate upon albumenized paper from 15 to 25 per cent., which will be felt by every photographer in the country, both professional and amateur. The rate upon other classes of scientific apparatus appears to be but slightly increased. Travelers from Europe are nominally allowed to bring in apparatus free as "professional implements," but, this privilege being largely dependent upon the rulings (and whims) of the local authorities, we fear it will not be of much practical value. The whole business is an excellent illustration of the absurdities of a "protective" system; but, even allowing that protection is a benefit, there is neither sense nor justice in taxing scientific research. However, the authors of the bill have been consistent in this respect, and a government which taxes art 15 per cent. and literature 25 per cent. may well impose a tax of 45 per cent. upon the apparatus of those who are endeavoring to advance the progress of civilization by the study of the sciences.

A peculiar and instructive accident recently occurred in the city of Lynn, Mass. The electric lighting station caught fire, and the wires carrying the current from the powerful dynamos were burnt off, thus breaking the circuit and cutting off the current. Relieved of the work of producing the current, the 700 horse-power engine became unmanageable, and started off at such a rate of speed that the large fly-wheel was broken into fragments by the centrifugal force, and flew in all directions, causing much damage to the building. This occurrence is an excellent illustration of the principle of the transformation of energy, as the power produced by the engine, instead of being transformed into electrical energy, was, on account of the breaking of the circuit, suddenly changed into the centrifugal force which caused the wreck of the fly-wheel. It is also shows plainly that it really costs something to produce electricity, and that it is not an unlimited and costless source of power, as many suppose.

A curious discovery in photography is, that when eikonogen is used as a developing agent, a positive instead of a negative image may be produced on the plate after exposure in the camera. The process depends upon the addition to the developing bath of a substance known as allyl-thio-carbamide, made from oil of mustard. Although the process has not, as yet, been perfected for practical use, it is of the highest interest, and will doubtless prove of great value to professional as well as amateur photographers.

A leading natural gas company in Pittsburgh has notified the iron manufacturers of that city that it will no longer supply the gas for use in puddling furnaces. The company explains its action by stating that it is not taken on account of any scarcity in the supply, but because the gas can be used to greater advantage in private houses, as the price there paid is many times greater than for the same quantity of gas used in the iron furnaces. This will be a serious disadvantage to the iron manufacturers, and seems unjustifiable except on the supposition that, notwithstanding the denial, the supply of natural gas is really diminishing. The permanency of the gas supply is a very interesting and important question, and although the quantity stored up in the earth's strata may be sufficient to supply all demands, both present and prospective, for many years, yet the time must certainly come when it will be exhausted; and, in the absence of any definite knowledge in regard to the available supply, a careful and economical use of this valuable gift of Nature would appear to be the part of wisdom.

Investigations by Mr. E. A. Partridge upon the atomic weight of cadmium give the number 111.8015 as the most probable value. The nearest approximation hitherto made to this weight is 112. Mr. Partridge's determinations seem to have been made with great care, and are, undoubtedly, the most accurate up to the present date.

In a paper read before the Franklin Institute, of Philadelphia, Mr. Reuben Haines gave an account of his examination of water from an artesian well, which had passed through a galvanized iron pipe. Over six and a half grains of carbonate of zinc were present in every gallon. The water also contained an unusual amount of carbonate of ammonia, and Mr. Haines concludes that the enormous amount of zinc present in solution was due to the formation of a double carbonate of zinc and ammonia, held in solution by the excess of carbonate of ammonia present in the water. The case is an exceptional one, but the action of water on galvanized iron pipes is so variable and uncertain that
they are entirely unfit to carry water used for drinking. The salts of zinc have a most prejudicial effect upon the health, and the danger of contamination of water in contact with zinc or galvanized iron is a constant one.

**A MEDIEVAL CYCLONE.**

The past summer has been remarkable for the storms and cyclones, which in destructiveness, if not in number, have surpassed those of previous years. The terrible loss of life caused by the cyclone near St. Paul, and the hardly less serious destruction of life and property at Lawrence, Mass., in a region supposed to be free from such visitations, is still fresh in the minds of all; and in France, Switzerland, and other European countries, thunder-storms and tempests of wind and rain of exceptional severity have caused great damage.

It is by no means to be inferred, however, that "the climate is changing," or that similar meteorological events have not occurred in previous years. With the settlement of our Western country, and the improved means of observation and communication of modern times, such phenomena, when they do occur, are much more likely to be brought to public notice; and the greater damage caused by them is simply due to the existence of a greater number of persons and buildings in the regions affected by them.

This view is confirmed by accounts of meteorological phenomena in old books, which, freeing from the superstition and ignorance of those days, must have referred to cyclones and thunder-storms similar to those of the present day. In an old work published in 1557, the *Livre des prodiges*, by Lycosthenes, are two quaint wood engravings, which we reproduce,—one designed to illustrate a cyclone, and the other a violent thunder-storm, which in those superstition days, before the advent of Benjamin Franklin, were supposed to be due to the battles in the air of armies of evil spirits. Although, thanks to modern investigations, we have learned much about the cause of such occurrences, and are able to protect ourselves to a certain extent from their consequences, there still remains a great deal that is mysterious and unexplained; and as regards the cause of the formation and action of cyclones,—or, more properly, tornadoes,—we know but little more than those persons who were unfortunate enough to have lived in the sixteenth century.

**THE BRITISH ASSOCIATION AT LEEDS.**

The sixteenth meeting of the British Association for the Advancement of Science, lately held at Leeds, was, although 1,775 members were in attendance, comparatively small and quiet. It was, moreover, evident that those who had come to Leeds were there for serious, steady work. This work was, on the whole, good and of high quality, though too often on matters of purely technical interest. The section rooms were, therefore, seldom more than fairly filled—a state of affairs now become so common that the officers of the Association are giving much attention to the question of a remedy. Conferences for the full and free discussion of subjects of general interest have been already tried in some of the sections, and found to be popular. If three-quarters of the time of the meeting should be given to these, and more time allowed for discussions that spontaneously arise, it is thought that the interest and usefulness of the occasion would be largely increased.

That much can be done to improve the organization of sectional work has been abundantly proved in the case of Political Economy and Statistics—a section once a reproach to the Association, and a refuge for every theory that could nowhere else find utterance. Under the guidance of Mr. T. H. Elliott, its recording secretary, preparations for the Leeds meeting were begun early in the year. The organizing committee met often, decided what were the subjects of importance and present interest useful to bring before the section, limited these in number, communicated with the best men in each department of the science, and induced them to take part in the discussions arranged. As a result, three or four papers only were read each day,—in other sections the average number was sixteen,—and these were on such broad and live subjects as: "The Probable Effect on Wages of a General Reduction in the Hours of Labor," (Professor Munro); "Recent Forms of Industrial Combination," (Professor Haldes); "The Utterly Ains of Co-operation," (Mr. B. Jones); "The Value of Labor in Relation to Economic Theories," (Mr. James Bonar); "Progressive Taxation," (Professor Bastable); "A Theory of the Consumption of Wealth," (Professor Geddes); and "Modern Changes in the Mobility of Labor," (Mr. Llewellyn Smith). The geographic section was, moreover, invited to confer with the Economists on the "Lands of the Globe Still Available for Settlement by Europeans."

In the sections of pure science, the papers—of which there was an abundant supply—had little interest for the general public. Among those of exceptional scientific value were the contributions to the discussions on electrolysis and solutions, which are to be printed in full, and a communication from Professor Rowland, of Baltimore, on the spectra of minerals. Among the geologists the work included Professor Marsh's account of discoveries in regard to the gigantic ceratopsids, or horned dinosaurs, of the Laramie beds in the Rocky Mountain region, and a report from the government geologist of New South Wales showing that most of the commercially valuable minerals occur in more or less abundance in that country. Vesuvius and the exploration of caves came in for their usual share of attention, and suggestions were given as to the sites in the Southeast of England where trial borings can most economically be made for the coal that undoubtedly underlies that district. Mr. J. Logan Lobley discussed at length the facts recently made known concerning the deposition of gold by marine action. Unaltered sedimentary rocks, even of the Tertiary Age, may be shown to contain an equal amount of gold in proportion to their bulk with that of those metamorphosed Cambrian and Silurian rocks hitherto regarded as the earth's treasure stores of the precious metal. Moreover, Somadi's discovery of nearly a grain of gold to the ton of sea-water, and Daintree's of the power of organic matter to precipitate gold from a solution of the technolites, give reason for the supposition that the deposition of gold on sea-bottoms is still going on.

A large part of one day was devoted by the biologists to a consideration of the subject of teaching botany in schools, introduced by an able and far-reaching paper by Professor Marshall Ward. Botany, he urged, should be taught, not in order that names and facts may be committed to memory, but that habits of accurate observation may be acquired by the pupil, and great principles and laws grasped which in future may be applied under any special conditions. In these views he was supported by the eminent biologists present, who, one and all, agreed that it is time to leave the blind worship of facts, and, instead of measuring a scholar's progress by the amount of dogmatic information imbibed and put into an exclamation paper, look to his understanding of the relation between facts and the way in which he intelligently describes what he sees.

In the Anthropological section the boldness and grasp displayed by ladies in dealing with mental evolution and the Darwinian doctrine of reversion, was somewhat of a surprise to the older members, though it was not at all a part of the proceedings. The question of the crucible reactions was again brought forward, this time by the Reverend J. Stuart Geddes, who endorsed the conclusions recently published by Schrader, that the indication afforded by the languages and culture of the primitive Aryans and the actual conditions of life on the Russian steppes at this moment point to Southern Russia as the original home of those ancestors of ours. The present aspect of the jade question was stated by Professor F. W. Rudler, whereby it seems no longer necessary to seek an exotic origin for the nephrite and jadeite implements found in ancient graves in Europe and America, jade having been found in both those continents in situ. By far the most popular paper presented to any section was that of Miss Dowle, granddaughter
of the late Robert Chambers, of Edinburgh, describing his exploration of the Carpathian Mountains. Travelling with no other companion than a peasant attendant, she lived for ten weeks among the people, concerning almost entirely to their ways of life. For account of the villages she passed through and their occupants was delightfully given and greeted with a round of cheers. At its close Miss Dovey received congratulations from the chairman on the courage and enterprise she had displayed, and thanks was, with much enthusiasm, accorded her.

The address of the President, Sir Frederick Abel, a survey of the progress of applied science in certain definite lines, was adapted only to the specialists among his audience. In this respect he was followed by more than one of the vice-presidents. Of the others, Captain Noble gave a strikingly clear and concise description of the Forth Bridge, followed by a comparison of the mechanism and effectiveness of the war ships of the early part of the century with those of the present, and a discussion of the explosives now coming into use. The association of Leeds with Dr. Joseph Priestley, provided Professor T. E. Thorpe an opportunity of emphasizing Priestley’s true relation to the marvellous discovery of the combustion of gases. It was a moment which marked the close of the last century. Sir Lambert Playfair, Consul General for Algeria, taking his large audience on an historical-geographical tour around the shores of the Mediterranean, sketched the succession of events in those regions from the founding of Tyre to the French annexation of Tunis, considering at the same time some of the practical problems of the present day. Upon the scheme which marked the closure he poured contempt, but spoke with enthusiasm of what may be done there by artesian wells. In those places where the drainage, instead of flooding open spaces and forming what are called chotts, finds its way through the permeable sand till it meets impermeable strata, he has seen one well alone throw into the air a column of water equal to 1,300 cubic metres per diem—a quantity sufficient to redeem 1,500 acres from sterility and to irrigate 60,000 palm trees.

To the Economists, Professor Alfred Marshall presented with characteristic openness of mind a review of some of the changes that are going on in the mode of action of competition, and the attitude of economists regarding it. Discussing the various aspects of the problem of production, Professor Marshall digressed on the way to speak a little on protection and free trade. American protectionists, he admitted, have something to say for themselves, and once had more. But, having in their own country studied their position, his deliberate judgment is in favor of free trade for the United States. Those phases of competition and combination touching the struggle for the control of capital have much of the union of great capitalists in the form of trusts, received careful and impartial consideration. The address began with the statement that economists of today no longer keep a supply of generic propositions and dogmas ready for special application at any moment. It concluded with the expression of the speaker’s profound conviction that the struggle for production proceeds a complex; every year the necessity of studying them from many different points of view and in many different connections becomes more urgent. Every year it is more manifest that we need to have more knowledge and to get it soon, in order to escape on the one hand from the cruelty and waste of irresponsible competition and on the other from the tyranny and the spiritless death of an ironbark socialism.”

The Leeds meeting will be remarkable in the memory of most of those who attended it for the general lectures given in the Coliseum. Probably at no meeting have any more masterly, more intelligible, and more instructive been given. Professor John Perry, of London, gave an explanation of a rapidly made series of experiments with spinning objects—some set in motion by the hands, but others, including tops and gyrostats, set in very rapid rotation by means of an electric motor. The object of the lecture was to show that all problems raised by these spinning objects had their analogies in the rotation of the earth, and that the fact that the earth is a spinning top is a great and persistent cause of many phenomena. It is, he said, probable that terrestrial magnetism is altogether due to it. Mr. E. B. Poulton, discovered, delivered without a single note, made clear the relation between minima and the other uses of color in the animal kingdom. The illustrations thrown upon the screen were, so far as possible, new, and, though some of them had been described before, all had been prepared specially for this occasion. Not less fascinating was the lecture by Professor C. Vernon Boys on the wonderful properties of quartz fibres, which he himself may be said to have discovered. Finding it necessary in the use of one instrument, a radiometer, to measure a force so excessively small that even a silk fibre was too coarse, he obtained finer wires by shooting a very light arrow, which drew after it a very fine fibre of quartz from a piece of molten quartz held in the flame of an oxyhydrogen blowpipe. In this manner he obtained a thread not more than 1 to 1,500 of an inch in diameter, with which he was enabled to exert a force of a thousand-millionth of a grain weight applied at the end of a lever one inch long. This lecture was also illustrated with lantern slides, showing the various applications of the fibres, and a comparison of their thickness with that of fine wire, spun glass, and silk from a silkworm cocoon.

Lectures such as these, prepared for and delivered to large audiences of what are called in England the operative class, form no small part of the usefulness of the British Association, and, perhaps better than in any other way, further its main object—the advancement of science.

Original in Popular Science News.

BRIEF STUDIES IN BIOLOGY.

BY PROF. JAMES H. STOLLER.

CONCLUDING CHAPTER.

THE VERTEBRATA.

These studies in animal biology have now dealt with examples of six of the great primary groups, or sub-kingdoms, of the animal world. But one more sub-kingdom remains, and that is the great one which has been included in all considerations of animals—namely, the most animals that are familiarly known, both those domesticated and those that live in the wild state. And it is true that not only in general interest, but also from the standpoint of zoological science, the five classes of vertebrata—namely, fishes, amphibians, reptiles, birds, and mammals—are each of as much value as any of the sub-classes of invertebrates. It is these structural differences—structure being the ground of classification—each of the vertebrate sub-kingdoms must be given the same importance as the great division Vertebrata. Hence these five classes are thrown together into one sub-kingdom, co-ordinate with the six, typical animals of which we have already studied.

Instead of taking a single animal as a type of the entire group, it will be best in our present study to have in mind examples of each of the five classes of the Vertebrata. Let us choose as familiar representatives of these the horse—a mammal, and in their natural order as named above, the trout, the frog, the lizard, the robin, the dog. We will notice what characters these animals have in common, and thus gain a knowledge of the distinctive features of vertebrates in general.

Our attention is first directed to the fact that these five animals are like one another in the fact that they possess an internal skeleton. We must remark, too, that in the great vertebrate animals we have studied; some of these—the starfish, the grasshopper, and the snail—possessed an external skeleton, but in none was an internal one present. Stopping only to observe that this is a broad distinction between the two great primary divisions of animals, and that it is obviously correlated with general differences in the arrangements of organs, we next notice, beginning with the external skeleton of the five animals, that in all it shows an axial portion, consisting of a row of bones, called the vertebral column, jointed at the anterior end to a box-like, bony structure, called the skull. It at once becomes clear that this column of bones, with the skull, is the leading feature of bodily structure in these animals, and that it is properly determinative of the vertebrates. For in all we find that the several systems of organs, particularly the nervous system, have the same situation in the body, relative to the vertebral column. In regard to the nervous system, it is to be noticed that its main portion is contained within the hollow of the vertebral column and that of the skull, forming the spinal nerve-column and brain. From these considerations alone it becomes clear that animals which upon superficial examination seem so unlike as the trout and the dog, must be placed in the same general group (sub-kingdom).

But further observation shows that there are other features of resemblance besides the fundamental one of the possession of a backbone and cerebro-spinal axis. Looking at the external parts of the animals, it is seen that the organs of locomotion, whether fins, wings, or legs, are arranged in pairs, and that the same number of pairs—namely, two—is present in all. (It is true that in the fishes, besides the paired fins there are median fins which aid in locomotion.) Further examination of the limbs—using this word as applied to locomotive organs of any sort—shows a much closer resemblance than the regard to mere arrangement and numbers. It is seen that all show the same plan of structural development that is, consist of like parts, similarly related. Thus an examination of the skeletons of the fore limbs shows that in all, save the fish, there are present, bones of the upper arm, fore arm, wrist, and hand—the same, it will be observed, as in the arm of man. In the case of the fish the difference is by the union of the two. But in that of man there is only the upper division of the limb that is lacking in the fish, and these are the one and the same in man as the one and the same in the fish. A comparison of the skeletons of the hind limbs of the several animals shows a like correspondence. Furthermore, a study of the sets of bones, called arches, by which the limbs are joined with the main body, shows a close structural correspondence in all. We may say, therefore, that the parts by which locomotion is effected in all the five classes are plainly made on the same plan, but they show modifications in adaptation to the physical surroundings of the animals—the limit of the fish to locomotion in water, that of the bird (in the case of the fore limbs) to a life in the air, etc. The relationship of the five classes of vertebrates thus seems clearly established on the basis of correspondence in structure. Equally strong evidence...
is afforded by comparison of other parts, as, for instance, the brain, in regard to its division into lobes. Nothing could be more interesting than a comparative study of the brains of five typical animals, such as a bird, a fish, a mammal, and a reptile. It would be open to the mind that in all there are the same number of paired lobes and having the same serial arrangement. But the relative size of these lobes varies as we go successively from the lowest group, fishes, to the highest group, mammals. That lobe which is the seat of the higher functions of mentality, namely, the cerebrum, is small in fishes, but, as we pass to the higher groups, it becomes larger and larger, until in the mammal-brain it overtops the others, constituting three-fourths of the brain-mass.

These comparisons inevitably suggest the question of the genetical relationship of the five classes of vertebrates. Is there a true family relationship among them? Are they all descended from a common ancestral vertebrate type? The interested reader can only be referred to the literature upon this subject. However, in concluding this paper, we may refer to two or three points that have a bearing upon this great question, and that are illustrative of the great mass of evidence that, to almost all persons who have studied the matter, is convincing of the truth of the doctrine of evolution.

1. It may have occurred to the reader that while what is said above is true of the five animals under examination, there are some vertebrates that do not have four pairs of fins, while some fishes have only the common tail—that have only one pair of fins, and some reptiles—as the snakes—that have no limbs at all. Now if all vertebrates descended from an ancestral generalized type, those now living which lack two pairs of limbs must have lost these parts in the process of evolution. Also it is antecedently probable that in some the parts would not yet be fully lost. It is in process of gradual disappearance, and this is the fact is most strongly indicated by the presence of imperfect (called rudimentary) limbs, or arches for the support of limbs, in some of the fishes and snakes. Thus in the box-constrictors there is a pair of claws, supported by bones, the positions and attachments of which are the same as of the hinder limbs of other reptiles, as the lizard, the gecko, and the snakes, which, lacking any trace of ventral fins, they all pass through a stage of embryonic development in which two pairs of limbs are present.

2. There is a single animal, the lancelet, which, while thrown with the fishes in classification, is much lower in rank— is the lowest type of organization among the vertebrates. In the lancelet there is no bony vertebral column or skull, but in their place a gelatinous cord, called the notochord. Overlying this cord is a nerve-axis, but its anterior part is not developed into a brain. The blood contains only colorless corpuscles, whereas that of all other vertebrates contains both white and red corpuscles. Now all vertebrate animals—every species of fish, amphibian, reptile, bird, and mammal—pass through a stage of embryonic development in which they are like the lancelet in the characters just named. The inference is, that all vertebrates have been derived from a type of origin which retained the now living lancelet in respect to these fundamental features.

3. The study of fossils shows that in past ages of the earth there lived vertebrates which were connecting types between the classes as now living. Thus some were partly fish-like and partly reptilian; others, partly reptilian and partly bird-like, etc. Also fossils are known which form a tolerably complete series of types between these generalized forms and the classes of vertebrates now living. Moreover, the strata in which they are found prove that the succession of types in time was from the generalized forms to those of living animals.

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[Special Correspondence of Popular Science News.]

PARIS LETTER.

Swallows are leaving and scientists are coming back. The vacations are over, and after a trip to the sea-shore or to the mountains, all return to their studies, and an intense-organismic activity is observable; their doors; lectures and courses are again in full play. The season of work has begun—of indoor work, as nature is now going to sleep. Although it is rather late now to communicate the information, as far as immediate application is concerned, here are some observations made by some Swiss sheep-herds of the Zurilch canton, concerning the prognosis of weather through the observation of plants and insects. When Alisina media opens its corolla by 9 A. M. and keeps it open till 4 P. M., approximately, the weather will be fair the next day; but if the flower is not open at 9 it predicts rain. If the flowers of Galium verum give off a strong smell, rain is not far off. When the petals of Carialis vulgaris shut, rain is coming. Flowers of Cates- duelis stellata close after 2 or 3 A. M. when rain is to pour the same day. If leaves of Oxalis aceto- sella shut, rain, or cold, or a storm are near. Lap-sana communis must not keep its flower open at night; when it does mean rain. Such is also the case if Didea veron inclines its leaves toward the ground, and if Cratoeres latifolia turns the superior aspect of its leaves in the same direction. The Zurilch sheep-herders consider these plants, and many others, as so many barometers, and it is quite certain that many flowers and leaves do exhibit definite peculiarities when some change of the weather is impending, but we would not advise to dispense totally with the usual barometer. Marshal Bugeaud, in his African campaign, had with him a glass jar containing some green frogs (Hydra a'torhyn) for the purpose of predicting the weather. These animals indicated it by climbing, or by going down, on the side of the glass, and the Marshal said they were capital barometers. With many others, I tried the plan, and never saw that they cared at all about the weather, and their movements indicated nothing at all, as they always kept as high as possible, whatever the weather might be.

Bacteriological studies are being pursued in many directions, and with success in France and Germany, where a great number of men have trained themselves in the special work and methods of this recent science. Two periodical publications are in France, especially open to bacteriological researches; the one is the Archives de Pathologie Experimentale, edited by Professor Strauss, of the Medical School; and the other, Annales de l'Institut Pasteur, conducted by Professor Duclaux, a very able and talented scientist, a member of the Academy of Sciences, and one of the most remarkable men in the art of grasping the delicate points of a subject at first glance, and of explaining them ex abrupto in the most clear and precise language.

He possesses the French genius in the highest degree, and it is said that when he has to explain a difficulty or criticising a theory. His Annales are full of excellent information, inasmuch as he has assumed himself the task of reviewing the more important foreign publications.

Among the principal papers recently published, I would call the attention on Gabrichievskv's researches on Chlorella. This new name has been set forward by Pflicter, and expresses the fact that the micro-organisms endowed with mobility are attracted or repelled by definite chemicals, organic or inorganic. This fact has given birth to a new method of research. If we want to know what occurs in such or such a micro-organism, in such and such water, or matter, we prepare some capillary tubes filled with any substance which attracts the micro-organisms; one end is shut and the other stops in the water or matter to be examined. In a short time the micro-organisms get in the capillary tube, when they are easily detected by the ordinary methods. This new method is a rapid one, and no doubt may be expected in the future, as it is rendered bacteriological analysis much more rapid and easier.

Another very important paper is by Winogradsky, and refers to the agencies of nitrification. Scientists have long been perplexed by the question of ascertaining how, and under what form atmospheric nitrogen can be introduced in plants, and help to build their chemical structure. As all the nitrogen in animals is given to them by plants, the question is of great biological interest. It is known now that nitrogen gets into plants principally, if not exclusively through the agency of some micro-organisms which dwell in the roots of plants, and when these micro-organisms are killed by heat, for instance, the plants suffer and die, unless some of them are artificially introduced in the roots. These micro-organisms—or this one, as one only has been discovered yet—are always present in the soil and their influence on life generally considered is one of utmost importance.

M. Drake del Castillo, an able French botanist, has recently obtained a reward from the French Academy of Sciences for a good memoir which he published on the Polynesian flora. The Academy had proposed a question, asking the significance of the flora of Polynesia generally. M. Drake del Castillo, the successful competitor, after a careful study of the matter, comes to the conclusion that the whole flora is of foreign origin. The idea of a former Polynesian continent, of which the present islands and archipelagos are fragments,—which has been discarded, for geological and floral reasons. Sea soundings exhibit enormous depths between many islands or groups, and it seems impossible that the former continent could have been so deeply immersed. Then the character of the flora shows that all the species of Polynesia are either cosmopolitan or of American and Asiatic origin. The flora has been introduced by currents and other natural agencies of dispersion. But a curious fact is, that Polynesian flora exhibits peculiar features, and M. Drake del Castillo is of the opinion that the migration took place a long time ago, and that while the original species have generally disappeared and died out in their primitive habitat, to be replaced by analogous but different forms, the Polynesian flora has kept the same original forms. Polynesia would then present an older flora than is commonly believed. Another hypothesis is, that while the Asiatic and American species did persist, the species introduced in Polynesia varied somewhat, on the contrary, in account of the climate and new surroundings. Both explanations are likely enough. At all events, the principle of the existence of a Polynesian continent has existed, and that the flora of Polynesia is an Introduced one. Although short, M. Drake del Castillo's memoir is full of good information, well summarized.

Books are scarce at present; during the summer months publishers do not issue many, but now comes the season for new publications. However, we must signalize M. Armand Collis's new series—"An Encyclopaedia Hortensis et Agricultura," a series of
books devoted to agriculture and horticulture, of which two are out: one on rivers, the other on butchery. The price is low, and the books are good.

Another good book is M. Prout's lectures on hygiene, a series of eight lectures for students on the elements of hygiene. It is clear, and full of information on the way we ought to live—but do not.

II.

MEETINGS FOR OCTOBER, 1890.

TEMPERATURE.

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<tr>
<th>Average Thermometer</th>
<th>Lowest</th>
<th>Highest</th>
<th>Range</th>
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<tr>
<td>At 7 A. M.</td>
<td>44.9°</td>
<td>64°</td>
<td>21.1°</td>
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<tr>
<td>At 1 P. M.</td>
<td>55.4°</td>
<td>65°</td>
<td>10.6°</td>
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<tr>
<td>At 9 P. M.</td>
<td>47.9°</td>
<td>64°</td>
<td>16.1°</td>
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<tr>
<td>Whole Month</td>
<td>49.3°</td>
<td>65°</td>
<td>15.7°</td>
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The last month has been just one degree and a half below the average for October in twenty years. The lowest point reached by the mercury at the hours of observation was 52°, on the 22d, and this was the coldest day, with an average of 59.50°. The highest point was 71°, on the 2d. The 3d and 4th were the warmest days, each averaging 62.66°. The first week was warm for October, and for the most part pleasant, with an average of 57.50°. The second frost of the season was on the 13th, with a third and fourth on the 22d and 23d. No severe cold during the month.

SKY.

The face of the sky, in 93 observations, gave 36 fair, 20 cloudy, 22 overcast, and 13 rainy,—a percentage of only 38.7 per cent. The average fair the last twenty Octobers was 41.5, with extremes of 37 in 1850, and 73.7 in 1874. The last three months have each been remarkably cloudy, with an average of only 43.8 per cent. fair, while the average for these months in twenty years has been 66.9, a difference of over 3 per cent.

PREDICTION.

The amount of rainfall the last month was 9.70 inches. On the 20th and 24th 2.38 inches fell each storm. The average the last twenty-two Octobers has been 4.26 inches, with extremes of .75 inch in 1874, and 13.20 inches in 1869 (the only instance when the amount has exceeded that of the present October). The amount since January 1 has been 45.75 inches, while the average for these ten months has been only 39.30,—showing an excess thus far this year of 6.27 inches.

PRESSURE.

The average pressure the past month was 29.85 inches, with extremes of 29.38 on the 27th, and 30.30 on the 22d and 23d,—a range of .92 inch. The average pressure for the last seventeen Octobers has been 29.96 inches, with extremes of 29.62 in 1873, and 30.10 in 1885,—a range of 2.23 inches. The present was the lowest pressure in October, with one exception, in seventeen years. The sum of the daily variations was 6.21 inches, giving an average daily movement of .200 inch. This average in seventeen Octobers has been .165 inch, with extremes of .113 and .211. The largest movements were .84 on the 17th, and .40 on the 24th and 30th.

WINDS.

The average direction of the wind the last month was W. 67° 27' N. (or nearly N. N. W.). While the average for the last twenty-one Octobers has been only W. 17° 60' N., with extremes of W. 32° 13' S. in 1880, and W. 80° 25' N. in 1835,—a range of 117° 40', nearly ten and a half points of the compass. The storms on the 17th and 24th were noted as specially windy.

From the above survey it appears that the last month was one of much lower temperature, far more clouds and rainfall than usual, with very low barometric pressure, and more northerly winds than are common in October.

COMPARATIVE METEOROLOGY OF NEW ENGLAND FOR SEPTEMBER, 1890.

The table below is gathered from the valuable Bulletins of the New England Meteorological Society for September, and exhibits the mean temperature and precipitation, State by State, and that of New England combined; also, that of the extreme localities, range, and number of reports contained in each division.

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<tr>
<th>SPECIFICATION</th>
<th>Temperature</th>
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The lowest space in the above table gives the average temperature and rainfall in New England from records kept over ten years, with those at Natick over twenty years. The extremes of temperature in New England for September were 65° at Newport, R. I., and 53° at Mayfield, Me. The extremes of rainfall were 11.14 inches at Chichester, Mass., and 4.69 at Block Island, R. I. The amount at Natick was 5.06 inches; at Springfield, 11.12 inches,—quite a difference.

D. W. NATICK, November 6, 1890.

[Originally Computed for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR DECEMBER, 1890.

There will be an eclipse of the sun on December 11-12, invisible in the United States. The path of the central eclipse begins just north of the island of Martinique, goes eastward, then southeast, then northeast, and ends east of New Zealand and south of the Marquesas Islands. The eclipse will be annular at the beginning and end of the central line and total in the middle. The sun is at the solstice and begins to move northward on December 21 at about 3 P. M. The earth is in perihelion on the afternoon of December 31.

Mars was in fair position for observation during the latter part of the month. It is an evening star, and comes to greatest eastern elongation on December 28, when it sets about an hour and twenty minutes after the sun. For ten days before and several days after, it sets at least an hour after the sun, and may be seen on a very clear evening, just after sunset, in the western twilight near the horizon. Venus comes to inferior conjunction with the sun and changes from an evening to a morning star on the night of December 3. It moves rapidly away from the sun, and toward the end of the month becomes visible as a star, setting two hours and more before the sun. Mars sets at a little before P. M. during the month. It is moving eastward and northward among the stars. Its distance in miles from us will be about three times what it was in June, when it was nearest to us, and will be about one and a half the earth's distance from the sun. Jupiter is still quite prominent in the western sky at dusk, and the brightest object there after Venus has passed conjunction. It sets at about 9 P. M. on December 1, and at about 7h. 30m. P. M. on December 31. It moves eastward among the stars about 6° during the month. The following eclipses of its satellites will be visible at one part or another of the United States during the month. The phenomena all take place off the right-hand limb of the planet, as seen in an inverting telescope. D. denotes disappearance; R., reappearance. Times are Eastern Standard.

II. R. December 3, 6h. 37m. P. M.
I. R. December 3, 5h. 41m. P. M.
III. R. December 8, 5h. 37m. P. M.
II. R. December 10, 10h. 30m. P. M.
I. R. December 12, 11h. 18m. P. M.
III. R. December 18, 11h. 40m. P. M.
IV. R. December 19, 11h. 33m. P. M.
IV. R. December 17, 10h. 17m. P. M.
I. R. December 17, 10h. 34m. P. M.
II. R. December 17, 7h. 41m. P. M.
I. R. December 26, 9h. 3m. P. M.

Saturn rises about midnight on December 1, and at about 5 P. M. on December 31. It is in quadrature with the sun on December 8 at 1 P. M. It is in the constellation Leo, and moves slowly eastward during the month until December 25, when it begins to retrograde, i.e., move westward. The earth is not far from the plane of the rings, and, as seen in a small telescope, the rings will appear almost like a straight line. During the coming year the rings will disappear, except for the most powerful telescopes. Uranus rises a little before 4 A. M. on December 1; and at a little before 2 A. M. on December 31. It is in the constellation Virgo. Neptune is in quadrature with the sun, and is on the meridian at midnight at the beginning of the month, and about two hours earlier at the end.

The Constellations.—The positions given hold good for latitudes differing not much from 40° north, and for 10, 9, and 8 P. M. for the beginning, middle, and end of the month, respectively. The head of Perseus is nearly in the zenith, the rest of the constellation being mainly to the east. Aries is high up on the meridian, south of the zenith, and Cetus is lower down. Taurus is to the left of Aries, high up on the southeast. Below Taurus is Orion, and before Orion is Canis Major, just rising in the southeast. Canis Minor has just risen in the east. Below Perseus (in the zenith) are first Auriga, then Gemini, then Cancer; the last just above the horizon; a little north of east. Leo is just rising. Ursa Minor makes a small bear, lying parallel to the sky. Herion is partly below and partly to the left. Cassiopeia has just passed the meridian between the zenith and the pole, and Cepheus is below Cassiopeia. Cygnus and Lyra are low down in the northwest. Andromeda is high up, just west of the zenith, and Pegasus is below it. Aquarius is just setting in the southwest, and Pisces lies between Aquarius and Aries.

[MAKE A CORRECT, ALMOST ODORLESS, AND PERMANENT MUCHARGE, NEUTRALIZE THE FREE ACID PRESENT IN THE GUM WITH LIME WATER. INSTEAD OF WATER USE A MIXTURE 20 PER CENT. LIME WATER AND 50 PER CENT. DISTILLED WATER.]
ANOTHER "MAGNETIC" MAN.

My attention has been called to the following account from a Lewiston (Maine) paper, dated September 25, of a scientific phenomenon in which your readers may be interested.

"The writer attended Friday evening by a wonderful man, a resident of College Street. The gentleman is a well-known citizen of most trust-worthly character. After an evening's performance he felt exhausted in the morning. He can do nothing with the palms of his hands on the object, but must use the tips of his fingers only. He first began with a common table with swinging sides. Placing his hand in that particular spot, in about thirty minutes, he could cause it to rise to the height of a man and remain suspended. It would rock, beat time to music, or turn a complete somersault. No part of his body touched the object but his finger-tips; and there are no secret wires, for we examined the table carefully. Next he let down the swinging sides, which are on hinges, and, by placing his finger-tips, could raise the leaf, and hold it in that position for several minutes, while we tried to pull it away from his fingers. Then he took a heavy bradied rug, and folded it in four thicknesses, and placed it on the table. With this obstruction he easily lifted the table, and turned it completely over. A plate was put upon the table, and this proved no hinderance. Then a thin dish, inverted, was given to him, and still the table not only continued to rise, but shot fast to the table. He lifted chairs and other objects while resting. Then the table was inverted; and, placing his finger-tips upon the table-legs, the heavy table came up, and remained clearly suspended from the floor, with one foot of clear space beneath.

"The writer then sat upon the end of the table, which came up so suddenly as to throw him off upon the floor. He lost a strong bet upon the table. He lifted chairs and other objects while resting. Then the table was inverted; and, placing his finger-tips upon the table-legs, the heavy table came up, and remained clearly suspended from the floor, with one foot of clear space beneath.

"Finally we grasped hands and tested our natural strength in pulling, and the writer was the strongest man; but, as the current came down in his arms, it went up into ours, feeling just the same as when we held the handles of a battery. Then the strength of the gentleman was wonderful, throwing us around the room as one would handle a toy. The whole evening was filled with these performances. There is no possible chance for deception, and those who have seen this say that the only motive power which these objects receive comes directly from the finger-tips of this man. He can perform the same feats in any room, or with any soft-pine table, which may be placed in any position."—E. W. HALL, in Science.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

R. H. B., New York.—What is the most recent theory in regard to the formation of hot springs?

Answer.—The further we go beneath the earth's surface the higher the temperature of the strata becomes. It is probable that at a comparatively short distance from the surface the whole interior of the earth is in a molten condition. Hot springs are formed the same as any others, except that the water comes from a depth where the temperature of the earth is high enough to heat it, in many cases, to the boiling-point, or, as in the geysers, even higher.

W. W. C., California.—A machine moved by the radiant energy of the sun's heat or light would not be a true "perpetual motion," because the source of energy is not a perpetual one. There can be little doubt that in the course of ages the sun, as well as all luminous celestial bodies, will become cold, dark, and dead like our moon at the present time.

E. F. E., Mass.—An egg which has begun to decay will float in water. How can the development of gas inside the shell change its specific gravity.

Answer.—As is readily shown by a microscope, an egg-shell is quite porous, and readily allows the escape of gas. After a short time the water is replaced by the gases of decomposition, the change in the specific gravity of the egg is quite enough to make it lighter than water, and, consequently, float.

D. D. S., Iowa.—You are wrong in supposing that the white clouds issuing from a steam-pipe are composed of steam. Steam is a perfectly invisible gas, and can only be seen under compresion when translated into innumerable minute drops of water, forming the white substance which is popularly known as "steam," but which is really water, and identical with fog and clouds.

LITERARY NOTES.


Contrary Currents, a novel by Robert H. Ward, publisher, 196 Summer Street, Boston, Price, $2.00.

This work is a collection of essays on social questions, with especial reference to their relations with the great principle of evolution and development. While many of the views advanced by the different contributors are not the same, it is but fair to say that anyone who has given thought to the subject, yet there are other essays of the highest scientific and philosophical value, and the whole work is an admirable compendium of the best modern thought upon these important subjects, from all points of view, expressed in a perfectly plain and popular style. We can heartily recommend the book to our readers.

We have received the Report of the Interstate Commerce Commission for 1889, with a request for criticism. It is a very important and fair work of the Interstate Commerce Commission. We have also received the Report of the Interstate Commerce Commission for 1889, with a request for criticism. It is an important and fair work of the Interstate Commerce Commission.

Koch's Consumption CURE.

When, at the Berlin Medical Congress last summer, Doctor Koch made his preliminary announcement of a probable cure and preventive of consumption, it created at once a most profound sensation, due, however, to the effort to which he occupied in the medical world than to any other cause. Immerable "sure cures" for this terrible disease have been brought forward, only to attract attention for a short time and then pass into oblivion. The confident and positive statements of the discoverer of the tubercle bacillus are, however, worthy of the highest and most respectful consideration, and although it would be impossible to express any opinion in regard to the value of the new remedy until its composition and method of action is announced, yet, making all allowance for the sensational and untruthful stories that are sent from Berlin to the daily press, there seems to be a fair probability that some agent has been discovered which can destroy the tubercle bacillus present in the human body without destroying the life of the individual himself.

There is nothing inherently impossible in the alleged remedy. Jenner's discovery of vaccination has practically rendered small-pox an unknown disease in communities where the practice is thoroughly carried out. Who gives a thought to the possibility of an attack of small-pox nowadays? And yet not many years ago its ravages were as great as those of consumption, and no one could feel sure that he might not at any time be attacked by this disfiguring and dangerous disease.

There is, however, a great difference between an acute, self-limited disease like smallpox, and the general constitutional infection of phthisis. Granting that the tubercle bacilli are the cause and not the result of the disease, and that Koch's inoculation—if it is an inoculation—can destroy them without injury to the patient, it remains to be proved whether this will result in the permanent arrest of the disease, even in its earliest stage. It would seem as if the conditions of susceptibility which led to the original attack of the disease must be removed or modified before a radical cure can be assured. It is hardly possible that in the later stages of consumption, with extensive destruction of lung tissue, even Koch himself would claim to be able to afford any permanent relief.

Probably by the time this number of the Popular Science News reaches its readers the lookd-for announcement will have been made, and the medical profession given a chance to pass judgment upon the new remedy. It is to be regretted that such an air of quackery has been cast over the whole.

Medicine and Pharmacy.
matter by the mysterious and untrustworthy statements purporting to emanate from Koch’s laboratory, and one cannot help recalling to mind Brown-Sequard’s “Elixir of Life” in this connection; but for this he cannot be held in any way responsible. It is pitiful to read the dispatches from Berlin which state that the hotels of that city are fast filling up with consumptive invalids from all parts of Europe, in anticipation of the announcement of the remedy which is to give them relief from their sufferings, and ready to submit at the first opportunity to the treatment which is to give them a renewed lease of life—and the whole civilized world would share in the disappointment if the remedy should fail to meet the expectations of its discoverer. But if a cure or preventive for consumption has really been discovered, with the possibility of its application to other diseases, then Doctor Koch will certainly take the highest rank in the scientific and medical world, and no honors or emoluments will be too great for one who has conferred such an invaluable blessing upon humanity.

APPENDICITIS.

Analysis of seventy-two cases seen in the last four years leads to the following conclusions:

1. Many cases of appendicitis are so mild as not to demand surgical treatment. Although one-third of all post-mortem examinations may show lesions indicative of appendicitis at some period of the patient’s life, the clinical history will frequently be negative.

2. A personal experience, if sufficiently large, is likely to afford conclusions which may have a greater value than those derived from a much larger number of selected cases. In Dr. Bridge’s paper it was stated that four-fifths of the patients were males. In my personal experience there are only twice as many males as females. The diagnostic value of sex is then distinctly less than the collective experience claimed.

3. In general the diagnosis of appendicitis is easy. It is based upon a localized tenderness, and the exclusion of all causes for such tenderness but the appendix. Still it has been my misfortune to make a diagnosis of appendicitis when it did not exist, and to fail to recognize its presence until after death in a patient upon whom laparotomy was performed for the relief of a supposed acute mechanical intestinal obstruction. The following are the cases in which appendicitis was supposed to be present:

A. Circumstances found in the right lumbar and iliac region, and from its seat, sudden origin and rapid progress was thought to be due to an appendicitis. The cavity was successfully drained, but the patient died of acute pneumonia in the course of a fortnight. The peritonitis had originated from an abscess in the liver, and this was attributed to a case of hepatitis of long standing.

In a second case of erroneous diagnosis there was a spreading peritonitis of the lower abdomen of sudden onset. The abdomen was opened and drained, but the appendicitis was found to be free from disease. After death the peritonitis was found to have resulted from a suppurating sub-peritoneal inguinal lymph gland, the result of a gonorrhoea. Information concerning the latter disease was withheld until after the autopsy. A third case gave such a mise

leading history that a pyosalpinx was mistaken for an appendicitis. The tubes were removed and the patient cured. Lastly, a girl of ten years, suffering from a sudden and spreading hypogastric peritonitis, the stomach was found to be empty, but the abdominal cavity was filled with blood, as was seen by Dr. Hornans. Although some doubt was entertained as to the appendicular source of the distention a laparotomy was considered urgent. Dr. Hornans successfully removed an ovarian cyst, the pedicle of which had become recently twisted and its vessels strangulated.

4. Recurrence proved to be much more frequent than was found in the collective experience—44 per cent, in many cases against 11 per cent. In the larger series. It is interesting to note that the frequency of the recurrence was about the same in those cases which were subsequently treated medically as in those which were operated upon. So far as this evidence goes, a recurrent attack makes no more urgent a demand for surgical treatment than does an original attack.

5. With regard to the duration of the disease, it may be said that although more cases recovered during the first three weeks under purely medical than under surgical treatment, this fact must be attributed to their mildness. Of the severe cases quite as many demanded from four to eight weeks for complete recovery, whether the treatment was medical or surgical. It cannot be claimed, therefore, for the surgical treatment of appendicitis that it has shortened the period of recovery. At least such a claim would not be justified by the results found in the cases which have come under my observation.

6. The rate of mortality in appendicitis is by no means clearly established. The physician who sees chiefly medical cases says that it is very low, while the surgeon who is called upon for aid in the grave cases considers the mortality to be very high. So far as I am aware, the cases observed by me form the largest number reported in the experience of a single individual, and they may be considered as establishing, for the present, the rate of mortality.

Of these cases 74 per cent. recovered and 26 per cent. died. About one-half of those were treated medically, the other half receiving surgical treatment. Among those treated surgically 40 per cent. died, while of those under medical treatment 11 per cent. died. The spontaneous evacuation of pus, an event to be anticipated and guarded against, took place in 7 per cent. Of the cases treated medically 11 per cent. died, and in 14 per cent. there was spontaneous evacuation of pus; thus in one-fourth of these cases the treatment should have been surgical. Since these medical cases were about half of the whole number seen, it follows that the treatment should have been surgical in about five-eighths of the cases. The percentage of the cases ending in resolution was 36, which is practically the same as the surgical rate.

It is evidently desirable to make the rules for the surgical treatment of appendicitis as simple as possible. I would advise surgical treatment for urgent symptoms, rising pulse and temperature, increasing distension and spreading pain with or without a tumor, and for a tumor with or without urgent symptoms. Recurrent attacks should be treated as the first attacks. If recurrence is so frequent as to debar the patient from the enjoyment of life or the ability to earn, removal of the appendix between the attacks should be advocated.—Dr. R. H. Fritz, in Boston Medical and Surgical Journal.

The use of the salts of iridium in photography is likely to come into vogue, the metal iridium being at present somewhat cheaper than platinum.

Specially Compiled for Popular Science News.

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARKE, M.D.

SOME NEW BACTERIAL POISON.—Dr. V. C. Vaughan sums up the present state of our knowledge on the above subject as follows:

1. Man is attacked by the infectious diseases either through the alimentary canal or through the blood stream.

2. The gastric juice is a physiological guard against infection by the way of the intestines.

3. Additional guards against infection by the intestines are probably to be found in the absorbing cells of the stomach and intestines.

4. Susceptibility to the intestinal infectious diseases is increased when for any reason these physiological guards are defective.

5. All toxicogenic germs are dangerous when introduced into the intestines, and their capability of doing injury lies in their production of chemical poisons.

6. Many of these poisons are protein in character.

7. These poisonous proteins most probably act by catalysis.

8. The splitting up of complex molecules into simpler ones, heat is liberated and fever manifests itself.

9. The physiological guard against infection through the blood or lymph lies in the germicidal action of the proteids of these fluids.

10. Susceptibility to infection through the blood or lymph is increased by impoverishment of these fluids.

11. We can continue to treat consumption and other systemic diseases by the employment of liberal diet, exercise in the open air, and constitutional remedies without being unscientific in our practice.

12. Filth, without being the bearer of a specific germ, is a cause of disease.

13. Wherever man pollutes the soil about him, the air which he breathes, and the water which he drinks with his own excretions, there enteric fever will be found.

14. In their causal relation to disease, germs cannot be classified without a knowledge of the chemical changes which they induce.

15. While certain bacterial poisons can result only from the growth of certain germs, other poisons similar to one another in their action, though probably not identical, may result from any one of a number of organisms. In the former case we have such diseases as anthrax and small-pox, with their practically constant symptoms and well-marked course; in the latter case we have such diseases as the summer diarrhea of infancy and enteric fever, with their varying symptoms.—Med. News.

PNEUMONIA AND HEMORRHAGIC.—M. Crocq, who has frequently written and spoken in favor of the revival of venesection, made a powerful speech dealing with this subject at a recent meeting of the Belgian Academie de Medecine. Speaking of pneumonia, he declared his disbelief in the cause of the disease being either Friedlander’s bacillus or the diplococcus of Fraenkel and Wielchelbaum. Inoculation with the latter microbe, he remarked, is said to procure immunity from subsequent inoculations, which is exactly contrary to the effect of an attack of pneumonia, for it rather predisposes the subject to subsequent attacks. Again, M. Crocq injected sputum from pneumonic patients, in which the diplococcus had been found, into the lungs of four rabbits, but none of them contracted pneumonia.
Cannabis Indica in Affections of the Stomach.—One of the most troublesome symptoms associated with disturbed functional conditions of the stomach is the pain to which they not uncommonly give rise. This may take the form of colic, due to gaseous distension; heartburn, or the mere sensation of weight and malaise referred to the epigastrium. Nothing, according to Prof. Germaine See, gives so much relief in this class of affections as the extract of cannabis indica in one-third of a grain doses. This drug does not interfere with digestion, while the irritability of the stomach is overcome. To effect a cure it is, of course, necessary to carry out the usual treatment, dietetic and medicinal, and when there is hyperacidity of the gastric contents, alkalies should be given three or four hours after a meal. It is necessary to bear in mind, however, that no relief is afforded in atonic or dilated conditions of the stomach.

Resection of the Liver and the Regeneration of This Organ.—At the recent congress of German surgeons held in Berlin, Dr. Ponfick, of Breslau, reported some experiments he had made on the liver in rabbits. He chose the rabbit because the liver was strongly developed. He did not excise portions of the liver with the thermo-cautery, but with cautery ligatures. If a quarter of the liver was excised, the animal stood the operation well; but if half the organ was removed, the animal, for the first few hours, lost its appetite, became feeble, but by degrees it recovered, and the greater number survived for some months; one hundred rabbits were experimented on. If three-quarters of the liver were removed the disturbance produced was still greater; twelve rabbits survived this operation, and Dr. Ponfick does not believe that the removal of more than three-quarters of the liver is compatible with life. The most remarkable fact noticed in connection with these experiments was the rapid regeneration of the liver, and that the amount of regeneration exceeded the quantity of liver removed. In a case where he removed three-quarters of the liver in a rabbit the whole right lobe was regenerated and increased in volume; it presented an irregular surface. This reproduction is very rapid. In one case the rabbit was killed five days after excision of a portion of the liver, and on examination the regenerated portion amounted to 80 per cent. of the amount removed.

Lactic Acid in the Treatment of Diarrhoea.—In small doses (one to two fluid drachms) lactic acid is a valuable aid to digestion, and, in view of its anti-purgative powers, it is of service in the treatment of various forms of diarrhoea. When given in small doses its effects are confined to the stomach, but in larger doses (over two drachms) it appears in the urine and faces; hence, when desired, its topical effect on the large intestines can be obtained. A very good formula is to present it in the shape of a lemonade containing about one part of the acid in a hundred with syrup and water. Dr. Hayen claims to have derived great benefit from it in the treatment of cholera and typhus, as well as in the diarrhoea due to tuberculous lesions of the intestines and other varieties of gastro-intestinal irritation.

The first laparotomy ever performed in England was by Sir Benjamin Brodie, in 1827. The cause of obstruction was a hernia of intestine through a tear in the rectum. The woman died of peritonitis. The operation had been performed in Italy long before—as early as 1677.

The Treatment of Pyloric Carcinoma.—Mr. F. B. Jessett reports two cases of gastro-enterostomy for pyloric carcinoma, (Lancet), in which Sen's homoeopathic treatment was used. One patient died of exhaustion five days after the operation; the other patient recovered. Mr. Jessett has now records of seven cases operated on in this way, and none died from the operation—that is, although two died, yet the operation was a success, as there was perfect union between the stomach and intestines in both cases. These cases he believes would have recovered had they been operated on. Mr. Jessett does not stress the importance of uniting the jejunum to the posterior wall of the stomach instead of the anterior; he thinks this avoids all risk of kinking of the intestine. Mr. H. G. Rawdon, of the Royal Southern Hospital, Liverpool, (Ipsil. Mirror and Lancet), reports a successful case of pylorostomy for carcinoma. The stomach was sewed up all but one inch, and the duodenum was similarly treated; Sen's plates were introduced and the parts brought together. The patient made a good recovery. He was supported by nutrient enema for the first six days.

Dr. W. T. Bull last April, at the New York Hospital, excised the greater portion of the stomach for carcinoma. The cut ends of the stomach and duodenum were sewed up, the edges being inverted and a Lembert's suture employed; then the jejunum was joined to the stomach by a separate operation as a gastro-enterostomy by Abbé's rings. The patient recovered rapidly, and when last heard of was quite well.

Accidents in Anaesthesia.—According to Dr. H. C. Wood, of Philadelphia, the rules for the proper treatment of accidents during anaesthesia can be boiled down to very few words. The anaesthetist is to:

Avoid the use of all drugs, except etyrine, digitals, and ammonia.

Give the tincture of digitals hypodermically.

Draw out the tongue, and raise up the angle of the jaw, and see that the respiration is not mechanically impeded.

Lavet the patient briefly and temporarily.

Use forced artificial respiration promptly, and in protracted cases employ external warmth and stimulation of the surface by the dry electric brush, etc.; and, above all, remember that some, at least, and probably many, of the deaths which have been set down as due to chloroform and ether have been produced by the alcohol which has been given for the relief of the patient.—Jour. Am. Med. Assn.
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The Publishers of the POPULAR SCIENCE NEWS will send an extra index sheet, without advertising matter, to all subscribers applying for it by postal card or otherwise.
AN EXCEPTIONAL YEAR.

The Year 1891 has been marked by a greater advance than any similar period since the Magazine was established. Not only has the literary and artistic excellence been maintained and increased, but a corresponding gain has been made in the sale and influence of the Magazine. At the end of 1891 the circulation has risen to more than 140,000 a month, and it may justly be promised that the further improvements for the coming year will be proportionate to these largely increased opportunities.

FOR NEXT YEAR.

It is not possible to give, in a brief space, an account of all the features in preparation, but the following announcements will indicate that the material is deficient neither in importance nor range of subject:

THE POOR IN THE WORLD'S GREAT CITIES.

It is proposed to publish a series of articles, upon a scale not before attempted, giving the results of special study and work among the poor of the great cities. They will be written by authorities so experienced in their respective fields that the series will appeal to civilized people the world over. The plan will include the account of conditions in those cities (in many lands), where the results of research will be helpful for purposes of comparison, as well as for their own intrinsic interest. The treatment will be thoroughly popular and the elaborate illustrations will make the subject vivid. Additional particulars may be found in the prospectus appearing in the Christmas number.

IMPORTANT MOMENTS.

The aim of this series of very short articles is to describe the signal occasions when some decisive event took place, or when some great experiment was first shown to be successful—such moments as that of the first use of the Atlantic cable, the first use of the telegraph and telephone, the first successful experiment with ether, the other of the Chicago fire, the scene at the moment of the vote on the impeachment of Andrew Johnson, etc., etc. Each of the topics, it is expected, will be described by an authority whose names appear.

WASHINGTON ALLSTON. UNPUBLISHED REMINISCENCES AND LETTERS of this foremost among early American painters. Two articles, which will appear early in the year, give most entertaining glimpses of the original personality of this famous artist. A number of illustrations will lend additional interest to the articles.

OUT OF DOOR PAPERS. SMALL COUNTRY PLACES, how to lay out and beautify them, by Samuel Park-sons, Jr. FISHING Lore FROM AN ANGLER'S NOTE BOOK, by Dr. Leeoy M. Yale. MOUNTAIN STATION LIFE IN NEW ZEALAND, and RACING IN AUSTRALIA, by Sidney Dickinson, with illustrations by Birge Harrison. The illustrations which will accompany this series are made from original material, either photographs or sketches, secured for this purpose.

PARIS THEATRES AND CONCERTS, co-operation of some of the first actors, managers, and critics. Théâtre Français and himself a playwright.

RAPID TRANSIT IN CITIES. Two articles of great importance by Mr. Thomas Curtis Clarke, the well-known engineer, on this subject, will be, in all respects, among the most notable papers of the year, taking up their subject in its widest range, and showing the increasing need of consideration with the enormous growth of our great towns.

THE NICARAGUA CANAL, SPEED ON RAILWAYS, ETC.

Two articles on the NICARAGUA CANAL, the result of a special investigation of the present state of the undertaking, elaborately illustrated. There will be articles on the AUSTRALIAN RAILWAYS (as the only profitably operated government system existing), by D. H. Neale; on THE SPEED OF LOCOMOTIVES (which is just now attracting special attention), by H. Walter Webb; and on the GREAT WATER-WAY FROM CHICAGO TO THE OCEAN, by Charles C. Rogers, U. S. N. Illustrated.

AMERICAN ILLUSTRATORS.

A series of articles on modern illustrators, with examples of their work, will be begun early in the year. This will be of the greatest interest to all readers who watch in the Magazine from month to month the drawings which, in these days, are so accurately reproduced as to represent the artist at his best. The group of illustrators, whose work will appear in this series, comprises Vedder, Cox, Low, Frost, Pyle, Blum, and others.

THE ILLUSTRATIONS of the Magazine, during the coming year, will be of increased interest and beauty. Not only have the services of the best American artists been enlisted, but also several French painters and illustrators, whose work represents the very highest standard, have been engaged. Among others, Charles Delcort, L. Marchetti, Albert Lynch, Eugène Morand, and many others whose works and names are equally well-known.

MR. ROBERT LOUIS STEVENSON will continue to contribute to the Magazine during 1892. In addition to the serial "THE WRECKER," which is now appearing, there will appear, in an early number, an account of a journey which Mr. Stevenson, the prominent novelist, made with Sir Walter Scott. Mr. Stevenson discovered this manuscript while looking over some old papers at his home in Samoa and has written an introduction to the narrative.

SUBSCRIBE NOW, BEGINNING WITH THE CHRISTMAS NUMBER.
Familiar Science.

THE NEBULA IN LYRA.

We reproduce from La Nature an engraving of a photograph of the well-known ring nebula in the constellation Lyra, taken by MM. Trepied and Rabourdin at the observatory of Algiers, which presents some very interesting features.

The photograph required an exposure of six hours, which was obtained by two separate exposures, on different evenings, of three hours each. The original picture was only 1/50 of an inch in diameter, but was so clear and sharply defined that it could be enlarged sixty-four times, to the size of the engraving.

This photograph shows, what was previously known, that the brightness of the nebulous ring is not uniform, but is concentrated at points roughly approximating to the shorter axis of the ellipse; but the most remarkable feature is the central star or luminosity, which has never before been observed, all previous drawings and photographs only indicating a dark space, or one very faintly luminous surrounded by the ellipse-shaped ring. This central star is entirely invisible to the eye, even when aided by the most powerful telescopes, and only the sensitive gelatine film is able to receive and record for us the very feeble luminous waves of radiant energy proceeding from the matter forming this wonderful celestial body.

Thanks to the power of the lately discovered dry photographic plates of gelatine and silver emulsion, we are just entering upon a new epoch of discoveries in regard to the mysterious nebulae, which have puzzled astronomers for so many years. The key has been placed in our hands, and it only remains for us to use it and discover the true way in which the stellar systems were formed. We can hardly doubt that in such bodies as these we are witnessing the actual formation of a stellar system like our own sun and its planets, and enough has already been discovered to show that La Place’s original nebular hypothesis, while mainly correct, must be considerably modified to harmonize with the facts as at present known. Every day now brings new discoveries and illustrations of the power of the means of astronomical research in our possession, and it is impossible to set any limits to the knowledge of the celestial universe which we may hope to attain to by the aid of the spectroscopic and the photographic plate.

SOME NOVELTIES IN PHOTOGRAPHY.

The multiple portrait (Fig. 1) is an ingenious and amusing device of a Constantinople photographer, M. Paboullian, by which an indefinite number of portraits of the same person may be taken simultaneously on a single plate. The principle involved is the familiar one of multiple reflection from two mirrors placed so as to face each other. Fig. 2, a, shows the arrangement. AA and BB are the two mirrors, BB being the smallest; the sitter is placed at C, and the camera as shown in the illustration. The mirrors should be without frames, which would interfere with the success of the picture, and, as a part of the light is lost at every reflection, a rather lengthened exposure must be given to bring out the more distant figures clearly. While, theoretically, the number of successive images is infinite, practically they are so fast fades away into invisibility, owing to the loss of light at each successive reflection, as is very clearly shown in the engraving.

Fig. 4 is an instantaneous picture of a group of boys diving into the waters of the harbor of Marseille, and is interesting both for the artistic attitudes of the group and for the superior mechanical execution of the photograph.

The view of a fast trotting horse, in Fig. 5, is especially remarkable for showing the animal apparently suspended in the air, and proving that, at a certain point in the trotting gait, all four feet of the horse are lifted from the ground at once.
Of course this position only obtains for a very small fraction of a section, and it was a piece of good fortune that the person taking this picture snapped his camera at exactly the right moment.

steam engine. A little further on, verse 17, it says, "His tail will set upright like a cedar." This, the author concludes, refers to the smoke-stack. In verse 18 we find, "His hollow bones are tubes of brass, his solid bones are bars of iron," which is a very good embodiment of modern engineering practice. In verse 21, which the special translation renders, "We will rest beneath light skidder and within a covering of thick reeds and clay," the author finds an allusion to non-conducting covering for boilers and steam pipes. Going on to the next chapter, we find verse 21 thus rendered, "Companions will feast upon him, they will share him among speculative," which it is needless to say fits the case of modern railroad companies and speculators exactly. This is one of the extraordinary parallels of the work. It is, perhaps, equalled by verse 2 of the same chapter, where the hook (ring) in the monster's nose is construed as an allusion to the piston rings of a locomotive, and where the jaw bored through with a thorn supplies an allusion to the piston rod through with its piston rod. The bad effects of an engineer allowing his water to run down is given in the same chapter, verse 26. "From dryness rendering him furious, he will not have power to withhold; the curved cask being caused to break up and lose the armor." This, of course, means that the engineer must watch his water-gages or there will be an explosion.

For a portion of verse 23, chapter xl, and for verse 24 immediately following, the author furnishes the following translation: "Behold he will absorb a river and will not fret; . . . he will gather it up in his fountains by means of traps and with a performed nozzle," the author in this finds described the action of a pump with its valves (trape), and the perforated suction pipe with a screen at its end to exclude solid particles. Even the coupling and parts of the coupling are found in verse 5 of the next chapter: "Then will extend Leviathan with a hook, or with a snare which thou shalt cause his tongue to press down." The tongue, our author believes, is the representative of the coupling link, and the hollow drawhead and pin be the "snare." The engraving of the scenes of the boiler is found in verse 15 of this chapter: "His strength depends on courses of shields closed up tightly with a seal." Our author finds nothing clearer than that the "shields" are boiler plates, and the "seal" the caulking iron. He reserves, however, the possibility that the steam rivet is the scaling mechanism.

The above engravings are copied from the photographs, taken by French amateurs, and are reproduced from La Nature.

Fig. 3.

Fig. 4.

The author has, strangely enough, overlooked a Biblical passage of, perhaps, even earlier date, which, if his theory is correct, undoubtedly contains a distinct reference to the incompatibility of stray cattle and limited express trains. In Genesis, chapter xv., verse 17, we read: "And it came to pass that when the sun went down and it was dark, behold a smoking furnace and a burning lamp that passed between the pieces." The passage is complete even to the locomotive headlight.

Fig. 5.

Seriously, such a burlesque of scriptural criticism and interpretation is only worth notice from its very absurdity, and as an illustration of the vagaries of the human mind when its reasoning powers are led captive by a dominant idea. We have heard of commentators who have found definite allusions to the events of American history in the Bible, but to put into the mouth of the worthy patriarch, Job, a complete description of a modern locomotive, is a flight of fancy higher than anything heretofore brought forward.
It remains to notice that desmidie possess the power of locomotion. The little plant is seen to move very slowly onwards, or with an oscillating movement backwards and forwards. How the movements are effected is not known; but one has been able to discern special organs of locomotion, as cilia, or vibrating hairs, possessed by some one-celled organisms, both plants and animals. It is probable that their movements are consequent upon vital acts, taking place in the protoplasm.

Union College, Schenectady, N. Y.

[Original in Popular Science News.]

GEOPOLITICAL FORMATION OF THE EARTH—ITS EVOLUTION FROM CHAOTIC ORDER RELATIVE AGE OF ORGANISMS

BY JOSEPH WALLACE.

The interesting and searching discoveries in fossils, which were looked upon a century ago as a burden to the mineralogist, soon became an important auxiliary to geology and a valuable aid to natural science. The hypothesis which was accepted by many of the learned in regard to the Flood, gradually gave way to more reasonable opinions as they progressed in their discoveries. The parenched animals and plants, referred to in our last article, which floated together were not mixed together, but rather in quite a determined distribution. Frequently in one layer plants and remains of animals were well preserved; in the other, one could only discover with the greatest difficulty few and hardly recognizable traces of organic life. Here an existent flora arose, there a numerous fauna. In those layers were prominent bones of land and mammals, in which the denizens of the sea were vastly more numerous; now, mollusks, then numerous animals; and to the fishes and amphibia, vertebrates were added. In one place, one could find forms which seemed to indicate quite a different world; in another, he could see a more or less approaching to the present world, and kinds which now populate both land and water.

With the development of geology, it became a particular matter of fact, that the greater number of the species of the fossil animals and plants did not live with man; that the lower and oldest layers contained species which are wanting in the upper and youngest ones. All these things were unfavorable to those who held the Flood hypothesis. The results of the researches demanded longer periods of time for those species which died out; and from the situation and embalming of the fossils, one could, in some places, draw conclusions with greater certainty, that the excellent preservation of the animal and vegetable forms were only the consequence of a slow, quiet, progressive petrifying process.

Slowly but surely the dawn of light was breaking over the horizon of darkness; there was no more doubt among geologists that the sliny shells and amallike, which formed the vegetable world, and those of the Flood were quite different things. They recognized that the formation of the earth was far from being completed when the first organism had already arisen; and the dispute between Neptunists and Phytologists was decided with regard to the stratified rocky regions. There, where organic beings were living, the destroying power of fire was excluded.

Relative Value of the Organic Remains.—As the conditions for the preservation of organic remains exist more favorably under the sea than on land, marine organisms must be far more abundantly conserved than those of the land. This is as true today as it was in past geological periods. Hence, for the purpose of the geologists, the fossil remains of marine forms of life far surpass all others in value. Among them there will necessarily be a gradation of importance, regulated chiefly by their relative abundance. Now, of all the marine tribes which live within the juxta-terrestrial belt of sedimentation, unquestionably the molluscs stand in the place of prominence as regards their aptitude for becoming fossils. In the first place, they almost all possess a hard, durable shell, capable of resisting considerable abrasion, and readily passing into a meteoric state. In the second place, they are extremely abundant both as to individuals and genera. Moreover, they appear to have possessed these qualifications from early geological periods. Happily for science, we have in the marine molluscs a common ground of comparison between the stratified formations of different periods. They have been styled the alphabet of geology and the library of the members of creation. It will be seen, further on, how much in the interpretation of geological history depends upon the testimony of sea-shells.

Looking at the organisms of the land, we perceive that, as a rule, the abundant terrestrial flora has comparatively a small chance of being well represented in a fossil state, and only that portion of it—the leaves, twigs, flowers and fruits, which are subject to decomposition and the rest of smaller organic remains—is likely to be partially preserved. Terrestrial plants, therefore, occur rarely among stratified rocks, comparatively speaking, and furnish only limited means of comparison between the formation of different ages and countries. Of land animals, the vast majority perish and leave no permanent trace of their existence. Predatory and other animal forms, whose remains may be looked for in caverns or peat morasses, must occur more numerously in the fossil state than those of birds; consequently, they are correspondingly more valuable to the geologist for the comparison of different strata.

Relative Age of Fossils.—Although absolute dates cannot be found in geological chronology, as already stated in a recent issue, it is not difficult to fix the relative strata. Fossils are furnished, and, consequently, of their enclosed organic remains. For this purpose the fundamental law is based on what is termed the "order of superposition." This law may thus be defined: In a series of stratified formations the older must underlie the younger. It is not needful we should actually see the one lying above the other. If a continuous conformable succession of strata dips steadily in one direction, we know that the beds at the one end must underlie those at the other, because we can trace the whole succession of beds between them. Rare instances occur where strata have been so folded by great terrestrial disturbance, that the younger are made to underlie the older; but this inversion can usually be made quite clear from other evidences. The true order of superposition is the decisive of the relative ages of stratified rocks.

Accordingly, if formations lie regularly above each other,—B upon A, C upon B, D upon C, and so on,—it is evident that the organic remains found in A must have lived and died before those in B were entombed; the latter must have been covered up before those in C, and likewise again, before those in D. The chronological sequence of fossils must be determined, first of all, by order of superposition of their enclosing strata. There is nothing in the fossils themselves apart from experience, to fix their date. unless, for example, we know...
from observation or testimony that *rhynchonella pleurdon* is a shell of the calciferous limestone, and rhynchonella is a shell of the dolomite. We could not from mere inspection of the fossils themselves pronounce as to their real geological position. It is quite true that, by practice, a paleontologist has his eye so trained that he can make a close approximation to the actual horizon of fossils which he may never have seen before; but he can only do this by availing himself of a wide experience based upon the ascertained order of appearance of fossils, as determined by the law of superposition.

Thus, it is seen for geographical purposes, and, indeed, for all purposes of comparison between the fauna and flora of different periods, that it is absolutely essential, first of all, to have the order of superposition of strata rigorously determined. Unless this is done, the most fatal mistakes may be made in paleontological chronology. But when it has been once done in one typical district, the order thus established may be held as proved for a wide region, where, from want of sections, or from geological disturbance, the true succession of formations cannot be satisfactorily determined.

When the order of superposition has been determined in a great series of stratified formations, it is found that the fossils at the bottom are not quite the whole of the strata of superposition, but they are the top strata. As we trace the beds upward, we discover that species after species of the lowest platforms disappear until, perhaps, not one of them is found. With the cessation of the older species, others make their entrance. These, in turn, are found to die out and are replaced by newer forms. After patient examination of the rocks, it is ascertained that every intention is to be found superimposed on the lower, by its own species or genera, or by a general assemblage or facies of organic forms. This can, of course, be determined by actual practical experience over an area of some size. When the typical fossils of a formation are known, they serve to identify that formation in its progress across the country. Thus, as we trace the formation into tracts where it would be impossible to determine the order of superposition, the want of sections, or the disturbed condition of the rocks, we can employ the fossils as a means of identification, and speak with confidence as to the succession of the rocks. We may even demonstrate that in some mountainous ground the beds have been turned completely upside down, if we can show that the fossils which are now the uppermost strata ought properly to lie underneath those in the beds below.

[Original in Popular Science News.]

LACK OF SOCIAL HARMONY TO THE AGE OF THE ABORIGINES OF NEW MEXICO

BY M. J. GORTON

A STUDY in cosmopolitanism, not only of many districts, but of peoples belonging to the successive epochs of the race development, may be made a most interesting subject for observation in traversing old New Mexico. From low grades of Comanche and Apache Indians, still woolsh in instinct, up through the Pueblo inhabitants, nomads of pastoral grade, living in stolid apathy—living monuments of unsocial life and spirit—upon the next grade of telegraph and the railway, with the incalculable deeds of dejection and animalism which deny all expression of even the slightest suggestion of intelligence to their faces, they note the on-rushing tide of life, in which they can take no part, as they are unlifted by lack of capacity to understand the complex incidents of a civilization beyond their comprehension, save as unwilling spectators; and so on up to the modern type of the highest intellectual and best developed philosopher of civilization, perfectly able to scientifically unravel all the riddles of a past and—by the savage descendents—forgotten ancestry.

The name New Mexico is a misnomer, as the archæologist finds many traces of a pre-historic population, which in numbers, manners, customs, and peculiarities show that the country must have been gray with antiquity long previous to the discovery of the mimbres and the lawrence. The cipherable remains show the occupancy of the land by the cliff-dwellers; and then are found distinct traces of the wild prairie Indian, followed by the rule mining contrivances of the Spaniard, who dominated the cliff-dweller and drove back the invading predatory hordes of the wolish Indians; then came the Mexican, followed by the restless peoples.

In Moapa County, where excavations were made, the plan and size of the ancient villages showed distinctly the traces of a people similar in characteristics to the Pueblos Indians of the communal houses at the present date. In all the excavations were found earthen-ware pots, filled with charred corn and large quantities of pottery, well-made arrow points of flint and obsidian, and hand-mills with pestles. The mounds, some of them large, the remains of which are 12 to 15 feet across, from which the fact crops out, if the individual mining observations is keen enough to note the indications: that at some time, the Spaniard, in his greed for gold and silver, compelled the Pueblo Indians to work the mines along the mountains from the Santa Fe range to the Organ range and elsewhere, and that although traces are found of the metals in the regions of the Pueblos, nothing of value was found during the excavations, showing that while the old abandoned shafts were worked by the Pueblo Indians under duress, they were not conversant with these metals previously; or, more exactly, that the people, pre-historic and of an old type, and other to those found when Espejo made his famous tour, three centuries ago, did no work among the precious metals.

The Indian is the natural mineral wealth of New Mexico. Situated as it is in the belt of the flint griddle of the Rocky Mountains, it is, from its position, the link in the mineral belt which extends across the continent binding Colorado to the north and old Mexico to the south, as has long been known. It was after the conquest of old Mexico and the finding of the precious metals there that the Spaniards pushed on and up into this country, conquered it, and unceasingly sought out the placer miners and established smelters, numerous of which are still found. When new leads are accidentally found, there is an uncanny sensation in the discovery of old residuum, and at that long unused gangway hidden away under the wash from the mountains above; or, as many believe, concealed by the Mexicans when the Americans obtained a social change, unceasingly still, that the Pueblo Indians obliterated the traces of ancient mining, to keep the Spaniards from again sending them to enforced labor in the mines. But in the Jarillas district are found what is now known as the Silver Hills, and here are traces of ancient workings of a considerable territory, and extensive works all covered over with debris from some source which has caused the number of which are still found, under present modes of treatment and advantages of transportation. If such development of the mines obtains through out the Territory, it shows the slack method of the enslaved Pueblos; and there must be fabulous wealth hidden away in the dump-heaps of all the old half-developed mines and carelessly scaven gered waste lots.

The view old obtained in the Cerrillos mining district, one of the oldest and most marked of the Spanish workings in the Santa Fe district. About twenty miles south of Santa Fe, it was the home of the Tegua and Tanos nations of the ancient races. Here are the abandoned pueblos of San Marcos, San Lazaro, Calisteo, Cienaga, Agra Frio (Qui mado), and the pueblos of the Arroyo Honda. A deeper insight shows that the Spaniards conquered the metals, and then enslaved the Pueblos to have the mines worked. This culminated in the great revolution of 1860, when the Spaniards were driven back.

The Rio Grande meanders through this lonely land, and the sun stares down on the naked waste, not sparing its barren, ugliness, and baldness; and the sun-baked, desolate land and the dreary waste, nothing disgusting, bare and blantly. In all the dreary sameness and loneliness there is no grateful freedom or repose in all its unadorned, unprotected breath. For the loneliness was broken in upon by the slow throbb of the engine at the reduction works, and the hot air was wafted by the sense of a furtive toil and ever increasing monotony, in which the sun shone without joyousness, and the wide-stretching barren solitude was without many individual who is open to its influences may be healthfully nourished by the social atmosphere of the time.

[Original in Popular Science News.]

SPRING ROCK CAVES

BY H. J. SMEYTHE

ALTHOUGH the above heading is not found in any of the guide-books used by travellers viewing the wonders of Niagara, yet the entrance of said cave is in plain sight of every one who passes along the road on the west, or Canada bank of the river, a few rods below the upper suspension bridge. Looking across to the American side, my curiosity was often roused by what appeared to be two or three entrances into the rock, having a rude likeness to Gothic doorways.

On a holiday last summer, as I was crossing the bridge, intent on a walk for exercise and amusement, I discovered a small ladder fastened against the perpendicular rock on the east side, reaching down to the tallus below. "Now is my opportunity," thought I, "to investigate these holes."

Proceeding to the place where I had seen the ladder, I found a substantial stairway leading a dozen mere feet down to a shelf in the precipice, at the farther end of which there was a copious spring of the coolest of water, which was apparently much used by the neighborhood. From this shelf a narrow and rather frail ladder reached down some eighteen or twenty feet to the tallus below. The placing of this ladder was evidently due to the enterprise of some number of whom were at that moment bathing in the river. Crossing with some difficulty the tail-race of a factory, the waters of which poured out of a hole in the rock above me, that was some eighty feet below the surface above where the factory was situated, and streaming up through a thicket of oaks, vines, and berry bushes, I found myself in close
PROXIMITY TO THE OBJECT OF MY SEARCH. Viewed from the south side near the perpendicular ledge, it appeared like an excursion attained to the rock some twenty feet high and extending out from it about sixteen feet. Viewed from the front it was, perhaps, more than twenty feet wide. The form of it suggested that of a kiosk or pagoda built up against the rock. It was covered with green moss, and water in considerable quantity was running down over its roof and dropping from its edges in front of the recesses or alcoves that opened out from it.

Entering the first and smallest recess at the south side, I found a hole a little larger than one's head had been knocked through a stone partition that constituted the back side of the recess, and looking into it I saw an inclosed space large enough for two or three men to lie down in. There was a high and round door-step to the other two recesses or alcoves, of which the water was dropping, and it was only with much effort and some wetting that I succeeded in getting in. There was no even floor, only good standing and sitting places, and near the roof at one end, a shelf or rock forming a nice basin filled with cool, sparkling water from the spring.

Looking out upon the broad, green river through the darkness, I found an unknown perfidy had been falling in front of the doorway, I naturally speculated on the questions as to who was the architect of this curious structure, and what was his building material, where did he get it, and how did he shape it. As for the material, it was very different in appearance from the native limestone behind me. It was light colored, porous, and unstratified, appearing like dried mortar. Evidently it was a deposit from the water of the spring, the depositing being occasioned by the warmth and light of day as it emerged from the dark recesses of the limestone. In this case the blue-laden water came out of a point in the precipice that leaned over beyond the perpendicular, and the growth of moss at its month helped the deposition from the petrifying water by affecting more surface. As the moss grew, the deposit at its roots grew, producing finally the curious structure that we see this day.

There are possible only two methods by which space is inclosed. One is by hollowing out a solid substance, as caves are often hollowed out by dissolving waters in limestone regions. Another way is to surround a space with walls and cover it with a roof, as with ordinary human dwellings. It is very rarely that nature adopts the latter method as in this instance. Think of a house growing for hundreds of years without labor and without hands.

Niagara Falls, Nov. 18, 1890.

ANTIOCHITY OF THE CARPENTER'S PLANE. A very interesting discovery has been made at the Basilica of Silius, Silchester. The excavations came across a dry well, which, on being explored, proved quite a little museum of antiquity. Some fifteen feet down, a Tinas correspondent says, the diggers found a urn-shaped pottery vase, about a foot in length, quite intact, and, curiously enough, protected by humps of chalk built around it. The vase, which probably originally contained some precious substance, was, however, quite empty. Above it were deposited a great number of iron implements, most of which were in a wonderful state of preservation. They seem to have been the tools of a carpenter and a coppersmith or silversmith, with some miscellaneous objects of blacksmith's work thrown in. The principal specimen is a carpenter's plane of quite modern type, although unquestionably more than 1,500 years old, three inches in circumference and five cutting edges and still quite serviceable, a number of chisels and gougies of all shapes and sizes, hammers, adzes, saws, files, etc. In the smith's department may be specified a brazier for burning charcoal, quite complete, two or three anvils of different sizes and shapes, a fine pair of tongs adapted for lifting crucibles, a curious tripod candle-lantern, lamp, or candle-stick, and several other curious objects the precise uses of which have not yet been determined. In addition there are several large bars of iron, a couple of plow-shares, and a broken sword. Probably more will be found deeper down in the well. This is undoubtedly the most important find at Silchester since the discovery of the bronze Roman eagle now at Strathefield Saye, some years ago.

WHERE PUMICE STONE COMES FROM. We often hear it remarked, and particularly after an eruption of a volcano, that pumice stone ought to be plentiful and cheap, as quantities must have been ejected during the volcanic disturbance. The mistake lies in a popular idea that to be a stone in general use is obtained from active volcanoes. It comes from deposits of the article discovered in one or two quarters of the globe, the best of which is at present to be found in the island of Lipari, situated in the Tyrrhenian sea. The island is mountainous in character, and consists of tufts and lavas and of highly siliceous volcanic products. The district where the stone is found is called Campo Mannu and Monte Pellelo (3500 feet above the level of the sea).

After riding a considerable distance, partly along precipitous paths sufficiently dangerous to be interesting, and partly through vineyards and over grassy plains, one almost suddenly comes upon a seemingly snow-clad narrow valley enclosed by hills, also quite white, and the whole glaringly bright on a sunny day. Into these hills workmen are busily digging deep burrows, working within by candle light. In their excavations they come across many lumps of pumice stone, which are placed in baskets, subsequently being conveyed along the valley to the seashore, where small boats are loaded and sailed to the seaport near by, where the stone is sorted, packed, and shipped to distant parts, either by Messina or Leghorn.

Manufacturer and Builder.

INDUSTRIAL MEMORANDA.

PNEUMATIC CHISEL.—Moses E. de Bachert & Co., Berlin, Germany, have, according to L'industrie moderne, introduced their stone-cutting establishment a pneumatic chisel. The apparatus consists of a big cylinder, a syringe which the operator holds with both hands, and as he lets it slide over the surface of the stone or metal, the chisel chips off splinters and particles. Compressed air acting on a piston imparts to the chisel a rotation of from 10,000 to 12,000 revolutions per minute. A crack in a piece of metal is prevented from extending further by the well-known means of drilling a hole where the rent ends; but when the hole is not bored on just that spot, the crack is apt to continue beyond the limit. To facilitate the search of the exact point, Revue Industrielle recommends moistening the cracked surface with petroleum, then wipe it, and then immediately rub it with chalk. The oil that has penetrated into the crack exudes and thus indicates with precision where the crack stops.

Magnificent Railroad Construction.—A commercial traveller, who has just returned from Mexico, reports that he was much struck with the magnificent construction of the Mexican Gulf Railway. The sleepers are of sound mahogany, and many of the bridges and culverts are, he says, built of white marble. Though this might appear, at first sight, to be lavish extravagance, the contractors have found the employment of these substances to be economical, as both mahogany and marble exist in the country traversed by the line.

Printing a Newspaper with a Steam Road Roller.—An incident occurred a few days ago which may serve as a practical example of fertility of resource in emergency. It appears that, owing to an accident at the gas works, the town of Middlesbrough (England) was deprived of gas for all purposes. This did not reach the ears of the manager of the North-Eastern Daily Gazette until 10 o'clock, but a novel idea was evolved and promptly acted upon. A gang of men was hastily obtained from the gas works, and their tools were laid in the Grand Hotel yard, adjoining the printing-machine room, through the wall of which a large aperture was made. A 15-ton steam road roller was then got into position, shored and rapidly geared, and one hour only after the ordinary time of starting, the printing machine began work, the issue of 64,000 copies being produced, without a single hitch in the unique manner described.

Scientific Brevities.

Great Advance in Platinum.—According to Russian advices, the whole of the platinum which will be produced in the Ural mines for the next ten years has been sold in advance to certain foreign companies. Owing to these contracts the price of platinum has advanced to about $20.00 per ounce.

Luminous Crayon.—Mr. Cecil Carus-Wilson writes to Nature that he has invented a luminous crayon for the purpose of enabling lecturers to draw on the blackboard when the room is dark. He hopes that the invention may prove of value not only to lecturers, who use a lantern, but also to students who wish to take notes.

Electrical Conduction.—The idea that electricity flows through a wire somewhat as water flows through a pipe is likely to pass away, as reasons appear for believing that the energy is not transmitted by the wire at all, but by the surrounding ether. In some experiments by Professor J. J. Thompson, the velocity of electric disturbances along the wire surrounded by air was nearly double the velocity along the same wire surrounded by sulphur, and the velocity of the discharge through a vacuum tube fifty feet long was comparable with that of light. The conclusion is that the conductor merely guides the discharge impelled through the ether.

The Utilization of Niagara Falls.—The Carcraft Construction Company, organized for the utilization of the water power, has decided to construct a tunnel of 400 square feet section on a slope of 7 feet in 1,000. The form is rectangular, with a semi-circular arched roof; the width of the tunnel is 18 feet, height from bottom to spring of arch 13.485 feet, arched roof 9 feet radius, with door conveyance to a radius of 41 feet, being one foot deep in the center. The bottom of the tunnel where it discharges into the lower river will be some 30 feet below average water height, so that only the arched roof will be shown above the water of the river. It is estimated that the velocity of the water in the tunnel will be over 25 feet per second.
The Out-Door World.

Edited by HARLAN B. RALLARD, President of the Agassiz Association.

Arrangements have been made by which "The Out-Door World," the Agassiz Association department of Popular Science News, will be continued during 1891, and enlarged from two pages a month to three. This gives us nine columns devoted to our special interests. The whole paper admirably meets the needs of our members, and we hope and believe that the Popular Science News will now receive from the Association a support so generous that the publishers may feel justified in making our department a permanent feature. To insure this result we must get three hundred new subscribers within the year. Is there any member of the Agassiz Association who cannot afford to send a month's subscription, for the excellent paper? The information contained in a single article is often worth more than the price of the paper for the whole year. We suggest that each Chapter and member may well take enough interest in their paper to secure a few subscriptions—one at least—to inclose with his own.

The new Chapters that have been organized during the past two months have all been of an unusually promising character. They have started with an average of twenty members, are well officered, and have begun work with carefully-considered constitutions and well-drawn by-laws. Schedules for the winter are thoughtfully planned and neatly printed, and every indication which the work of the Agassiz Association for 1891 is to be of a higher order than ever before.

It is an excellent time to organize new Chapters, either in colleges, schools, or private families. We have on hand a large variety of printed material illustrative of our methods of organization and work, which we will gladly send to any who may wish to learn more of the practical working of the Agassiz Association. This includes the constitution and history, the constitutions and by-laws of various local Chapters, schedules of study in different branches of science, programmes and hints for field-meetings, descriptions of our courses of laboratory work directed by correspondence, accounts of our charters, handbook, badges, visiting cards, and official organ, and a fine wood-cut of Professor Louis Agassiz, from whom we derived both our inspiration and our name. These papers will be sent free upon application until the supply is exhausted. We invite the correspondence and cooperation of all who are interested in the best practical education of young men and women.

CORRESPONDENCE AMONG CHAPTERS.

Many of our local societies wish to correspond with others with a view to mutual improvement and the exchange of special information. They find great advantage in becoming acquainted with those who in distant States are interested in like studies. There are, however, not a few Chapters that prefer to confine their attention to their own homes. They do not care to spend the time involved in writing letters. Some of them even refuse to answer letters at all. From this difference of feeling one of our most serious difficulties has arisen. It is well illustrated in the following extract from a letter recently received from one of our most earnest Canadian members: "Our Chapter decided to sever its connection with the A. A. and remain under the title under which we started. The motives of so doing were as follows: We had received no help from the A. A., either in the way of letters or exchange sheets. We wrote to several Chapters, but received no answers. We had no connection to link us with the rest of the Chapters."

Now this was entirely wrong, it is the plain duty of any Chapter or member to answer promptly every courteous letter that is received. If correspondence is not desired, that fact may be politely stated, but some answer is due to every letter. The grievance of this Canadian Chapter is a real one. But the remedy is simple: that the only wonder is that no one has ever suggested it before.

The remedy is this: We will make a list at once of all those Chapters that do wish correspondence with others, together with a memorandum of the subjects on which they prefer to correspond. Let every Chapter that will engage to send a prompt reply to every communication received, send me its address, and indicate the subjects in which it is especially interested, and we will then publish the list for the benefit of all. It is no discredit to any Chapter that it does not feel willing to enter into correspondence, but it will be an advantage to have a list of Chapters on whom we can always depend.

The same is true of individual members. We have never printed the addresses of those who joined us by themselves—partly because we felt that some of them might object, and partly because we could ill afford the space. But now, at the beginning of a new year, we will make the experiment.

The following form may be used by all who are willing to unite in this plan: "We agree to answer all letters or postal-cards sent to us by Chapters or members of the Agassiz Association during 1891, or until notice to the contrary. The subjects in which we take most interest are," etc. Letters should be answered whether postage is inclosed or not, but it is proper for the one making the first advances toward a correspondence to inclose a stamp in the first letter.

We may note that, as a rule, all new Chapters are written to the addresses of those already organized. The list may well be headed by the following regular Corresponding Chapters, which are always glad to receive and answer communications from anyone interested in their specialties.

LIST OF CHAPTERS THAT WILL ALWAYS ANSWER LETTERS.

119. Isaac Lees Memorial Chapter of Conchology; Professor Josiah Lees, Milledgeville, Ga.
223. Massachusetts Archeological Chapter; Lyman D. French, 23 Winter St., Fall River, Mass.
241. Wilson Ornithological Chapter; J. R. Richards, Box 32, Fall River.
382. Gray Memorial Chapter of Botany; G. H. Hicks, Box 125, Oswego, Mich.

To this list we shall add from time to time the addresses of all such Chapters and individual members as may request it. Meanwhile the President will continue to send personal answers to all who may address him in any manner regarding the Agassiz Association, whether postage is inclosed or not, and we shall soon have a large circle of those who can be absolutely depended upon to answer every communication promptly. If parties failing to obtain prompt replies from any Chapter included in this list will notify the President, the matter shall be immediately investigated, and, unless a satisfactory explanation is secured, the delinquents will be stricken from the list.

Chapter addresses, new and revised.

No. Name. No. of Members.
357 Litchfield, Conn. R. P. N., 6
366 Minneapolis, Minn. C. 17
374 Westfield, Mass. E. F. Bacon, 1324 Harvard Place.
375 Waterbury, Conn. Arthur S. Burke.

GEOLOGICAL INFORMATION WANTED.

Members of the A. A. will greatly aid me in my present work if they will send me:

1. Written or printed accounts of artesian or other wells; noting the temperature of the water, character and dip of surrounding rock and soil, depth of boring, etc.
2. Mines; depth, temperature at bottom, character of rock, etc.
3. Boulders: kind of rock, geographical position, direction of vein, marks of glacial action, dimensions, etc.
4. Tides: noting the height along the coast, in estuaries, on promontories, etc.
5. Caves: depth, character of rock, and other details.

I wish to collect as much information as possible on these points, and in return I will give all the aid I can in this line to any desiring it. I should like drawings when convenient. I hope to give the results of my investigations in a future report.

Herbert N. Johnson.

FAILURE OF SANTA CLAUS.

It is with regret that we have to chronicle the failure of the publishers of Santa Claus, the bright Philadelphia weekly in which we had a department until August last. Our first thought on receiving the news might have been expressed in the language of the well-known epitaph on the baby that lived only a week:

"If it was so soon to be done for,
What on earth was it ever begun for?"

But the fact is that to establish a new periodical for the young at this day requires a greater expenditure of money, time, wisdom and energy than can easily be commanded. Popular Science News generously filled free of cost unexpired A. A. subscriptions to Santa Claus in all cases where the Santa Claus subscriber was not already a reader of this paper. On many accounts we are sorry to lose our department in Santa Claus, but there are advantages in having all our interests united in one journal, especially when that one is so well conducted, so long established, and of so low a price as Popular Science News, which now becomes our "official organ."

In this connection we must notice a curious inquiry just now received regarding the Swiss Cross. The curious part of the question is that it relates to the Cross before that was merged in Science. We do not understand that the Swiss Cross was never merged in Science. Science has not now, and never had, the remotest connection with the Agassiz Association. The Swiss Cross was merged in Santa Claus, and, since Santa Claus is dead, it now reappears as "The Out-Door World" in this A. A. department of the Popular Science News.

By the way, there are only half a dozen complete files of the Swiss Cross remaining, and these will soon be gone. They will be sent to any address, express paid, for five dollars a set.
PLAN FOR STUDY OF HISTORICAL GEOLOGY.

We wish to make this department practically helpful to every Chapter and member of the A.A.G., as well as to the general student of science. We therefore make room for the following schedule of study recently adopted by the Barton Chapter, 23, (B), Boston, Mass. It is full of hints and suggestions which can be worked out in any branch of natural science.

PLAN FOR STUDY OF HISTORICAL GEOLOGY.

The following books are recommended for general use throughout the course: Text-Book of Geology, by A. Gellert; Elements of Geology and Geomorphology, by Jos. Le Conte; Manual of Geology, by J. B. Dana; Ancient Life-History of the Earth, by W. A. Nicholson; Geological History of Plants, by J. W. Dawson.

Oct. 6. INTRODUCTION AND OUTLINE.

AZOIC ERA.

Oct. 20. R. P. Williams. From the unknown to the known. The earth’s origin.

LITERATURE.


World Life. Alex. Winchell.


EOZOIC ERA.


LITERATURE.


Nov. 17. TACOSIN PERIOD. Mrs. Fuller. The link between the crystalline and sedimentary rocks. First fossils. Carrara statuary marble and iatromantic found only here.

LITERATURE.


PALE OZOIC ERA.


LITERATURE.


Dec. 15. Ordovician Age. Miss Merrington. Transition period from shallow to deep seas. Brachiopods characteristic of this age. Granulites have cups on both sides.

LITERATURE.


Minnesota State Survey, Vol. II.

Jan. 5. Silurian Age. Mrs. Ramsey. In life a gradual transition; a few fish appear. All species of Orlovichian fossils disappear before close of Silurian.

LITERATURE.


LITERATURE.


10th Vol. 10th Census U. S. Peckham.


LITERATURE.


March 2. Review and Questions.

MESOZOIC ERA.


LITERATURE.


LITERATURE.


CENOZOIC ERA.

April 20. Tertiary Age. Mr. Holt. Age of mammals. Rocks are principally sand or clay. Genesis of the horse.

LITERATURE.


May 4. Quaternary Age. G. H. Barton.

Glacial period.

LITERATURE.

Great Ice Age. James Gellie.


LITERATURE.


June 1. RETROSPECT. R. P. Williams. „Natural fundamental method is a procedure, through continuity, from the general to the particular,” Winchell.

June 15. Review and Questions.

Lest it should seem to any that this course makes too free use of books, we give also the programme of field-meetings and excursions by which the same Chapter admirably supplements its indoor study. It is equally suggestive.

OUTINGS, AUTUMN AND WINTER, 1890-91.

Sept. 6.—Nantasket. Study: Dikes and overflows. Specimens: Melaphyre, tuff, porphyrite.

Sept. 13.—Boxborough. Study: Archon limestone. Specimens: Yellow calcite, garnet, jasper; actinolite, scapolite, crystals and variegated, black serpentine, pyroxene.

Sept. 20.—Nahant. Study: Georgia limestone and slates and their relation to the eruptive diabases. Specimens: Diabase, epidote, quartz, pyroxene, limestone, chrysozoite, biotylites.


Oct. 4.—Allston. Study: Concentric weathering of dikes. Relations of volcanic rock and sandstone. Specimens: Amygdaoids, tuff, slate, sandstone, ripple marks (?).

Oct. 18.—Winthrop. Study: Drumlinis. Specimens: Fossil shells, glacial pebbles, hornite, pyrrhotite, dolomite, etc.


Nov. 8.—Agnasiz Museum, Cambridge.

Nov. 22.—Museum of Peabody Academy of Science, Salem.

Dec. 6.—Peabody Archaeological Museum, Cambridge.

Dec. 20.—Museum of Boston Society of Natural History, Boston.

Jan. 3.—Boylston Mineralogical Museum, Cambridge.


At all excursions each member is requested to make a collection of the characteristic specimens of a locality, and for this purpose to carry a hammer, cold chisel, and bag, as well as a note-book and label-paper. These should be properly labelled and classified, under the direction of the Committee on Instruction.

Season tickets, entitling the owner to accompany the Barton Chapter on all excursions during the year, will be sold for 50 cents. To members of A.A. Chapters the price will be 25 cents. Tickets for a single excursion, 10 cents. Tickets may be obtained from members of the Outing Committee.

THE PRINCETON SCIENTIFIC EXHIBITION OF 1891.

BY ARTHUR M. MILLER,
Of the Agassiz Association.

CAMP COTTONWOOD, 3 MILES FROM MONUMENT.

GRANT CO., OREGON, JULY 17, 1891.

MR. HARLAN H. BALLARD—DEAR SIR:

Your letter forwarded from Baker City to Monument was received by me on my arrival in camp last Thursday, after being nearly 19 continuous hours in the saddle. It is now over two weeks since we, a party of 15, left Baker City mounted on horseback and bound for the Miocene fossil-bearing beds of the John Day River region in this State. We were—what the exception of our guide, Mr. Davis (an old collector in these regions), our cook, and a boy from Baker City—a Princeton College crowd, all graduates with one exception. Prof. Scott, '77, is our leader. Prof. Boyd, of Macalaster College, and myself are '86 and '84, respectively. Eight are '89 men, and the undergraduate is of the class of '90.

For just one week we rode through the wildest and most beautiful mountain country of Eastern Oregon—the forests all of fine large "Oregon yellow pine," without undergrowth, and, although (owing to the season) we saw none, full of wild game, such as deer, elk, and bear. The days were hot, and we toiled dreadfully; the nights cool to frostiness, and we slept soundly. We have had our share of small adventures, for some of our horsemen were buckers, and we the tenderest of "tender feet." Two of the broncos were so incorrigible that they had to be trounced off, and one fellow's horse ran away with him "down a steep place violently," and he came into camp so much cuticle off his nose, chin, and forehead that he presented a woeful spectacle, indeed. Being such a conical wag himself, he got only laughter instead of sympathy.

Our progress, necessarily slow at best, was, by reason of our heavily-laden wagon of stores, still more slow. Before entering the worst part of our journey, indeed, we found it necessary to store a part of our provisions in order to lighten the load. And even then it was with difficulty that our four-horse team, aided by our efforts at the wheels and from behind, could get up the steep, rugged lava-boulder-strewn hills.

Sunday morning, July 7, we wound down from the last mountain summit into the first open running country we had seen, and went into camp on a small stream seven miles from the nearest fossil beds on the middle fork of the John Day.

Monday morning we went into these beds, and in the three days that we worked them, made a number of excellent finds—among them the shell of a rhinoceros and the leg bones of a three-toed horse, both new species. The Professor and I stayed that night at the nearest ranch, while the rest of the party returned to camp. In the morning we two got to work bright and early at the rhinoceros skull, with Mr. Sloan, our host, for a very interested spectator. Mr. Sloan had lived on that ranch in plinth sight of those "white chalky" cliffs, and although he "had heard there were fossils in them hills," Davis had been there in '79 with Professor Cope, had never seen any. Perhaps he expected to see a fully articulated skeleton sticking out of the cliffs, or at least as complete and perfect a set of bones as presented by the bleaching remains of that blizzards- killed sheep in the gulch below.

I found this error to be quite common—even in scullhite circles. A person in charge of one of the finest Tertiary mammal collections in this country, apologized for them as being in "a very fragmentary and worthless condition."

To most people such specimens, even after there has been expended on them by the curator much labor with chisel and plaster and glue, appear sorry-looking objects upon which to base such researches, and still more elaborate theories of descent as are found in geological textbooks. What would those same persons say, should they see those bone chips or shattered teeth fresh from their matrix, which the paleontologist recognizes as a "Protohippus" or "Oreodon?" Not that some wonderfully complete skeletons are not occasionally found, but they are rare indeed; and what wonder when we consider to what exigencies they have been subjected.

All this country was, in Miocene Tertiary times, a vast fresh water lake. The wash from the surrounding land mingled the bones of the then existing land animals with the ordinary slow accumulating sediment. Notice that this means partial preservation of disassociated fragments. Then came the consolidation and heaving up of these piles of bones, the destruction of this accumulation, and the formation of new hills. A hill in sight of camp shows faulting of strata, and all bones found here show more or less distortion by pressure. "Coincident with and subsequent to this deposition came the heaving up through and pouring out upon these beds, great dikes and vast sheets of lava. In my excursion yesterday after fossils, I chambered over two large dikes, each forming the backlash of a long range of hills and jutting up above into ridges carved by erosion into craggy and fantastic shapes. As I write I can look over and beyond these dikes and count eight successive terraces of lava sapping these white, sloping exposures, which form the fossil beds of Cottonwood Creek. Last of all has come the extensive denudation, which, while it has removed them accessible to the collector, has removed vast fossil accumulations in the process, and shattered and crumbled those which it loosens from their long interment.

Removing a fossil from a steep, while cliff facing a glaring afternoon sun, is exhausting work. It took two of us just one solid day to chisel out that rhinoceros skull. Footholds had to be plied in the nearly perpendicular cliff. Then a trench was dug around the node containing the skull, and deepened until it was deemed safe to wedge it off. As pieces of teeth or bone loosened, they had to be glued on or removed, wrapped separately in tissue paper and numbered in order to facilitate museum restoration. We finished these middle fork beds in three days. Wednesday the main body of the expedition broke up camp, and, sending word for me to follow, set out for our present camp about thirty-five miles distant from where I was at work. I started about 3 o'clock, but, night coming on, lost track of the party, and it was not until 10 o'clock the next morning that I rode into camp about as tired a pony as one often sees. I was a little tired myself.

The country about here presents a wild and odd appearance, with its lofty lava-terraced buttes, with its lines of crags, steep, precipi-

tous approaches, chalky white on their steep, gulch-furrowed sides. It is a country of rattle-snakes. Three have been killed on the edge of the camp.

We had a little excitement Sunday night. A thunder-shower (rare in this locality at this time of year) drove us into a leaky log barn (for) the night. The horses were driven to the river and remain in here the day before, and it was with joking reference to this fact that we spread our blankets upon the straw and turned in for the night. Soon I became convinced that the heaving up of the straw under my shoulder was due to something more than the wind surging in between the logs. A lantern was lit, our cook seized an old sheep trough, my best fellow a pitchfork, while I removed the blankets. The rest of the fellows rushed up and awaited developments, chuckling all the while. My companion raised the fork, and, with unerring aim, plunged it into the designated spot;—a smothered squall, and then was hoisted aloft a poor old setting hen. Shaken from the trees she ran off cackling; and what a greeting our exploit received from the rest of the gang.

Although the Miocene exposures here are quite extensive, they have not, as a whole, very richly repaid our labors in this locality. Only one small area of a few square yards has yielded anything of value. From this we have obtained a skull of paleochoerus (ancient hog), eoceneus, three turtles, one in excellent state of preservation, and numerous fragments of bone and teeth. A portion of the firewood we carried yesterday, while working on some rich finds seven miles up this stream, on which we are encamped. Tommocyon (a dog) and agrolochers are, among others, the animals whose remains have been already found there. We leave soon for a place called "The Cove," on the main fork of the John Day, where fossils are abundant, and where we expect to be occupied for some weeks.

SIMPLE AND RAPID PREPARATION OF PURE GASES.—Instead of using an acid for the evolution of carbonic anhydride, sulphuric anhydride, and similar gases, it is convenient to use sodium hydrogen sulphate or sodium bisulphate. A mixture of equivalent quantities of the respective salts in powder given, when wetted with water, a regular stream of the required gas, which will be free from the impurities usually derived from the use of an acid.
The Popular Science News.

BOSTON, JANUARY 1, 1890.

AUSTIN P. NICHOLS, S. D. EDITOR
WILLIAM J. ROLFE, LITT. D. ASSOCIATE EDITOR

The typographical change in the present number of the SCIENCE NEWS is, we think, one that will be appreciated by all its readers. We have translated an entirely new "dress" of type, of uniform size, and of such a style that it will be found as clear and easily read as the larger type used in former volumes. The use of this smaller type practically adds nearly two pages of extra reading matter to the paper, thus making it in a greater degree than ever the cheapest scientific periodical in the world. We have also made such arrangements as will ensure its prompt publication about the 25th of each month, and avoid the annoying delays that have occurred during the past year. We must ask our readers to kindly overlook any errors or delay in the present issue, due to the reorganization of our printing department, and the further delay at the moment of going to press, arising from a fire in the establishment where the paper is printed; but we hope to have everything in good working order by the time the February number is published. We would also mention in this connection that all articles not otherwise credited are from the pens of the regular editors.

Little additional information has been gained lately concerning the nature and action of Koch's field; but so far the results of its use have borne out the comparatively modest claims made for it by its discoverer. The usual supply is extremely small, and, for some reason, only a very few physicians have been able to obtain enough for a single experiment. A few specimens have reached this country, and the first inoculation made in America was performed at New Haven, Conn., by Dr. Francis Bacon. While the general effects of the operation were identical with those observed in European hospitals, a sufficient time has not been allowed for physicians to test out all the real value of the remedy. All that can be said is that the prospects are encouraging, although the discovery seems almost "too good to be true."

At a recent trial in France of a man and woman charged with murder, a scientific interest was aroused by the claim of the woman that she was led to assist in the deed against her will, being under the hypnotic influence of her partner in crime. This ingenious plea, while varying the monotonous of the worn-out "insanity" dodge, is even less worthy of consideration. The whole subject of hypnotism is still in an exceedingly elementary state, and so mixed up with deceit and trickery—both intentional and unintentional—that the basis of facts on which the present theories rest is a very unstable one, and much further study will be necessary before any really reliable knowledge of the subject can be obtained. Such a claim as was offered by the French murderer was preposterous on the face of it, and, in refreshing contrast to many murder trials in this country, the judge refused to admit any such worthless evidence; and both of the criminals were found guilty, and sentenced—one to death and the other to imprisonment.

Mr. E. A. Kirkpatrick, of Worcester, Mass., desires information from parents or persons having the care of children in regard to the development of the faculty of speech. Any observations on this point, even if apparently trivial, may be of importance by comparison with those of other observers: and the systematic arrangement of such facts will, undoubtedly, be of great scientific and practical value.

A Russian physician claims to have discovered that the ordinary incandescent electric light is a very effective analgesic, or pain-curer, and says that he has with remarkable success in the treatment of neuralgia, rheumatism, lumbago, etc., the pain being quickly and permanently relieved when the lamp is applied to the parts affected. It is evident that the enthusiasm of this Moscowite medical man is greater than his judgment, for it is impossible that any electric current could enter the body of the patient under such circumstances, and, even if it did, it could hardly produce any curative effects. The only effect of the application of an electric lamp would be from the warmth of the bulb enclosing the highly-heated carbon filament, and the same result could be obtained in a much easier way by the old-fashioned bottle of hot water. We do not believe that the physician of the future will be under any necessity of carrying an incandescent lamp and a storage battery as part of his regular equipment.

An Antarctic polar expedition is soon to start from an Australian port, with the intention of making a thorough survey of that little-known region, and penetrating as near to the south pole of the earth as possible. Nearly all the previous polar expeditions have confined their efforts to the exploration of the far northern regions, but it is certain that the opposite end of the earth possesses many secrets, and is within the southern pole is completely covered by an ice cap, similar to that which is supposed to have covered the northern part of this country during the glacial period, and a complete investigation of this formation might throw much light upon the geological phenomena and formations of that most important epoch in the earth's history. The electric, magnetic, and tidal conditions of the earth are of universal interest, and constitute a close study, as well as the climate, which, from the probable absence of large areas of land, must be very different from that of the Arctic regions. We shall await the result of the expedition with interest, and trust that the members may be spared the sufferings and misfortunes of most of the northern explorers.

M. Kaesner has discovered a new process for preparing oxygen gas, which may prove to be of commercial importance. It is based upon the singular properties of a salt known as plumbate of lime, which is supposed to have the composition Ca2 Pb O6. When this compound is heated with an alkaline carbonate it is decomposed, the first products of this decomposition being carbonate of lime and peroxide of lead. At a higher temperature this peroxide of lead is decomposed, in its turn, into peroxide of lead and oxygen gas. The latter is evolved in the free state, whilst in the retort remains a mixture of protoxide of lead and carbonate of lime. Now, the interesting part of the process is this, namely, that the mixture of carbonate of lime and protoxide of lead, when submitted to an appropriate temperature (not too high) in a current of air, is again transformed into plumbate of lime, so that the operation is continuous. If these reactions can be alternated indefinitely, without the salt losing its properties, and if it is found that the proper degrees of heat can be easily obtained, the new process will, doubtless, come into extensive use, and give us a cheap and easy method of obtaining an unlimited supply of oxygen gas by separating it from its atmospheric companion—the nitrogen.

A correspondent sends us an interesting note of a hen's egg, which, when broken, was found to contain another perfect egg, about the size of that of a sparrow. Similar abnormally formed eggs have been observed before, and, in fact, been described in the columns of this paper, but they are very rare, and the one described by our correspondent appears to have been one of the most perfect of its kind.

The radical known as ammonium is composed of the elements nitrogen and hydrogen, and is particularly remarkable in that it acts in almost every respect like a strongly basic element, very similar to potassium and sodium. Like these, it is a powerful conductor of electricity, and, combined with other elements, forms amnium amalgam with mercury, the constitution of which has been a subject of much discussion among chemists, some claiming that it was only a mechanical mixture, or "froth," of metallic mercury and ammonia and hydrogen gases, while others claimed that it was a true chemical combination between the mercury and the ammonium radical. The latest investigations seem to prove that the amalgam is a compound. It also, apparently, forms an amalgam with mercury, the constitution of which has been a subject of much discussion among chemists, some claiming that it was only a mechanical mixture, or "froth," of metallic mercury and ammonia and hydrogen gases, while others claimed that it was a true chemical combination between the mercury and the ammonium radical. The latest investigations seem to prove that the amalgam is a compound. It also, apparently, forms an amalgam with mercury, the constitution of which has been a subject of much discussion among chemists, some claiming that it was only a mechanical mixture, or "froth," of metallic mercury and ammonia and hydrogen gases, while others claimed that it was a true chemical combination between the mercury and the ammonium radical.

The existence of such substances as ammonnia, cyanogen, and other compound radicals, as they are called, is a strong argument in favor of the compound nature of the bodies commonly known as elements. If a body known by us to be a chemical compound of other forms of matter acts in every way like the simple bodies which have never been decomposed, and are considered to be the elements, then the supposition is a fair one that these so-called elements may also be composed of two or more forms of matter, and that only the discovery of some sufficiently powerful means to decompose them is needed to demonstrate their compound nature. As to this, nothing can, as yet, be definitely said; but the results of numerous investigations tend to show that so, at least, of the bodies herebefore considered as elements are really compounds, and it is by no means impossible that—as is already held by some chemists—all forms of matter are but modifications of one primitive substance, which is either hydrogen itself or possesses properties closely resembling that substance.

The Fulminates.

Everyone has noticed the greyish substance in the interior of a percussion cap, which only needs the blow of the hammer to cause it to explode with great violence. A similar substance is found in the torpedoes so popular among children on the Fourth of July. This body is known to chemists as fulminate of mercury, and is not only interesting from its chemical composition and relations, but is of great commercial importance, although a comparatively small quantity is needed to supply the demand for it.

This exceedingly unstable and explosive substance is the mercuric salt of an acid known as...
fulminate acid, (from fulmen, the thunderbolt). The free acid has never been produced, but the fulminate of mercury is easily and cheaply prepared, and has the empirical formula Hg C2 N2 O2. Like nearly all the compounds of nitrogen, the molecule is extremely unstable, and a slight blow, a temperature of 399° F., or even contact with strong sulphuric or nitric acid, causes the molecule to break up like a house of cards, and to be transformed into nitrogen and carbondioxide gases and vapor of mercury. Like nitro-glycerine and other high explosives, the reaction, or explosion, takes place in the molecule itself, and is not, as in the case of gunpowder, simply a very rapid combustion, and this property explains the intense force of the explosion. It is estimated that at the moment of explosion a pressure of 729,000 pounds to the square inch is generated.

Mercuric fulminate is prepared by dissolving mercury in an excess of nitric acid, and adding alcohol; a very brisk reaction and effervescence soon begins, and the fulminate separates as a crystalline precipitate. The actual chemical changes which take place in this reaction are very complicated, and are not thoroughly understood, but the final result is as above stated. As soon as red fumes begin to appear, water is poured in to stop the reaction, and the precipitate collected on a filter, washed, and kept moist until needed for use. This experiment is a very dangerous one for inexperienced persons, both from the risk of explosion and the poisonous gases evolved, and should not be attempted by beginners in chemistry.

Large quantities of this fulminate are manufactured at Prescott, in Ontario. Two or three times a year an American firm sends a party of workmen to this place with the necessary quantity of nitric acid, mercury, alcohol, etc., and for a few days the town is redolent with the fumes of alcohol, aldehyde, ethers, etc., until the desired amount of the explosive is prepared and safely packed in kegs of water for transportation to market. The profits are said to be very large, but we hardly think any one will grudge the manufacturers of this treacherous compound all that they can make out of it, or would desire to undertake the work themselves at any price. With proper care the risk of an accident is small, but when an explosion does occur the destruction is complete and there is little or no chance for escape.

The pure fulminate is so powerful that, in the manufacture of percussion caps, it is generally mixed with other substances to moderate the price of the explosive. Chlorate and nitrate of potash, sulphide of antimony, and powdered glass have been used for this purpose; but it is probable that they have no chemical effect upon the explosive decomposition, but simply act mechanically by diluting the pure fulminate. One pound of mercury will produce enough fulminate to fill over 25,000 percussion caps.

One of the most interesting applications of fulminate of mercury is its property of detonating dynamite and other nitro-glycerine explosives. Dynamite cannot be easily exploded by contact with flame, and it may even take fire and burn up quietly, but if a tube containing fulminate of mercury be placed in the midst of a charge of dynamite and exploded in the usual way, it induces a similar explosion or detonation of the whole mass of dynamite with its well-known powerful effects. It seems as if the violent detonation or rapid molecular vibration of the fulminate induced a similar detonatory vibration in the molecules of the dynamite, just as the strings of a piano are set into musical vibration when a note of the same pitch is sounded in their vicinity.

Fulminate of silver is analogous in composition to that of mercury and is made in a similar way, but is much more violently explosive. It detonates when merely pressed with a hard body, and at a temperature a little above that of boiling water. Even when wet it is not safe to keep it in a glass bottle, and we know of a case where a quantity exploded while being washed on a filter, the probable cause being the friction of the stream of water which was being poured over it. The glass funnel was shattered into atoms, but the chemist who was washing it escaped, almost miraculously, without serious injury. A compound silver-ammonium fulminate is also known, which is even more violently explosive than the silver salt.

Pulminates of zinc, copper, sodium, potassium, etc., are known and are all explosive, but have only a theoretical interest. Nitrogenous compounds of silver and gold are also known to chemists by the names of fulminating silver or gold, but they have no connection with the true fulminates, and are of little consequence.

The effect of the element nitrogen upon its compounds is one of peculiar interest. The element itself is a neutral, inactive body, with no particular characteristics and of little practical consequence, but when in combination with other elements it usually confers an element of instability upon the whole compound, like an arch with a defective keystone. If this falls, the whole arch is destroyed, and so in the molecules of the fulminates and similar bodies; the integrity of the molecule seems to depend upon the feeble chemicals this largest known of all tree fruits. Especially noteworthy is the long period which the plant takes to prepare itself for the great work of fruit-making. It must vegetate thirty years before a flower-bud is produced. During this time it builds a columnar trunk, which, since it must support the heavy fruit and resist the force of tropical gales, needs to be of extraordinary strength. To compensate in a measure for the consequent rigidity, a unique arrangement acting like a ball and socket joint is developed at the base of the trunk. The lower end of the column is flattened and fits into a sort of bowl composed of exceedingly hard material like the shell of the nut, and pierced by holes the size of a thimble, through which the roots make their way into the surrounding soil. This arrangement permits the tree to sway in response to strong winds; or, in spite of the rigidity of the trunk. The maximum height of the tree, about one hundred feet, is attained in about as many years. This statement
however, applies only to the male, or staminate, trees, the female ones being somewhat shorter, in order that the pollen which is transferred by the wind may more readily reach the pistils. After the ova have been fertilized, ten years are required to ripen the fruit. In four years they reach their full size, which is about eighteen inches long by the same in breadth, and nearly as much in thickness, but at this time the nut is soft and filled with a semi-transparent jelly. This becomes firm and edible like the meat of a coconut, and is surrounded by an extremely hard shell which, in turn, is covered by a fibrous husk. As many as eleven of these enormous fruits may be produced at one time, thus making a cluster of between four and five hundred pounds weight.

Now that the origin of the Lodoiceae is no longer veiled in mystery, the belief in its medicinal virtues has largely died out. The nuts still have their use, however, which, if more commonplace than formerly, is at the same time more real. When sawed in half the shells make excellent jugs, and are also commonly used for balling boats. An entire nut will hold three or four gallons, and, being very durable, they serve well as water kegs.

\[\text{[Specially Observed for POPULAR SCIENCE NEWS.]}\]

METEOROLOGY FOR NOVEMBER, 1890, WITH REVIEW OF THE AUTUMN.

TEMPERATURE.

<table>
<thead>
<tr>
<th>Average Thermometer</th>
<th>Lowest</th>
<th>Highest</th>
<th>Range.</th>
</tr>
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<tbody>
<tr>
<td>A. T. M.</td>
<td>36.13°</td>
<td>42°</td>
<td>5.87°</td>
</tr>
<tr>
<td>A. C. P. M.</td>
<td>42.33°</td>
<td>63°</td>
<td>20.67°</td>
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<tr>
<td>A. C. P. M.</td>
<td>42.33°</td>
<td>63°</td>
<td>20.67°</td>
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<tr>
<td>Whole months</td>
<td>39.58°</td>
<td>63°</td>
<td>23.42°</td>
</tr>
<tr>
<td>second average</td>
<td>30.39°</td>
<td>63°</td>
<td>32.61°</td>
</tr>
</tbody>
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| Last 20 Novembers   | 38.30° | 48.62° | 10.32° |
| Second average      | 30.62° | 48.62° | 18.00° |

| Autumn of 1890      | 30.32° | 58°     | 27.68° |
| Last 20 Autumns     | 30.01° | 48.35° | 18.34° |

The past month was unusually pleasant for November, and quite in contrast with the preceding month of October. It was one degree and a third above the average of the last twenty Novembers. The lowest point of the mercury, at the hours of observation, was 13° on the 28th, and this was also the coldest day, with an average of 22.33°. The highest point reached was 63°, on the 9th, and this was the warmest day, averaging 53°. The range the 12th was only 4°; that on the 10th was 22°, with the warmest observation in the morning.

The temperature of the present autumn was a near average with the last twenty years, with extremes and range as given in the table above.

SKY.

The face of the sky, in 90 observations, gave 56 fair, 14 cloudy, 14 clear, and 6 very cloudy—9 per cent of 62.2 fair; while the average fair the last twenty Novembers has been only 54.7, with extremes of 40 per cent, in 1888, and 74.4 in 1874. “Gloomy November” has been much brighter than usual, having had a more clear sky only three times in twenty years. We have quite a number of fine days, and several foggy mornings.

The average frost on the 1st of November was 48.1, September and October having been unusually cloudy. The mean for the last twenty autumns has been 54.6.

PRECIPITATION.

The amount of precipitation the past month was only 1.10 inch, and this fell on three occasions between the 11th and 17th, with a trace on the 1st, leaving four-fifths of the month without rain or snow. There was a trace of snow on this 11th, the first in the season, and a beautiful exhibition it was of very, very large flakes, falling thick and fast, without the least wind, melting as it fell. The average precipitation the last twenty-five Novembers has been 4.08 inches, with extremes of 1.10 in 1890 and also the same in 1882, and 7.45 inches in 1877. The amount since January 1st has been 46.67 inches, while the average for these twenty-five months the last twenty-two years has been 43.33.

The amount of precipitation the present autumn has been 15.56 inches, while the average for the last twenty-autumns is only 15.32, with extremes of 3.42 in 1874, and 21.47 in 1888. These figures show a wide autumnal range in this department.

PRESSURE.

The average pressure the last month was 29.974 inches, with extremes of 29.38 on the 18th, and 30.26 on the 16th, a range of .88 inch. The mean for the last seventeen Novembers has been 29.078, with extremes of 29.810 in 1878, and 30.093 in 1880, a range of .253 inch. The sum of the daily variations the past month was 6.34 inches, with a mean daily movement of .211 inch. This average in seventeen Novembers has been .321, with extremes of .327 and .283. The largest daily movements the present November were .70 inch on the 17th, and .65 on the 18th, in connection with the principal rainfall .70 inch.

The mean pressure this autumn was 29.974 inches,—the same as that of the present November. The mean of the last seventeen autumns was 29.976. The average daily movement the present autumn was .276 inch, and that of the last seventeen autumns .174.

WINDS.

The average direction past month was W. 36° 0' N. (a full N. W. by W.) The mean for the last twenty-one Novembers is W. 18° 24' N., with extremes of W. 10° 30' S. in 1870, and W. 77° 59' N. in 1876,—a range of 86° 20', or nearly eight points of the compass. It was remarkable that in the month of November the moon was not far distant in the south, or east, or northeast, or southeast, but as follows: 15 N., 31 W., 23 N. W., and 21 S. W. The relative progressive distance travelled by the wind the past month was 64.40 units, and the last twenty-one Novembers 1,065, an average of 50.71, showing less opposing winds than usual.

The mean direction the present autumn was W. 41° 43' N., while the mean for twenty-one autumns has been only W. 14° 38' N. The distance travelled was 123.2 units, while the mean in twenty-one autumns has been only 110,—showing less opposing winds the present autumn than usual.

In review, we may notice that the present November was warmer than usual, had a much fairer sky, with very small precipitation, a mean pressure, and no casterly, but more northerly winds than usual,—a fine November for out-door labor.

The present autumn, notwithstanding the favorable November, has had less fair sky, a larger rainfall, and more northerly winds than usual,—a fine November for out-door labor.

The present autumn, notwithstanding the favorable November, has had less fair sky, a larger rainfall, and more northerly winds than usual,—a fine November for out-door labor.

[Specialty Computed for POPULAR SCIENCE NEWS.]

ASTRONOMICAL PHENOMENA FOR JANUARY, 1891.

Mercury at the beginning of the month is an evening star, having passed eastern extremity of the constellation Condor, on Jan. 27. It sets about an hour and a half after the sun, and may be seen on a clear moonless night throughout the month, just after sunset. It rapidly approaches the sun, and passes into inferior conjunction on Jan. 13, becoming a morning star. It moves rapidly away from the sun, and by the end of the month is nearly at western elongation, which it reaches on Feb. 6. On Jan. 31 it rises about an hour and a half before the sun, and may be seen in the morning twilight low down in the southeast. Venus is also a morning star, having passed inferior conjunction on Dec. 3. It is a considerable distance away from the sun, and rises two hours and a half or three hours before it. It is in perihelion on Jan. 8, and also comes to its greatest brilliancy on that day. This last depends not only on its distance from the sun, but also on its distance from the earth, and the period of greatest brilliancy occurs when the planet is about half way between either elongation and inferior conjunction. For some time after this time the planet may be seen in broad daylight by the naked eye, if one only knows where to look for it. Mars is moving rapidly eastward and northward, and sets at about 10 P. M. throughout the month. It is growing fainter and getting further away from us, but is still rather a conspicuous object. It passes from the constellation Aries into Pisces, and crosses the equator from the south to the north near the end of the month. Jupiter is getting quite near the sun, setting less than three hours after Jan. 1, and less than one hour on Jan. 31. It is so near the sun at the close of the month that it cannot be easily seen. None of the eclipses of the satellites could be easily observed, except, perhaps, a few during the first half of the month. Saturn rises at half past ten on Jan. 1, and at about half past eight on Jan. 31. It is in the eastern part of the constellation Leo, and is moving slowly westward and northward. The rings of Saturn, as seen in a telescope during the present year, will be very narrow, owing to the fact that the earth is very nearly in the plane of the rings. The earth passes this plane about the middle of September, and from that time until about Nov. 1, the face of the rings which is turned toward us will be illuminated, as the sun does not cross to the northern side of the plane until the latter date. Uranus is in Virgo, rising at about 11 P. M. at the end of the month. Neptune is in Taurus, a little north and west of the group of the Hyades.

The Constellations.—The following positions of the principal constellations give their places at 10 P. M. on January 1, 1 P. M. on January 16, and 8 P. M. on January 31. Arigia is near the zenith, and is the principal star, Capella, being a little north. Orion is just entering the horizon, and is shining with a light on the south, about halfway between the zenith and horizon. Below and a little east of Orion is Canis Major, with Sirius, the brightest of the fixed stars. Nearly on the same level, and east of Orion, is Procyon, the principal star of Canis Minor. Near the eastern horizon is Leo; above this, Cancer, and above Cancer and near the zenith is Gemini. On the west is Ursa Major, the two pointers being nearly as high as the pole star, and the handle of the dipper pointing downward. The greater part of Ursa Minor is under the pole, and the brightest stars of Draco are very close to the northern horizon. Perses is near the zenith in a CUPIC inch of water contains 252.286 grams, of which contains the English pound contains 7,000.
Correspondence.

Brief communications upon subjects of scientific interest will be welcomed from any quarter. The editors do not accede to literary or other requests in any case. All communications are subject to revision by their correspondents.

THE PHOENICIANS IN BRITAIN.

Editor of Popular Science News:

Dec., 1890.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

A. G. S., Va.—Is there any preparation which will cause gray hair to resume its natural color, but which is not a dye?

Answer.—There is nothing of the sort known. All the "hair restoratives" are nothing but dyes, and are both unsatisfactory and uneconomical. The loss of color of the hair depends upon constitutional causes, and it cannot be cured by any methods short of resting the hair from its usual use; that is, by using it less than before. The wool of the sheep and the fur of the rabbit are much lighter than the same hair before the process of rest or the change of diet. The same is true of the other substances, especially of the nails, which are composed of keratin, and the hair itself. The treatment of technical works, too, is on a broad scale. The volume, as is well illustrated by the definitions of magnesia, magnet (and its derivatives), magnate, magnate, or magnet, is a large scale, and contains an immense amount of information about common words, neglected by other lexicographers, the names of things, and the names of processes and substances. It is a comprehensive dictionary, and is one of the best ever published in English.

E. W. S., Ohio.—A very bright star is visible every evening in the west, and it is said to be the reappearance of the Star of Bethlehem. Is it a star?

Answer.—The star in question is only the planet Venus, which is now (November 1) at about its greatest brilliancy. It is at its greatest brilliancy as evening star once or twice every year, and as often as morning star, when it rises before the sun. Usually at such times it is bright enough to cast a distinct shadow, and can be seen in broad daylight. The planet has nothing to do whatever with the "Star of Bethlehem," but statements to that effect usually appear in the papers at every period of brilliancy.

SUBSCRIBER.—About fifteen cubic feet of hydrogen is sufficient to lift a hollowed author weighing exactly one pound. The specific gravity of coal gas varies, but, on an average, about twice as much would be necessary if the pressure were less low than for either, but its buoyancy depends entirely upon its temperature.

K., Allegheny, Penn.—In a recent article in the Times, it is said: "if the ether is not matter then it has no existence," and time and energy are not matter; have they no existence?

Answer.—The statement quoted above must be taken in connection with the rest of the paragraph to be understood. In discussing the supposed existence of the hypothetical ether, it was only intended to show that it must be matter, as in a vacuum. It said, in other words, that the ether cannot be a force. Space and time are simply relative ideas, conditioned upon our perceptions. In a similar manner, also, the conclusion, the idea may be legitimately advanced, that without the existence of matter there would be no space, and without the existence of life, or molecular life, we should not have space and time.

W. C., Phila.—Can I make use of a Leyden jar for measuring the current of a dynamo, the jar being placed in the circuit and alternately charged and discharged?

Answer.—As we understand your question, you cannot measure the current by such a method. Probably a voltmeter or ammeter, such as is sold by dealers in electrical apparatus, is what you need. A current of low tension can be converted into one of high tension by means of an induction coil, but the current from the ordinary dynamo is in the circuit a part of the current that passes through such a coil without destroying it.

SUBSCRIBER.—In the majority of cases, lead pipes used for conveying water become covered with rust, which protects them from further action, but for absolute safety, iron is the best material. The only objection to its use is that it sometimes rusts away quite rapidly; but such cases the "rustless" iron pipes can be used.

LITERARY NOTES.

The fourth volume of The Dictionary of the Century Encyclopedia is just issued, containing entries M to P, inclusive, and forming a quarto of 1,223 pages, illustrated by nearly 1,500 cuts. The present volume is the largest and richest in material, having rich a careful examination of its pages and a comparison of the various works of the kind will show. With each successive leaf, the dictionary has become more and more clear that the original estimates were too small, both as regards the volume of the book. The value, and the thorough and scientific character of the dictionary. Beginning with the letter M one meets the prefix macro-, followed in rapid succession by micro-, meta-, micro-, and meta-.

G. B. N., Conn.—No planet has ever been discovered outside the orbit of Neptune, and no planet has ever been observed nearer the sun than Mercury, although the existence of the hypothetical Vulcan has been strongly suspected. Neptune is about 2,850,000,000,000,000 miles distant from the sun, and makes a complete revolution around it in a little more than 164 years.

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HEALTH AND DISEASE.

The natural condition of living beings is one of health. A normal life history would be one of gradual development from birth to maturity, the continuance of maturity or adult life, with the perfect and uninterrupted actions of all the bodily functions, even to the ripening of the body, and at the last a gradual fading of functions until the vital spark goes out, like the flame of a lamp exhausted of oil, quietly, painlessly and almost imperceptibly.

It is safe to say, however, that not one person in a million can pass through life in this natural and ideal manner. The more highly developed the organism and the more complicated the vital processes, the greater the liability to abnormal conditions of their action. The lowest forms of life are, apparently, not subject to disease, but, as we ascend higher in the scale, the number and variety of diseases, as well as the susceptibility to their attack, constantly increases, until, in man, with his highly differentiated and specialized organism, his immensely developed mental faculties, and the numerous unfavourable conditions of his civilized mode of life, every separate human being is not on the point of breaking down either by the degeneration of its organic structure or by the abnormal performance of its functions. This we call disease, and those who have not experienced it in a greater or less degree are exceedingly few in number.

Man, above all other animals living, is out of harmony with his environment. The course of his development from lower forms of life seems to have taken place with so great rapidity that the bodily organs have not had time to adjust themselves to the changed conditions of his existence.

The extraordinary and disproportional development of his mental faculties has led him to adopt habits of life which his anatomical structure and physiological functions are not adapted to sustain.

Every gynecologist and obstetrician can testify that the abdominal organs are not even yet fully adjusted to the upright position of the body, and the structure of the circulatory system shows that, from the standpoint of the evolutionist, it is at a comparatively recent date that our progenitors abandoned the horizontal for the vertical position while walking or standing. If it were for this superior mental development, which forces the bodily organs and muscles to perform functions to which they are not fully adapted, man, or the more highly civilized races at least, could not exist upon the earth, and as it is, the tendency seems to be for the older species—that is, those of the highest mental development—to decline and leave their places to be filled by those who, with less highly organized brain, possess lower bodily organs and muscles adapted to the conditions of existence and the maintenance of life.

Among savage races, diseases are supposed to be caused by an evil spirit, and when it is exorcised or driven out of the body the patient recovers; thus, in the beginning of civilization, we find the offices of priest and physician performed by one and the same individual. That belief is not entirely extinct even among people calling themselves enlightened, is shown by the numerous reported cures at the various shrines and holy places in Europe, to say nothing of that popular and preposterous delusion, the "faith-cure" in our own country. Even now the popular idea of the action of "medicines" is that it drives out, or in some way neutralizes the disease which is causing the patient discomfort or danger. Even the latest discoveries in regard to the microbial origin of certain diseases do not go to the root of the matter, and the truly scientific physician recognizes that health and disease are but incidental conditions and phenomena of life. The great mystery of vitality will probably never be solved, but we know that disease is merely an abnormal action of the bodily functions, and that the natural tendency of the vital forces is to restore them to normal conditions. We have also found, by empirical observation, that certain substances, when introduced into the system, produce certain alterations in the action of these functions, and aid Nature in effecting a cure, and on these accumulated facts the whole science of therapeutics rests.

Health is the normal condition of life, and existence depends upon the perfect equilibrium of all the vital processes. If this equilibrium is disturbed, disease ensues, and unless Nature can restore the balance, death is inevitable. As a result, to aid Nature in this work is the task of the physician, and the modern triumphs of medical skill bear a strong and convincing testimony to his success in his noble work.

A TALK ABOUT BACTERIA.

By J. HOGART EGGERET, A. B., M. D.

For convenience in classification we may include the various forms of micro-organisms which occasion putrefaction, fermentation, and certain pathological changes in living tissues, under the general term Bacteria. Putrefaction and fermentation are merely terms representing similar changes, the former being applied to those occurring in proteids, the latter, in carbohydrates. In either case a chemical change is brought about, through the presence of the bacteria, which reduces the protein or carbohydrate to simpler forms.

Bacteria are not insects or "bugs," but plants; they have, however, the power of spontaneous motion. Like other living things, they take in water and carbon dioxide, and give off matter and manifest energy. In association with all vegetables not possessing chlorophyll, they require organic food for the maintenance of life; but they can subsist upon food which contains no protein—being able to take nitrogen and sulphur from inorganic sources, and with carbon from organic sources and with water, they build up proteid material. They share respiration in common with all living things, taking in oxygen and giving off carbon dioxide. Certain bacteria, however, do not require free oxygen, being able to unlock it from the substances in which they exist; and certain chemical processes attributable to them evidently depend upon this power of unlocking oxygen from stable compounds.

Bacteria are very widely distributed, being present in almost every place in vast numbers, and also existing in earth and air. They cover the surface of our bodies and line our entire alimentary canals; fortunately, however, they are chiefly of the benign variety, which will not thrive in living tissues—hence called non-pathogenic.

These micro-organisms are among the smallest objects which the microscope reveals. A very important form of these is that known as the bacterium typhosum, which is an ordinary rod-like cell about 1-25,000 of an inch in breadth, and less than twice its breadth in length. It is non-pathogenic, easily killed by antiseptics, and is always found in putrefying or septic fluids; hence it is sometimes called the corion or septic fungus.

The living bacteria may be described as a simple "cell." Like other cells it is composed chiefly of protoplasm, and has a distinct cell-wall but no apparent nucleus. The protoplasm is of its usual composition, and may be found in vacuoles; the cell-wall is composed of cellulose.

From the forms presented, bacteria have been divided into three general groups. First, we have the Sphero-bacteria or Micro cocci (coecus—"a berry"), which are simply round or oval bodies, from 1-10,000 to 1-25,000 of an inch in diameter. The non-pathogenic micro-cocci produce putrefactive and fermentative effects while among the pathogenic species may be mentioned the "bacillus anthracis," the "bacillus typhosus," the "bacillus gas bacilli," "bacillus erysipelas," "bacillus gonorhoeas," "bacillus acicnecrosis," osteomyelitis, septiciemia, and pyaemia. Secondly, the Baellii ("little rods") are, as the name implies, rod-like bodies of more than twice their breadth in length. They may be straight, or bent, or curved in one direction. A bacillus with a single curve is spoken of as a "comma bacillus." There are many forms of these bacilli; the surgical interest are the anthrax bacilli, the bacilli of diphtheria and blood poisoning, the bacillus of glanders, of leprosy, of syphilis, and of tetanus. The third variety are known as Spiro-bacteria, and consist of rods bent or curved in more than one direction, representing spirals and the like. The outer surface of the cell-wall of the bacteria is birefringent and ill-defined, being usually surrounded by a jelly-like substance, known as protoplasm. By this they are often united in masses or chains.

Bacteria have a passive or vibratory movement,—the so-called "Brownian movement,"—but since this is exhibited by both living and dead bacteria, it is not indicative of vital energy. They also exhibit vital or active movements,—not ameboid, however,—by which they rapidly change from place to place. They may revolve on their long axis, or revolve, one end being fixed, or a central may be fixed with revolution of both ends—the "hour-glass" movement. Ottloine's hour-glass movements and appendages called cilia are to be observed. There may be but one cilia attached to either end or to one end; or two or more cilia at one end. Whether these cilia are projections of the cell-wall or elongations of the protoplasm is not definitely established; since by movements the organisms possessing them are moved along, it is reasonable to suppose that they are composed of protoplasm.

Reproduction of bacteria occurs by fission, by spores, and by budding. Multiplication by fission takes place very rapidly; one may become two in half an hour or even less time, and these two proceed at once to divide into two new cells, and so on. The process is sometimes spoken of as "vegetation of bacteria." The spores of bacteria are capable of withstandng higher and lower temperatures than those of the higher vegetables. Possessing this power of endurance beyond that possessed by the ordinary bacteria, the latter, when placed in circumstances unfavorable to their existence, turn to spores more rapidly than do bacteria, and thus in the circumstances then existing until they are again in favorable conditions, when a new bacterium is formed from each spore. The same property is illustrated in the seeds of higher plants, which retain their vital power through conditions which would positively destroy the plant.

Destruction of Bacteria.—Cold (32°F.) suspends their animation, but does not kill them—many withstand a much lower temperature. Boiling water kills many bacteria, but those that are in the condition of spores can withstand a much higher temperature, or can withstand the temper-
Early Rising and Longevity. — Professor Humphry's recent Collective Investigation Report on Aged Persons contains some very positive evidence on a matter which has already engaged the attention of medical and physical writers. The opportunity for nutrition to do its restorative work was, in nearly all, provided by the faculty of "good sleeping," to which was commonly added its appropriate attendant, the habit of "early rising." Thus there is a relation between early rising and longevity. No doubt many people will hastily seize upon the sentence just quoted, and employ it in justifying their own habits, for the young, or embody it in popular medical works. Important qualifications follow in Dr. Humphry's report, but they are likely to be overlooked. Doubtless the habit of early rising is in itself healthy; most of all, it is a good sign of health when it evidence is sufficient rapid recovery from illness. Again, it usually denotes a strong will, the gift, as a rule, of a good physical constitution, or at least the safeguard of average bodily strength. Late risers are generally either invalids or persons of bad habits, idlers who are never free from other vices besides idleness. The nervous exhaustion which keeps a man wakeful through the small hours produces sleep late in the morning. This exhaustion is invariably due to one of several life-shortening influences, especially anxiety, or a discretion in diet or drink. Early rising is a rather obvious sign of one of these influences, another result of which is longevity, than a cause of longevity. To turn a weakly man out of bed every morning at 7 o'clock will not prolong his life. It will be noted that by "good sleeping" Professor Humphry signifies quick sleeping: "that is, the reative work which has to be done in sleep is done briskly and well." Here, again, we have an effect of a cause; but preventing a weakly subject from sleeping more than four or five hours nightly, would not cause him to live long, but would rather tend to shorten his life. Equally important are Professor Humphry's observations which show that by "early" he does not entirely mean the time by the clock. The word "has a relative significance with reference to the time of getting to bed," and "retires to rest four hours after midnight and gets up at 10 A. M. may be strictly regarded as an "early ricer."" Thus early rising is synonymous in long-life histories with short sleeping, which means rapid recovery from illness, a sign of bodily strength. These scientific facts in nowise contradict the alleged value of early rising as a practice to be cultivated by all persons in good health. It is excellent as moral discipline, and eminently healthy as a matter of fact. Most persons will eat three meals daily. When a man gets up late, those meals willprobably follow each other at too short intervals to be wholesome. When he is an early ricer it will probably be otherwise. He can enjoy a good breakfast, and by the time for his lunch or mid-day dinner he will have an honest appetite again. — British Medical Journal.

Diet. — The Medical Press and Circular states that it can not be denied that the restrictions imposed by medical men on the diet of patients are oftentimes the outcome of prejudice or whim, and it would be well if the practitioner paused awhile and considered whether or not the object in view might not be better attained by some less drastic method. It is, after all, there is no absolute standard of what is right and proper when individual stools act in question. The safest guide in such matters, under ordinary circumstances, is the patient's own palate. This organ acts under the guidance of a natural instinct that is rarely at fault, though many persons mistrust its indications as if they were the suggestions of some frivolous and wanton agent, rather than a skillful and godly guide. At the same time he is careful to remind us that the sense of taste, like any other sense, may be wrong and betray the confidence of its possessor. It is the duty of the practitioner to detect these eccentric or vicious palates, and to assist their owners in neutralizing their evil promptings; and, to sum up the recommendations, a change of diet is often better than mere restriction, and it will often be found that the punishment of eating the food which the patient literally despises is an effect of a particular article instead of prohibiting it altogether. These may be in the kind, in quantity, or in the disposition of the meals. This is the secret of the success of the cases at watering places, with their rigidly enforced dietetic and hygienic rules, and the result can be obtained on much less onerous terms if only the patient can be induced to modify his regimen accordingly. The last form of adjustment is that which imposes itself as persons pass from youth to old age. Digestion and assimilation are on the wane, and the intake, both in quantity and kind, must be modified accordingly. On the whole, it is well to beware of hard and fast lines, for no two cases are exactly alike, and their management is complicated by collateral circumstances which have to be taken into account.

RIB FRACTURE FROM MUSCULAR ACTION. — In an article upon this subject (Univ. Med. Mag.), Dr. Joseph P. Tunis has tabulated all the recorded cases of this rare accident, including one observed by himself. His conclusions in regard to this fracture are given as follows: 1. Forty cases having been reported, we may reasonably expect to hear of others, perhaps to see them ourselves. 2. Of these accidents more than one-fourth have occurred in individuals of apparently sound constitution. 3. The left side has been most often affected, and either the middle or anterior third of the rib the usual position of the fracture. Of forty-nine fractures, only five have occurred above the sixth rib. The great majority have been on the eleventh or twelfth. 4. The exciting causes have been: Congestion (25), muscular effort (11), sneezing (3), and vomiting (1). The determining cause has been the action of the muscles, unless thirty-four observers have been deceived by the testimony of patients, who could give nothing by such deception. 5. Herard reports the youngest example of this accident, a woman 22 years old. No case has been published younger than this, no doubt on account of the great elasticity of the ribs in youth. 6. Of these forty cases, two died of some intercurrent affection. The remaining thirty-eight made a complete recovery in the usual time. 7. More men (22) have suffered than women (17), and the average age has been 48 years.

LAPARATOMY FOR PERITONEAL TUBERCULOSIS. — Lauerstein (Centralblatt for Chirurg.) offers some suggestions upon the rationale of laparotomy for the cure of peritoneal tuberculosis. He thinks the withdrawal of the coexisting acetic fluid stops the further progress of the malady, for the reason that the peritoneum is made dry, which condition is incompatible with the development and existence of the tubercle bacilli, and that, therefore, the absence of these bacilli is the cause of the disappearance of the asetes after laparotomy, stand in direct relationship. Furthermore, Koch's experiments show that sunlight quickly kills all bacteria growing upon a culture medium, and the tubercle bacilli in from a few minutes to one hour. The author then argues further that, insomuch as a thorough examination of the abdominal cavity requires a short exposure to the cutaneous rays, it makes no difference at a time of day when the light is the greatest, and that the operation room is usually very light, the direct action of sunlight may exercise a curative influence along with drainage. This supposition gets some support from the fact that in no other form of tuberculosis is incision and drainage followed by cure, and in no other form is direct sunlight used as in most tuberculous cases. The author concludes with the narration of a case of peritoneal tuberculosis, in which he made laparatomy, drained off a large amount of acetic fluid, and wiped out the cavity without uti1izing antiseptics. He then allowed sunlight to fall in every part of the cavity for ten minutes. The fluid did not reappear, and the patient remains well now, two months after operation.

Epilepsy.—In the Med. Record, Dr. W. W. Parker describes a very simple and effective method of controlling nose-blood, which he uses to the exclusion of Bell'scul's curulus and other methods. Fifteen or more threads of lint, or coarse sheep wool, about four inches long, are tied together at their middle, folded upon each other, and pushed into the nasal fossa, so that the thread ends are at the anterior nares. The nostrils may be plugged in front if need be. The method is comparatively painless, the plug gives no discomfort, and may easily be withdrawn in twenty-four to forty-eight hours.

A Visible Heart. — There is at the present time in St. Mary's Hospital a child about a fortnight old, in whom the sternum and costal cartilages are imperfectly developed. The heart is seen most distinctly through the thin cutaneous wall of the chest. The shape and size of the auricles and ventricles, with the filling of the auricles with blood, are quite as visible for all practical purposes as if the organ were completely exposed to view. — Med. Press.

A Case of Tuberculous Inoculation. — T. Denuke (Deut. Med. Wochenschr.) reports the case of a seven mouths' child of a phthisical mother, that fell and injured its head against a vessel containing some bloody sputum of the mother. The clean-cut wound was disinfected and healed rapidly. The cicatrix later began to enlarge, and shortly swelling appeared in the region of the parotid, with suppuration and enlargement of the neighboring glands. This suppuration finally caused the death of the child. In the pus of the part, the tubercle bacillus was found abundantly.
ALCOHOLIC CHORIOIDES IN A CHILD.—The Journal of the American Medical Association states that Dr. H. M. Biggs recently presented before the New York Pathological Society a specimen of an advanced choroiditis of the liver, obtained by him at the autopsy of a boy aged only 13 years, whose body also presented all the other usual lesions of chronic alcoholism. It was reported to Dr. Biggs that when the deceased was a baby of 2 years old, he had a bronchitis which was suspected to be due to the inhalation of alcohol. During recent years they had given him money to spend for alcoholic drink. His capacity for disposing of alcohol became so increased that he would take from six to eight drinks of whiskey each day, of about 1-2 ounces each. The day after his death he bought a larger quantity than usual and took it all at one drink. He was found in a comatose state, some hours later, and never rallied. At the post-mortem examination, the liver and other organs presented nearly the same pathological appearances that mark alcoholic saturation in the adult.

SUCCESSFUL TRANSFUSION.—The Lancet mentions a case of cancer of the breast, which had been removed ten days before. While the wound was being dressed the patient was suddenly attacked by syncope. She became pallid and completely collapsed—a condition not to be accounted for by the fact that she was the subject of mitral disease. After the subsequent injections of brandy and ether, and the performance of artificial respiration, the surgeon decided to have recourse to transfusion. This was effected by means of Aveling's apparatus, the blood being taken from his right arm (he is left-handed), and injected directly into the patient's veins. It was calculated that more than a pint of blood was transfused, the operation being terminated by the operator becoming faint. The result was most satisfactory, for, at the end of ten minutes, the patient had completely recovered, and in a few days was able to leave the hospital. The cause of the collapse was thought to be internal hemorrhage, as on the following day the patient was completely blackened. There is no doubt that the patient owes her life to the surgeon's prompt and courageous act, which he had to perform with only the assistance of a nurse.

HEADACHE AND ACHING OF THE EYES.

Eye strain should be the first thought suggested by any complaint of headache, for, in our day and civilization, it is byfar the most common cause of this symptom. It enters as a factor into the causation of nearly all headaches not due to pyrexia, toxemia, or diseases of the brain or its membranes. The simple existence of headache, therefore, should suggest the possibility of its being due, in part, at least, to this cause. A careful inquiry as to the manner and time of occurrence of the attack and the location of the severe pain will be almost conclusive as to the origin of the trouble.

Often it comes on whenever the eyes are used, and is absent when the eyes have had a proper session of rest. When the occasions of most severe requirement in the line of work, and the conditions of doing anything requiring accurate near vision, taxing both the accommodation and the convergence, or travelling, shopping, attendance at public gatherings, which entail more use of the eyes than the patient is at the time conscious of, and often under unfavorable conditions.

In hyperopia in young people, the accommodation is in excessive use so long as the eyes are open and the attention fixed on any visible object, and hyperopia is the most common cause of constant headache. The writer was formerly subject to a constant headache whenever confined to the house, and regarded it as caused by breathing vitiated air, until it was quite cured by the correction of his hyperopic astigmatism. Many persons have the same idea as to the causation of the headaches they always experience when attending the theatre or other place of public amusement, or near objects, especially due to eye strain. Others ascribe these headaches, and those experienced in travelling and shopping, to exhaustion. This is nearer the truth, only they commonly have in mind a condition of general exhaustion, whereas it is largely one of local exhaustion of the special nervous apparatus concerned in the act of seeing.

Congestion, irritability, or inflammation of the eyes and their appendages, should always suggest the suspicion of eye strain. A single attack or manifestation of this kind has no special significance, but repeated attacks of inflammation, or prolonged congestion, or irritability are exceedingly suggestive of a continuing cause, and the most common of these is the one now under discussion. No case of chronic inflammation of the margin of the lids, or of recurring conjunctivitis, or repeated sites, has failed to establish it until it has been carefully investigated for eye strain. Persons at the period when they begin to feel the effects of the loss of accommodation in presbyopia or absolute hyperopia suffer from repeated attacks of conjunctivitis, which they commonly ascribe to "taking cold in the eye," but which are cut short by use of the appropriate lenses, and which, if unchecked, would tend to establish a chronic cataractous condition, which is a chief discomfort in the lives of many people.

We should like, also, to call attention to car sickness in connection with eye strain. We have had eight or nine cases of this kind, all of which were relieved by glasses. One case was that of a gentleman who, every journey, had car sickness. While he had the mydriasis in his eyes he went to Washington and New York without any trouble whatever. Subsequently, after he had glasses, he made a trip to St. Paul without any of the former trouble. Recently we have had two cases—one that of a girl who could not ride a short distance in the street cars without vomiting. We found a decided degree of hyperopic astigmatism. With the mydriasis in her eyes she rode home without her usual trouble.

A strange thing with reference to eye strain is that it often exists to an exceptional degree without showing any symptoms in the eye. The patient will often say that the eyes are perfectly good and have never caused any irritation. The referees seem to have settled in some other place. This is an interesting pathological and physiological question.—Medical Times and Register.

A WORKING MODEL OF THE EYE.

A small camera which I have recently constructed as a model of the eye, has proven so much use in illustrating to students the elementary facts concerning the refraction of the eye, the various forms of ametropia, and the methods of determining the degree of the latter, that I have thought it worth while to describe it, and to give a description of it. The model is made of wax, and is suitable for the purpose of illustrating the law of refraction, and the forms of ametropia. The model is useful in illustrating the law of refraction, and the forms of ametropia.
A REFLECTION UPON DOCTORS, MORTALITY, AND ATHLETICS.

Our esteemed and reflective contemporary, Life, has been engaged of late in certain contemplations upon mortality and death.

In the subject of sickness, it wonders why Mr. Richard Croker, whom the doctors pronounced incurable, incontinently got well; and it deduces some conclusions unfavorable to the certainties of medical science. Perhaps its reflections are not altogether without justice, although medical men are, we think, particularly careful in giving positive unfavorable prognoses. When given, they are generally correct, for most fatal and incurable diseases are readily recognized. We must believe that in the case of the eminent statesman above referred to there is a mistake. Either the doctors did not in fact say he was incurable, or else his time will come later. We trust Mr. Croker will not forget what he owes to the science of prognostics and the stability of professional reputation.

But Life is also puzzled over the careers of the late Cardinal Newman and John Boyle O'Reilly. The former was a tall, slight man of infirm constitution, but despite this he lived to a very advanced age: the latter was a man of splendid physique, who kept his system in training by physical exercise, athletic sports, and followed all the suggestions of modern physical culture. Yet he died in the prime of life. Shall we not, then, live quiet, ascetic lives, ignoring the body and cultivating the spirit? or shall we cultivate both body and mind? The latter course is the one so much commended today; yet it is not a sure passport to longevity, as many cases prove. In fact, the brain-worker is better if he lives a regular, temperate life, and pays no attention to the development of his muscles. A little walk in the fresh air, and sound sleep are all he needs. Some people, to be sure, can be athletes and do brain work also, but it is not the rule. A sound mind should have a sound body, but it does not need hereafter muscles.

The best athletic work is done by growing boys and adolescents, who have an extra supply of vitality. When they have matured, and understood the taken responsibility of work, they speedily drop off from their high standards. And this is the lesson we would draw from the opposite cases brought up by Life is, that athletes are not needed by brain-workers, and will, if carried to excess, shorten life rather than lengthen it.—Medical Record.

STERILISED MILK.

So-called "sterilised milk" by no means always deserves its name, in some cases being much fuller of germs than ordinary boiled milk fresh from the cow. Herr Kohlmann, of Leipzig, on subjecting two samples of boiled, as sterilised to examination, found that one of them really was so, no germs being discoverable; while the other specimen contained 350,000 germs per cubic centimetre. For the purpose of comparison other examinations were made, and it was found that a sample of fresh milk bought in the street contained about 160,000 germs per cubic centimetre, and that of water from the Holzbrunnen 12,000. Herr Kohlmann suggests that the failure of whatever process was used to sterilise the milk, may have been due either to water having been mixed with the milk before the process was commenced, or perhaps to too long a time having been allowed to elapse between milking and sterilising. This last point exercises a very great effect, as is shown by Frenenrich's observations. He found that milk which, when received, contained only 5,300 germs to the cubic centimetre, after being kept for three hours at 60 Fahr. contained 10,000; after six hours, 25,000; and after twenty-four hours no less than 5,700,000. It would therefore appear that our knowledge of the conditions under which milk may be really sterilised, is at present somewhat insufficient, and that report of the results of the feeding of infants with milk which is reputed to be sterilised, must always be received with a good deal of scepticism, unless specimens of the milk have been frequently examined by a competent person.—Lancet.

A HEALTH BOARD ON CHEWING GUM.

The following bit of useful information is published in the monthly bulletin of a certain State Board of Health:—"Chewing Gum a Healthful Exercise.—We have seen some most excep- tionable young lady, with a highly strung nervous organization, under its magic influence become as quiet and contented as the well-fed cow that lies in the barnyard chewing its cud. We know of nothing that will with anything like such unimpeachability (ale) enure so much mastication. We have chewed a piece of this gum contentedly for two hours without any perceptible change in its bulk, and after remaining under the seat of the chair, on the under side of the table, or on the bedpost over night, if not found and confisicated, it was ready for as grand service as when first pressed between the molar. We believe that every ship sailing upon the high seas should be well supplied with chewing-gum; and in time of danger of shipwreck the passengers should be furnished with at least a half-dozen pieces, so that if cast upon some barren and uninhabitable coast or island, they might have something with which to beguile the weary hours; and we know of nothing so innocently beguiling."—Boston Medical and Surgical Journal.

FATAL RESULTS OF LACING AMONG SAVAGES.

We have been told that the vices introduced by white men are depopulating the South Sea Islands, but now it would appear that white women are also responsible for the rapid depopulation of New Zealand. When female missionaries went among the Maoris they insisted that the Maori women should wear clothing. The latter could not be induced to overcome their prejudice against skirts, but the missionary women wore corsets, they decided that the latter was a garment not wholly devoid of merit. The result is that every Maori woman now goes about her daily work neatly clad in a corset laced as tightly as the united efforts of half a dozen stalwart warriors can lace it. Being accustomed to tight-lacing, the women are dying off with great rapidity, and the repentant female missionaries now regret that they ever asked their dusky sisters to consider the question of clothing.—Medical Record.

Wife—"What are you busy at?" Young Physicist—"I am writing a letter to the newspapers, abusing Dr. Blank, the great scientist." "But Dr. Blank has never done you any harm, and you agree with his theories." "True; but it is against the rule for physicians to advertise, and I must get myself before the public somehow."

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The writing master who wrote that his business was flourishing, doubtless used ESTHERHORN'S No. 12¢ extra fine elastic pen, the best for ornamental writing.

All subscriptions to this journal received before December 31st will be credited for the entire year, and the printed address label of this number. See if yours reads, Jan., 1892.

We would call special attention to the advertisements of standard periodicals in this number. By mutual arrangements between the publishers, subscribers to the Science News can obtain them at a large discount from the regular prices.

From WILBUR BIXLTON, M.D., Baltimore: "I have used COOK'S LIQUID BEEF TONIC in my practice, and have been much gratified with the result. As a tonic in all cases of debility and weakness, anemia, chlorosis, etc., it cannot be surpassed."

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The ICE MACHINES made by DAVID BOYER, of Chicago, have an enviable reputation for economy, efficiency, and reliability. In many cases they have been substituted for the machines of other manufacturers, with satisfaction and profit. They incidently produce a large quantity of pure distilled water, which can be sold for domestic uses in localities where the natural supply is unsatisfactory.
FAMIIAR SCIENCE.

CONTENTS OF AN ANCIENT ROMAN TOMB.

During some recent excavations in Rome, in the ancient gardens of Domitian, a coffin was discovered, which, from its contents, has proved one of the most interesting ever brought to light. It contained the remains of a young girl,—Creperelia Tryphaena by name, according to the inscription,—and a bas-relief on the coffin represents her sleeping upon a bier with her head inclined to the left shoulder. An older woman is represented sitting at the feet of the bier, while at the head stands a young man in an attitude of mourning.

By a fortunate accident the coffin seems to have been filled with water from an indefinite period, which has aided greatly in the preservation of the remains. The head is still covered with long, fine hair, which has perfectly resisted decay. This resistance of hair to decay is very characteristic; and in a museum at York, England, there is a mass of human hair still adherent in a classical knot, and held in place by pins of jet, from the neighboring deposits at Whitley, all the rest of the body of the ancient Roman woman having crumbled to dust. York was an important British-Roman settlement, and this interesting relic is doubtless of approximately the same age as that of the Roman maiden described above.

It is evident from the contents of the coffin of Creperelia Tryphaena that she was betrothed, probably to the youth represented in the bas-relief. A crown of myrtle leaves, sacred to Venus, was found at her head, fastened by a silver clasp, very much oxidized, from which fact we may assume that the metal was an impure alloy. Several gold rings were also found; one set with a piece of dark colored glass; another with an onyx engraved in relief with the word Fileus—probably the name of her lover. Another very interesting ring contained a piece of red jasper engraved in intaglio, with two chiseled hands holding in their fingers stalks of ripe olives. This was doubtless the engagement ring of the Roman maiden, the wheat being an allusion to the ancient rite of marriage by con-farreiato. Two other rings—or bangles, as we should call them—were found in the coffin, one of which was attached a miniature key, while the other was composed of two separate circles joined together into a single ring. A brooch is ornamented with an amethyst engraved with a classical group referring to Apollo and Diana. Two fine chains depend from the brooch, to the ends of which are attached two miniature ivory leaves. Other ornaments found were an amber hairpin, two small combs, two earrings, a necklace, and two metallic mirrors, these last being objects of value in those ancient days.

The Roman history, as we read it, is a sad record of war, bloodshed, and crime, but the great mass of people must have lived their lives as at present, with little reference to the quarrels of emperors, generals, and politicians; and when Creperelia Tryphaena passed away the brightness went out of the world of her Roman lover, as it has in the succeeding centuries and doubtless will for ages to come. It seems almost a sacrifice to display the ornaments and treasures of this poor girl to public view, but those who are interested will find them in the Capitolium Museum at Rome, together with many other relics of that wonderful ancient civilization.

The accompanying engraving is reproduced from one published in La Nature.

Perhaps the most remarkable object of all was the wooden doll, which had evidently been laid in the coffin as a souvenir of the childhood of the maiden. It is about a foot in height, carved with considerable artistic skill, and, very curiously, the joints are articulated, just as may be seen in certain dolls of the present day. The hair is represented as arranged in a classical knot, and the features are said to resemble those of the Empress Faustina.

Such a discovery as this renders the life of the Romans much more real to us than all the myths, or statues, or records of battles they have left.

EVOLUTION AND THE VEGETATION OF THE PRIMEVAL WORLD.

BY SAMUEL BRAZIER.

As early as September, 1855, Mr. Alfred Russel Wallace, of England, published an essay on the law which has regulated the introduction of new species. Other minds were thinking in the same direction, but, though Mr. Wallace, as well as Mr. Darwin, had discovered the law of natural selection, it was left to the latter to expand its universal and immensely important applications. Probably no discovery in the scientific world has done more to influence modern thought. Mr. Darwin's work was followed by the publication of Herbert Spencer's views, and others also pronounced what is known as the doctrine of evolution.

The doctrines of evolution and natural selection are closely associated, though distinct. Between the head of the animal kingdom, man, and the lowest form of animal life, and between a forest tree and the lowest form of vegetable life, imperceptible gradation exists. If we turn from space to time—from the living organisms which our earth contains today, to those which preceded them during the countless ages of the past—the same gradation is observable. Geology discloses the fact that complex structures existed when the recent formations were deposited, while simpler structures have left their testimony in the most ancient rocks. Admitting certain breaks in the line of continuity, this may be regarded as the general fact which geology teaches.

What is meant by evolution? Every living form becomes what it is by virtue of two forces, or rather two sets of forces: those of inheritance, and those of its environment. An animal inherits certain peculiarities of structure and habit, which fit it to live in a certain habitat and subsist upon a certain kind of food. But, within certain limits, it has the power to change its habits and also its structure, in obedience to external influences. A carnivorous animal learns to live on vegetables; and, slowly, a land animal becomes amphibious, or takes to the water altogether. The influence of education may render a human being who inherits a small brain intellectually superior to another who inherits a larger brain. Animals and plants...
receive their education from external nature. Soil, climate, heat, moisture, altitude, position, food, furnish conditions under which they become healthier, larger, stronger, or the reverse. When the change in external conditions is considerable and long continued, what we call varieties are produced, and during longer periods new species are also developed. An organism would not change as long as the external conditions remained the same; it would change, they would change, or die. Some plants may be grown either in water or in soil, but the changes produced by changing them from one element to the other are so great that they may be taken for distinct species. Artificial selection illustrates the more slow and patient work of natural selection. Breeders of rabbits produce what color they prefer by careful selection. Nature has done the same thing. Quite black or white rabbits can be more easily seen by their enemies, and would have less chance of escape. They have therefore died out. The grey rabbit—i. e., the fittest—has survived.

Natural selection means that those organisms which can adapt themselves to external changes, themselves change and survive; the others perish. The fittest and most successful species, therefore, will be the fittest and most successful. A variety reigns through nature. The offspring of the same parents vary. No two individuals are quite alike. Some are better adapted to the changes which may be taking place than others. They may be stronger, fatter, or of more suitable color. Evolution produces these peculiarities, and natural selection takes advantage of them. It may be said that evolution produces new forms, and natural selection preserves them. Every organism possesses a certain potentiality for change, and the extent of any change it undergoes is measured by this potentiality and the extent of the external influences. Will this change always be in an upward direction, from lower to higher forms? It does not follow that it should, and nature teaches that it may be either progressive or retrogressive.

The theory of evolution explains many facts which are otherwise inexplicable, and intense excitement in the scientific world has attended its study and application to living forms, chiefly those of the animal kingdom. A field for investigation less explored, but of great interest, exists in the vegetation of the primeval world. The animal remains of those days are common—bears, tigers, and mammoths, for example—but the vegetable remains are scarce. The artificial changes brought about by the interference of man with the growth and development of plants and animals, are rapid, and therefore unstable, while those of nature are slow and more permanent. For the demonstration of the truth of the theory of evolution, unlimited time is required. The changes it implies are the result of the slow and perfect state of preservation of these ages so vast that, in comparison, the historic period is an insignificant point of time. The human remains and the cats and crocodiles which were embalmed by the Egyptians, prove that the 3,000 years that have elapsed since they lived are utterly inadequate to bring about such results. With respect to plants, the prehistoric age and vegetable organsisms existing on the earth today are inexplicable on any other theory, the "testimony of the rocks" is required to complete the demonstration that evolution is something more than a splendid and ingenious hypothesis.

Herbert Spencer has been inclined to grant that the records in the rocks afford sufficient evidence on which to base an opinion; but increasing geological knowledge warrants the opinion of other high authorities that the stories written there—although the continuity is often interrupted—are sufficient to give us a clear perception of the history of the earth. The crust of the earth for a considerable depth is composed of series of rocks which have been formed under water. These stony archives contain the remains of animal and vegetable forms, which are the only relics we have of the biology of the earth's early days. Some of these series of rocks are many thousands of feet in thickness, representing incalculable periods of time. The very lowest of these series—the Laurentian, 30,000 feet in thickness—contains no fossil plants. The next series—the Huronian, 18,000 feet thick, and the Cambrian, 15,000 feet thick—yield only a few traces of vegetable life. Little more can be said of the next series,—the Silurian, 32,000 feet thick,—in which have been found chiefly a few spores and, in one or two cases, parts of organism which are usually classified under Devonian beds—that first affords evidence of luxuriant vegetation. One deposit in this series—the old red sandstone—has been made classical by the labors of Hugh Miller. In England, in Ireland, and in New Brunswick these beds contain magnificent fossil remains.

If evolution necessarily means the development from simpler to higher forms, the evidence afforded by the vegetation of the ancient world would not be entirely satisfactory. As we ascend through the later rocks referred to, the forms diminish in size. Club mosses, such as abound in the forests of South America and New Zealand, were forest trees in ancient times; and plants which appear as forest trees in the Pennine beds, have dwindled into lower forms. Instead of developing into higher forms, we see evidence of a change into lower. We have no evidence to show that the forest trees of the present day have been developed out of the gigantic forms which flourished in the forests of the ancient world, and they have possibly been developed out of other and inferior forms. The theory of evolution is consistent with degeneration. But the most striking and remarkable example of plants that have undergone little or no change, except in size, from the time when the coal measures were formed till the present day. Underlying the Carboniferous series, they are found as tree forms in the oldest Devonian rocks. They abound in the coal measures and in the Oolites, and survive in the forests of New Zealand, and the central parts of America, and, except in size, appear to have undergone no change through all these long ages. The contrary is true in reference to the conifers, or cone-bearing plants. In the coal measures trunks of these trees have been found more than forty-four feet in height. They were more nearly allied to the Araucana or Norfolk Island pines than to European. The theory of geological change tells us that we shall reach the Carboniferous series of rocks, but have changed very little from them to the present day. The cyads do not appear till the Triassic Age, long after the coal measures were formed, and they cannot be traced back to any forms found in the Carboniferous beds. In the Oolite rocks they appear in vast numbers and migrate from north to south. They occur in the Cretaceous beds,—the latest of the Secondary formations,—but in the Tertiary beds they magnificient forms disappear. Their modern representatives, the cyads and zamia, still linger in the southern hemisphere, in a narrow line which bounds the outside of the tropical zone. Of flowering plants, monocotyledons and dicotyledons, there were scarcely any traces in the Oolites, and only a few in the Cretaceous beds. These and the earlier formations represent innumerable ages during which the earth had been devoid of any green vegetation more complex than that of bryophytes. It is only when we reach the Tertiary period that they are found in abundance. In these later beds twenty-five or more orders of these plants have been found, including the palm, maple, willow, luxton, almond, plum, and the meadow sweet, showing an approximation to the trees of the Post-Tertiary or modern period.

This brief glance at the vegetation of the ancient world may remind us that a marked difference is shown between the development of plants and the development of animals. The animal kingdom exhibits a high stage of development at an early period. Vertebrate animals—fishes of the highest organization—are found in the upper Silurian rocks. The family of sharks stands at the head of the animal world. The vast sphere of the land forms have not been explored, but it is probable that few or the highest order—such as the Port Jackson sharks. Yet probably 120,000 feet or 130,000 feet of rocks must be passed through before the most highly organized plants make their appearance. Assuming, as a general fact, that the thickness of any series of rocks is indicative of the relative length of time that must be assigned for their formation, it appears that the highest forms of vegetable life did not appear till a comparatively late period in the world's history, and then they appeared suddenly and in great abundance. Nine-tenths, or a still greater proportion, of the immense cycles of time required for the formation of the earth's crust had passed away before the highest vegetable forms appeared. It is scarcely surprising to find that this period of magnificence and abundance in the vegetable kingdom is also marked by a corresponding display of animal life. Lions, tigers, elephants, and mammoths flourished in the middle Tertiary period, and the earth seems to have possessed the same great variety of animal forms which characterizes it today. The sudden and personal appearance of the highest forms of vegetable life is a significant fact, the fuller meaning of which further geological researches may reveal. It must be borne in mind that the researches of geologists have been pursued over a comparatively small portion of the earth's surface, and investigations in other quarters of the globe may bring to light facts to show that the appearance of abundant yet heretofore the highest forms of vegetation has been suddenly and more abundantly. The more we learn of the present condition of life on the globe and the revelations of geology warrants the conclusion that the difficulties which the theory of evolution is inadequate at present to solve, are insignificant compared with the beauty and order which all nature assumes in the light of its teachings. Every living form tends to vary, more or less, from its original type. No species builds upon the foundation of any form, but is capable of adapting itself, in a greater or less degree, to changed conditions. Those forms which vary in the most suitable direction, and are able most
easily to change in obedience to external influences, survive. Nature selects the fittest; the rest gradually pass away. The fauna and flora which are now living are the successors of similar systems which, in infinite variety, have been produced by slow changes, such as are now operating, and have been in ceaseless operation since life first appeared on the globe.

[Original in Popular Science News.]

**GEOLOGICAL DEVELOPMENT—USE OF FOSSILS IN GEOLOGY.**

By JOSEPH WALLACE.

In some of the preceding articles much space was given to fossils, as a great deal of misunderstanding still exists in regard to them. We hope that what we have written is so clear and comprehensive that the student in paleontology will have no trouble in following such as the presence of land, rivers, lakes, and seas in places where they do not now exist, change of climate, and former distribution of plants and animals. A few examples will suffice to show the manifold assistance which fossils furnish the geologist in the elucidation of ancient geography. Former land surfaces are revealed by the presence of tree stumps in their position of growth, with their roots branching freely in their underlying strata, representing the ancient soil, often contains leaves, fruits, and other sylvan products, together with pieces of bone, remains of insects, land shells, etc.

Ancient woodland surfaces of this kind are found between the marls, and even below water line, around different parts of the British coast, and they unquestionably prove the subsidence of the land. More ancient dates are the "dirt beds" of Portland, which, by their layers of soil and tree stumps, show that cycles of woodlands sprang up over an upraised sea-bottom, and were buried beneath the silt of a river or lake. Still further back in geological history arose the numerous coal growths of the Carboniferous period, pointing to wide jungles of terrestrial or aquatic plants—like the modern mangrove swamps—that were submerged and covered with sand and silt. The former existence of lakes can be satisfactorily proved from beds of marl or limestone formed from fresh-water shells, or from the silt with leaves, fruits, and insect remains. Such deposits are abundantly forming at the present day, and they occur at various horizons among the geological formations. The "dirt beds" of Switzerland, a mass of conglomerate containing a thickness of 6,000 feet, can be shown from its fossil contents to be essentially a lacustrine formation. We may also derive a good deal of information about the distribution of land, water and climate, and so on, from the position and nature of the separate strata and their organic remains; but we must be very distrustful, on account of the incompleteness and uncertainty of the materials on which the premises are founded. The maps which have been drawn of the different parts of the earth's surface as it appeared in the earlier periods, must, in many cases, be considered as merely hypothetical sketches. The animals that were attached to the ground, the trunks of shells, for instance—were destroyed by gradual deposit of the surrounding strata; in other cases, sudden events—such as changes in the sea level, earthquakes, and volcanic outburst in the middle of the sea, recently observed near Sicily, killed an immense number of sea animals around it. Similar events do not cause the destruction of animals which we find petrified in masses, although it is believed they could have escaped. Buckland, speaking of the discovery of fossil fishes, observes: "There exist stations under which the fossil fishes are found at Monte Baldo, seem to indicate that they perished suddenly on arriving at a part of the then existing seas, of which the adjacent basaltic rocks afford abundant evidence. The skeletons of these fish lie parallel to the laminae of the strata of the calcareous slate. They are always entire, and so closely packed on one another that many individuals are often contained in a single block. All these fishes must have died suddenly on this fatal spot, and have been speedily buried in the calcareous sediment then in the course of deposition.

From the fact that certain individuals have even preserved traces of color of their skin, we are certain that they were entombed before the decomposition of their soft parts had taken place, and that the fish, when sent up to the surface from muddy water, mixed, perhaps, with noxious gases, to have formed by their sediments a succession of thick beds of marl and clay, and at the same time to have destroyed the testacea and lower orders of marine animals within the region thus invaded."

Second. Another main purpose to which fossils may be put in geological research is to furnish a key to the vegetable organization, which, however, may be classified according to relative date, and the facts of geological history arranged and interpreted as a connected record of the earth's progress. But fossils have become useful to natural science in another way, as they teach us about plants and animals which have existed on the earth, but, for the most part, do no longer exist. The history of the present animal and vegetable world is supplemented by that of the flora and fauna of the primeval world, and natural history thus becomes complete. As we have written about the "order of superposition" in stratified formations in a recent number of Popular Science News, and of the "former and present fauna and flora" in a former issue, there is no occasion for repetition.

But the word "fossil" often conveys to our minds another idea: the remains of plants and animals belonging to the primeval world. So the bones of species of animals now existing—that is, the present races of dogs, sheep, and cattle—would not be called fossils, even if they were found petrified or buried in strata. This is supported by the following: First, Dr. Agassiz, Dr. Truax, and Marcel de Serres; the latter suggests that the name of "huamneath" be used instead of fossils for petrifications of the latter kind. This strict distinction between the primeval and present world is connected with the theory that the plants and animals which are supposed to belong to the earlier periods of the earth's history all perished, as if by some overwhelming catastrophe, as if they were, had thus been made upon the earth, the present vegetable and animal world was created. Thus, fossil men would be primeval men; so that, if it could be proved that these fossil men exist, it would follow that in ancient times the earth was inhabited by men—the so-called pre-Adanutes, who were not our ancestors, but a race that died out before our historic ancestors appeared upon the world's stage. Most of our modern geologists have given up the idea of a strict distinction, in respect of which we have spoken of, between the present and primeval world. According to the theory which is gradually becoming established, some kinds of animals which exist now also existed in the earlier periods; and we are therefore not justified in assuming that a geological catastrophe took place, which destroyed the former animal and vegetable world which preceded the present fauna and flora. Consequently, the boundary between the primeval and present world, in the sense spoken of, and the idea of a primeval race of men falls to the ground. If the period before the appearance of man on earth is called the primeval age, of course there can be no question of primeval men; they would have existed before all the records we have of the first man. However, there is much yet to be said in mystery regarding the development of man in pre-historic times, and there is much yet to learn and discover of a higher development and perfection in planetary spheres.

As the animals and plants whose remains are found in the strata of the separate systems must have lived on the earth before these strata were formed, we can obtain a proximate idea of the fauna and flora which belonged to the fossils that have been found in the separate strata; for, on the one hand, those fossils which have been preserved are not thoroughly known; and, on the other hand, many organisms that may have existed were either not of a kind to be petrified,—such as fungus, slugs, etc., that are entirely wanting in hardness,—or could not be petrified because they existed on land, on high mountains, or in the air. Many geologists have overlooked, or have only lately set up systems of the history of organic beings which latter discoveries have shown to be false. It was formerly thought certain that land animals and land plants had first appeared in the Carboniferous period; since then they have been found in the Devonian, or upper Silurian system. Before 1824 many persons believed that reptiles first existed in the Triassic period; in the course of research it has been proved that they had existed in the Carboniferous Age, and even before that time. Prior to 1816 everyone had accepted the general opinion that the earliest remains of warm-blooded animals occurred in the strata of the Carboniferous period; since then they have been found in the Jurassic, and even in the Triassic systems. That is to say, in the Mesozoic system. It is because of this that Lyell asserts this conviction: that in some ways science is only on the threshold of discovery as to the order in which the separate classes of organisms appear in the strata, and that in the second half of the century, as in the first, it will repeatedly find itself compelled to modify its previous theories.

**Petrified Plants in the Coal Measures.**—Most of the plants which are found petrified in the coal measures are land plants, especially tree-like ferns, and trees which existed between these and the pines. These plants seem to have been partly torn from the then existing forests by floods, and to have been collected together with peat, and transformed to coal. Probably most of the coal beds were formed on the place where the trees and plants had grown. The vegetation passed first into the condition of peat moss; was then flooded by the sea, in consequence of the sinking of the land; was covered with a layer of mud and sand; by a subsequent elevation, the mud was converted into dry sand, and was fitted to produce a new
forest, which then, in process of time, again became peat moss. By the recurrence of this process, the alternate layers of coal, sandstone, and slate were formed, which constitute the strata of the Carboniferous period.

SCORPIONS.

By W. J. PRENTICE

There are several different species of the Arachnida, such as eurus, mites, spiders, and scorpions. Under the name "scorpion" may be enumerated:
1. Book scorpion, which belongs to the family of Cheliferidae.
2. Water scorpion, of the genus Nepa, found in ditches, etc.
3. Sea scorpion (Cottus scorpius), a voracious salt-water fish.
4. Whip scorpion (Thelyphonus giganteus), or mole-killer.

Rock scorpion (Both maer), found on rocky cliffs. Perhaps a brief description of one or two will be sufficient to convey some idea of the structure and habits of these venomous little animals called scorpions.

To anyone interested in entomology, the whip scorpion—of that interesting intermediate group known as Thelyphonidae—will prove a most interesting subject. The antennae of the whip scorpion are not like the harmless feelers seen on the heads of beetles, moths, and butterflies, but are changed into venomous fangs, or claws. The fore feet are formed of a great number of joints, so that the front limbs are converted into flexible organs of touch. The anterior pair of legs are much thinner than the other three pairs. This species derives its name from the whip-like shape of its caudal appendage, which is flexible, and can be moved about by the owner at will. It is found in the dark recesses of the forests of Florida. It is nocturnal in its habits, hiding under chips, leaves, etc., during the day, awaiting the approach of night, when it can go forth in search of prey, which consists generally of bugs and insects, which it greedily devours. When disturbed by cattle or mules travelling through the underwood, it often seizes them with its poisonous, jaw-like claws; and the poison usually prove fatal in a few hours.

The next species I wish to call your attention to is called the bed-sawer, or rock scorpion. The body of the rock scorpion is usually about five inches long from tip to tip. They breathe air, and in this respect are unlike crustaceans, but unlike crustaceans. They are like the crustaceans, however, in this respect: they have no distinction of head and thorax, the two being united into what is called a "cephalo thorax." They undergo no metamorphosis, and have no true antennae or wings. My attention was first called to this species on the 15th of June, 1882, after the 77th Regiment, Pennsylvania Volunteers, but unlike from Tuscaloosa, Alabama, and were preparing to encamp on the south bank of the Tennessee River. I commenced clearing away the brush and leaves on a high cliff overlooking the river, preparatory to pitching our tent for the night. I was somewhat startled at the rapid and pene- culsive movements of a small animal whose headless I had disturbed, and which, on closer examination, proved to be a rock scorpion of a dark brown color, and about four and one-half inches long. This specimen, however, differed from any I have since seen in this particular, as the legs and back part of the head it had a hemispherical receptacle corresponding in curvature to that of the telson, or last joint of the tail. Into this receptacle it would turn and rest the end of the tail, as if to steady its aim before making a spring backwards, at the same time striking a blow at the stick to which it was fastened. Otherwise it did not differ materially from others of the same species. I have since examined. It was very active, and I found that it could run about as fast backwards or sideways as forward. The only thing I ever found they were apparently afraid of was a current of air. This I found by striking it with my hat, when it would cling to the piece of bark on which I placed it, as if afraid of being blown away. I then tried striking it on the tail, which it would take no notice of whatever. I then tried blowing on it gently, when it would immediately flatten itself out and cling tenaciously by the chela, or claws.

As I said before, there is no distinction in the scorpion between the head and thorax. The abdomen and posterior segments are segmental. The tail consists of from six to twelve segments, terminates in a pair of pincers, and a sharp stinger which communicates with two poison glands in the base of the joint. They have no true antennae, or feelers, such as are developed on the heads of butterflies or beetles, but are represented by the large mandibles, or lobster-like claws, at the tips of which are the modified palpi. The eyes differ in number in numerous species, but are usually five in number, or they are entirely wanting. The poison of a sciren of the order of the arachnida, or scorpions, is apparently fatal.

The breathing organs—four pairs of pulmonary vesicles, found in the sides of the body—admit air by apertures, called stigmata. The legs—eight in number, four on each side, as in all arachnida—are quite long, and at the tips are converted into chelae (pronounced kee-lay), or nipping claws. On examining the underpart of the body, two remarkable appendages are seen, called the combs. The number of teeth in the combs vary according to the species. Some (the rock scorpion) have thirteen teeth, while others (the red scorpion) have never less than twenty-eight. The poison from the sting may be pressed out by the fingers, when it is found to be a white, milky fluid with a very pungent smell. I have seen the sting of a scorpion very painful, but it is not always attended with fatal results, and can often be relieved by the use of alkaline remedies. The result depends somewhat, however, on the constitution of the person stung, and the size and species of the scorpion. The most venomous, however, I believe, is found in Mexico, as stated in a communication from Dr. V. Gonzalez, which was read by Dr. Leidy at a meeting of the Academy of Natural Science, at Philadelphia, in 1888, giving an account of the scorpions of Durango, Mexico, and the deadly effects of their sting. He stated that the sting was fatal, and especially so in the case of children from two to three years of age, they dying in a few hours, and sometimes in a few minutes, in strong convulsions. No antidote has hitherto been discovered.

Efforts have been made to exterminate the scorpions by offering a reward of one and one-half cents each for males and three cents each for females, and it is estimated as many as 100,000 have been destroyed in one year. The poison of a scorpion is quite powerless to kill itself or another, although the same species had its legs and tail by their being stung with their tails, penetrating the sting, and thus trying to commit suicide by the same poisonous instrument with which they had, no doubt, slain many a defenseless victim upon whom they had chosen to prey.

A writer in a paper called "Land and Water," relates that while in a house in Jamaica, suddenly a moving mass dropped from the cedar roof above to the table near where he was standing, which he found, on examination, to be the body of a large female scorpion, from which ran away in every direction thirty-eight young scorpions, about one inch and a half in length. The mother scorpion lay dying, and soon ended her feeble struggle, as the whole of her back had been eaten out by her own offspring, leaving but the thin outer shell. She had clung to the shingles until, death approaching, she had dropped to expire in a few moments, and thus gave up her life for her young.

MODES OF COLLECTING SPECIMENS OF THE MORPHOLOGIES OF FRESH AND SEA WATERS.

By EDWIN CUYLER, LL. D.

Since 1884 I have studied this subject more or less. It has given great delight and pleasure. Perhaps some would like to know what has proved to be the best modes.

I.

(That of Professor Paulus F. Reinsch, of Erlangen, Germany, the best zoologist I know of.) He selects a group of water plants that he can squeeze in the palm of his hand and through the fingers, and forcibly compressed. The exudate is caught in a bottle, and is ready for use. Usually there are several streams, the largest of which is taken. About half an ounce of liquid is thus collected, which is full of the flora and fauna which make the plants their habitat. Do not be deterred if the quantity is small. Professor Reinsch made up the mode with me in a hollow corn from Boston to Cape Cod. After dark we came to Holbrook, where the road ran through a pond. The professor got out, reached in his hand, and got a handful of plants at the first grab. About two teaspoonfuls of fluid were secured, as the mouth of the vial was small and it was impossible to see much. At our hotel we spent a good part of the night studying the forms found. They were very interesting, and many of the desults were new to science.

II.

(Also Reinsch's mode.) Things needed: A a bag of cotton or flannel cloth, 18½ inches, made thus: Take a piece of thick cloth, 4½ x 3 inches; fold the lengthwise; turn over the edges ½ inch, and stitch over and over. B, a string. C, a common goldlet. D, a hydrant fancet. Tie A on D with B, and let the water run till the bag is clogged so that the water has to come out in jets. Then remove so that the bag is half full of water; favor contents into C. Then turn the bag inside out and sop in the water, thus dispersing many forms of life from the bag. Finally, twist the bag lengthwise and catch the strips in the goblet. The specimens are then ready for the microscope.

III.

(The writer's mode.) For ditches, canals, and ponds, even out in the middle, while the collector is in a boat or on a raft. Things needed: A, a bag as above. B, a tube about 1 inch in diameter,—an old lawn India-rubber hose pipe is best,—or 4 or 5 inches long. C, a funnel. D, a dipper or tumbler. E, a string. F, a bottle, an ounce or larger. The bag is tied on to the tube; the funnel is put in the other end of the tube. Arrived at the littoral margin, the central, or other part of the surface of the water in lake, pond, ditch, or canal, dip water and pour it in the funnel as long as it lasts.
off readily. It is surprising how soon the bag becomes clogged sometimes. The bag is then emptied as described in mode II. If one has one's clinical microscope the forms of life can be studied on the boat or place where the carbonate is collected.

IV.
When the fauna or flora are collected under a hydrant pressure, many of the delicate ones are more or less torn or destroyed. To obviate this, I said to myself, "Why not collect as in mode III., and thus avoid this destruction?" I then took hydrant water after it had left the faucet, and, of course, had lost the hydraulic pressure, and followed mode III. It was a success. Of course the principle of having only a pressure equal to the length of the collecting tube, can be applied in other ways.

Remarks.—The writer hopes that those who are unfamilial with the study of life in water may try the modes named, as he is quite sure that the pleasure derived from this muse of the eye will quite equal that from the music of the ear, and exalt the ideas about the Creator, Lately, in crossing the Atlantic Ocean, I made collections, but found a scarcity of forms; while at Harleam, Amsterdam, Alkmaar, The Hague, etc., I got a rich variety with the same apparatus. In place of the India-rubber tube a glass lamp-chimney was utilized, which worked very well. Holland is a delightful place to study the fauna and flora of water. Here I found the Asthatos eillaris in its natural habitat, for the first time, I think. The Asthatos is found on those who have the "grippe." Also some new Polyphenus, which were viviparous. The forms of life varied at each of the places named.

NEW YORK, Oct. 21, 1890.

SCIENTIFIC BRIEVIETIES

The Most Expensive Thermometer in this country is in use at the Johns Hopkins University. It is known as Prof. Rowland's thermometer, and is valued at $10,000. It is an absolutely perfect instrument, and the graduations on the glass are so fine that it is necessary to use a microscope to read them.

The Dollar Sign ($) is not a monogram of "U. S.," but dates from the days when the transfer was made from Spanish to American dollars and accounts. It is kept equal in dollars and reals. Thus: one dollar $ eight reals (American and Spanish parallel accounts). Later the 8 was placed between the cancellation mark, [8]; then the perpendicular lines crossed the 8, and finally the 8 shaded into an 8, and, combined with the cancellation line, evolved the present sign ($)?

A Mountain of Iron Ore.—About five miles north of the railway station of Nittoor, on the Harihar line, Bangalore, is a mountain of iron ore. The ore has been worked by the natives for ages, and is still worked. On the southeast face of the hill two galleries pierce the mountain, and from these openings the ore mined in the heart of the hill is carried out. Numerous bulkloos, buffaloes, and asses loaded with panniers carry the ore to the furnaces in the neighboring villages, where it is melted and wrought into plough-share tips and other metal wares.

The Floro-Spar of Quincey.—Certain varieties of flour-spar, if powdered, emit a peculiar odor. The spar from Quincey gives off gas of a penetrating scent, which recalls that of ozone and also that of fluorine. It decomposes water, forming hydrofluoric acid and ozonised oxygen. It is concluded from these experiments that the fluor-spar of Quince contains an occluded gas, which is observed escaping when the mineral is broken up under the lens. All the reactions of this fluor-spar may be simply explained by the presence of a small quantity of free fluorine among the occluded gases.

Antiquity of Man in America.—Prof. F. W. Putnam, the well-known permanent secretary of the American Association, recently made an interesting discovery which furnishes fresh evidence in support of the theory that man in America was contemporaneous with the mammoth. In a communication to the Boston Society of Natural History, Professor Putnam describes a shell found by Mr. J. A. Scott in Massachusetts.

The portion of this shell is serrated like the round outline of what, without doubt represents a mammoth. The shell was found under peat, and near by were human bones, charcoal, bones of animals, and stone implements.

On the Name Bronze.—Berthelot in his Introduction à la Châtes des Anciens, expressed the opinion that the name "bronze" took its name from the town of Brundusium, the seat of certain smeltings going through these vessels. But in a manuscript three centuries older, discovered in the library of the canons of Lucca, and reprinted by Muratori in his Antiquitates Italicae, we find: "De composite brandi; eumen partes II., plumbi partae I., stagni partae I.

Another formula in the same work prescribes: "eumen partes II., plumbi partae I.; vitri dimidiati et stagni dimidiati. Cuniceses at condita; funda; secundum manus variat facit et agitatem eramneunt mum acrienlit." It is Remarkable that the word "bronze" in the exact meaning of vitriol is repeatedly found in this MS., which shows that the word is much more ancient than the epoch of Albertus Magnus.

LARGE METEORITES.—In an article about Mexican meteorites and widespread meteoric showers, in the Mineralogical Magazine and Journal of the Mineralogical Society, London, Mr. L. Fletcher describes the bonanza masses as fourteen ponderous masses of native iron, the largest of which plies upward of four feet above the ground, having a form of a bededal, being five feet in diameter where it enters the soil, into which it descends for an unknown depth. The Butler masses consist of eight pieces, varying from 260 pounds, which is the smallest, to 634 pounds, which is the largest, making a total of nearly 4,000 pounds. Before the explosion the weight must have been much greater. The Sancheze estate mass weighed 252 pounds. The fort Duncan mass weighed 97½ pounds. A mass estimated to weigh 4,000 pounds, and which was an uncut mass of meteoric iron, is preserved at Washington, in the United States National Museum. It was exhibited among Mexican meteorites, as was sold to have been brought from the State of Chihuahua. Mr. Fletcher concludes that if the masses really belong to a single fall the maximum dispersion is 266 miles.

LABORATORY NOTES

Buette Float.—Wolf proposes small discs of paraffin of slightly less diameter than the buette and about 2 m.m. in thickness. A layer of paraffin the required thickness is made by spreading it out on hot water. When the cake is nearly cold it is laid upon paste-board, and discs of the proper diameter are cut out with the card-horsec.

Fluorfoam.—A French chemist, M. Meslans, has succeeded in preparing fluorfoam. It is the analogue of chloroform and iodoform, the chlorine and iodine of these substances being replaced fluorine in fluorfoam. But whereas chloroform is a liquid, and iodoform is a solid at ordinary temperatures, fluorfoam is a gas. It is colorless, and has a pleasant ethereal smell, recalling that of chloroform.

WINE-GAUGE Air-Bath.—An arrangement is suggested for applying gentle heat to small quantities of liquid in large vessels, as on re-dissolving small precipitates in the vessels in which they were thrown down. It admits also of the application of a stronger heat. It consists of a rectangular frame of iron resting on four feet, about 22 c. m. in height; a movable sheet-iron box (about 80 by 30 c. m.) with a bottom of wire-gauze, about as fine as that used in safety-lamps; four wire-gauze covers working on hinges, and four Bunsen burners. If a gentle heat is required the flames are reduced and the vessel is set upon the highest of the four covers.

AN IMPROVEMENT IN ORGANIC COMBUSTION.—The back end of the combustion tube, which is 114 c. m. in length, projecting 10 c. m. out of the furnace behind, and 19 in front, is closed with a movement glass tube, which passes a glass tube 19 c. m. long. In this a glass rod, 40 c. m. long, carrying at its front a strong platinum wire, can slide air-tight backwards and forwards. An air-tight closure is affected by means of a piece of enameled tubing drawn tightly over the glass rod and the glass tube. By means of the rod the platinum tube, with the substance to be analyzed, is moved backwards and forwards. To affect a firm connection between the wire and the heat, there is a small appendage to the latter, having a narrow slit in its upright part. By thus rendering the boat movable, the combustion can be much more neatly and easily regulated than heretofore.

PRACTICAL RECIPES

The following varnish will maintain its transparency, and the metallic brilliancy of the articles will not be obscured. Dissolve ten parts of clear grains of mastic, five parts of camphor, five parts of sandarach, and five parts of elemi in a sufficient quantity of alcohol, and apply without heat.

A Good Cement for Joining parts of apparatus etc., permanently solid and waterproof, and which resists heat, oils, and acids, is made by mixing concentrated syrupy glycerine with finely powdered litharge to a thick, viscous paste, which is applied like gypsum. Glass, metal, and stone are joined together by it.

Impermeable Glue.—To make an impermeable glue, soak ordinary glue in water until it softens, and remove it before it has lost its primitive form. After this, dissolve it in linseed oil over a slow fire until it is brought to the consistency of a jelly. This glue may be used for joining any kinds of material. In addition to strength and hardness, it has the advantage of resisting the action of water.

Imitation of Marbles.—Good Portland cement and cores that take on that material, are mixed dry and made into a paste with a small quantity of water added. One paste has to be made for each color. The different pastes are placed on top of one another in layers of different thicknesses; the mass is pressed from all sides and beaten so that the colors of the different parts impress themselves on each other without uniformity. The result is that more or less deep veins and blossoms are formed on top of the plates which are pressed into a mold for twelve days, during which time it is necessary to keep them moist as long as they are not entirely hardened. The plates are polished in the same way as marble.
The Out-Door World.

EDITED BY HARLAN H. BALLARD, PRESIDENT OF THE AGASSIZ ASSOCIATION.
[O. O. ADDRESS, PITTSFIELD, MASS.]

For two or three months the usual reports from our Chapters have been crowded out, owing to the pressure of matters of special importance. Now that our courses of correspondence study are smoothly running,—Professor Gutttenberg having more than seven hundred enthusiastic pupils at work on his course in mineralogy,—now that our prized personal observations have been awarded our arrangements for making Popular Science News our "official organ" completed; and now that everybody has once more been duly informed of the objects and methods of the Agassiz Association, and cordially invited to unite with us,—we listen again with pleasure, not unmixed with gratitude and pride, to the accounts of the excellent work which our numerous branch societies are doing. We cannot give all the reports,—nor even all the excellent ones,—but shall select from month to month those which, on the whole, seem best fitted to help all our members by their suggestions, and to animate us all by their earnest spirit. To have a report printed in these columns may therefore be considered a special compliment, and an honor for which every Chapter should earnestly compete. No hand shall be shown to Chapters strong in numbers and means, but the smallest and weakest branch shall have an equal chance, the criterion being merely the faithfulness and honesty of the effort made by each.

SELECTED REPORTS OF CHAPTERS.

762, Kingston, N. Y., [A].—We have continued our meetings, gained two new members, studied mollusks and crustaceans, and made a good beginning in botany. We investigated one field, where, apparently, nothing but clover was growing, and we succeeded in finding more than twenty different species of grasses. —K. B. Forsyth.

[Patient observation is always rewarded, no matter how limited the field chosen. There is not a square foot of the earth's surface which will not yield rich and surprising results to anyone who will keep his eyes on it for a half an hour with intelligent attention. As an experiment, I once marked off a bit of a dry pasture as large as could be covered by my handkerchief, and lay down in the summer sunshine to see what could be seen. Within fifteen minutes I had been delighted by the unexpected beauty of half a dozen tiny flowers; had for the first time discovered one of the curious altoids, or "jumping spiders," whose athletic feats easily break all collegiate records; and had seen a grasshopper wobble off several blades of grass in a manner to me new and surprising. Who will try this simple experiment, and keep a careful record of his observations, and report the result?—Ed.]

703, Ripon, Wis., [A].—Our society is not yet fully organized, but we have done some work in preserving fungi, endeavoring to preserve their original appearance. In this we have been fairly successful.—Mrs. C. T. Tracey.

[I would suggest as a general hint, that, in all such cases as this, the experiments made be fully set forth in the report, and the best means of accomplishing the result given for the benefit of our readers. The question is, How can fungi be preserved so as to preserve their original appearance? We should like answers from all who have succeeded.—En.]

709, Philadelphia, Penn., [Z].—During our first year a great deal of interest was felt in the welfare of our Chapter; meetings were held regularly, and each member was required to read an essay on some scientific fact. The next year the interest decreased; one member withdrew, and another ceased to attend the meetings. Since then we have attended lectures on botany, geology, and chemistry, and one member has taken a year's course in geology. If you consider our work satisfactory, we will continue.—Mary Reilly, Sec.

[Continue, by all means. All honest work is satisfactory. The cause of a decline in interest, however, in this case, is plainly to be found in the fact that your work has been studying about what someone else was going to see for himself and to see something yourselves. It is dull work to read or listen to essays or lectures on scientific subjects, compared to the interest of learning far fewer and simpler facts by your own observation. I had rather watch an industrious ant or spider for an hour, noting down just what I see him trying to do, than to read a whole library of accounts, which can do nothing for them, more fun, and one learns more. The interest attaching to such work never declines, but always grows stronger while life lasts.—Ed.]

711, Glen Falls, N. Y., [A].—Pleasant and instructive lectures were given by Professor Williams during the fall and winter terms on astronomy, and during the spring term on botany. Our work is done by the Chapter's lines, with the addition of a few readings in geology. The telescope was often brought into use, and the names and positions of the more prominent constellations learned, together with enlarged ideas of the immensity of space and time, of the distances, magnitude, and motion of stars. Agassiz's birthday was celebrated by a field-day. The number of meetings held during the year is thirty-two. We have commenced the year's work with increased interest and attendance, and for our winter's work are to study the practical applications of natural science as illustrated by the various industries of our town.—Professor Charles L. Williams, Pres.; Frances T. E. Boyd, Sec.

[This report again illustrates the importance of immediate contact with the objects of our study through the senses. Lectures on astronomy are here wisely used to supplement the constant use of the telescope. The student sees the moons of Jupiter with his own eyes, and, after that, is ready to listen with attention to an account of what special students with superior instruments have been able to learn about them. The result is, of course, "increased interest and attendance." This result follows this method as naturally and necessarily as darkness accompanies an eclipse.—Ed.]

713, Athens, O., [A].—Most of our time has been devoted to the study of the minerals of this region, and to the study of the anatomy of different animals, all of which has been carried on under the supervision of Professor Morrill. We have made interesting excursions in search of specimens. We have sixty members at present, and meet in Professor Morrill's recitation-room.—Ben Cornwell, Pres.; Murray Dalton, Sec.

[This Chapter is doing excellent work, to which this report does scant justice. We recommend to all Secretaries to give as many details of their Chapter's work as possible. How interesting it would be, for instance, to have an account of the minerals found about Athens, in addition to the fact that the Chapter has been studying them. Remember that those who read our reports read for information about the minerals, animals, and plants quite as much as for news of the Chapter's activity.—Ed.]

728, Binghamton, N. Y., [A].—We are now holding regular meetings on each Friday evening. We have eight members. We are studying Shaler's geology, and anticipate a pleasant winter's work. On March 8 we observed a curious rainbow. At sunset the air was very cold, and a great mass of mist passed over the Flooring one. The bow was made by a single raindrop, which, after the mist had risen to a certain height, was condensed, and fell in a very fine snow, which covered the ground for some distance on each side of the river.—Willard N. Chute, Sec.

[For several years "728" has been one of our most active Chapters. Although this report contains only one of the observations made during the month, it is more than a mere statement of the general condition of the Chapter. It would be a good plan for each Chapter to have an "observation-book" or a box, in which the members should place from day to day a brief record of their observations. From the material thus accumulated the Secretary could compile a most valuable report at the end of the year. Any notes of special importance should be forwarded to the President at once, however, as it is well to have our notes as fresh as possible.—Ed.]

756, Gilmann, Ill., [A].—We have neither.

We have enlarged our collections. Our ornithologists have made a list of 127 species of birds frequent this county. In botany we had a very good summer's work. Our members have all increased their private collections. A new member, Mr. Bostwick, has joined this section of the Chapter. He has been for years an enthusiastic student of plants, and has the finest herbarium in Ioquois County. It numbers 563 specimens, nearly all of which have been secured within a radius of ten miles from his home. We have added to our library "Jordan's Manual of the Vertebrates," "Dana's Mineralogy," "Ord's Comparative Zoology," various National and State reports, and the "Proceedings of the National Museum." Wishing the A. A. success and continued prosperity, we remain, yours truly, W. A. Crooks, Sec.; F. H. Crooks, Pres.

[This wish for the continued prosperity of the A. A. comes with especial grace from a Chapter whose excellent work is doing so much to insure that prosperity. The success of the Agassiz Association is nothing but the success of its Chapters, and no Chapter can in any way increase the general prosperity so well as by doing its best in its own home field. On the other hand, these Chapters which are most faithful in their own work are always found to take the deepest interest in the general welfare of the A. A.—Ed.]

739, Ledyard, Conn., [A].—Although I am left as the sole representative of our Chapter, my interest in observing nature never expires. In the past two years I have had a little book in which to note the arrival of the flowers and birds in the spring, and other observations as the seasons pass. It is interesting to compare the notes of these two years, and the comparison will be more interesting the longer the plan is followed. Can anyone tell...
Agassiz established his famous school. The school buildings are still standing, and we have spent much time wandering over them. Among the many mottos and proverbs hung about the rooms, this one in particular attracted our attention: "Study Nature, not Books."—Fred Scoum, Sec.

844, Peru, Ind. [B.]—We have gained one member, and have held sixteen meetings. At our last meeting J. F. Wittle exhibited some balls of cotton which he had grown from seed. We are principally interested in plants. My own observations during the summer have already been sent you in competition for the microscope offered by the editor of POPULAR SCIENCE NEWS. Since then I have noticed "golden" fruits, mushrooms, and a fungus with a strong odor. You will find this interesting, as I have never before seen a fungus with such a distinct odor. I think you will agree that it is a very interesting and unexpected finding. —A. E. Walker, Sec.

845, Boston, Mass., [H.]— Chapter 849 still lives, and its members are as much interested as ever in all that pertains to nature and the A. A., and have made considerable progress in botany, mineralogy, and geology. We have ten members. One of our most faithful workers, Miss M. Ella Pitcher, died during the year, and her loss is deeply felt by us all. Personally, I have been appointed an herbarium and studying botany. With good wishes to the A. A., Abby B. Brown, Sec.

851, Weybridge, England.—This is a "family Chapter." The ages of our children are nine, eight, and six. We find formal meetings too dry for so restless little mortals. Our "reni-yous" is the stump of a tree in the woods, alternating with a foot-stile in the meadow path. This year we have learned to recognize the notes of the robin, thrush, chaffinch, jay, and hawk. During the summer we collected all the different kinds of grasses that grew wild in the neighborhood, and have now forty-three varieties. This autumn we are collecting the various nuts and berries. Our "bungow" is in a small avenue of chestnuts, and on windy nights we are awakened by the rattling of the chestnuts on the roof as the pods burst and drop them. We are much interested in the many kinds of fir-cones growing here. You may be interested to know that we live within two minutes' walk of the Surrey home of Mr. Hancock, the great naturalist, who has recently died. We have spent hours in his garden—a collection of trees acclimatized from all parts of the world. Most of his valuable collections are in the New- castle Museum; but the birds in his house here are lovely, one case alone being valued at £100. —E. M. McDowell, Pres.

852, Willis, Montana.—The work of a "family Chapter" like ours is less regular, but not less interesting, than that of an organized society. All children are students of nature, if allowed to be so, and directed a very little; and we, the President and Secretary of Chapter 852, find ourselves pleasantly reviewing much while listening to the discoveries of the children, who have found a new flower, a curious insect, an interesting mineral, or, possibly, a "leed." Think of that! You will feel that we have been fortunate indeed to have such active members. Wherever we may go, Chapter 852 of the A. A. will go with us, and live and flourish.—F. A. Reynolds, Sec.

[These little "family Chapters" are among the very best branches of the Agassiz Association. What better means can any father and mother adopt of keeping their children with them in person and in spirit, than to unite thus with them in the daily study and observation of nature?—Ed.]

880, Grand Rapids, Mich.—We spent our summer on Mackinac Island, where many interesting observations were made and many valuable specimens taken. Here 133 species of birds, seven mammals, and eight reptiles were recorded. Bird migration began August 6, but it was not until the 10th that birds became common. Wilson's black-capped warblers first appeared August 24. On the 25th they were abundant, and, in reduced numbers, were seen until September 6. Two Connecticut warblers and an olive-sided flycatcher were taken. Nine Cape May warblers were also captured. In the early morning of September 6 the warblers appeared in immense numbers, thousands of them feeding along the edge of the bluff, and covering the bushes in one continuous flock. All the birds were moving restlessly, and every little breeze or puff of wind ruffled the waves, creating high over head, uttering loud calls, and settling reluctantly down again. After breakfast, much to our surprise, all excepting a few stragglers were gone. Fifty different species were observed. That afternoon gulls and terns were abundant, and we succeeded in taking one. —Gilbert White, Sec.

[We commend this excellent report to the attention of all our Chapters, as an illustration of the interest that attaches to a simple relation of details, as opposed to mere general statements.—Ed.]

882, Bedford, N. Y., [A.]—Sickness and death among the families of members prevented our meetings during the winter of 1890-91, but we began to hold them again with renewed courage on April 7. Our meetings have been very interesting. We have been able by economy to keep a small balance in our treasury. Living specimens from stagnant water have been shown, one of them being identified as the larva of a gnat. Some unfamiliar spider cocoons were kindly identified for us by Mr. H. F. Bassett, of Waterbury, Conn. Specimens of native ferns, pressed plants, a few sea-anemone galls, etc., have been added to our collection. A number of specimens of woods have been kindly prepared and presented to us by Dr. W. M. Ramsdell, of Brooklyn, N. Y. Papers have been read on "The Culture of Bacteria," "Spiders," "Hygiene," "Water Crowfoot," "Music Among Animals," "Northern Flora," and "Fruits." Three new members have been added. On the whole, we feel hopeful for the future of our society, and feel that we have been benefited by the efforts we have made to obtain a closer insight into the wonders and mysteries of nature. —Eloise E. Luquer, Sec.

883, North Weare, N. H. ("Chestnut Hill").—This "family Chapter" was formed on New Year's Day, 1890, with four members. Most of us are specially interested in botany, having formerly belonged to a botanical society. We are preparing an herbarium. Among our flowers are two somewhat rare in New England—the Rhodendron maximum and the Corryediella spectabilis. One member, who is specially interested in spiders, notices one species at work in this way: Having the radiating gyropoles fixed, they began at the center to make a light starging, the lines being nearly an inch apart. Then they began at the
outside and made the sticky lines from one-eighth to one-fourth of an inch apart, taking down the slender staging as they worked. They do their work in the early morning. He also stated that at one time he saw a great number of spiders’ webs floating on the breeze, which was slight. On one of them he thought he saw a spider passing at good speed. He saw a spider start from a hayrack “with incredible ease and rapidity.” One member has commenced the Gutenberg course of mineralogy. Another is specially interested in birds. Through the editor of “Ornithology” in the Observer, a bird that has been a puzzle for years has been named—the olive-sided flycatcher.—Henry Osborne, Pres.; Lucy P. Osborne, Sec.

SOME OF THE METHODS OF TRAPPING SMALL MAMMALS.

In your September issue I read the letter from Mr. W. Sheraton, stating the difficulty he met with in securing small mammals for his studies. Having had no little experience in collecting the forms he mentions, it is possible I can at least add a word or two to the replies I trust his letter will call out. Perhaps of all the smaller mammals none are more difficult to capture than the shrews; and I am indebted to Dr. George E. Dobson, F.R.S., of the medical department of the British Army, a pre-eminent authority on the Soricidae, for an excellent means of taking them. One must carefully study the brooks, runs, and water-ways of the region wherein he is collecting, for in such places the shrews are often present, are sure to be found. Often the little paths they make will be found along the edge of the streamlet or marsh-way. Now in the middle of several of these we must dig an excavation of sufficient depth to sink a large, wide-mouthed bottle, in such a way that the rim of the mouth just comes up to the level of the ground. Into this pitfall your shrews are sure to tumble, sooner or later, and you have them in the bottle at your mercy in the morning. Bats I have best captured by means of a hand-net, with large hoop and fine mesh. I have taken half a dozen in an hour or more in this way on the edge of the forest, with a lantern hung in a suitable situation on a tree. Of course if you can find their hiding places during the day,—as barns, caves, or hollow trees—you can often make a splendid capture. A collector of mine in New Orleans, several years ago, thus secured me some thirty specimens of a rare bat in a few moments. They were packed closely together under the eaves of a building. Moles I have often taken by patiently ruppip up their superficial burrows, and running them to their termination, where the occupant was finally secured. It is a great thing to be continually in the forest and about the haunts of the animals you desire. In the case of mice, I have taken many a one by suddenly pouncing on his nest, with both hands gloved, and thus having him within my grasp. In the case of woodchucks and other small rodents, the shot-gun and small-caliber rifle are not to be despised, nor are figure-of-four dead-falls and snare steel traps. Sometimes burrows are so near a building and were so available, that the occupants can be easily drowned out. I have often secured prairie dogs (Cynomys), badgers, and various species of gophers in this manner. In Forest wall Stream, under the article “Badger,” several years ago, I described an admirable Indian trap for that animal, and one that probably successful. By consulting the lists of books of the larger publishing houses of this country and England, or communicating with the publishers themselves, it will be found that a number of works have been published giving excellent information upon all such topics; and, among other means, I would advise your correspondent to try that also.

Sincerely yours,

R. W. SHUFELDT.

TAHOMA PARK, D. C.

PRESS NOTICES OF OUR CHAPTERS.

We clip the following from the Buffalo Express of January 9, and shall be pleased to receive similar clippings whenever they may appear:

AGASSIZ ASSOCIATION'S ANNUAL.

The annual meeting of the Agassiz Association [Chapter 132] was held at the Buffalo Literary Building last night. Several reports were read, showing that there had been considerable activity on the part of the members during the year. The Chapter is in a prosperous condition, thanks to the fostering care of the Buffalo Society of Natural Sciences, toward which the members feel much gratitude. The cabinet in the room occupied by the Association is filled to overflowing with rare and valuable specimens, collected by the members, and are mostly preserved. A special feature of the work mapped out for the coming year is a study of the formation of the boulders found in this vicinity.

The following officers were elected: Edward J. Weber, President; Edward W. Dennigan, Vice-President; Henry C. Gram, Jr., Treasurer; Richard F. Morgan, Secretary.

The following Chapters desire to be added to the roll of those agreeing to reply to all correspondents until further notice:

990, Brooklyn, N. T. (P); O. Doeringer, Secretary, East Lafayette, Ind.
81, Camnax, Conn. (A). On mineralogy, ornithology, botany, and geology. J. S. Adams, Secretary.

ORIGINAL OBSERVATIONS.

287. LOCAL NAMES FOR THE PEANUT. [See Note 265.].—Before the late war, I was always familiar with the name “goober” for peanut, used by our negroes in the low country, i. e., the coast. “Goober” is a corruption of “ inocula ”; another name for it is “Angola pea.” I think your member, Mr. James, will find “inocula” in some work on botany. You can easily see how “inocula” can be changed to “goobu,” “goobsa,” “goober.”—E. F. J.

288. PROBABLY TRUE FLAVIPE, OUR ONLY WRITING ANT. —Though not a member of the Agassiz Association, I wish to mention the discovery of an insect I have never before seen, and one of which I can find no description. I can give no minute account of its structure, but will say that it is of a pearly gray, has a soft-skinned body, cylindrical abdomen, and short thorax, and, from the flexibility of its head, the two seem to be separate; its motions are rapid and graceful. It is somewhat like an ant in its actions, though not so brisk and strong, but smooth and gliding. Its most remarkable peculiarity, however, is the fact that it builds upon the tree boxes in front of our house—which are of rough poplar board—a covered way, (in some places one-quarter of an inch, in some several inches thick), of grains of sand mixed with clay, running them upward from the ground into the box. This it does from within and below, coming to the open upper edge and building rapidly by depositing a grain at a time with a quick, adroit motion of its flexible head. This it does apparently in a fear of discovery and in much haste. “It seems to prepare the way for its work by cleaning off the fibrous, weatherbeaten surface of the wood, making a very smooth floor for its covered way. I suspect that it gathers this food for or to line its nest. I had intended to make further observations of its habit,

nest, etc., but have not had time. Its larvæ—of which I found a few specimens, as I suppose, along the course of its work—is of a dark gray, covered with hairs of different colors and lengths. I forgot to say that the end of the abdomen is bluntly rounded, without tapering as in other insects. I shall be much obliged if you or any member of your useful Association can tell me the name of the above insect. Very truly yours,—W. S. Ryland, Russellville, Ky.

The recital of our Chapters, as given in the preceding columns, is highly gratifying, and shows that the Agassiz Association is keeping well up to its high standard. All who are interested in this work, and who would like to help interest their young friends in similar studies, are cordially invited to join us. Illustrated circulars will be sent free on application.

ANCIENT CHINESE MINERS IN INDIA.—An interesting discovery has been made on the Haunci gold mine in the Mysore, says the Indian Engineer. While sinking the main shaft the workmen broke into an old shaft, dug perhaps a thousand years or more ago. There were found mining implements of various kinds used by the ancient workers. It is supposed the workings were made by Chinese, of whose presence in Mysore there is unmistakable evidence. The tools found are said to be very like those used by the Chinese and unlike anything known to be used by Hindus.

Some new discoveries have been made at Pomepi, near the Stabiana gate, and a description of the is given hereof. Nature states that three bodies were found, two being those of men and the third that of a woman. Not far from the resting-place of these bodies was the trunk of a tree, three meters in height and measuring forty centimeters in diameter. This tree, together with its fruits that were found with it, having been examined by the professor of botany, M. Pasquale, who finds in it a variety of Laurus nobilis. By means of the fruits, since they came to maturity in the autumn, he concludes that the eruption did not take place in August, but in November.

FLUORSPAR FOR OPTICAL INSTRUMENTS. —In a paper read before the British Association, Professor Silvanus Thompson dwells upon the remarkable advantages that colorless fluor spar, which is unfortunately much rarer than is generally thought, offers for optical instruments; the merits of having discovered its low dispersive power and other peculiarities belonging to Doctor Abbé. Professor Thompson has utilized such fluor spar for direct vision polariscopes by combining two outside prisms of fluor spar with one of Iceland spar. Such instruments are very convenient for an examination into dispersion and polarization.

Now is the time for each Chapter and each member to do his utmost toward extending the circulation of our official paper, POPULAR SCIENCE NEWS.

COMPLETE files of the POPULAR SCIENCE NEWS for 1890 will be mailed to any address for seventy-five cents each.

Reports from the Third Century (Chapters 201-300) should reach the President by March 1.
Among metallic products ever, dead matter has caused the greatest sensation, says Prof. Dr. Koch, in failing to obtain a substance resistant to the disease, tuberculosis, of cattle. The Associate Editors, the publishers, and the subscribers, to whose copies the editors are pledged, have been waiting for the report of this work. It is a matter of congratulation that the prize was not only awarded to an American astronomer, but to one who is so worthy of it in every respect.

In another column will be found the report of Dr. Koch regarding the composition and preparation of his lymph. Although somewhat unsatisfactory in giving the particulars of its manufacture, and containing many incomprehensible statements, probably due to errors in translation and telegraphic transmission, it gives a fairly good idea of the nature of the now famous lymph. As has been surmised, the effective substance seems to be a product of the organisms or tubercle bacilli, and is obtained by extracting it with glycerine from a nutritive fluid in which they have been cultivated for a sufficient length of time. It is noticeable that Koch has no definite explanation to offer, either of the exact chemical nature of the effective ingredient, or of the manner in which it exerts its remarkable influence upon tuberculous tissue. In fact, the quantity present in the undiluted lymph is so minute—a fraction of one per cent.—that investigations upon these points will be awaited with unusual difficulties. After all, perhaps the most interesting and important part of his report is found in the concluding sentence, in which he says that two consumptive patients inoculated three months ago have had no return of their symptoms, and are apparently cured. Fuller details, by mail, will be awaited with interest.

A word of commendation should be given to Dr. Koch for the eminently scientific way in which his great discovery has been announced to the world. From the moment of his original communication to the Berlin Medical Congress last summer, when he modestly stated the probability of the curability of consumption by this means, a most tremendous pressure has been brought to bear upon him from every side to divulge the secret of the remedy; but, realizing the incompleteness of his work, and the dangers attending the indiscriminate application of such a powerful and little understood agent, he steadily continued his investigations until his first results were confirmed, and, after a limited but careful experimental proof of the efficacy of the “lymph,” he has finally made a free gift of his discovery to the whole world.

To a less high-minded man the temptation to quackery would have been irresistible; as it is, this has been confined to writers on the subject, a number of whom have already issued splendid pamphlets, which have appeared under various titles, in fact, for their sensational articles, and have been compelled to confine themselves almost entirely to the imagination.

But bacteriological science is not only occupied in the discovery of a substance for destroying the lower forms of life it may be expected that a great deal may be done to mankind. It is stated that Professor Snow, the State Entomologist of Kansas, has successfully introduced a contagious disease among the chinch bugs which infect the grain fields of that State, by placing previously inoculated bugs in the fields among the healthy ones. It is claimed that the bugs in these fields were exterminated, and the farmers declare that their crops were thus saved from destruction. If this method of destroying this devastating insect proves successful on a large scale, it will be of the greatest economical importance—especially as it includes the probability of the destruction of other pests by a similar method.

A correspondent at Akron, Ohio, sends us an account of a sad accident, caused by the light dresses of several young ladies accidentally taking fire during some Christmas festivities in that city, by which two were fatally, and several others seriously burned. The danger arising from the high inflammability of light cotton and linen clothing has led to many attempts to render the fabric incombustible by treating it with certain chemicals. Among the best of these is the salt known as tungstate of soda; and, on receipt of our correspondent’s letter, we made some practical experiments with it. We found that when cloth, cotton wool, and similar substances were soaked in a strong solution of this salt and dried, they could be placed in contact with fire without burning into flame. The material charred and smoldered away, but there was no blaze, and the fire could be easily and quickly extinguished. The appearance of the treated cloth was unaltered, and, if necessary, it could be starched and ironed, although, of course, washing the cloth would remove the salt. Tungstate of soda is comparatively inexpensive, and in cases where there is danger of clothing taking fire it can be used in this way to great advantage.

The application of the stereoscopic principle to magic lantern pictures, by which they appear to stand out from the screen in relief, has been accomplished in a most ingenious manner. As is doubtless known to our readers, in the ordinary stereoscope two slightly dissimilar pictures are combined into one by means of properly formed lenses. In the magic lantern projection two lenses are used, and the two pictures thrown upon the screen so that they will be superposed upon each other, as in the familiar dissolving views, the only difference being that in one lantern a green light is used and in the other a red. These colors being complementary to each other, the combined images are observered under the usual white light. But if, now, the spectator places before one eye a piece of red glass, and before the other a green one, the combined pictures on the screen are separated, each eye seeing a different one corresponding to the color of the glass before it. But, by a well-known law of vision, the two separate and slightly differing images are re-combined by the eyes, and only one image is perceived, but in relief, the same as when looking through a stereoscope. The effect is said to be surprising, and the only disadvantage of the method is that when the pictures are shown to a large audience each spectator must be provided with a pair of spectacles fitted with glasses of the proper tints.

We recently noticed in a restaurant that the wires from which an incandescent electric light was suspended were completely encrusted with dead flies. The proprietor said that although they were constantly removed, they continually gathered from the air the dust and direct view of the fire, apparent danger fatal to every fly that touched it. The wings of every fly were outspread, as if death had occurred instantaneously at the moment of reaching the wire. It hardly seems possible that a current of such low intensity passing through an insulated wire could destroy even so small an animal as a fly; but such seems to be the case, and we offer this question freely to any ingenious inventor who may wish to devise a patent electrical fly-catcher.

The perspicacity of old superstitions is shown by an item which has been going the rounds of the newspapers. Last week in the Justice Court of Canada has decided to purchase a newly patented photographic apparatus, which will enable a copy to be taken of the image in the retina of the eye of a dead person. This is regarded as very important, especially in cases where there is no other clue to the perpetrator of the murder. The idea that the retina of a dead person retains the image after death has been an old one, but has no foundation whatever in fact; and the only image that could be photographed under such conditions would be the reflection of surrounding objects, which would, very likely, include the operator himself. We hope, for the credit of the common sense of our Canadian friends, that the statement is an incorrect one.

GARNER has obtained a chrome blue by melting together, in a linseed crucible: Potassium chromate, 48.64 grammes; fluor-spar, 50.55 grammes; silica, 157.0 grammes. The product is a glass of a fine blue, surrounded with a thin layer of metallic chromium, which is capable of being detached. Red, yellow, and green compounds of chromium have hitherto been known, and this last discovery completes the scale of colors, and shows that the metal well deserves its name.

ARTIFICIAL RUBIES.

In our issue for June, 1888, we chronicled the success of two French chemists, MM. FREMY and VERNET, in artificially producing rubies precisely similar in color and chemical composition to the natural stones.

On the 19th of last November the same chemists announced to the Paris Academy of Science that they had succeeded in preparing much finer stones, which were of a size sufficiently large to be set in jewelry, as shown by certain specimens illustrated in Fig. 1. As these rubies are precisely identical with the valuable natural stones, it is a delicate question as to how they should be valued commercially, as the only difference between them is due to the application of an artificial leg, and that produced by a freezing-machine.

The natural ruby is simply crystallized corundum, or oxide of aluminium (Al₂O₃), with a trace of coloring-matter, probably chromium. The
rubies originally produced by the French chemists
were made by heating to redness ordinary alumina
containing a little bichromate of potash with cer-
tain fluorides, particularly fluoride of barium.
The only difference in their latest mode of pro-
cedure is that the mixture rendered alkaline with
potassium bicarbonate, and the mingle of the
components purposely left imperfect so that the
combination should take place between the vola-
tilized elements, and the crystals could grow by
its brilliant blue tint, which has heretofore been
supposed to be due to a trace of cobalt, copper, or
some other metallic oxide giving that color. It
was found, however, in these experiments, that
blue rubies, or sapphires; were produced in the
same crucible as the red ones, although in much
smaller numbers; and in one case a crystal was
red on one side and blue on the other. It is thus
probable that the ruby and sapphire both over
their brilliant colors to the same metals—possibly
chromium in different stages of oxidation.
The accompanying illustrations are reproduced
from La Nature.

AN EXTRAORDINARY PROJECT.
The success of the Effi B Tower at the recent
Paris Exposition has developed a craze for novel
and audacious engineering feats, with the idea of
eclipsing that remarkable structure. The latest
project in this direction is that of a French en-
engineer, M. GARRON, who proposes to build a conical-
shaped carriage, sufficiently large to contain
fifteen persons, and, having erected a tower one thousand
or more feet in height, to allow the carriage to
drop from the top into a funnel-shaped reservoir
of water, which, it is expected, will bring the car-
rriage slowly to rest without shock or damage to
itself or its passengers.

After the process is completed, the rubies are
found adhering to the sides of the crucible (Fig.
2) in a crust of gauged nearly one inch thick, from
which they can be readily removed by simple rub-
bing. The largest rubies thus far obtained weigh
75 milligrams—about one and a quarter grains,
or one-third of a karat. Their crystalline form,
hardness, and physical characteristics were in
every way identical with the natural stones.
As is well known, the sapphire is chemically the
same stone as the ruby, only differing from it by

It is claimed that the mathematical conditions
governing the fall of such a carriage from a great
height have been carefully worked out, and that
the project is a perfectly safe and practical one,
worthy the attention of the managers of the com-
ing exhibition at Chicago. We are afraid, how-
ever, that even the offer of a free pass over this
aerial road would not tempt many persons to
undertake the journey, unless a few of those
cacks who delight in risking their worthless

"feeding," as is done with crystals by the wet
process. Another difference is in the manipula-
tion. Instead of using a gas furnace, they were
enabled, through the courtesy of M. Appert, the
glass manufacturers, to keep large crucibles
constantly heated for one week at a temperature of
2,400° F. In this manner batches of six pounds
were obtained out of ten-pound charges.

A heavy body falling from a height of a thou-
sand feet would attain a velocity of over two hun-
derd feet per second before reaching the ground.
This is much more than twice as fast as the swift-
est railroad train. The details of M. Garron's
scheme are shown in the illustrations. The con-
eshaped carriage is shown in Fig. 1. The pass-
engers are comfortably seated in easy chairs,
and, according to the author of the scheme, "the
rapid vertical fall will be a source of physiological
emotions which, with many persons, will be very
vividly appreciated."

lives might be induced to make a "trial trip." It
would probably not be any more dangerous than
going through the Niagara rapids in a barrel, as
several persons have safely done; but the possi-
bilities of the carriage falling to drop directly into
the well are too great to ever make the project a
popular one, and we are of the opinion that the
scheme will not be practically realized until
another century at least.

Assuming that the idea could be practically car-
rried out, it is an interesting question what would
be the effect produced upon the passengers in the
car. When riding at night over a smooth railroad
one is often almost unconscious of the motion, and
aeronauts say that they have absolutely no per-
ception of the motion of the balloon. It is most
probable that the fifteen passengers shut up in
Garron's car, with no communication with the
outside light or air, would be entirely unconscious
of the journey; and would have no physiological
emotions whatever, beyond a slight shock at the
commencement of the journey and—let us hope—
a not much more violent one at its aequus ter-
minal.

[Special Correspondence of Popular Science News.]

PARIS LETTER.
The Koch method for the treatment of tuber-
losis is, as might be expected, the topic of the
moment. If some journalists of the extra-radical
and extra-silly type—such as are always to be found
—are excepted, it must be recognized that the
whole scientific press and the larger part of the
daily one, all serious organs included, have hailed
Koch's discovery with the utmost satisfaction.
PERSONALLY, Koch is known to be an indefatigable worker and a conscientious one, and he has won for himself the honor he enjoys. But many Frenchmen—although they do know that, after all, Koch is only a pupil of Pasteur’s—and that all future discoveries in the matter of infectious diseases must be in part ascribed to Pasteur, who opened the way, literally—regret that the discovery and the cultivation of bacteria and mycelia has not advanced a step further in France. The Public Health Institute does not seem to have done anything on the subject, although it is rumored that important facts will be made known at some time; and, worse yet, that L'Œuvre de la Tuberculose, for which M. VERNEUILL has been of late years gathering subscriptions, and making a tremendous noise in order to make people believe that he and his friends are at last earnestly engaged in France. The Public Health Institute has not accomplished the slightest work, and has only been the ageney for the publication of some volumes of memoirs,—mostly clinical, generally not valuable,—in which the experimental method is as much ignored as it must have been in Noah’s epoch. This is most unfortunate, and in scientific circles comments on the state of science are heretical. Now that the Koch methods have been for some time in use in the hospitals, where some eminent physicians have been able to try it,—through Koch’s courtesy,—the general opinion, very sanguine at the beginning,—hyper-sanguine, if I am allowed to coin the word,—is much more sedate. Of course I speak only of the physicians’ opinion and that of those who have tried the effects of the lymph. Their opinion is this, that a good deal must be done before any definite conclusion may be obtained; and they generally advise their patients not to ask for lymph injections. The first enthusiasm—which was exaggerated—is much abated, and it is felt that the remedy is not what it was expected to be. It may, however, be less, and for all that remain a valuable acquisition, even if it does not cure or inhibit tuberculosis under any or all forms. Time will tell. In the meanwhile, two French professionals, MM. Héritier and Court Richet, have made known the results of interesting experiments of anti-tuberculous vanculation on animals, by two different processes: injection of heated cultures, and of dog’s blood (on rabbits). The details of the experiments are to be found in the proceedings of the Société de Biologie for November and December.

The lack of criticism of some so-called men of letters and journalists is something astounding. The Petit Journal, the most popular paper in France, and the Nouvelle Revue—which is edited by Madame Juliette Adam, who writes on politics and being so she is the best adviser of the Ministry of Foreign Affairs on external politics generally—both concur in giving their highest praise to a quack recently arrived in Paris, who cures tuberculosis with grass juice and bottled electricity (of live sordis and prices, of course), and who has hardly time for sleeping or eating, and none for the remainder of the human functions, on account of the throng of patients. Human folly is an unwearable garment, and a schema of poverty of mind, manifestations on the probable condition of some human brains.

I cannot quit the topic of microbes without informing you that a big book has been recently published on the Microbes de la Bouche, by Dr. Th. David, and am confident that it will make our readers happy to hear that our mouth and alimentary canal are the "paradise of microbes," and that among the flora of the mouth, "as this poetical dentist has it,—which contains certainly some hundred species, many are most dangerous, and are lying in wait for an opportunity of pouncing upon the patient. M. VERNEUILL has called this a state of "latent microbeism"—a par of new words to cover old facts. Among the pathogenetic microbes waiting for an opportunity with unifying and unending patience, we notice those of pneumonia, of tuberculosis, of diphtheria, etc. It is a pleasant sensation to feel that one is living with such admirable creations, providing with them heat, food, lodgings, etc., that "latent microbeism" is merely latent death!

For some years agricultural matters have been the subject of great care in France, and many are the men who endeavor to develop agriculture. This is one of the reasons of the publication, by the Hachette firm, in Paris, of a splendid Dictionnaire des Sciences Agricoles, which is now completed, in four volumes. It really is, as it claims to be, a complete agricultural cyclopedia, and when it is considered that its contributors are Servillet, Barral, Riser, de Vilmonir, Delerain, Ducuan, and some twenty others, one cannot wonder at its success. This sort of work is to be encouraged in all parts of the world.

There remains to be mentioned the first agro-hygienic instruction in all university towns in France. The government intends to revert in part to the old university system, and to confer the name of "University" to the group of scientific and literary faculties in five or six towns in France. Who are to be the favored six? Lyons and Montpellier are at the head of the list; Nancy and Lille are likely to come after. But for the two last vacancies a fearful competition is going on; Toulouse howls, Bordeaux despairs, Marseilles offers heaps of money, Dijon—the mustard town—is said to agitate itself, and Grenoble listens to its death-toll. Many small towns, in which one or two of either of the four faculties required for the new universities are present, are sure to be out; the students will always prefer a town fully endowed, and the State really wishes that only five or six wholly well-equipped universities should represent higher education in France.

PARIS, Dec. 24, 1890.

SOMETHING ABOUT PEPPER.

BY ANNA HINRICHS.

The German expression, "Wurde er woere where the pepper grows," is indicative of the fact that the home of this much-used spice is in a region that is much hotter than ours. In fact, pepper is transported miles and miles, or land and sea, ere it reaches the American table.

Black pepper (Piper nigrum) is native along the coast of the East Indies; also in Ceylon, Sumatra, Borneo, and Java. In these localities, and also in the West Indies, it is cultivated in enormous quantities. Being one of the best and most indispensable of spices, its use was already known and employed by the ancients. Its original Sanskrit term, "pippap," altered by the Persians into "pippard," has, with but slight transitions, gone unchanged into all languages. The Romans, duty on pepper being exorbitantly high; consequently, its use was rendered an expensive luxury. Even centuries later, after the great Italian cities of commerce, Venice and Genoa, assumed almost exclusive monopoly of this trade, its prices remained exceedingly high. By its traffic enormous wealth was amassed by the merchants of these and other cities. Duty on this, almost an article of necessity, remained unreasonably high all through the Middle Ages. Indeed, its valuation was so great, that in the time of the money famine (year 1400) it was given and accepted in lieu of cash. Fortunately, with the discovery of navigation to the East Indies, the price was lowered. Gradually its propagation was on the increase. It was transplanted to the West Indies, and produced in almost incredible quantity. Nevertheless, the demand was in excess of the supply. In quantity of export it far outranks that of any other of the spices. Fully half the amount of exportation is supplied by the island of Sumatra. Excluding Europe, China is reputed to import the greatest quantity of pepper. As it is needless to repeat, rice is a daily article of subsistence in that country. This general article of diet they season—and that liberally—with pepper. The same may be said of other inland where rice forms the staple article of existence.

Pepper, in its natural state,—that is, the kernel,—is the fruit of a plant of creeping or climbing habit and of branching growth. It attains a height of somewhere thirty feet. Its leaves are short-stemmed, uniform, and pointed. On the immense East Indian pepper plantations, the young cuttings are set out in long rows and trained on poles. In this particular it bears a striking resemblance to a hop-field. The plant bears fruit in its first year, but not to any great extent. It is most prolific from its fourth to its twentieth year.
The present December has been an unusually cold one, having been exceeded only three times in the last twenty years. The lowest point reached by the mercury was 2° below, on the 30th, and this was the coldest day, with an average of 10°. The highest point was 48°, on the 23rd, which was also the warmest day, averaging 39.3°. The entire month was 4° below the mean in December for twenty years. The monthly range during this period has been a full 15.5°; the daily range the present December was 46°. The daily extremes of this month in twenty years have been 45° in 1888, and 65° in 1873,—a range of 7°.

The average temperature the last year was 48.58°, or 0.87° above the average for the last twenty years. For the extremes see above table. The unusually warm January and February more than counterbalanced the cold December. The almost equal temperature of January, February, and March, 1890, was remarkable. Co. January was only 1.14° below March.

The face of the sky the last month, in 53 observations, gave 48 fair, 16 cloudy, 18 overcast, 7 rainy, and 4 snow,—a percentage of 51.6 fair. The average fair the last twenty Decembers has been 50.1, with extremes of 49.5 in 1887, and 52.5 in 1877,—showing 1.5 per cent. more fair than usual; although there has been a very heavy amount of precipitation.

The last year was remarkable for unusual cloudiness, being nearly 5 per cent. less fair,—or more cloudy,—than usual, including eight of the twelve months.

PREFECTION.

The amount of precipitation the last month,—including at least 10 inches of melted snow,—was 7.87 inches. The average for the last twenty-two Decembers has been only 4.13 inches, with extremes of 0.73 in 1875, and 7.89 in 1884,—the only instance barely exceeding the present. This large amount fell almost entirely on three days, as follows: 4.30 inches on the 17th, 2.24 on the 20th, and 1.15 on the 5th. About 1 inch of snow fell on the 3rd and 9th, and 8 inches or more the 29th. The snow fell rapidly nearly all day, with but little wind, till about dark, when it changed to rain, and, again growing cold, left the snow in good condition for excellent sleighing until the present time.

The amount of precipitation the last year was large, being 54.54 inches, including 43 inches of melted snow. Nearly half of the entire amount of precipitation fell during three months,—March, October, and December,—leaving most of the growing season deficient. The average amount the last twenty-two years has been 47.46 inches, with extremes of 32.28 in 1883, and 64.40 in 1888.
will rapidly diminish until the rings disappear in the autumn. Uranus is still in the constellation Virgo, rising somewhat before midnight. It is nearly stationary among the stars, moving first a little eastward, and then (after February 4) moving more westward; but the whole motion is only about half the diameter of the moon. Neptune is in quadrature with the sun on February 22. It is in the constellation Taurus, a little west and north of the group of the Hyades.

The Constellations.—The positions given for 10 P. M. February 1, 9 P. M. February 15, and 8 P. M. February 28. Gemini is near the zenith, the principal stars, Castor and Pollux, being a little south and east. Canis Major, with the first magnitude star Procyon, is on the meridian to the south; and is to be seen near is the brightest of the fixed stars. Cancer is just east of Gemini, and Leo is about half-way from the eastern horizon to the zenith, while Virgo is just rising in the east. Ursa Major is high up in the northeast, and Bodie is below it on the horizon. Ursa Minor and Draco lie principally to the east and below the pole star. Cassiopeia is in the north-west, and Hydra is in the south-west. Just west of the zenith is Auriga; below this and a little to the north of west is Perseus; and Andromeda is near the horizon, below Perseus. Taurus, with the groups of Pleiades and Hyades, is a little south of west, and below it are Ariete and Piscis Austrinus. Orion is about half-way between Taurus and the southern meridian, the principal stars being at a little lower altitude than those of Taurus.

LITERARY NOTES.


This interesting little work is exactly what every student and lover of nature needs to guide him in his studies of the countless forms of common insects and the wonderful life and habits of the insect world. All the various species and varieties are fully described and beautifully illustrated, while a personal and intimate account is given concerning their structure, life, and habits. No better book can be found for these Chapters of the Agassiz Association devoted to the study of natural history.


This work is published as a "manual for advanced students," but it seems equally well adapted for beginners in chemistry who intend to pursue their studies beyond the usual elementary course. The arrangement and treatment of the subject is most excellent, and includes the most recent advances and discoveries in the science. The work is worthy of the attention and favorable consideration of both teachers and students of chemistry.

Greek for Beginners. ($1.00), by Edward G. Cox, M.A., is a recent publication of the American Book Company which is equally valuable with its previous issues of educational textbooks.

Messrs. Funk & Wagnalls, New York, are about to publish a new single-volume Standard Dictionary of the English Language which will comprise many new and valuable features. Full information about this book may be obtained by addressing the publishers.

The American Annual of Photography and Photographic Times Abroad should be in the possession of every photographer. The large amount of useful information and numberless practical hints which it contains is simply marvelous. The book is illustrated with artistic photo-gravures from the negatives of the most celebrated artists. Published by the Scribner & Co., New York Company. Price, 50 cents.

Lee & Shepard, of Boston, have favored us with the All Around the Year Calendar, which is one of the most complete and popular of all work. Each calendar for every month is embellished with a unique and beautiful drawing, the whole forming a pleasant souvenir of the year 1891.

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shows a strange change. It becomes hard and assumes a darker coloring, which is not confined to the inoculation spot, but spreads to the neighboring parts until it attains a diameter of from 0.05 to 1 cm.

In a few days it becomes more and more manifest that the skin thus changed is necrotic, finally falling off, leaving a flat ulceration which usually heals rapidly and permanently without any involution of the adjacent lymphatic glands. This is not associated with any noticeable condition. The further development of the lesions is the same.

The blood has coagulated, and becomes necrotic, but even in a more concentrated form than the original glycerine solution. It can be precipitated by it, though not, indeed, in a pure condition, but still combined with the other extractive matter. It is likewise insoluble in alcohol. The coloring matter may also be removed, rendering it possible to obtain from the extract a colorless, dry substance, containing the effective principle in a much more concentrated form than the original glycerine solution.

For application in practice this purification of the glycerine extract offers no advantage, because the substances eliminated are unessential for the human organism. The process of purification would make the remedy unnecessarily high.

Regarding the constitution of the more extractive substances, only surmises may for the present be expressed. It appears to me to be derivative from albuminous bodies, having a close affinity to them. It does not belong to the group of so-called toxalbumins, because it bears high temperatures, and in the dithyizer goes easily and quickly through the membrane. The proportion of the substance in the extract to the total appearance is very small. It is estimated at fractions of one per cent., which, correctly, we should have to do with a matter whose effects upon organisms attacked with tuberculosis go far beyond what is known of us of the strongest drugs.

Regarding the manner in which the specific action of the remedy on tuberculous tissue is to be represented, various hypotheses may naturally be put forward. Without wishing to affirm that my view affords the best explanation, I represent the process myself in the following manner: The tubercle bacilli when growing in living tissues, the same as in artificial cultivation, contain certain substances which variously and notably unfavorably influence living organisms in their vicinity. Among these is a substance which, in a certain degree, may be regarded as a poison, kills off the animal protoplasm that it passes into a condition that Weigert describes as coagulation necrosis. In tissue thus become necrotic the bacillus finds such unfavorable conditions of nourishment that it can grow no more and sometimes dies.

This explains the remarkable phenomenon that in organs newly attacked with tuberculosis, for instance the lungs, the caseous material develops with a peculiar condition of the new tissue, the caseous necrosis, consists almost entirely of whitish substance in a condition of coagulation necrosis, as is often found in cases of natural death in tuberculous guinea-pigs. The single bacilli cannot, therefore, be isolated from the caseous for a long time; the necrosis is the cause of the extent of the growth of the bacilli subisd and therewith the production of the necrotizing substance. A kind of reciprocal compensation thus occurs, causing the vegetation of isolated bacilli to remain extra-ordinarily restricted, as, for instance, in lungs, and other necrotizing glands.

In such cases the necrosis generally extends only to a part of the cells, which then, with further growth, assumes the peculiar form of a cylindrical, or giant cell. Thus interpretation, first follow the explanation Weigert gives of the process generally. If now one increases artificially in the vicinity of the bacillus the amount of nutritive substance in the tissue, the necrosis would spread a greater distance. The conditions of nourishment for the bacillus would thereby become less unfavorable than usual.

If I increase, therefore, the blood vessels in the vicinity of the bacillus, the necrosis must extend even further, but still cut off the neighboring vegetation that would much more speedily be killed than under ordinary circumstances.

It is just in looking at such changes that the effect of the remedy appears to consist. It contains a certain quantity of necrotizing substance, a correspondingly large dose of which injures certain tissue elements even in a healthy person, and perhaps the blood-corpuscles or adjacent cells, thereby producing fever and a complication of symptoms; whereas with tuberculous patients a much smaller quantity suffices to induce at certain places—namely, where tubercle bacilli are vegetating and how already preaggrigated the disease may be there to the necrotizing matter, more or less extensive necrosis of the cells, with the phenomena in the whole organism which result from and are connected with it.

For the present, at least, it is impossible to explain the specific influence which the remedy, in accurately defined doses, exercises upon tuberculous tissue, and the possibility of increasing the doses with such substances, rendering it more or less effective, more or less extensive necrosis of the cells, with the phenomena in the whole organism which result from and are connected with it.

No bacilli have appeared in their spumon for the past three months, and their phthisical symptoms have gradually and completely disappeared.

[Specially Compiled for Popular Science News.]

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARKE, M.D.

THE RATIONAL TREATMENT OF PNEUMOCONIA.—The medical profession has long turned interest of reports of new and curative drugs in pneumonia. When, however, an ingenious, logical, and sensible application of known physiological data is made to the therapeutics of this disease, a more scrutinizing attention is called for. An article by Dr. H. Smith, in "Acute Obstructive Diseases of the Lungs," (American Journal of the Medical Sciences), has all the characters just mentioned. Dr. Smith shows that in an obstructive lung disease like pneumonia it is the right heart that bears the chief burden. The physician ought, therefore, to watch it with even more care than the right heart. The pulmonary artery pulse cannot be felt, but its strength and that of the right heart can be gauged by the intensity of the pulmonary artery valvular sound.

In an obstructive pneumonia the blood is dammed back into the veins, and there is venous congestion, while the arteries are not full enough. The therapist should aim, therefore, to diminish congestion of the lungs by taking away blood from the veins by venesection. But a safer method is to use such drugs as utropeine and the other amines. Alcohol is also
thought to be of great value, not only as a general stimulant and food, but as an arterial depressor. Dr. Smith asserts that too much food, especially liquid food, should not be given to pneumonia patients, as this embarrasses digestion and fills up the circulatory system with fluid. Oxygen gas and artificial respiration are also recommended, to be used even before the patient's condition is critical. Digitalis should not be used in most cases of pneumonia. This is a dietum supported by good authority and large experience. Yet digitalis continues to be given.

Dr. Smith's contribution to the therapeutics of pneumonia is the best that has been made for years. Yet he makes no allusion to antipyretics or baths. His conclusions are given as follows:

1. In acute pulmonary obstruction, the patient, being from exhaustion of the right heart, the pulse at the wrist does not give reliable indications as to the gravity of the condition.
2. This can be appreciated more correctly by studying the pulmonary circulation by the aid of the pulmonary valve-sound.
3. Marked accentuation of the pulmonary valve-sound indicates a fairly vigorous right heart laboring to overcome resistance in the pulmonary circulation.
4. Decrease of previously existing accentuation, with only moderate dyspnoea, indicates decrease of pulmonary obstruction.
5. Decrease of accentuation, with increase of respiratory distress, indicates that the right heart is becoming exhausted.

6. Relief is to be sought: a, by regulating the diet in conformity with the diminished power of digestion and sanguification; b, by the use of medicines which dilate the arteries and promote transference of blood to them from the veins; c, by the inhalation of oxygen gas; d, by artificial respiration; e, by placing ligatures about the extremities in order to retain the blood in them and prevent its return to the heart.—N. Y. Med. Record.

The Influenza in Massachusetts.—The Secretary of the Massachusetts State Board of Health closes his annual report with the following interesting facts about last winter's epidemic:

1. The first appearance of the Influenza in Massachusetts was on October 12th. It was stated to have been on December 19 or 20, and the place of its first appearance was Boston and its immediate neighborhood. 2. It increased rapidly in the number of persons attacked, and reached its crisis generally throughout the State in the week ending January 11, 1890, after which date it gradually declined in severity, and had nearly ceased as an epidemic by February 10th, so that the duration of the epidemic was about seven weeks. It reached its crisis earlier by several days in Boston than in the smaller cities and the remoter parts of the State. Its course was still later in Nantucket, Dukes, and Barnstable Counties.

3. The ratio of the population attacked was about forty per cent.—or more exactly, as indicated by the population statement of the census, about eight hundred and fifty thousand persons of all ages. 4. People of all ages were attacked, but the ratio of adults was greatest; of old people next, and of children and infants least. 5. The weight of testimony appears to favor the statement that persons of the male sex were attacked in greater number and with greater severity than females. In fact, in many of the cases, the attack (acute stage) was from three to five days.

7. The predominant symptoms were mainly of three general groups—nervous, catarrhal, and enteric, the last being much less common than the others; the special symptoms most observed in the nervous group being extreme depression, pain, and weakness; in the catarrhal group, cough, dyspnoea, and coryza; and in the enteric group, nausea, vomiting, and diarrhea. 8. The chief diseases which followed in the train of influenza, and were intimately associated with it, were bronchitis and coryza. In the majority of cases, the victim of the attack, was undoubtedly aggravated; and, in many cases, a fatal termination was hastened. 9. The ratio of persons attacked in industrial and other establishments employing large numbers was about 35.5, per cent., or less than that of the population at large. That of the inmates of public institutions was still less—twenty-five per cent. 10. Those who were obliged to leave their work on account of illness from influenza was about twenty-seven per cent. of the whole number employed. 11. The average length of their absence from work was five days. 12. Special occupations do not appear to have had a marked effect in modifying the severity of the epidemic upon operatives in such occupations. While the atmosphere may constitute one important medium of its communication, human intercourse also suggests itself as an equally important factor.

Distribution of Tubercle Bacilli outside the Body.—The following are the most important results of Cornet's investigations on this subject:

1. In the dust of rooms of private patients suffering from consumption, Bacilli were found always to expectorate into a spitting-cup, and never into a handkerchief or on the floor, tubercle bacilli were never found; if, on the contrary, they expectorated into a handkerchief or on the floor, bacilli were always present in the dust. 2. The dust of most consumptive wards in hospitals contained tubercle bacilli. 3. The air of two polyclinics, of a theatre in a pathological institute, of the dormitory in an orphan-house, of several streets, and of several public buildings, was found free from bacilli. Tubercle bacilli are incapable of multiplying and nourishing except in the tissues of men and other animals. Many cases of tuberculous disease are due to the ingestion of bacilli in meat, and especially in milk; but in most cases in consumption the virus is derived from other consumptive patients. The breath of such patients does not contain bacilli—the spumum is the means of infection. From moist spumum bacilli can never get into the air; it is when the spumum becomes dry and is converted into a fine powder that it becomes dangerous. It can easily be understood that as long as the spumum is expectorated into a spitting-cup, with the damp of infection is slight; but if the spumum is deposited on the floor or in handkerchiefs, towels, etc., it soon dries, and movement and friction—e. g., shaking and using the handkerchief—really convert it into powder which can float about in the air. When spumum is expectorated in the open air, as in streets, the danger of infection is slight. Rain dilutes the moisture, and the damp of infection is less; and if it does dry and become coagulated the winds dilute it to an infinite degree and blow it away. The practical rules which Dr. Cornet lays down are: Consumptives should never expectorate into a handkerchief or other cloth, or on the floor, but should always use a suitable spitting-cup, in which some fluid may be kept in the state of a thin paste. When expectoration is ever unavoidable, the handkerchief should be at once boiled and washed. Consumptives should not be kissed; if this must be done, the forehead or cheek should be chosen rather than the mouth. Spoons, glasses, etc., used by consumptives should be carefully cleaned.—The Dublin Journal of Medical Science.

The Value of the Cystoscope.—Dr. O. K. Newell, of Boston, who has had considerable experience in the use of the cystoscope, quotes Nitzche as stating that by the aid of the instrument we are enabled to determine with the cystoscope whether or not two uretal orifices are present, which is of great importance in those cases where a second kidney does not exist. We are enabled to see whether or not both orifices empty fluid into the bladder, and further we can observe by extended observation whether the fluid comes in equal quantity from both sides, whether it is clear or cloudy, and whether the urine has a metallic or milky appearance is due to the admixture of pus or blood.

Dr. Newell adds that this tussle with his own experience, and that the cystoscope is of great diagnostic value in determining whether hematuria, e. g., comes from disease of the bladder or farther up the urinary tract.

Examination of the Spumum for Tubercle Bacilli.—Kühne, Wiesbaden, (Centr. f. Path. und Parasitenk.), after referring to the failurces and difficulties with which the search for tubercle bacilli in spumum from phthisical patients is surrounded, describes a new method of staining the bacilli. When it is difficult to spread out the spumum on a cover glass he uses a concentrated solution of borax, to which at least an equal quantity of spumum is added. The mixture is shaken up in a suitable glass, or is worked up in a mortar, after which it is easily spread in a thin layer over the cover glass. Nunnular sputs from cavities may be broken down by a watery solution of carbonate of ammonia; this has the advantage that it is partially volatilized as soon as the cover glass is heated, and what remains is broken up by the action of the acid. An equal layer on the cover glass being obtained, the albumen is coagulated by careful heating over a flame, after which the specimen is stained in Ziehl's fuchsin solution for five minutes, the color is completely removed with a 30 per cent. solution of nitric or sulphuric acid, and the specimens are washed in water and dried. In order to obtain a contrast stain, two or three dilutions may be used. If aniline oil in aniline oil may be added to a watch glass containing pure aniline oil; a drop of this, placed on the slide before the cover glass is lowered into position, gives a sufficient yellow contrast stain to cause the red tubercle bacilli to stand out very prominently. They may be examined with a magnifying power of x50 to x100, and where they are in great number, as is the rule in "cavernous" sputs, they appear under still weaker magnifying power as particles of red dust on a yellow ground. To make a permanent preparation, Kühne recommends that the aniline oil be driven off by means of his hand blower, and that the specimen be mounted in Canada balsam. By this method the tubercle bacilli only are stained.

The Treatment of Enlarged Bursa and Ganglia.—Mr. Bond states in the Practitioner, that he is strongly in favor of the treatment of enlarged bursae in the neighborhood of large joints by the radical method of excision of the whole or a large part of the cyst-wall. In dealing with those swellings in the popliteal space, the incision must be made well down to the cyst-wall before beginning any dissection; if this be done, and the cyst well defined while tense and
before it is opened, it can be isolated without dif-
feulty. It is then best to lay it open, and ascer-
tain from within what extensions and communica-
tions it has; these must be dealt with, and then
as much of the cyst-wall removed as possible.
In dressing the wound, pressure should be applied
with wool dressing, and the limb bandaged in a
semi-flexed position, so that the skin and soft
parts fall together, and a tightly-stretched scar
is avoided. The same method may be extended to
the enlarged bursae over the olecranon and pat-
tella. The treatment of the swelling in the
sheaths of the tendons in relation to the wrist-
joint is next discussed. Those simple ganguila
which are too large to rupture, are best treated by
excision; an incision is made over the swelling,
which is isolated as far as possible; it is then laid
open and its prolongations defined; as much of
the cyst-wall as can be isolated is then cut away,
and the posterior portion lying over the wrist-
joint is left. As a rule, the wound heals by first
intention without any adhesion of the tendons.
In cases of compound ganglia, the operation is
sometimes very complicated, the tendons being
stretched over with a velvety membrane and vas-
cular fringes, like the lining membrane of the
cyst-walls. In these cases the tendons must be
picked up separately and systematically cleaned
one by one, after this is done, the wound should
be stitched up, and, as a rule, good movement is

SCORIASIS OF THE LUNGS IN PORCELAIN
WORKERS.—Dr. Lemaistre has published a paper
upon scoriases of the lungs as induced in the work-
ers in porcelain. Sections of the lungs are gen-
erally colored, according to the material that has
been introduced; but here the lung is blackish,
although the substance introduced may be white,
owing to inflammatory conditions. The symptoms
are analogous to tuberculosis, and the diagnosis
is difficult. The posterior aspect of the lung is most
frequently the seat of the scoriases. Sometimes the
sounds of pulmonary emphysema, or of pleur-
ery, may be heard. It is, however, differentiated
from emphysema by the absence of tympanitic
sounds. The sputa are characteristic. There is
no hectic fever or nocturnal sweating. Men are
more frequently attacked than women. He has
found haemorrhage in the spuva, and regards the disease as
tuberculous etiology. The silicious particles
produce ulcerations in the bronchiole, upon which
the tubercular matter is grafted, and continues
to exert an irritant action which induces hyperplasia
of the connective tissue. This, to a certain ex-
tent, is salutary. Jodides constitute the best
treatment in this form of scoriases.—Le Progrès
Medical.

THE CHOLECYSTITIS.—Professor Tes-
sler, of the medical faculty of Lyons, has returned
from a journey sent last March to take evidence upon the
cause of the disease and the various conditions of its
evolution. He found that inflammation is a growth of Russian soil.
and when not a raging malady is a smoldering one.
The way the people live in winter, locked up in heated houses; the flatness of the soil, its consequent bad drainage, and universally sodden
condition of the public rooms have been blamed,
the dampness of the farmyards, the village streets, and
the rivers, which become suddenly swollen, and on
falling leave a putrid mud behind; all conduce to
make influenza endemic. Its microbe is, in fact,
to be found in this mud. Dr. Tessler calls it a
strophi bacillus. What is peculiar in this disease
is the alliance with this bacillus of pneumococcus,
which also lives in Russian marshes, river mud,
and village pools.

A CIGARETTE IN THE BRONCHUS FOR FOUR
MONTHS.—Dr. Lapeye mentions in a Paris medi-
cal journal a remarkable case in which an elderly
man continued to smoke the cigarette he had
back, unconsciously drew the cigarette he was
smoking into his right bronchus, where it re-
mained without causing any symptoms or in any
way revealing its presence for nearly two months,
when it set up pneumonia of a circumseribed area,
and produced cardiac weakness and some edema of the legs. After this condition had lasted with-
out much change for about two months the pat-
ite expelled, during a violent fit of coughing,
the cigarette, enveloped in mucus and waxy-look-
ing matter, and then remembered that he had
never found his cigarette after the slap on the
back four months before. The pneumonia per-
sisted for two or three months after the expulsion
of the foreign body, and some edema of the right
leg, due probably to obolism, remained at the
date of the report nearly a year later. This, as
well as some other cases that have been published,
appears to show that the bronchi are exceedingly
tolerant of foreign bodies even when not encysted.
—Lanced.

GRATING THE THYROID FOR MYXEDEMA.—
The operation of grating the thyroid in a case of
myxoe dema has again been performed with suc-
cess. The patient was shown at the recent meeting
of the Société Médicale des Hôpitaux in Paris; the
thyroid graft was taken from a living sheep at the
time of the operation; no antisepsis were used,
but the graft and wound were kept carefully ase-
tptic. Healing occurred by first intention, and the
patient, a woman aged forty-one, improved con-
siderably. The improvement appeared to be due
great in part to the arrest of myxedema, from
which the patient had previously suffered for
months at a time; the hemorrage ceased three
days after the operation, and had not recurred
when the report was made three months later.
The swelling of the face had decreased, the
pseudo-lipomata diminished, and the mode of
speaking became more natural.—British Medical
Journal.

THE OPERATION OF THE REMOVAL OF THE GES-
SERIAN GANGLION FOR JOINT-FLAET.
—This operation was shown at the recent meeting
of the Société Médicale des Hôpitaux in Paris; the
thyroid graft was taken from a living sheep at the
time of the operation; no antisepsis were used,
but the graft and wound were kept carefully ase-
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days after the operation, and had not recurred
when the report was made three months later.
The swelling of the face had decreased, the
pseudo-lipomata diminished, and the mode of
speaking became more natural.—British Medical
Journal.

A HUMOROUS HEALTH OFFICER.—The Michigan
State Board of Health recently took Health Officer
Davis, of the Village Proprietors, to task for failing to
fulfill his duty in a recent report. His reply was un-
expectedly logical. He says: "There has not been enough sickness here
in the last two or three years to do much good. The physicians find time to go to Milwauk-
ee on excursions, serve as jurors in justice courts, sit around on dry-goods boxes, and beg tobacco,
chev gumm, and swap lipes. A few sporadic cases of "wet" have been treated mostly by old women, and no deaths occurred.
There was an undertaker in the village, but he is now in the State prison. It is hoped and
expected that when green truck gets around, melons plenty, and cucumbers in abundance, that
something may revive business. If it does I will
let you know!"
The automatic pedestrian is a curious little toy, interesting from its very simplicity. It consists (Fig. 1) of an inclined plane formed from a piece of wood and some bent wires, and a small figure of tin, the legs of which move freely on a pivot of wire, as shown in the enlarged drawing. Two other wires passed through the body of the figure prevent the legs from moving beyond the length of an ordinary step. In its hands is placed a piece of wire bent into the shape of a V. This serves as a balance-pole, and when the figure is placed on the board it brings the center of gravity below its feet, so that it will retain its upright position. If, now, the "pedestrian" is placed at the top of the inclined plane, he starts off and walks rapidly down towards the lower end, throwing his weight from one foot to the other in a quite natural manner. When it is considered that there is no machinery at all concealed in the figure, the result is quite surprising, but is easily explained as the result of the slight oscillatory motion given to the figure by the balancing-wire.

It is, in fact, a pendulum, and as it swings from side to side, the point of support is shifted automatically from one foot of the figure to the other, while the weight of the whole causes it to fall or walk down the inclined plane in a very natural and amusing manner.

A very pretty stage trick was recently introduced in a play at a Paris theatre, where certain robbers were exhibited, which, when lifted from the chest in which they were contained, shone with a golden or silvery light, and were, apparently, self-luminous. This beautiful effect was obtained by placing a powerful electric light underneath the stage, and reflecting its rays through the stage and into the chest, through openings provided for the purpose. The chest was filled with a light, thin, yellow gauze, which, when lifted out, reflected the light in all directions, in a manner analogous to the illuminated fountains and jets of water which were such a feature of the last Paris Exposition. To obtain a silvery or "moonlight" effect, blue gauze was substituted, and a piece of blue glass placed before the electric light. When the scene was finished, the robes were replaced, the "traps" in the stage and the chest closed, and the chest could then be lifted and removed from the stage, making the illusion complete. Modern stage effects owe much to the discoveries of science, and especially to the various manifestations of electricity, the ease with which this agent can be handled and applied, and the surprising phenomena exhibited by it, rendering it peculiarly adaptable to this purpose.

Brass is, perhaps, the best known and most useful alloy. It is formed by fusing together copper and zinc. Different proportions of these metals produce brasses possessing very marked distinctive properties.
As the popular science new.
batic exhibition that is unsurpassed anywhere; and, secondly, he is supposed to be a steady consumer of microbes,—those invisible horrors which fill the air with danger to man,—a benefit so insensible that, though it fails to do so, it should serve the ends of good and praiseworthy ends, to more tender and pardonable in our eyes all its puny teachings.

A favorite field for the display of his agility is the window, where he amuses himself by the hour in alternately walking over the panes and buzzing up and down them. How does he do it? How accomplish the walking? How manage to cling to that smooth and slippery surface? or, still more marvellous, to move equally well upon the ceiling? Does anyone surely know? Men of science have made a study of it,—have spent weary days and years in attempting to solve the problem. Each has had his theory. There have been plausible conjectures; sure discoveries made, only to be afterwards proved mistaken. The latest,—and just now it is very well received,—is that the hairs, which thickly cover the membraneous discs of the fly’s foot, themselves terminate in minute discs. These exert a power of suction, which, by means of their number, becomes sufficient to support the weight of the fly, while at the moment the suction is exerted a fluid exudes from the hair-discs which adds to their adhesive power. This may prove to be the true explanation of a phenomenon that has baffled clever men for ages.

At the approach of cold the swarms of flies rapidly diminish in numbers. A curious disease seems to be borne to them upon the wings of the chilling autumnal wind. Instinctively they crowd within the shelter of our warmest rooms; but even this fails to save their lives, and they die clinging to walls, window-panes, and draperies in the attitudes of life, but with bloated abdomens, ringed with white, and diseased to deformity. Others, free from this disease, yet enfeebled and grown stiff by reason of the cold, are destroyed and eaten in great numbers by other insects and by birds. There are still, however, a good many left to hibernate in corners of our homes, and to appear again after their winter’s sleep on the first sunny days of early spring. They are somewhat rusty and very clumsy, it is true, at first; but soon, by dint of brushing and pluming themselves, they acquire once more an air of youth; and, following in its train, seems to come to them a great amount of bursting energy, which they display by buzzing here and there in search of food, or in greedily sucking away at such stray morsels as they may be fortunate enough to come upon.

But it is not alone that she may eat, drink, and make merry that the life of Madame Fly has been preserved through all the dreary days of cold. A great responsibility has been given her; she has a duty to perform upon which depends the future of her race,—and she will not fail. Faithful to her earliest associations she seeks for some mass of filth and bile, decaying vegetable matter, or, still better, a dung heap, suits her taste or needs,—and here she proceeds to deposit her eggs. While choosing for them a nest so sordid, she places her seventy, eighty, or ninety eggs with a precision and orderly array that is truly beautiful;—then leaves them to the heat of the sun and the kindly care of Mother Nature. Time shows her trust to have been well bestowed; for, the resulting supply proves ever unfailing, and even more abundant than is necessary to satisfy our fullest desires.

One volt of electromotive force is generated for every 100,000,000 lines of force cut per second.

POPULAR SCIENCE NEWS.

PREMONITIONS, COINCIDENCES, AND SUPERSTITIONS.

BY M. J. GORDON.

NOBODY can fully explain the states of his own inner consciousness, or tell the reasons why, when in apparent good health, the atmosphere is luminous with transcendental glory, and anon is shadowed by dimly comprehended spectres. Many individuals have strangely recurrent coincidences or presentiments, which, considered abstractly, are—whether fore-warnings of good or of evil—so frequently fulfilled that it is difficult to assume them to be casualities only. Science, however, is dumb in explaining the rationale of such phenomena. There are times and seasons when the entire firmament is rose colored; and then, without any apparent reason, the heavens are overcast, and we each learn this lesson anew that the cause of our sorrows, discomforts, and misfortunes lies deep in the nature of things. Perhaps this is one reason why we pay attention to mystical forecasts, and there seems to spring into existence, "the prophetic soul of the wide world dreaming on things to come."

It is customary to say it is lucky to do a certain act at a certain time; it is unlucky to do certain things, or to leave undone this, that, or the other. People do a great many things, and some phenomena of which such observations sprang, it is found all such superstitions are based upon the law of coincidences. Take an individual in a slightly morbid or reflective state, and the dark side of human affairs thrusts itself upon his notice,—the tyranny of the strong towards the weak, the cruelty abounding in nature, the transitoriness of all human affairs. Instinctively the mass of coincidences occur bearing upon some one of these subjects of thought, and a superstition is founded, which may be transmitted and become perpetuated from generation to generation.

Many persons reject and ridicule the common superstitions found to exist quite as much among the intelligent as in the everyday life of the common people. The individual who sits at the table, making the company blithereal, will laugh and jest at the timorous anxiety of his hostess, who, previous to his unexpected arrival—been to consider trouble to avoid such a casualty; but will feel uncanny if he spill the contents of the salt jar accidentally, and will hasten to burn some immediately, to ward off any evil effects which might otherwise occur in his business relations; or he will pass some anxious moments if he observ-es the new moon over his left shoulder, instead of his right; nor will he undertake anything important on Friday. Many persons who pride themselves on being proof against the folly of superstition, yet feel uneasy if they do not observe the rules governing this bit of unreason in other people. Scientific scholars who have reasoned from cause to effect, are disinclined to accept the fact that matter and force are indestructible,—such minds may be observed to be influenced by the good will of Pussay, she having since the days of the Egyptians traditionally brought good luck to the house of her choosing; while the breaking of a mirror is supposed to bring misfortune seven years long while the unlucky possession from effect to cause is illogical to assume. Such minds may be observed to be influenced by the good will of Pussay, she having since the days of the Egyptians traditionally brought good luck to the house of her choosing; while the breaking of a mirror is supposed to bring misfortune seven years long while the unlucky possession from effect to cause is illogical to assume.

The negro and Indian races are very superstitious; their comings and goings, their up-risings and down-sittings, are governed by a series of invisible laws that would render life one long nightmare to a more sensitive and highly trained intellectual race. Among the negroes, after death, the soul of the dead is supposed to be hovering around, and many devices are resorted to appease the ghost, and to appease the ill will that may have been awakened by lack of reverence to the living and unseen portion of the departed in time to prevent them from breaking the circle of despair and disease. The Germans have a blight,—is lame, sick, bruised, or sore—he will not touch the dead, as his ailment is thereby rendered incurable; indeed, anyone who assists in caring for the body of a deceased person will be sure to carry away something belonging to the deceased, to insure him against visits from the "duppy," or ghost. The flight of certain birds over the house and back again, indicates a sudden death in the family. The beautiful turtle-dove, from the plaintiveness of its note, is looked upon as a token of evil omen, foretelling serious misfortune or death if it lights upon the house. No "duppy" ever visits the living with good intent, but always to work harm. There are certain plants and trees given exclusively to be the habitation of the ghosts, and no negro will pass or handle one of the bewitched specimens of vegetation.

The practice of dancing about the corpse is one of out of fear of vengeance to be now paid to any person from the ghost, as no one can make the circle who did harm (i.e., administered poison) to the deceased, as he would, if guilty, surely fall into convulsions and die miserably. Occult methods for removing poison from plants and deadly snakes can be as surprised and sudden as a disaster, as the "duppy" escapes discovery; hence this disgusting practice of the dance of the death circle. Remedies are prescribed of so simple a nature that if no good is done no harm can follow. Tying knots in a bit of woolen yarn, a knot for each wart, walking backward, muttering "de spirits done settle down," with the knotted string held in the hand till near the fire, they rubbing the knot, which would be slowly consumed, will cure the warts. A similar formula over a bit of wet paper plastered on the chest will cure hiccoughs. The hand of a dead person slowly rubbed over sore eyes, with the same formula, only "de spirits done walk ober" added, is a sure cure. Nails can be conjured from the joints of rheumatic patients by repeating a formula that is supposed to cause the nails to grow out of the flesh and cover the spot where the child under a charm. The faculty for seeing "duppy" is given to those persons who at birth had a caul over the face. This membrane is treasured by the family with much care, as the possession brings good fortune and the power to foretell coming events.

The Indians are quite as superstitious as the negroes, but they are a much more reserved and unsocial race, so it is much more difficult to ascertain the legends and explanations for their curious rites. An Indian will turn from his course and vary to the right or to the left without any explainable reason, apparently; he has come to a marching column of migrating ants, and he turned to one side to avoid crossing the route they have already taken. He would not break a wish bone; he would be drawn down on the unlucky mortal who failed to observe this rule. Birds are credited with having supernatural powers. The rain-crate, with its unearthly melancholy cry, is a very prophet of evil. They are popularly thought to be the spirits of the departed come back to mourn and average injuries done to them in life. Eating toad-grabes constitutes a sort of knighthood, and he who breaks the bond will be detected by the ticking of a certain beetle. The neighing of a horse when you meet a stranger betokens trouble. To have a crow cross your path, flying over your head, is a sure forerunner of sickness and death.

Most of these superstitions can be read by the
law of coincidence. Thirteen persons at table co-
incides with the unlikey number at the memora-
sible supper in which Judas betrayed the smashless
one and went to his own death. Spoiling salt is
 coincidenc with the evils that accrued to the salt-
tax gatherers during the French Revolution. The
strangest part of these coincidences—which, if
nothing else is collected, may be termed analogies—is, that there seems to be a cer-
tain unexplained law of the mind in its groping
that often leads to new facts and discoveries.

In his Budget of Paradoxes, De Morgan relates
the following story or theory: "The late Baron
Zach received a letter from Pons, a successful
finder of comets, complaining that for a certain
period he had failed to observe, through had
searched diligently. Zach, a man of much shy
honor, told him that no spots had been seen on
the sun for the same length of time,—which was
ture,—and assured him that when the spots came
back the comets would come with them. Some
time after, he got a letter from Pons, who in-
formed him with great satisfaction that he was
quite right, for the spots had appeared on
the sun, and that he had found a comet soon after.
"To make the story complete there should
now be found a connection between the comets
and the sun's spots. The curious thing is that
just this paradox was maintained before the Royal
Astronomical Society by Professor Asbe before
De Morgan's book came out.

I have known one who has the capacity for in-
vention to make statements about the necessary
mechanical appliances needed to produce certain
ends, that sounded wildly improbable; and yet
the most improbable are new facts. The quad-
ruplex system for use in telegraphy was dreamed
of when to relate the dream was a tale of wild
improbability. This has occurred many times,
and allows a perfectly natural interpretation,—as
some other mind traversed the same road and
solved his dream into practicability by creating
the necessary steel and iron image to express an
embodiment of his thought.

Again, there have been well-attested instances
in which mind acts on mind independently of
stances. It would be hard to prove that when we
think—and that in spite of a determination to
think of other things—of some absent person
that he is thinking of us. But if in a number of in-
stances a number of persons were to record such
experiences and compare results, the law of coin-
cidence would have great weight in determining
the truth or fallacy of such a law. In trying to
grasp an abstruse subject like the relation between
mind and matter, there must, from the nature of
the working medium, ever be many opportunities
for fallacious reasoning,—as it is impossible to
speak of mind as affiliated with the body, with a
brain and the nerve currents, without localizing
the mind, and proving its habitat and absolute
identity. Mental and bodily states are never
identical, but contrasted. There is no means of
affecting a compromise between them, and in try-
ing to express them in terms of the mind, the
results are endless.

leaving all this, however, and allowing the
statement that mind is, indeed, as a phenomenon
different from physical forces, but correlates more
or less directly in strict proportion with these,
as many physical forces correlate with the mind,
by the law of the related force. Of course it is quite impossible to
reduce the quantity or quality of mind force to
any method of mathematical precision. Vitality,
energy, mental qualifications, health, courage,

love, irascibility, may have a standard in our own
mind with regard to an individual, but we cannot
reduce such qualities with mathematical precision,
and cannot communicate to others with exactness
our own idea. When taking into consideration
the physical facts underlying the mental facts, it
may show that widespread concomitant action of
the nerve currents and the agitation of the brain
that may account for many of the unexplained
incidents, divinations, witchcrafts, and similar
phenomena as a result of that tumultuous con-
fect, and exercise of energy in reconciling the
union of the material to the immaterial, even
among the inferior races of mankind.

HINTS FOR EXPERIMENTERS.

EXPERIMENTAL MAGNETIC NEEDLES.

For electrical and magnetic experiments, ama-
tors sometimes find it desirable to mount mag-
netic needles on rigid bearings, and without
the aid of untwisted silk or other suspending fibres.
The accompanying figure illustrates a method by
which magnetized sewing-needles may be mount-
ed in that manner. The needle (N) is passed
through the small card (O) at right angles to the
needle (H). This supporting needle is held in a
vertical positon by a very simple arrangement of glass cap (G)
and by a glass tube (T). The small glass cup is
formed by holding one end of a tube of 1-16 inch
bore in the flame of a Bunsen burner until the end
has closed itself and has assumed the shape shown
in the figure. During this operation the tube
should be kept turning constantly, so as to heat
the glass evenly. When the glass has become
cool, the closed end is cut off and mounted in a
snugly-fitting hole bored in the wooden base (F). The
support (T) is made from a glass tube by
bending it and drawing it out into two tubes, each
ending in a point of very thin glass. The end of
one of these tubes is broken off at a point where
the opening so formed will just admit the blunt
end of the needle (H). This tube may be mounted
in a hole passing through a horizontal wooden
support. The card (C) should be as small
and light as possible, and the vertical needle should
goes through its center. An astigmatic needle mount-
ed in this way is shown at K. As may be seen,
these needles are not supported exactly at their
centers, and are otherwise unsuitable for electrical
measurements; but they answer very well for
many of the simple experiments which illustrate
laws of electricity and magnetism.—LANTON
BYLLESBY. [Original in *Popular Science News.*]

THE CARTESIAN DIVER.

For experiments with the Cartesian diver, I use
a large flat bottle and a small vial, such as is used
for homeopathic medicines. I completely fill
the bottle with water. I then fill the vial about
half full, a few trials determining exactly how much
and invent it in the bottle. The bottle is
then corked, the cork being put in with more
and more force, followed by repeated careful
loos.

The bottle, when taking hold of the bottle and pressing the sides,
the volume is decreased, and the vial descends,
rising again when the pressure is removed. This
method of showing the transmission of pressure
is not new, but I think it is not generally known.
I believe, however, that the following modificat-
on of the experiment is original with myself: Have
be the vial barely dotted. Then

during the bottle to the rise to the top. The
force required in this latter case is, of course,
greater than that required in the former. One
who has never used this simple apparatus will be aston-
ished at the considerable sensitiveness to pressure
which may be obtained.—CLARENCE M. BOU-
TILL, in *Scientific American.*

TEST PAPER FOR ACIDS.

Cut white filtering paper of neutral reaction in
pieces of about six inches square, and impropagate
them with tincture of curcurma (1 part curcuma,
7 parts alcohol, and 1 part water). Place the paper
on threads to dry. When dry pass a sheet of it
through a bath composed of 40 drops of liquor
potassa and 100 c. c. water. Then immediately
pass it through a bath of water,—flat earthen
baths are convenient for the baths,—and at once
place it on a thread to dry. As soon as it is dry
cut it in pieces and inclose them in tinfoil. The
paper will not bear long exposure to light and air,
but will keep well if inclosed in tinfoil. It is
much more sensitive than limus paper, and will
detet ated in a mixture of 1 part of hydrochloric
acid in 150,000 parts of distilled water, and
detect carbonic acid in spring water. If the water
be boiled to expel carbonic acid, and a yellow
color is produced, some free acid (besides CO₂)
is shown to be present. The best way to use the
paper is to touch it with a glass rod which has been
wetted with the liquid to be tested. The
paper can be freshly prepared in fifteen or twenty
minutes.—S. J. HINDSDALE, in *American Drug-
ner.*

SCIENTIFIC BREVITIES.

ON PROCT'S HYPOTHESIS WITH REFERENCE TO
THE ATOMIC WEIGHTS OF OXYGEN AND CARBON.

On considering the formulæ of different com-
pounds which only contain hydrogen, oxygen,
and carbon, J. A. Groshans concludes that the
figures 12 and 16 must be admitted for carbon
and hydrogen.

Mr. Berthelot has proved by experiments that
there is no foundation for the belief that the
earth absorbs and retains more carbonic oxide
than other gases—an hypothesis offered to
explain several cases of asphyxiation which have
occurred when miners went into a level shortly
after an explosion.

THE NAME OF THE KANGAROO.—At a recent
meeting of the Llanee Society of New South
Wales, some discussion took place as to the mean-
ing of this name given to the kangaroo. The
name appears to have been derived from the
language of the natives of the Endeavour River
region the word kangaroo means "I don't know."
This answer was given to Captain Cook in reply

POPULAR SCIENCE NEWS. [March, 1891.}
SILVERING IRON.—A new Austrian patented process for silvering articles of iron is thus described: With a view to finding when copper and a pickle of hot dilute hydrochloric acid, whence it is removed to a solution of mercury nitrate, and connected with the zinc pole of a Bunsen element, gas carbon or platinum serving as the other pole. It is rapidly covered with a layer of quicksilver, when it is removed, washed, and transferred to a silver bath and silvered. By heating to 390° C. (786° F.) the mercury is driven off, and the silver firmly fixed on the iron. To save silver the wire can be first covered with a layer of tin; one part of cream of tartar is dissolved in eight parts of boiling water, and one or more tin anodes are joined with the carbon pole of a Bunsen element. The zinc pole communicates with a well-cleaned piece of copper, and the battery is made to act till enough copper is deposited upon the wire. When this is taken out and the ironware put in its place. The wire thus covered with tin chemically pure, and silvered, is much cheaper than any other silvered metals.

CHANGES IN THE TERRESTRIAL AXIS.—At the autumn meeting of the International Conference on Degree Measurement, lately held at Freiburg, it was reported that a series of simultaneous observations carried on at Berlin, Strasbourg, and Prague, showed that a decrease in latitude was in progress, at least in Middle Europe, and a similar phenomenon had been noted in other parts of Europe. The departure from the perfect flatness of the earth’s axis. That is, the poles and equator, latitude and longitude, are not, as usually assumed, practically fixed data. The amount of ascertained decrease of latitude at the end of the six months’ period, from August, 1889, to February, 1890, was half a second. It was stated at the conference that the Berlin observations for the half year, July 1888, to December 1888, showed an increase of latitude amounting to 0.4, or two-fifths of a second. Fluctuation of the axis is thus due to a minute oscillation, probably owing to some changes in the internal mass of our planet, and not to be confounded with the precession of the equinoxes.

EFFECT OF COPPER UPON RUBBER.—In a paper read before the British Association, Sir William Thomson stated that metallic copper, when heated to the temperature of boiling water, in contact with the rubber, exerted a destructive effect upon it. With a view to finding whether this was due to the copper per se, or to its power of conducting heat more rapidly to the rubber, he laid a sheet of rubber on a plate of glass, and on it placed four clean disks, one of copper, one of platinum, one of zinc, and one of silver. After a few days in an incubator at 130° F., the rubber under the copper had become quite hard, that under the zinc was a little harder and partially effaced, and hardened at different parts, while under the silver and under the zinc was quite hard and elastic. This would warrant the inference that the metallic copper had exerted a great oxidizing effect on the rubber, the platinum had exerted a slight effect, while the zinc and silver respectively had no injurious influence on it. The rubber thus hardened by the copper contained strangely enough, no appreciable trace of copper; the copper, therefore, presumably sets up the oxidizing action in the rubber without itself permeating it.

The AGASSIZ BULLETIN.

A monthly paper of peculiar interest is The Agassiz Bulletin, issued by the Hyatt Chapter of the A. A., No. 490, New York, (N.). It is a paper of eight foolscap pages, two columns each, and is reproduced by hand from a manuscript copy. Nevertheless the price is only twenty cents per year—be it ever so late the offer will be kept in hand.

Among the interesting items in the first number (January, 1891) is this: "Hyatt Chapter meets on the first and third Wednesdays of each month at 2,063 Third Avenue. Lectures and debates are scheduled for every meeting. Visitors cordially welcomed."

PERSONAL OBSERVATIONS BY CHAPTER 604, A. A., TREDONIA, N. Y.

NOTES ON LAND-SHELLS.

We were interested in the article "Some Land-Shells in England," published in the Society Cross for December, 1888, but failed to identify any of our snails with the English ones described. We have found twelve species in this vicinity, eight of which are Helices, besides some individuals which we cannot yet classify. We have had these all living in our "snailery." We arranged a box twenty inches long, eighteen wide, and eight deep, by putting in a layer of garden mould two inches deep, then one inch of black wood-earth, and a covering of fresh moss with a few small plants—violets and heathias—growing in it. We sprinkled it often, to keep it like a bit of the moist woods, and set the box by a north window in the chamber. It was covered with a piece of wire screen, with a stone at each corner to keep it tight. We tried glass, but found it better to give plenty of air.

We put in two or three of each species of snail as we found them. About the middle of March they begin to move and feed, and are more active as the season advances. They are quiet through the day, usually glued to the side of the box or screen cover, or with the mouth of the shell buried in the earth; but at 9 o’clock P. M. finds them busy eating and travelling. In November they begin to hibernate, but warm days wake them up again. After frost comes they are quiet until spring. We sowed rape seed, and gave them the tender leaves. They ate this a little, but liked ebbage better, and lettuce best of all. We only put in bits of cooked lean meat a few times, as they did not appear to care for it, and left it to spoil. The children ask many questions that we cannot fully answer. We are sure snails have their likes and dislikes, and wish to be left quiet when they go to sleep.

Most people know Helix aspera (Say), with its large, stout shell. It sometimes has a white tooth, or a suggestion of one, on the pillar lip. Hy. trochus (Say) is nearly as large, but the shell is thinner and usually pinkish. It looks speckled when the animal is in it, but the little white spots change places. We think they are the bases of the globules of air between the animal and its shell. We often find a tooth in the mouth of this shell. The umbilicus is partly covered by the reflected lip. Hy. alternata (Say) abounds in low, wet woods. The flat, dark-colored, striped shell is rather pretty when cleaned. The animal is reddish; the umbilicus large and open.

H. pallata is a handsome shell of a rich brown color.
H. tridentata (Say) is very pretty. The animal is of a dark bluish-slate color.

H. intertexta (Hinney) is shaped nearly like an old-fashioned bee-hive.

The small H. monodon has so narrow a door that it is difficult to see how the animal gets out for a walk.

The little H. perspectiva (Say) is shaped like a saucer. We took seventy of these out of the decayed wood in an old stump.

Zonaria georgiana (Say) is a light yellowish-brown color. The edges of the shell are not often found perfect.

Z. fuliginosus (Griff.) is a beauty—glossy brown on the outside, and the mouth lined with bluish pearl.

Hyatina nihila (Muller) is the smallest land-shell we have found. It was under a block of wood at the front door, to which a foot-scraper was fastened. The wood lay close to the large stone steps, and was decayed on the under side. Having taken several at different times for three years past, I conclude they live under the edge of the stone.

Succinea tomentosa (L.) has the same speckled appearance as the previous species. The shell is frail and only a cover for its back. This has been plentiful at Van Buren and in low lands about Canadaway Creek.

On the south side of Cayuga Island, at La Salle, N. Y., we found plenty of Macrocycla concava (Say). The shell and the animal were very light cream color. The shape is similar to that of H. alternata, which is also abundant there.

Some of the names we took from an old report on the shells of New York State. All except H. palliata and H. monodon have been verified for us by a member of the Isaac Lea Memorial Chapter of the A. A.

To ascertain the size they would attain in one year, we took from the woods, April 27, 1889, H. alternata and H. palliata,—two or three of each species,—and put them in a separate box. About May 27 clusters of eggs under the moss—twenty or thirty in each cluster. The young snails came out about June 10. At four months old the young alternata were only one-sixth adult size, while the palliata were one-fourth adult size. When one year old the former were about one-half adult size, and the latter two-thirds adult size. The shells of both were quite frail. Perhaps in the woods they get food which suits them better; and yet we conclude it is likely that they do not attain full size until the second year, and that the shell then grows stouter. We are sure the alternata are cannibals, as we sometimes found the palliata with the top of the shell eaten off, and the alternata making a dinner of the innate.

AN INTRODUCTION TO THE STUDY OF MOSES—PROF. LEO LESQUEUX.

We are peculiarly fortunate in being able to give to our readers the following hitherto unpublished paper from the pen of the late eminent Professor Lesquereux. Before his death, one of our A. A. members wrote to him to inquire for some simple introduction to the study of mosses. Professor Lesquereux replied that he did not know of any excepting an introduction which he had written for his famous work, Manual of the Mosses of North America. This introduction, he said, had been omitted from the book in order to save expense; it had been mislaid, but he would find it if possible and forward it. Professor Lesquereux died before he was able to do this, but his son, finding it recently among his father's papers, has sent it, with full permission to publish it.

INTRODUCTION TO THE GENERAL CHARACTERISTICS OF MOSES.

By Prof. Leo Lesquereux.

1. Mode of Propagation of Mosses.—Mosses are reproduced by the germination of spores or by propagules. The seminal grana, or spore, is a small, round, body, formed of two membranes; the outer, perispore, more solid, often granulose on the surface and in the interior; the inner, soft, hyaline, and containing the elements necessary for germination. When perfect spores are ripe and exposed to humidity, the inner membrane becomes swollen, the perispore is ruptured, and allows the protrusion of the primordial cell—the first growth of the moss, named proembryo. This proembryonal utricile is first divided into two cells, which, by subsequent subdivisions, constitute more or less elongated filaments, which, by anastomosing at various angles, compose a compound tissue, protolithium, upon which buds of new plants are developed. Another mode of reproduction of the mosses, still more frequent, is from the development of buds, tubercles, or filaments, derived from different parts of mature plants. Either leaves, branches, individual granules, pseudopodes, attached to the leaves or the stems,—all have the property of sprouting into radicles and producing new plants.

2. The Zoot.—This organ, essential for fixing the plants to their place of growth, is found in all mosses. As rootlets, or radicles, they are not only attached to the base of the stems, but often distributed in fascicles along the stems and the branches, which they sometimes cover as with a matting, or tomentum. They may even appear at the top of the branches, or upon the surface of the leaves. They are composed of a single series of oblique cells with contiguous walls (parietes). They are either simple, or at length forked, or in fascicles. So-called "creeping roots" are merely subterranean branches, stolons, analogous to rhi- nations: a continuation of, or shoot from, the base of the plant.

3. The Stem.—Though sometimes very short, the stem is present in all the mosses. In the annual Acrocarpi it is generally simple; but it becomes compound by repeated simple, double, or multiple innovations when perennial. It is truly ramified only in the Pleurocarpi, whose lateral fructification does not impede the growth. For in the Acrocarpi, the fructifications being terminal and late, the annual development is continued only by lateral gemmules from under the flowers for the vegetation of a second year. As these annual innovations are not always simple, but in twos, threes, or more, the old plants are sometimes simple, sometimes double, or many times dichotomous, or fastigiatly branched. In the Pleurocarpi the ramifications is very varied—diffuse, plane, bipinate, ramulose, fasciculose, etc.

4. The Leaves.—The leaves are present in all mosses, in their natural state of development. They are attached to the stems, sometimes obliquely, rarely vertically. Their relative position varies in different species—sometimes even in different parts of the same plant. The characters of the leaves, their mode of attachment, their forms, the divisions of the borders,—which are never lobate, but entire, or dentate, or ciliate, etc.—the appearance of the surface,—opaque, glossy, papillose, etc.—are expressed by common botanical terms. They are generally formed of a simple stratum of cells of various forms, or, in rare cases, of superposed, double, or triple layers of cells.

5. The Organs of Generation.—The flowers of the mosses, like those of the phanerogams, plants, algal, or bryozoan, are polygamous or syncarpous when male and female organs are mixed in the same involucr; monoeocious or stamineous when in separate buds on distant or separate branches; parœocious when the andromeres are free in the axils of the pericheliate leaves; androgyny- nous or hypogynous when the male and female flowers are close to each other or separated by a single leaf. In the Acrocarpi, the female, either female or bisexual, are produced at the top of the stems or of the innovations. The male flowers are sometimes similarly placed, but more generally on the sides of the branches, especially at the base of the female flowers, which throw them aside in their growth. In the Pleurocarpi, the flowers—always lateral—are upon stems or branches. Polygamous as well as female flowers are enclosed into a kind of involucre of imbricated leaves, of which the inner ones—originally the smallest—gradually increase in size during the evolution of the fruit, forming a peculiar envelope, perichatium, which surrounds the inflated ovulate of the pedicle, the stamate. The involucre of the male flowers, periquetum, is a very different kind, though the inner leaves generally differ from the outer in some characters. The female organs of the mosses, archeogonia planitellula, show the greatest analogy to the pistils of the phanerogams. They are flask-shaped bodies, each with a cellular covering, narrowed upwards into a cylindrical tube, styrilium or collum, which, varying in shape, may more or less generally horizontally or vertically, expands until the anthesis, when it opens by an enlarging funnel-like mouth, to receive and give passage to the fecundating mate. The archeogones are more or less numerous in the different species,—two to thirty, or even more;—but generally one only is fructified, rarely two or three, the fruits in this case being clustered in the same perichatium. The androcarpi, that is, the male organs, enclosed with paraphyses in the periquetum, are generally composed of two parts,—an utricile, of an oval elongated form, rarely globose, containing the spermatozoid matter; and a pedicle, either short or somewhat elongated. When replete, the androcarps are sower, greenish white or hyaline at the apex; when empty, they become fuscated, rugose, redish or dirty yellow, and deformed by compression. At the time of fecundation the sub-valvate bacillate spermatozoids coivate in spiral, being freed from the spermatozoid mass wherein they are mixed, have a spiral motion of their own,—like small living animals,—and penetrate the archeogones through the cylindrical tube. The number of the androcarps is, like that of the archeogonia, variable in the same species, and species.

Filamentous organs, paraphyses, are mixed with the androcarpi and archeogones; they vary in their form and their number. They are generally as long, or even longer than the archeogonia; filiform and slender ingenous flowers, subcalyx, spathulate, etc., in dissect or anthoid ones.

6. The Fruit.—In ripening, the base of the fertilized archeogone gradually enlarges into a capsule, theca, composed of two walls; the inner, sporogone, or sporangia, soft, thin, which at maturity contains the spores, and which either adheres to the outer wall, or, free—except at its base—is like a small cylindrical bag attached to the outer walls by filaments. In the process of its growth, the cellular part covering the sporangium becoming
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dry and membranaceous is transparently ruptured at its base, and forms the clypeus—a cover which, pushed upwards, is either split on one side and thrown up obliquely (subtectiform), or is gradually expanded and presents on the upper surface a color like a conical hat (tateiform), either entire or lacerate at its base. In rare cases it remains attached to the base of the capsule, which then passes through by a longitudinal slit of its side. It is also sometimes divided, or split on one side in its whole length. The capsule itself, formed of a somewhat hard, solid membrane, composed of two or more series of cellules, distinctly colored and differing in different species of mosses. It is generally more or less perforated by stomates towards its base. In most species the capsule is gradually narrowed downward to a neck, colurn, or an apophysis. The colurn is merely the obconical upper part of the pedicle; while the apophyses is a more or less long prolongation of the infixed base of the capsule, from which it generally differ by consistence and color. In some species it is as long as the sporogony, or even longer, being an intermediate part between it and the pedicle.

The pedicle, or basilar support of the capsule, is sometimes short, or scarcely discernible, though present in all mosses. It is generally filiform, cylindrical, of equal thickness in its whole length, except under the base of the capsule. It is never or less rigid, elastic, generally smooth on its surface; sometimes rough, scabrous, or verrucose.

The lid, or operculum, also in all mosses except the Cladostercari, the Holocarpi, and the Schistocarpi, is the apex of the capsule, which becomes crenacincise, and is at length detached as a kind of cover. It is variable in shape, length, color, and affords very valuable characters for the diagnosis. The annulus is a narrow fringed component of one, two, or three series of hyaline cellules at the orifice of the capsule. The cellules, contracted by dryness when the capsule is ripe, and abruptly dilated by humidity, force the disruption of the lid. These cellules are detached from the orifice in fragments, or else they remain adherent to the lid, or fall altogether from the mouth of the capsule and are cast off in a narrow fringed component. The spores or sporidium enclosed in the capsules, are formed by compression when young, become globose in ripening; they are sometimes angular, but generally smooth or rugose. They are greatly variable in size—from 1-5 to 1-60 m. in diameter. They also vary in number; species of Archidium have no more than fifteen or twenty spores in each capsule; in the Hypnum teneaceum the spores are very small, and, indeed, innumerable.

The Peristome.—When the lid is removed, the orifice of the capsule, in most of the genera of mosses, is seen to be adorned by a simple or double—very rarely triple or quadruple—row of small teeth and cilia, called the peristome. When simple, the peristome is composed of eight, sixteen, thirty-two, or sixty-four teeth, slender or broad, the orifice of the capsule or a little lower inside of it; sometimes tubulose, or prolonged above the orifice into a cylindrical tube. The teeth are simple or compound—that is, in this last case they are formed of two or four similar parts adhering or united by the borders, and thus generate to filiform, dilabiate, or filiform, or often separate with age, doubling or quadrupling in number. A colored line marks the union of the teeth or the line of division. The teeth are very variable in size, form, and color, affording important characters for the diagnosis. When the peristome is double, the inner is generally composed of a pellicle, yellowish membrane, processus, of various lengths; it is rarely entire, sometimes irregularly lacerate, generally cut into segments and cilia. The segments are usually plicate-carinate lengthwise, more distantly and less distinctly articulate than the teeth. The cilia are generally narrow, diliform, distinctly articulated; sometimes barred (appendiculate) at the articulations. They are also derived from the inner membrane, and are alternate with the segments.

The columnella is a cylindrical cell, or axis, which occupies the center of the capsule, from its base to the top of the lid. It is generally fagacious, and soon breaks up or decays. In a few mosses however, the peristome and remaining parts are attached to the lid, supporting it above the mouth of the capsule when this becomes dry and effete.

Mosses live everywhere and on various kinds of material. In crick or on coarse sandstone, to which they are attached by short radicles penetrating the porous matter, are species of Desmato- don and Barabula; on coarse gravel along roads, Trichostoma; on the sand and naked earth of the plains, the Cladostercari, the Polytrichace, and the Widdows; on clay banks, Fissidens and Dicranea, on the wood of living trees, the Orthoceras, especially; on that of decayed trunks or branches, the Dicranum, the Hypanum; on the dung of animals, the Sphachna, etc. Their especial province in nature is to absorb and concentrate atmospheric humidity, and to retain it in their texture, either to hasten the decay of the dead woody matter to which they are attached, or to retard it when life still remains in the plants. They cover and protect the roots of trees and their base against atmospheric influences, cold or heat; they spread waste fields, swamps, and bogs, and by their gradual decay produce peat or humus. They are thus modestly pursuing everywhere a constant work of usefulness, always bearing a pleasant aspect, as they appear in the dance of life, and hiding the hand of death wherever its composition is at work.

Mosses are found in every station, under every kind of climate, and bear an uninterruptted life. They have their seasons for fructification, but even when dry and decolorized under the influence of the heat, they take life again and continue to vegetate as soon as they are rehydrated, or to retard it when life still remains in the plants. They cover and protect the roots of trees and their base against atmospheric influences, cold or heat; they spread waste fields, swamps, and bogs, and by their gradual decay produce peat or humus. They are thus modestly pursuing everywhere a constant work of usefulness, always bearing a pleasant aspect, as they appear in the dance of life, and hiding the hand of death wherever its composition is at work.

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or Gutenberg's course in mineralogy. We have a very fair collection, consisting of from 900 to 1,000 mineralogical specimens, 500 zoological, 60 eggs, 50 fossils, and 100 specimens of American algae. Our mineralogical collection includes most of the common minerals and rocks to be found in this vicinity, and also some which are very rare—as mountain leather, a specimen about 12" X 14", and being a formation of asbestos. This was found at King's Bridge, New York, in the excavations for the North River Canal, between two strata of rock. It has the appearance of newly tanned leather covered with sand, is very flexible, and is rather hard to tear. We have also specimens of meteoric iron ore, crystals of silver, lace silver from Colorado, moss agate, and specimens of almost all the gems—the diamond included. Two of our most highly prized specimens were found in Massachusetts, being geodes about six inches in diameter, the inside covered with beautiful quartz crystals. Our zoological specimens include shells from all parts of the world, most of the common Insects of the vicinity; a porcupine-fish, saw-fishes' saws, alligators' heads, and the like. We also have a fine microscope, and a large aquarium which we keep stocked with insects and reptiles. Our meetings are held at our President's room, 55 Lafayette avenue, Brooklyn, where we intend to hold an annual exhibition.—O. Doerflinger, Sec.

324, Bourbonnais Grove, III., [A].—Our Chapter has adopted as its special local name, "The Milvart Scientific Association of St. Viator's University." Our first work was to procure a stereopticon costing $500—quite an expensive undertaking, but not regretted, for it has afforded us much instruction and pleasure. We now have seventeen active members, and the following officers:

Director—Rev. J. Bencel, C. S. V.
President—T. A. Wilhelms
Vice-President—Charles Brady.
Secretary—M. Lentzart.
Assistant Secretary—M. Fortin.
Treasurer—G. McLean.
Censor—G. Carlon.

The authorities of this institution kindly promise to provide cases for our specimens.—M. Lentzart, Sec.

325, Sycamore, III., [A].—I have just returned from Colorado. I ascended Pike's Peak, visited the "Garden of the Gods," and Minnion Mineral Springs, securing fine mineral specimens. Our Chapter collects shells, minerals, and Indian relics. I had a pleasant visit with the Secretary of the Chapter at Colorado Springs, who has a fine collection of minerals. Six of the boys who used to belong to our Chapter here, now live in Colorado Springs, and during my stay there we took many trips together to points of interest. At Austin Bluffs we found agates and topaz.—Vernon Allen, Sec.

941, Avondale, N. J., [A].—Owing to serious and prolonged illness, our work has been interrupted. Our membership continues the same. During the summer we added materially to our herbarium and to our collection of minerals. After our enforced rest we have now started in with renewed interest.—M. C. Van Dier, Sec.

342, New York, N. Y., [Y].—On March 24, 1888, several students of the German American School of the nineteenth ward of this city organized an athletic club, under the title of the "Young Trojans Sporting Club." This club continued until February 1, 1890, when one of its members—who was a member of a New York Chapter of the A. A.—suggested that we should form a Chapter of your Association. The proposition was agreed to, and we were enrolled as German American Chapter No. 979, X. New York City. The work, thus ready for work, was applied to the Board of Trustees of the German American School for rooms in the school building, which were granted, and where we have held our meetings since the organization of this Chapter, clear of all expenses. Our original membership was seven, but it has increased until we now number thirty, viz., seventeen active, of whom the ages vary from fourteen to seventeen; eight honorary, and five corresponding. We have held twenty-one regular meetings and one special meeting. We belong to the New York City Assembly, and our delegates have attended every meeting, and our Chapter was fully represented at the exercises of the last convention. Of the four regular meetings held every month, the first is devoted to general business, the second to the animal kingdom and astronomy, the third to the vegetable kingdom and biology, and the fourth to geology, mineralogy, chemistry, and physics. At these meetings lectures and treatises are delivered by the members, and occasionally we have debates. Of the lectures and treatises delivered the following are a few, viz.: "The History of "Diamonds," "Diagnosis of a Lobster," "Introduction to Botany, Zoology, Biology, and Geology," and "The Solar System." Four of our members are taking Professor Gutenberg's course in mineralogy, and five Professor White's course in botany. Several botanical and mineralogical expeditions have been made, and we were obliged to appoint a committee to investigate about a cabinet, which will report at our next business meeting.—Richard P. Kent, Sec.

598, Surnworth, Penn., [A].—Last year we had regular, well-attended, and interesting meetings, our attention being given principally to entomology, entomology, and mineralogy. In our study of entomology we have endeavored to collect specimens of moths, the larve of which are destructive to our shade and fruit trees. One satisfactory result of collecting cocoons during the season of leafless branches and keeping them until the moths developed, was observing for ourselves the different habits of the male and female. The females deposit their eggs before attempting to fly. This is to compare our first cocoons we received the cocoons is the surest method of saving our trees, as well as getting fine, unmarked specimens. Our collection in mineralogy has been steadily increasing, and now includes specimens of most of the minerals found within a radius of six miles. This is in the Philadelphia belt and includes serpentine localities, so that we have a charming list. A fine cluster of aurumadite crystals is one of our latest additions, and is highly prized, as we had been told that this mineral was exhausted in this region. Our President is a member of the Corresponding Geological Chapter, and is deriving much benefit and pleasure from the circulating reports. We have a valuable addition to our library in more than sixty volumes of "Memoirs of Pennsylvania, including geological atlas of all the counties, Professor Lesley's Dictionary of Fossils (illustrated), and two volumes of plates of the "Coal Flora of Pennsylvania and Elsewhere." We have too much work to do not to feel alive and in good spirits.—Mrs. Ellen C. H. Ogden, Sec.

707, Chiliotehco, O., [A].—Our principal work has been in botany. We have made a list of Ross County plants, excluding grasses, sedges, etc., and find that we have about a thousand varieties. W. W. Franklin has completed several lists of the birds of our County. We have greatly enjoyed the year, and find great pleasure in the work of the Association. Hardly a day passed during the summer without finding us together, analyzing flowers or in pursuit of birds. With best wishes for the success of the Association, we remain Chapter 579.—John Ruhrah, Sec.

CHAPTER ADDRESSES, NEW AND REVISED.

No. Name. No. of Members.
260 Jamelde, Plain, Mass. A. 4
264 New York, N. Y. 250
445 Toronto, Canada. B. 4
100 Harvard, Conn. B. 13 Miss Anna Westcott, 145 Stoughton Street.

The following are to be added to the list of those Chapters and members that agree to reply promptly to all correspondents:

Chapter 12, Forreston, Ill. Specially interested in geology, mineralogy, botany, and entomology, and particularly glad to hear from members between the ages of eleven and fifteen. Mrs. C. M. Winson.

A. T. Huntington, 74 Chester Avenue, Chelsea, Mass. Invertebrate zoology.

A NEW HELPER IN CHEMISTRY.

It gives us pleasure to announce that Mr. Marcus Benjamin, 15 W. 121st street, New York City, has united with our organization, and offers his assistance to any who need it in the department of chemical technology for which specialty, by the way, he writes the articles in Appleton's Annual Cyclopaedia.

WILL NAME YOUR BEETLES FOR YOU.

BLOOMFIELD, N. J.

I will determine Coleoptera for any member of the A. A. under the following conditions:

1. That postage for reply and for return of specimens be sent.

2. That a number be attached to each specimen, and also a note giving the locality where found.

3. That corresponding numbers be attached to duplicate specimens in their own collection, if possible; as in some cases, through accident in the mails, I may not be able to get the specimens returned in good condition.

I prefer to identify specimens from New Jersey, and should like to correspond with New Jersey collectors.

RALPH HOPFING.

THE JAPANESE FILTER PAPER now so commonly used for cleaning objectives and eye-pieces is manufactured on a large scale in Japan, under the name "Usokei;" it is yellowish white in color, and has a silky lustre. On the one hand, it is so thin the finest writing can be read through it, and on the other hand, it possesses an astonishing toughness. In the case of California, it is only torn with difficulty. Microscopically examined, it is seen to consist of bast fiber, the threads, which form an irregular net-work, being exceedingly thin-walled. By comparison with other papers, Dr, Uloth was able to identify it as derived from the shrub Periclimenes convexus, which grows in the mountain forests of Middle and South Japan. This plant is related to the Mezeceans of Europe, and belongs to the same natural order.
The Popular Science News.

The article upon the study of mosses by the late Professor Lesquereux is published for the first time in the present number of the Popular Science News, and, although necessarily somewhat technical, will be found of unusual interest to all interested in botany. Professor Lesquereux was one of the highest authorities in his special department, and we acknowledge with pleasure our indebtedness, both to his family and the President of the Agassiz Association, for the privilege of presenting his latest work to our readers.

Mr. S. C. Sutdam, of Baldwinsville, New York, sends us an interesting photograph of some natural snow-balls, formed on the frozen surface of a river through the agency of the wind. The picture shows the river covered with hundreds of quite perfectly formed snow-balls, ranging in size from that of a barrel downdwards. Although similar occurrences have been observed before, the formation of these natural snow-balls is quite uncommon, as it requires a fall of slightly damp snow in connection with a high wind, and the exact combination of the necessary meteorological conditions does not often occur.

A new chimaera for the earliest discovery of the "Periodic Law" of the chemical elements has arisen, and a new question has been raised as to who, if anyone, was the first to give a correct name to chlorine. We refer to a curious pamphlet, written by a gentleman whose name has not yet come to our attention, published in the "Transactions of the Royal Society of Edinburgh," containing a list of all the elements known at the time, and adding a new one, which he calls "Climax." He says that he was the first to give the correct name to chlorine, and that he derived it from the Greek word for "climbing," as it is found in the atmosphere in a high degree.

A good example of the wild western imagination is found in a story recently published in the "Science News," which describes the method of obtaining gold by means of a new machine. The machine is said to have been invented by a certain Mr. Smith, who has made a fortune by it. The story is full of details, and is quite convincing, and the machine is supposed to be a great improvement on the old-fashioned method of panning for gold.

The Cincinnati Board of Health has distinguished itself by suppressing an exhibition of a certain kind of hypnotism, which is highly prejudicial to the public health. Even allowing that the attempted exhibition was one of genuine psychical phenomena, and not of mere deceit and trickery,—as is the case with ninety-nine hundredths of these travelling mesmerizers and hypnotizers,—we can see no reason for the interference of the Board. If a person chooses to place himself under the influence of a mesmerizer or hypnotizer, we have no objection to the practice, as long as it is done in a proper manner.
dom; its organs cease to exercise their functions, and, if left to itself, the chemical compounds of which it is composed are soon changed into more perfect and permanent forms. While the mineral kingdom is thus a very broad one, we may consider as a more characteristic type a crystalline body, a lump of salt, for instance, for there are few inorganic solids that are not crystalline in structure to a greater or less degree. Ibises, for instance, always occur in well-shaped crystals; while in the best qualities of glass it is not at all apparent, although a tendency to crystalization is always present.

If we allow a saturated solution of a chemical compound to slowly evaporate, it returns to the solid condition in regular geometrical shapes. In the case of common salt, the form is that of a simple cube; other substances—tartar, for instance—take very complicated forms, which require considerable mathematical knowledge to understand. By proper precautions we can cause our salt crystals to increase in size from the minute points which first appear, to cubes of several inches. In this sense the crystal grows like a plant or animal; but how different is the result! The salt crystal is nothing but a crystal from the very beginning. The largest and smallest are identical in everything but size; it possesses no function but that of simple accretion, and, of course, has no specialized organs, either for perpetuation or reproduction. If left undisturbed it will continue in existence forever, neither increasing nor diminishing in size, nor reproducing other similar forms. In this sense the crystal may be said to be immortal.

And yet there are some curious analogies between the crystal and the animal. Both have a definite and—within certain limits—an unvarying shape. It is not an entirely absurd supposition that the same forces which determine the unvarying shape of the salt crystal may also cause each living organism to resemble its predecessor. Although crystals have no distinct organs, they have a differentiated structure—as is shown by the phenomena of dichroism, double refraction, and the thermo-electric properties of tourmaline and other minerals. A curious imitation of the phenomena of reproduction may even be observed in supersaturated solutions of certain salts, like sulphate of soda, which remain perfectly clear until the magidea of a minute crystal of the same substance causes them to be converted into an almost solid mass of similar crystals. Of course these analogies are merely fanciful. The gap between living and dead matter is, as far as we know, an impassable one, and beyond our comprehension. But the forces of Nature are always in existence, and act upon all forms of matter alike; and it is not quite irrational to suppose that in time to come we may discover a closer connection between the three kingdoms than is now evident. If we admit that the same force which determines the form and structure of an amoeban determines also that of a man, it is not beyond the bounds of possibility that the wonderful structural phenomena of inorganic crystals may be conditioned by the same natural law, of which at present we can hardly do more than perceive its existence.

THE METEORITE OF OSCHANSK.

On the 30th of August, 1887, a large meteorite passed over the province of Perm, in Russia, and, bursting into a large number of pieces, was widely scattered over the country. Six pieces were afterwards found, the greater number being lost.

At Oschansk, a town near Perm, the fragment illustrated in Fig. 1 fell about mid-day, the sky being clear. According to the testimony of an eye-witness, the first indication of the approach of the meteorite was a loud rattling noise in the sky, and about half a minute later a blackish stone passed by him, whistling through the air like a cannon-ball, and buried itself in the earth to a depth of nearly two feet. When found it was still hot, about the size of an infant's head, and weighed over three pounds.

The passage of the meteorite over the country was marked by the usual phenomena, including the fiery train left by it in the air, which persisted for several minutes, and the loud noise, resembling the firing of artillery. It appeared to pass from the east to the west, and when seen in the air was incandescent like a mass of red-hot iron.

Much the largest piece of the meteorite was found at the village of Tabor, where its fall was witnessed by several peasants working in the fields. According to their account, the atmospheric disturbance caused by its passage was so great as to throw down men and horses. It buried itself in the earth to a depth of twelve feet, (Fig. 2), and was broken by the violence of the shock into numerous pieces, varying in weight from a few ounces to 200 pounds. The total weight of the Tabor fragment was estimated at 650 pounds. The pieces of the meteorite were covered with the usual blackish crust, but the unusual occurrence of blisters or bubbles on the surface, as large as a pea, was also observed.

The most remarkable fact in connection with this meteorite, however, was the discovery by Professor Meneler, that it was of the nature of a breccia, or composed of fragments of previously formed rocks, like some others that he has examined. He finds in the Oschansk meteorite two different mineral species, known as Limerickite and Montrejite, and concludes that it must have been originally formed under geological conditions similar to those which have led to the formation of similar breccias and conglomerates on the earth. We may also add that rocks of this description strongly, though not positively, indicate the presence and action of water, and lend weight to the theory that meteorites are the fragments or debris of larger bodies, which have passed through a geological history similar to that of the earth, and have afterwards by some means been broken up. The true origin and formation of meteorites still remains a mystery, and we must wait patiently for the results of future investigations to solve the problem of the history of these mysterious celestial visitors.

The accompanying illustrations are reproduced from La Nature.

AN IMPROVED LAMP-SHADE.

The ordinary lamp-shades of ground or translucent glass are exceedingly wasteful appliances, a large proportion of the light-rays being absorbed by them and practically extinguished. This is equally the case whether the lamp is used for general illumination of a room or for reading or working.

The shade represented in the illustration is particularly intended for throwing a bright light into a limited space—such as upon a book or piece of work. It is composed of metal, silvered on the inside, and bent into such curves that the light rays diverging from the lamp-flame are reflected nearly vertically downwards, according to the law of conjugate foils. The principle is somewhat similar to that of the locomotive headlight, which renders the diverging rays parallel and throws them forward upon the track. With a lamp-shade constructed on this principle, none of the light is wasted, but all is concentrated upon the point where it is most needed, much to the relief of the eyes and brain. Such shades would, doubtless, meet with a ready sale if placed upon the market.

[โดยเฉพาะ Observed for Popular Science News.]

METEOROLOGY FOR JANUARY, 1891.

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<th>Temperature</th>
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<td>Lowest</td>
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This is the third mild January in succession. Only two other Januarys have been more mild in twenty-one years. The five average 33.15°. The lowest point of the present month, at the hours of observation, was 28.2° above zero, on the 4th, and
this was the coldest day of the month, averaging 17.9°. The highest point was 50°, on the 11th evening and 22d noon, the latter being the warmest day, at 45.33°. The coldest month was 5° above the mean of the last twenty-one Januarys. The meath was more uniformly mild than any January during this period, as the January in 1875 was the most uniformly cold, as indicated by the low range of these two months—12° and 9°, respectively. The daily range on the 2d, 18th, and 19th only was 2°; the 10th and 11th it was 20°; these were the extremes. The range indicates the degree of uniformity.

**SKY.**

The face of the sky, in 33 observations, gave 38 fair, 13 cloudy, 23 overcast, 11 rainy, and 8 snowy, or a percentage of 40.9 fair. The average fair the last twenty-one Januaries has been 53.6, with extremes of 40.9 in 1891 and 81.4, and 61.3 in 1888, showing the present January to have been as cloudy as the cloudiest the last twenty-one years. The 2d was foggy all day, and the 25th in the morning, both warm, rainy days. The 25th and 26th were fine days—the latter very fine.

**PRECIPITATION.**

The amount of precipitation—including 14.50 inches of melted snow—was 9.63 inches, while the average for the last twenty-three Januarys has been 5.04 inches, with extremes of 1.80 in 1875 and 20.11 in 1891, and the first ten Januarys in my record average only 3.32 inches, while the last eight average 7.08 inches—nearly double the former period. The precipitation was well distributed through the month, three of the storms exceeding two inches each. The month began with fine sleighing, which three times alternated with sleighing, the ground being neatly covered with snow. The storm on the 17th ended in frozen rain, loading everything heavily with ice, imparting great beauty for three days to tree and shrub, but doing damage in some localities. The snowstorm of the 25th also loaded the trees, nearly equaling the ice in beauty and duration.

**WINDS.**

The average pressure the past month was 29.953 inches, with extremes of 28.83 on the 12th, and 30.50 on the 16th—an unusual range of 1.67 inches. My barometer has dropped below 29 inches but seven times in eighteen years, at the hours of observation, twice being in January. The mean for the last twenty-two Sunday Januaries was 29.21° N., with extremes of 29.54 in 1879, and 30.11 in 1890, a range of .71°. The sum of the daily variations was 10.27 inches, giving a mean daily variation of .331 inch. This average the last eighteen Januaries has been .304, with extremes of .390 and .319. There were several large daily variations, as 1.71 inches on the 5th, 3.77 on the 27th, .95 on the 3d, and on five other days over half an inch.

**ASTRONOMICAL PHENOMENA FOR MARCH, 1890.**

The sun crosses the equator from south to north and spring begins March 20 about 4 P.M. Mercury will be out of sight during the month. It is a morning star until March 23. It passes superior conjunction with the sun on that date and becomes an evening star, but does not get far enough away to be easily seen until nearly the middle of April. Venus is still a morning star, not quite as conspicuous as the others, but almost as near the sun as it can get, little nearer the sun. It is quite a distance to the south of the sun, and by the end of the month rises not quite two hours before Mars is still an evening star, and sets about three hours after the sun. It is a considerable distance north of the sun, and is moving somewhat rapidly northward and eastward—23° or 24° during the month. It is nearly 200,000 miles away from us and very much fainter than it was about the time of opposition, but it will still be bright enough to be made out without much trouble if it is looked for in the early evening just at the end of twilight. Jupiter is a morning star, having passed conjunction with the sun on February 12, but does not get far enough away to be seen easily until nearly the end of March. It will then rise a little more than an hour before the sun and will not be well observed during the month. Saturn is in very good position for observation during the month. It comes to opposition with the sun on the morning of March 4, and at the end of the month is on the meridian at about 10 P.M. It is in the constellation Leo, and moves about 2° westward during the month. As seen in the telescope, the rings are a little wider than they were during February, the ratio of long to short axes being about eleven to one. Uranus is in the eastern part of the constellation Virgo, and comes to the meridian at about 2 A.M. in the middle of the month. It is moving slowly westward. Neptune is in the constellation Taurus, a little west of the group of the Hyades.

**THE CONSTELLATIONS.**

The positions given are for the Martindale Atlas Edition, and for 10 P.M. on March 1, 9 P.M. on March 16, and 8 P.M. on March 31. Cancer is not far from the zenith, a little to the south. Leo lies east of Cancer, and Virgo lies below Leo, reaching to the horizon on the east. Between these constellations and the southern meridian are Hydra and one or two other constellations. On the north- west are Ursa Major, well up toward the zenith, and Bootes and Corvus low down. Draco and Ursa Minor lie mainly to the east of the pole star, while Cepheus is just below it. Andromeda is just setting in the northwest, and Cassiopeia lies between it and the pole star. Perses is above Andromeda, and Auriga above and to the south of Perses. Gemini is west of the zenith, high up; and Libra is a little to the south of the zenith, just above Arcturus, which is setting. Orion is to the left of Taurus, a little lower down. Canis Minor is about half-way from the zenith to the south horizon, and Canis Major is below, between Orion and the southern horizon.

**ECONOMY OF COMMODITY COMMODITIES.**

The Brooklyn Union Elevated Railroad Company lately ran their compound engine for ten days against a lot of the best simple locomotives on the road. The coal used was all weighed. At the finish of the test the compound was found to have effected a saving of 25% per cent. compared with the average coal consumed by the other engines.

**QUESTIONS AND ANSWERS.**

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

**SUBSCRIBER, California.**—Is it true that old rails can be made into signs or fence rails? Cotton or linen rags are nearly pure cellulose, or woody fiber, (C,H, O). By boiling them with dilute sulphuric acid, the cellulose is separated from water, and is converted into dextrin or glue powder, (C,H, O). The process is only a chemical curiosity and has no industrial value, but immense quantities of these cellulose are made from starch by a similar reaction.

**SUBSCRIBER, Illinois.** —What is the chemical composition of the explosive gas known to miners as "fire-damp."

**Answer.**—Fire-damp is principally methane, or marsh-gas, (CH,), the simplest of all the hydrocarbons. It is supposed that it has been produced in the course of the vegetable remains from which the coal was formed. "Choke-damp" is simply carbide dioxide (CO,), and when formed, as it necessarily is by an explosion, "fire-damp," is called by the miners "after-damp."

P. S. G., Phila. The name "galvanized iron" is a misnomer. It is simply iron covered with tin, and the process of galvanization or galvanisation is not used in the process at all.

S. C. M., N. Y. —Chemically pure iron, like nearly all other metals, is extremely soft, so that it can be readily cut with a knife. An almost infinitesimal amount of impurity, or alloy, will often completely change the physical nature of a metal.

**LITERARY NOTES.**

Tales from Shakespeare’s Comedies, by Charles and Mary Lamb. Prepared for school reading, and edited with notes by William J. Rolfe, Ph. D. New York: Harper & Brothers, Publishers. Lamb’s delightful tales from Shakespeare were originally written with the special purpose of introducing children to the study of the greatest English dramatic poet, for they are particularly well adapted for reading in schools of the intermediate grade. They are valuable as a new literature for the young, and the subjects they treat of: and Dr. Rolfe’s careful editing, and scholarly comments and explanations render the present edition especially useful, both for the home parent and for the teachers of “children of a larger growth” as well.

**Examination of Water for Sanitary and Technical Purposes, by Edward University Catalogue; Bean. Philadelphia: P. Blakiston, Son & Co.**

This second edition of the above work has been completely revised, and many changes and additions have been made, especially in the determination of organic nitrogen, biological examinations, and the purification of water. The appearance of a revised edition was overdue, and the subjects they treat of: and Dr. Rolfe’s careful editing, and scholarly comments and explanations render the present edition especially useful, both for the home parent and for the teachers of "children of a larger growth" as well.

**The American Patent System, by D. Walter Brown, 31 Nassau street, New York. Price, 25 cents. It does not aim to make an inventor a patent lawyer, but to enlighten him as to the nature of his rights, and what is needed to preserve them, so that he may proceed intelligently in obtaining them, and that he and the investor may avoid unnecessary litigation and often of the just return for their labor and outlay.**
THE FUNCTION OF NUTRITION.

A professional "fastier," an Italian named Sueci, has lately performed the feat of abstaining from food for a period of forty-five days, taking nothing into his stomach but fresh water and a secret "elixir" which appears to be simply a preparation of ammonia. He kept up his strength remarkably well under the ordeal, taking a horse-back ride on the fifteen day of his fast and daily exercise thereafter. At the beginning of his fast, Sueci weighed 147½ pounds, and at the completion 104½ pounds—a loss of 43 pounds, or less than a pound a day. He was constantly watched by a committee of thirteen physicians, and there is not much doubt but that the fast was a genuine one. It will be remembered that about ten years ago one Dr. Tanner created a great sensation by abstaining from food for forty days; but Sueci has far exceeded this, although the popular taste has become somewhat weary of professional fasters, and comparatively little interest was excited by this really wonderful test of endurance.

Although the statements are of the slightest use, and only serve to give a little sensational notoriety to those undertaking them, the fact that the nutritive functions of the human organism can be suspended or modified so that life can be supported without nourishment from outside sources, is of a certain physiological interest. Sueci's feat is not a unique one, although very exceptional. The East Indian fakirs and other Oriental religious devotees claim to have the same power, although in the absence of definite proof of their genuineness it has generally been supposed that their alleged fasts were fraudulent ones.

The phenomenon of hibernation in the animal world bears a certain analogy to these facts. A bear, after living sumptuously all the fall, will retire to his den on the approach of winter and pass the cold weather in a torpid state, without food, the sluggish vital processes being kept up in the animal's body. At the approach of spring, with a fresh supply of food in the woods, Bruin awakens from his long sleep and reappears on the scene "as thin as a reed," but in good health and spirit ofReady for another lamb. In the case of the bear, the vital processes seem to be carried on as usual,—there is no abnormal sleep or torpor,—but it is very probable that their endurance is due to the same cause which supports a hibernating animal during the winter: the power of the body to draw upon the supplies of oxidizable material previously stored up in its tissues, to the exclusion of that from outside sources. The stories of certain East Indian jugglers who have allowed themselves to be shut up in a tomb for several weeks, and have afterwards been resuscitated, are recalled to mind in this connection; and, as of some them seem to be fairly well authenticated, it is possible that this power may be due to the same abnormally sluggish activity which supported Sueci, through the experiment, of voluntary starvation.

The human body is analogous to a steam engine; both are kept in motion by the oxidation of carbon and hydrogen, and if the supply is cut off the one will die and the other cease to move; but, as the fires under the boiler may be "banked," and just enough combustion permitted to develop a slight amount of steam pressure, so it is not impossible that the mysterious vital forces may—"in some exceptional cases"—be held in abeyance, and the small amount of energy necessary for their perpetuation be obtained, for a greater or less time, by the oxidation of the bodily tissues themselves; or, in other words, a man may feed upon his own body—a form of cannibalism which is unquestionable from ethical grounds, in although in direct violation of all physiological laws.

[Spedally Compiled for POPULAR SCIENCE NEWS.]

MONTHLY SUMMARY OF MEDICAL PROGRESS.

By MAURICE D. CLARKE, M.D.

STRENGTH IN HEART FAILURE.—Of ammonia, atropia, alcohol, caffeine, cocaine, nitro-glycerine, ether, strephosanthe, salpicaria, and adonis vernalis, Dr. C. S. Bradfute says that none of them fulfills the indications for relief that are presented by most cases of heart failure, without at the same time exhibiting deleterious counter effects. An agent which will sustain the circulation must not interfere with the resulting good effects of such action by any secondary manifestations, and until one can be found that will behave in this manner the problem must be met by such a combination of remedies and methods as will most nearly resemble the desired drug.

The writer favors strychnine, if not the best, at least one of the best curative stimulants available. A study of its physiological action undoubtedly shows that it, too, has objectionable features, but fortunately they can, to a certain extent, be mitigated by the conjoin use of other remedies. Strychnine is very efficacious; it acts quickly, and the effect is sustained.

When the heart is minimally hypertrophied, it is the heart at once responds by an increase in the strength of its movements, the arterioles contract, and the blood-pressure increases. At the same time irritability of the sensory and motor nerves and the excitability of the muscular tissue are greatly increased, thus promoting nutrition changes and mechanically favoring a rapid blood-current. A spasmodic contraction of the renal capillaries is likely to occur if large doses are given, but the interference with the kidney secretion can be obviated by diuretics having a selective action upon the urinary organs. Lately strychnine has been strongly recommended by some eminent observers as a reliable agent when other members of the group of cardiae tonics are contra-indicated, and to the writer, who used it in a successful case while resident physician in the Pennsylvania Hospital, it has proved very satisfactory. The stimulation is not confined to the circulatory system, it is general, and in many respects very much resembles the effects of heat.

Its characteristic effect upon the spinal cord no doubt tones up, so to speak, through the sympathetic centers. It may be that the diffuse stimulation of the circulatory system, must certainly result in a supply of better blood to the nerve centers, and consequently to promotion of the vital functions.

A curious fact in connection with the action of strychnine is that the weaker the circulation the larger is the amount necessary. Its action seems to be in this part more due to the fact that the weak are trained. Dr. J. B. Penrose informs the writer that he has given hypodermically as much as two grains of the sulphate of strychnine in twenty-four hours, with the result of successfully tiling the patient over a crisis.—Med. News.

A PROLONGED FORM OF ACUTE COCAISM.—At a meeting of the París Académie de Medicine M. Hallopeau presented a communication, in which, after distinguishing two forms of cocaine poisoning,—namely, the acute, in which the symptoms are produced immediately after a dose and speedily pass off, and the chronic, in which they are due to the prolonged use of the drug,—he related a case which, in his opinion, showed that the poisonous effects, while concealing on an acutely, might last for a considerable time.

A man had about eight milligrams of hydrochlorate of cocaine injected into his gum as a preliminary to the extraction of a tooth. Toxic symptoms at once supervened. There was intense precordial oppression, with thready pulse, extreme excitement, and loquacity; the patient was delirious at raving, with his face red and his breath running out of his mouth, with his face, and his eyes out of his was dying. In ten minutes he became quiet and the tooth was extracted, after which he was able to walk home, arriving there, however, in a state of extreme prostration. Then ensued a train of nervous symptoms, such as continual headache, intractable sleeplessness, bad taste in the mouth, with a desire for food accompanied by giddiness, faintness, and a sense of impending death. All brain work was impossible; the patient could not do the simplest sum in arithmetic, and was in a state of profound depression. A sense of formication and numbness in the hands and forearms was almost incessant. This condition lasted four months, and it was two months after the injection before the least improvement was observed, and then progress toward recovery was slow.

M. Hallopeau thinks the symptoms indicate a poisonous action of cocaine on the nervous centers, and especially the brain. As it is impossible to suppose that so small a quantity of the drug should have remained in circulation, he is driven to the conclusion that it was stored up in the cells of certain nervous centers or that it produced in them persistent lesions. The prognosis in such cases is serious, in the sense that the illness is severe and may be protracted, and the disablement for business is complete while it lasts.—Brit. Med. Journ.

THE STRUGGLE BETWEEN CELLS AND BACTERIA.—The bacteria which cause some diseases, writes Dr. H. T. Bewsley, may perish in the body without the organism taking any active part in their destruction. In many diseases, however, the cells of the body must take an active part in the destruction of the invading germs. In some cases they seem to do so by enclosing the bacteria in their protoplasm, or devouring them, killing and digesting them. The most conclusive case of this is the diphtheria disease, in which the phagoeytes seem to be the chief if not the only agency that destroys the fungus. In larger and more complete animals the process is more apparent; in the mouse and rabbit, by encapsulating them; or they may form some chemical substance which poisons the bacteria, or they may destroy them by means of some vital influence or power. The theory of phagoeytosis may have a very widely extended scope; it has not been proved that it has not. On the other hand, it has not been fully proved that it has.—Proc. Med. Journ.

TYPHOID FEVER IN A CHILD OF EIGHT MONTHS.—Dr. Frank E. England, in the Canada Medical Record, reports a typical case of typhoid fever in a male child of eight months. In confirmation of this diagnosis the existence of three other cases of typhoid fever in the same household at about the same time. The babe was artificially fed, and the disease developed after a sojourn in the country.
CONCISE OF THE LUNGS AS A CAUSE OF PNEUMONIA.—Dr. F. W. Burton reports two cases of pneumonia of obscure origin. A boy of eleven was terribly struck on the left side of the chest with a hatchet. Cough and dyspnea came on in four hours, and the physical signs of pleuro-pneumonia at the base of both lungs later. The second case was a man of twenty-two who strangled his right side by tying suddenly to prevent the fall of a sack of malt. He developed all the signs of pneumoniadie and died, both lungs being in a state of red hyperatization.

BRIT. MED. JOUR.

HYDROPHILBOL AS AN ANTISEPTEC.—In a paper read at the late meeting of the British Medical Association, Mr. Thomas H. Bryce details some investigations bearing on the antisephal qualities of hydrophathol. He made use in his experiments of a standard solution of 1 to 100, consisting of hydrophathol 1 part, alcohol 10 parts, and glycérine 80 parts, which he diluted with different quantities of water. The staphyloccocus pyogenicus aureus was the organism experimented upon, on account of its ready recognition by its distinctive odour and frequent occurrence, and both the germicidal and inhibitory powers of the drug were tested. The author concludes that we have in hydrophathol a powerful and reliable antiseptic agent, and recommends its use in solutions of 1 to 400 prepared according to the above formula.—BRIT. MED. JOUR.

ARISTOL IN SURGERY.—Dr. Alois Pollak has employed arisotol as an antiseptic in twenty-two cases of unhealthy wounds, abscesses, minor surgical operations (such as removal of small tumors or enlarged glands), phlegmonous inflammations, and varicose ulcers, and is enthusiastic in its praise. He used the drug in form of a powder, or mixed with ether or vaseline. In all of the cases in which it was employed there was no reaction; and fever, if present, disappeared within twenty-four hours. No pain was experienced in or around the wound, and healthy granulations were rapidly formed. The author regards arisotol as an excellent and dependable antiseptic, and states that in the cases he has dealt with, the organisms being that it has no disagreeable odor and is effective in much smaller quantities. It is sufficient to cover the wound with a thin layer of the powder, and thus all danger of poisoning may be avoided.—The Therapeutische Monatsbyle.

AN EFFICIENT METHOD OF REMOVING FOREIGN BODIES FROM THE NOSE.—Dr. S. Johnson Taylor (Lancet) describes the following method of removing foreign bodies from the nose, which was successful in the case of a child of three years with a large bead in the nostril. The procedure is simply Politzer's method of inflation through the unaffected nostril. A bag of the Politzer type is introduced into the nostril which does not contain the foreign body, and if the patient is old enough he is requested to swallow a mouthful of water. During the act of swallowing, the bag is vigorously compressed, the escape of air from around the nozzle being prevented by grasping the nose with the thumb and forefinger. At the moment of compressed air the foreign body will probably be blown out. In the case of a young infant the compression should be made while the child is crying.

[EDINBURGH MEDICAL JOURNAL.]

HOW THE PATHOGENIC BACTERIA DO THEIR HITS

BRIEGER and FRANKEL have studied this question. Of course the first condition for successful inquiry was to employ pure cultures of the organism experimented upon. But, in both human and animal cases, they have been found to several pathogenic micro-organisms, such as the bacillus of typhoid, tetanus, cholera, etc. Yet it was found that this toxine did not invariably call forth all the phenomena of the infectious diseases due to the bacillus, from pure cultivations of which it had been obtained; the supposition, therefore, seemed fair, that besides the already found chemical bodies, there were others which played a momentous part. Brieger and Frankel considered that Loeffler's bacillus of diphtheria was well adapted for their purpose, because it is now beyond doubt that this organism is the genuine cause of diphtheria. Loeffler had already called attention to the fact that this bacillus, when inoculated on animals, guinea-pigs and pigs, produces a disease resembling the condition of the infected spot, yet grave alterations of texture and organs and speedy death of the animals experimented on follows. This connection of events could only be explained in this way—that the bacillus produced by their local multiplication a substance of exceedingly poisonous properties, which spread over the whole organism, and, in all probability, is the poison that works. Brieger and Frankel considered that they have proved that Loeffler's diphtheria bacillus engenders in its pure cultivation a poisonous, soluble substance separable from the bacteria, and which, when injected into susceptible animals, calls forth the same phenomena as the injection of the living micro-organism. The authors also have settled that this substance is destroyed by a heat of 140° F., and that it can stand a heat of 122° F., even in presence of excess of muriatic acid. This last fact of itself speaks against the supposition that the poison of the diphtheria bacillus is a ferment or an enzyme. Further examination of this substance showed it was not a ptomaine or toxine; no crystallizable substance, save creatin and cholin, was obtained. Shortly summing up their investigations, the authors seem to have discovered in the diphtheria bacillus a substance belonging to the albumen series of bodies, which has poisonous properties, and causes the phenomena of diphtheria when injected. They propose to give it the name of "toxalbumine." In the living body they consider that the bacteria build up and separate their toxalbumine from the albumen of the tissues. Brieger and Frankel also examined typhol, tetanus, and cholera bacteria, and staphyloccoccus aureus and watery extracts of the internal organs of animals killed by anthrax, in the same way as they had examined the diphtheria bacillus, and found in all of them bodies which, according to their chemical behavior, were albuminoids, were poisonous, and could therefore be applied. It appears that the normal constituents of the body to substances of the most dangerous kind seems a very short one, and our organism itself may be looked upon as the proximate cause of morbid conditions let loose by the life activity of bacteria.

[Medical Age.]

A LESSON IN LONGEVITY

The life of the venerable George Bancroft, just brought to a close at the advanced age of nearly ninety-two years, aside from the importance of its literary achievements, has another lesson to impart—that of its longevity, and the means by which it was attained. Here was a man who had spent a happy, active life in literary studies, and in endeavors to preserve that life. The illustrious historian, regularly every day for scores of years, took long rides on horseback, even in extreme old age, and when unable any longer to indulge in this form of fresh-air exercise, resorted to long walks. With strong mental powers, and using every means for their development, he never carried these to excess, to the detriment of health. Here is the point, he had respect to the animal part of his being, which requires fresh air and exercise for its full and complete development and preservation. Thus living, as it were, a dual existence, he was enabled to prolong life through three generations, lacking but eight years of completing a century. He exceeded the Biblical limit by twenty-two years, and if, as we are now taught, the physiological extent of full and complete life is one hundred years, he may be said to have forecast the future by one hundred years, even to an advanced old age, and it was his ambition, and the outdoor existence that he led. Here will be found the secret of many, if not every life extended to such a length.

There is no system of living that will insure longevity; but by moderation, and a due appreciation of the fact that however high we may have risen, we have an animal existence that must be cared for, we may prolong life to one hundred years. There are certain conditions, may be by endeavor to do so.

We are told that a man should be young until fifty; in the prime of life until seventy or seventy-five, with work completed at, say, ninety; living on in old age until one hundred. Mr. Bancroft very nearly completed the latter period—that of old age, proving again that mental work is not necessarily detrimental to long life, but, under certain conditions, may be conducive to it.

Continuing the reflections, and making deductions from the lives of a number of people who have attained great age, the following advice is offered on how to reach a hundred years:

1st. Live as much as possible out of doors, never letting a day pass without spending at least three or four hours in the open air.

2d. Keep all the powers of mind and body occupied in congenial work. The muscles should be developed and the mind kept active.

3d. Avoid excesses of all kinds, whether of food, drink, or of whatever nature they may be. Be moderate in all things.

4th. Never despair. Be cheerful at all times. Never give way to anger. Never let the trials of one depress you to the last.

The period from fifty to seventy-five years should not be passed in idleness, or abandonment of all work. Here is where a great many men fail—they resign all care or interest in worldly affairs, and rest of body and mind begins. They throw up their business and retire to private life, which in too many cases proves to be a suicidal policy.

During the next period,—the period from seventy-five years to one hundred years,—while the powers of life are at their lowest ebb, one cannot be too careful about catching cold. Bronchitis is a most prolific cause of death in the aged. During this last period rest should be in abundance.

[Medical Record.]

THE EXPERIMENT WITH THE DOG

The novel experiment of grafting a bone from a dog to that of a human being has naturally commanded a great deal of attention in medical, as well as lay circles. In the latter, however, it has received even more than its share of notice from anti-vivisection enthusiasts, who have hurled sensational reports concerning it in the daily press. Whatever publicity has been gi
to the operation, it is due to the experimenter to say that he has been in no way, directly or indirectly, connected with it. With an honest and humane purpose of benefitting a hopeless cripple, and with a becomingly tender regard for the lower animal, Dr. Phelps determined upon a new departure in surgery, the results of which are given elsewhere in these pages. He had, apparently, sufficient grounds, after careful investigation of the issues at stake, to warrant a trial of his theory. Notwithstanding actual union of bone with bone did not occur, such a possibility, with different conditions and surroundings, is reasonably hopeful. In this particular instance sufficient time was not allowed for the completion of such a process. An interesting fact, however, was that the soft parts promptly responded to the effort, and demonstrated not only that tissues of different species could be made to unite, but that a circulation could also be established between animals of different species without danger to either.

The application of the principle to reparative surgery is one which may open a field for future study. The word may have a wide-ranged usefulness to humanity. The possibilities in these directions obviously cannot yet be determined, until better means and opportunities are afforded to secure the end. If, hoping beyond this, we can look forward to a corresponding union of more solid parts, if bone can be made to grow to bone, the advance in the treatment of ununited fractures, the operation and animal. In view of the good that may accrue from success in similar trials, they should not be abandoned merely to satisfy the demands of the so-called humane societies. The charge of cruelty to animals no longer applies to experimentation in these directions. Even in the instance in question, which has been so severely and unjustly criticised by the sensitised presses, the operation was carefully and methodically performed. In the view of the good that may accrue from success in similar trials, they should not be abandoned merely to satisfy the demands of the so-called humane societies. The charge of cruelty to animals no longer applies to experimentation in these directions. Even in the instance in question, which has been so severely and unjustly criticised by the sensitised presses, the operation was carefully and methodically performed. In the view of the good that may accrue from success in similar trials, they should not be abandoned merely to satisfy the demands of the so-called humane societies.

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NOTES ON THE LATER LIFE-HISTORY OF THE FLOWERING DOGWOOD (Cornus Florida, L.)

BY M. ALSTON BIRD.

The genus Cornus, to which the dogwood belongs, is divided into two minor groups, one characterized by having a "head," or close cluster of greenish flowers, surrounded by a large and showy, four-leaved, corolla-like, white or rarely pinkish involucres; fruit bright red. The other has "white flowers in open, flat, spreading cymes; involucres none." The object of this paper is to try and show the derivation of the first group, which consists of the flowering dogwood and the cornel (C. Canadensis). The four large, white, petal-like expansions are not petals at all, but merely bracts—altered green leaves that grow near a flower. They form one of Nature's many devices for securing conspicuousness, in order to attract the attention of flower-loving insects, that they may effect cross-fertilization for the plant, cross-fertilization being—as Mr. Darwin has so forcibly shown us—the great object of plant economy. This is effected by insects, which transport the pollen of one plant to the sensitive stigma of another. This beneficent act is not intentional on the part of the insect, but is simply a result of his flower-visiting propensities; the pollen becomes entangled in his hairy coat, and thus gets carried to the flower next visited.

The dogwood is a very showy and conspicuous plant in flower, and scarcely less so in fruit, as clusters of red berries gleam through the green foliage. It thus seems well endowed with attractive features. The flowering dogwood and cornel are probably recent offshoots from the rest of the genus, to which they bear no resemblance to a casual observer; for on the other hand we have what seems to be a single large white flower with a central head, and on the other we have a loose bunch of small white florets.

I said above that C. Florida and C. Canadensis were derived from the second group of the genus, and not the second group from them, for the following reasons: 1st. These two form a much more specialized group, which means that they are later (the specializations are simply modifications of the family plan) and higher in the scale. They have crowded all their florets into a dense head, so that a large number can be fertilized at one visit, as in the common daisy, and thus a number of seeds are set from a single visitation. 2nd. In the head the flowers are of different ages, there being some in which the stamens are ripe, and others in which the pistils are ripe. When an insect lights on this he fertilizes those in the second stage and gathers new pollen from those in the first stage, as he turns round to suck the separate flowers in turn.

3d. Because the majority of the plants of the same genus, as well as those of the allied families, are simpler and display the open cymose type of inflorescence. When we see a general, simpler type prevailing in several allied families, you may be sure that they, or their common ancestor, gained these characteristics before they broke up into separate groups or families. And any small departure from them is the limits of a genus points to a more recent modification.
allies and the rest of the genus, they have gone a step farther and have produced their coherent seeds in a tube, which, as in the pinks, holds their petals in a tubular form also. This excludes a horde of miscellaneous small flies, and courts only those with longer tongues, which are thereby enabled to reach to the bottom of the tube. The plant thus narrows its fields, but gains more efficient workers as a compensation for diminished numbers. The authors are erect and exerted, and can hardly fail to festoon any insect of the above description that happens to light on the flower-head. At this stage the flowering dogwood and the cornel separated, for the latter, as will be seen in the figure, has not reached the perfection of the former; for, while the flowering dogwood has a perfectly compact head, with all the florets borne on an expanded and modified apex of the stem,—which is thus made to perform the offices of a receptacle,—the cornel still retains decided traces of the original cyme, and the florets are borne on very short branches.

So much for the flowers; now let us glance at the berries. In these there is no difference throughout the genus, except the comparatively unimportant one of color, which depends on the selective tastes of different birds. Why was there no change in the berries? Probably because the

### Dwarf Cornel

**Single flower. Section of fruit.** Flower of dwarf cornel, magnified to show the branched head. *a*, bract removed.

The berry of the parent form was good enough without change. To describe one will be sufficient, as they are much alike. The berry is a succulent, two-celled, two-seeded drupe, formed by the union of the calyx (coats) with the ovary. It is berry red and becomes red on ripening. A fruit in which this union of parts takes place is in advance of one in which the calyx is free.

Plants that have a drupaceous or succulent fruit generally have fewer and larger seeds than those without these facilities for dispersal. For each seed in a fruit that has fine facilities for dissemination stands a better chance of growing and becoming a plant than a seedless fruit that has fewer means of dispersal; and the plant that has fewer seeds can store those remaining much more effectively than it could a larger number. How did the fruit become drupaceous? Probably by the selection of the most succulent ones by birds. Hence, the those that were hard and dry perished, and the juicy ones were eaten by birds and transported by them to considerable distances, and so stood a better chance of hitting upon a good locality for growth and reproduction of vigorous offspring. As long as the seed is immature, the fruit remains hard, green, and incoercible, to escape notice, but as soon as it begins to ripen, it advertises that fact by assuming a bright red color. And now any hungry bird, coming along, will be sure to notice it, eat it, and the seeds, which are extremely hard and indigestible, will pass through the bird's body and be deposited in the best possible condition for germinating.

The red color of the fruit was produced in the same way as their succulency, viz., by the selection of birds. For if any of these fruits showed a tendency towards a red color it would greatly increase its conspicuousness, and thereby more than double its chances of being seen and devoured by birds—with the favorable consequences above mentioned. On the other hand, the green fruit would be more apt to be passed by, and hence undisembodied, so that it grew at all it would go under the delerious shade of the parent tree. Thus you see natural selection would tend pretty effectually to weed out the hard, incoercible fruits, and foster the attractive ones. This form of fruit was probably developed before the flowering dogwood and the dwarf cornel branched off from the main group, (for it is retained by them in common with the rest of the genus), and after the family Cornaceae branched off from the allied families, because the Cornaceae have the drupaceous fruit and the allied families have not. The bark of this family is quite bitter, and probably in a measure secures the young plant from the attacks of herbivorous animals.

All these advantages combined—the bitter bark, preserving the tender young plant; the closely packed heads of tubular florets; the conspicuous bracts, which all the constant attention of the higher insects, and so effect cross-fertilization without waste, and also serve as protective caps; and finally the attractive drupaceous fruit—allowed the plant, under certain circumstances, to spring from a shrubly to an arborescent form.

These are only a few of the facts and suggestions concerning the life-history of this plant, and are brought together principally as suggestions for further research. Among other things it would be interesting to find out which situations are preferred by the pink-bracted forms and which by the white, and also the insects found most frequently in those places. Also to notice what insects visit this plant, both habitually and accidentally; to see if there is as yet any difference in the relative number or in the species which visit the two colors; to see if they exhibit sleep movements. I observed no honey, (say specimens were slightly wilted), but think some must be secreted by the glanidial perigynous disk of the flower, as it tasted sweet.

These are only some of the questions that suggest themselves just now; there are many more awaiting the close observer.

There is really but one place in the world where violins are made extensively. That place is Markneukirchen, with its surrounding villages. There would be altogether about 15,000 people living there who do nothing else but make violins. The inhabitants, from the little urehin to the old gray-headed man, the small girl, and the old grandmother, all are engaged in making some part of a fiddle.

[Original in Popular Science News.]

### Hieroglyphic Inscriptions of Egypt and Palestine—How Read, and by Whom Discovered and Deciphered, by Joseph Wallace.

As we have been requested to contribute our knowledge of hieroglyphic inscriptions to the *Popular Science News*, we do so with pleasure, and hope the intelligent readers of this leading and worthy public publication will be pleased with the choice of such interesting subjects.

Not long ago there was a general belief at home as well as abroad that the ancient Egyptians and Assyrians had no literature, no schools, and no means of cultivating the mind or hand. This judgment was based on the present condition of these countries, seeing that they have made no progress in literature, art, commerce, or home industry. Oriental scholars, however, knew that this belief was erroneous. The recent discoveries in Egypt, Palestine, and Western Asia prove that literature was highly prized, and its cultivation carried on with zeal and industry in these countries for thousands of years; schools, colleges, and libraries were established for the foreign as well as the native student when the European was a painted savage.

The monumental history of Egypt has been an enigma to the learned of all countries for thousands of years. It was the great campaign of Napoleon I. in Egypt, 1798-1800, which gave the first impulse to Egyptian studies. The most distinguished members of the French Institute accompanied him, to study on the spot the ancient land of the Pharaohs, their ancient monuments now in ruins, and the numerous wrecks of a former civilization. The work which they executed was considerable; they studied ancient and modern Egypt under all its phases, and in the time the result of their labors was given to the public under the patronage of the French government. However, the most interesting and most instructive inscriptions which the Pharaohs have left us, and which alone could clear up and explain their labors and the events of their lives, remained illegible riddles, so to speak. It was reserved for a Frenchman, Jean F. Champollion, to reveal to us by an effort of his genius the secret of their mysterious writing, which is called *hieroglyphic*.

Nothing is positively known of the origin and chronology of the old Egyptian language. Though very distinct, it indicates some affinity to the Semitic, but not so great a relationship as that which exists between it and Hebrew, Aramaic, Arabic, and Assyrian. Besides the analogy in the mode of writing—which omits vowels and gives the words only in skeleton—there are numerous coincidences in the vocabulary. The Berber, Saho, and Galla languages—which are considered one in origin with the Semitic—have also an unmistakable affinity to the Egyptian. The Egyptian hieroglyphic system is especially mentioned by Benedey, E. Möhr, K. Lottiner, Lepusis, F. Müller, De Rouge, Elers, and Brugsch. Some words, however, are Indo-European, and Pott, Ewald, and Renan have placed Egyptian in that family of languages. Ewald and Renan, since then, have been less positive, and internal evidence seems sufficient to establish some relationship between the Semitic and Egyptian.

The theory of the development and decay of the language has not yet been traced; only the four distinct graphic systems—hieroglyphic, hieratic, demotic, and coptic—can safely be considered within chronological limits. The time of
The development of the old and full hieroglyphic writing is unknown. It was perfectly understood and freely used in the times of the third and fourth dynasties, which renders it probable that the date of its discovery must be placed much earlier than 3000 B.C. The third and fourth dynasties which reigned successively in Egypt, numbered less than three hundred kings. The sum of the years from the reign of Menes to Nectanebo II. (about 350 B.C.)—the last king of the thirtieth dynasty, who was succeeded by a Persian—was 3,355 years. ‘The succession of time,’ says Bunsen, ‘the fastest hitherto established anywhere in the world, is now also the best authenticated. It is based upon the registers of the early kings, which are written in hieroglyphic characters, and which are preserved in connection with contemporary monuments up to the fourth dynasty, with slight breaks. The era of Menes, according to Bunsen, was 3443 B.C.; Lepsius makes it 3383; Brugsch estimates it 3445, and Mariette places it at 3504. It is still a matter of dispute among Egyptologists whether the first seventeen dynasties were consecutive or not. It is maintained, however, by late writers that the dynasties, with considerable exceptions, were consecutive, and that the kings enumerated reigned over the whole of Egypt.

The use of hieroglyphic writing was not confined to the sacred class, as was formerly believed on the authority of the Greeks, but it was employed by all and for all purposes—shorter notes and records as well as the lengthier written document; hieroglyphic writing was also used in the manufacture of the figurines and friezes which adorned the tombs of the pharaohs and the temples. The hieroglyphic, or pictorial representations of the language, continued in use for important state documents, inscriptions, and religious compositions, and accompanied by transcriptions in demotic and Greek, down to the Roman emperor Decius; and, if Lepsius’ reading is correct, so late as the usurpation of the government of Egypt by Archilles, who was put to death by Diocletian, A.D. 296. The spread of Christianity in Egypt caused a proscription of the hieroglyphic, because the characters were full of mystical allusions and sensual figures. The want of a reading and writing nation led at an early period to the use of linear hieroglyphs in long documents, which subsequently developed into a cursive hand called hieratic. The great body of the Egyptian literature has reached us in this form, and this form the reading of which can only be determined by resolving it first into its prototype—hieroglyphic. It is not possible to fix the time of the first use of hieratic writing; but from the actual preservation of several hieratic papyri of the eleventh dynasty, presenting it as a perfectly distinct and well-developed mode of writing, it is safe to conclude that it must have come in use before 2000 B.C.

The demotic writing denotes the rise of the vulgar tongue into literary use, which took place about the seventh century B.C., when it was brought into fashion by the great social revolution in the reign of Psammetich. The oldest papyrus found, which is now in the Turin Museum, dates from the forty-fifth year of his reign, or 629 B.C. The demotic was used to transcribe the hieroglyphic and hieratic papyri and inscriptions into the vulgar idiom till the second century of our era, and the gradual transition from the obscure and difficult demotic to the more intelligible cursive alphabet. Demotic words were occasionally transcribed in Greek letters, with the sounds added before or after, found in Greek, preserving their original signs, which was in reality the cursive alphabet.

Copis is the exclusive character of the Christian Egyptian literature, and marks the last development or final decay of the Egyptian language, which became almost extinct during the last century and made way for Arabic.

The history of the recovery of the Egyptian language, of which not only the vocabulary but also the characters were totally unknown, presents one of the most remarkable processes of induction. The ancient Greeks and Romans were so little interested in the speech of other nations, and belting at the same time such imperfect linguists, that they left no other information concerning the language than that the Egyptians had two or three different kinds of writing for different purposes, and that two of them were confined to sacred use— an assertion now known to be erroneous. Other accounts from the same sources, regarding the Egyptians and their language have also been found erroneous. They picked up stories here and there from communicative priests, and these, by being mixed up without discrimination, passed current among the people, no one caring to criticize, compare, or methodize them.

The learned men of the last century turned much of their attention to Egyptian writing, and naturally consulted the works of the ancients. This was the main cause of their failure. With the exception of one passage in Clemens Alexandrinus, which is so obscure that it lends itself to many interpretations, all the ancients agreed in speaking of the hieroglyphic system as ideographic. They even gave the meaning of a few signs that are common in the inscriptions, and seemed well informed on their interpretation. As the hieratic and demotic characters appeared more curvilinear and better suited to the transcription of long documents, they maintained that by means of them the same language was written in letters representing sounds.

The writings of Kircher during the seventeenth century, De Guignes and Koch in the eighteenth, and later those of Zögg, were based on the opinions of the Greeks and Romans; consequently they failed to throw light on the language. Fortunately, in 1799, a French engineer officer, M. Brossard, while throwing up earthworks at Rosetta (Bashah), discovered a large black slab of stone, somewhat mutilated, with an inscription in hieroglyphic, demotic, and Greek. The victory of the English over the French, a few days later, brought the slab into the hands of the English ambassador, Sir William Hamilton, who had it transferred and deposited in the British Museum. By this accident a text was discovered, which the Greek version stated was an inscription of divine honors to one of the Ptolemies, and that the hieroglyphic and demotic versions were transcriptions of the Greek text. Though the sense of the hieroglyphic inscription was thus preserved, the difficulty of determining the value and sound of each character. It was observed that about the place corresponding to the name Ptolemy in the Greek version there was in the hieroglyphic inscription an oval ring enclosing a group of characters; and, as long series of sitting figures on the temple of Karnak had also such rings written, it was supposed that the names or titles, it was conjectured that this ring was the sign of the proper name.

- PHOTOGRAPH OF A SUBAQUEOUS EXPLOSION.

The unusual severity of the past winter in Northern Europe has caused much loss and suffering, from the unaccustomed cold and snow to which the inhabitants were exposed—although to the natives of New England the European winter would have seemed an exceptionally mild one. The Seine and other French rivers were frozen over, and, on the return of milder weather, small ice-bergs formed, much to the dismay of the Frenchmen, unaccustomed as they were to such formations, which in this country are of almost annual occurrence. Nitro-glycerine and other powerful explosives were used to break up the ice, with fairly good success. Our illustration is copied from an instantaneous photograph of one of the preliminary experiments, where a cartridge of melinite was exploded under the surface of a stream of water, to judge of the effect which it would have upon a mass of ice. The picture is interesting, both as showing the form of the water column and the markedly vertical action of the explosion, and also as a fine example of an instantaneous photograph which must have been obtained under peculiarly difficult conditions. The photograph was taken by Milo, Villain, of Roull, and was first published in Le Nature, from which we reproduce it.

[Original in Popular Science News.]
POPULAR SCIENCE NEWS.  

[April, 1891.]

plants, properly acted upon by light and under other suitable conditions, will, instead of taking from, add to the proportion of oxygen present, and will thus restore the balance without resorting to mechanical aeration. This explains why tanks used by horticulturists still retain their tenants living and breathing healthily, and the same water as first put in still capable of supporting life.

A prominent experimenter states that he placed two small gold fish in a glass jar capable of holding twelve gallons of water. Half filling the vessel with fresh spring water and placing some sand, quartz, limestone, and sandstone, he planted a small Vallisneria, a water-plant, in the mud and left the whole undisturbed. After a time the water became thick, and a coating of scum or coniferous vegetation obscured the glass so that the interior could not be discerned. On introducing a few water-snails, he found that they fed on the conerva as well as on the decayed matter of the plant, and soon restored the water to a clear and healthy condition.

The pruning of the older leaves encouraged the growth of many small shoots. The snails flourished on the vegetable matter, which they consumed, and the fishes thrived on the eggs which the snails deposited, and in the renovated water.

The aquarium is subject to a great many modifications in shape. The proper proportion of dimensions should be something like this: Length, twenty-four inches, width, eighteen inches, and depth, ten or twelve inches. A great many, and in fact the greater number, are of improper form, being as deep or shallower than we are wide. In an aquarium the fact that the proportional surface to the air is of far more importance than the volume of water contained, should be borne in mind. A sloping bottom is also preferable. The bottom should be laid with sand or small gravel suited to the condition they are intended to represent. Some water animals like to burrow, and should therefore have a bed of sand in which to gratify their desires in that direction. A few bright pebbles added give the vessel a pleasing appearance and afford shelter for minute animals.

A few larger stones laid on the gravel is all that is necessary to keep the small fish happy. If the aquarium is used for ornamental purposes, then in this case should consist in the water-plants. Clear, river water is preferable, as it is best for both animal and vegetable life. Among the plants common and easy to get for your aquarium are, "starworth," "water soldier," "new water weed," "frog bit," and "water plantain." Most of the smaller species of fish will live and breed freely in tanks well supplied with oxygen, and there is no way in which the beauties of their forms and markings can be so well seen as through perpendicularly, evenly mullioned glass. Here their graceful, easy movements can be watched without their being disturbed by refraction. Most of them enjoy their dwelling, if we can judge from their lively yet not restless bearing. It must be remembered that they are mostly animal feeders, and if put into a vessel with other animals smaller or weaker than themselves, they will not live quite as happily as the cat and mice in the "happy family." Some fishes are much more voracious than others. I heard of an instance where a pike two inches long attacked and destroyed a fish of another species half as long again.

Among the many suitable fish for aquarium study, the goldfish, perch, eelfish, young bass, trout and German carp are preferable where they are obtainable. Water tortoises and newts if kept should be supplied with mud and also some exposed rock where they can stay out of the water at their leisure. Among molluscs, fresh water mussels, snails, and slugs are useful as scavengers. The first few days your aquarium should be well watched for dead fish. It is natural that some fish so recently introduced into strange surroundings will die. As time goes on, with the shelter afforded by the drift slowly back. There is no better or more interesting way of gazing a knowledge of nature than by a close and careful attention to a well-stocked aquarium.

[London Chemical News.]

GENESIS OF THE ELEMENTS.

BY DR. WILLIAM CROOKES.

It is now generally acknowledged that there are several ranks in the elemental hierarchy, and that besides the well-defined groups of chemical eleme-
tals, there are underlying sub-groups. To these sub-groups has been given the name of meta- ele-
tals. The original genesis of atoms assumes the action of two forms of energy working in time and space—one operating uniformly in accordance with a continuous fall of temperature, and the other having periodic cycles of ebb and swell, and intimately connected with the energy of electricity. The centre of this creative force in its journey through space scattered seeds or sub-atoms that ultimately coalesced into the groupings known as chemical elements. At this genetic stage the new-born particles vibrating in all directions and with all velocities, the faster moving ones would still overtake the laggards, the slower would obstruct the quicker, and we should have groups formed in different parts of space. The constituents of each group whose form of energy governing atomic weight was not in accord with the mean rate of the bulk of the components of that group, would work to the outside and be thrown off to find other groups with which they were more in harmony. Those elements that proved to be left behind were left in a nascent state, and we should have our present series of chemical elements each with a definite atomic weight—definite on account of its being the average weight of an enormous number of sub-atoms or meta-elements, each very near to the mean. The atomic weight of mercury, for instance, is called 200, but the atom of mercury, as we know it, is assumed to be made up of an enormous number of sub-atoms, each of which may vary slightly round the mean number 200 as a centre.

We are sometimes asked why, if the elements have been evolved, we never see one of them transformed, or in process of transformation, into another? The question is as futile as the idea that in the organic world we never see a horse metamorphosed into a horse. Before copper, e.g., can be transmuted into gold it would have to be carried back to a simpler and more primitive state of matter, and then, so to speak, shunted on to the track which leads to gold.

This atomic scheme postulates a to and fro motion of a form of energy governing the electrical state of the atom. It is found that those elements generated as they approach the central position in the periodic table, are more probable ones to receive this position are electro-negative. Moreover, the degree of positivity or negativity depends on the distance of the element from the central line; hence calling the atom in the mean position elec-
trically neutral, those sub-atoms which are on one side of the mean will be charged with positive electricity, and those on the other side of the mean position will be charged with negative electricity, the whole atom being neutral.

This is not a mere hypothesis, but may take the rank of a theory. It has been experimentally verified as far as possible with so baffling an enigma. Long continued research in the laboratory has shown that in matter which has responded to every test of an element, there are minute shades of difference which have admitted of selection and resolution into meta-elements, having exactly the same properties as those of the earth ytrrin, which has been of such value in these electrical researches as a test of negatively excited atoms, is of no less interest in chemistry, having been the first body in which the existence of this sub-group of meta-elements was demonstrated.

[Amateur Electriican.]

ELECTRICAL HEATING.

Now and again one hears of electric heating in a vague kind of way that would hardly lead any- body to suppose practical results had been ob-
tained. But the fact is that the electrical heating apparatus is already in quite general use and that several companies have been formed for its intro-
duction.

One of the earlier forms of electric heat-
ers, which was especially designed for street traffic purposes, is well known and has also been given a shape resembling that of the familiar metal foot-warmer. The rapid increase in the number of electric street-cars in our northern latitude has given a stimulus to ingenuity in this field, and a new heater has been brought out, which, for simplicity and economy of space, seems hard to excel. It consists of a narrow strip of carbon, the ends of which are connected with a few inches of wire, respectively, and are about three inches in width and quarter inch in thickness. This strip is placed under the car seats, extending from one end of the car to the other, and is protected by a wire screen. A second strip of the same dimensions is attached to the first as a kind of compressing plate, and the wires are imbedded in the asbestos. These strips are 12 to 24 volts, and are capable of giving out a great length of radiating surface exposed in a given area. The current being turned on, the wires, by means of the resistance they are purposely made to offer to the current, become very hot, and this heat is radiated, therefore, steadily and equally throughout the car. A more agreeable means of heating it would be hard to imagine. No space is taken up by the stove, nor are any of the seats under rendered unpleasant by proximity to the heating apparatus. One part of a car is just as warm as the other, and by means of various methods of arranging the strips the degree of heat can be regulated to a nicety. There is no need to get the car ready for the approach of winter nor to make any special arrangement whatever, other than the simple attachment of these strips under the seats, which is all that is necessary when heat is wanted is that either the driver of the electric car or the conductor shall switch or turn on the cur- rent through the heating apparatus, and thus the same agency which propels the car and lights it also provides it with warmth. The question which comes into one’s mind on riding in one of the many electric cars now equipped with this ex-
celent arrangement is, why so scathing of the same kind cannot be rendered available for office or household use. The probability is that it soon will be. In speaking of electric car heating at a recent street railway meeting at Columbus, O.


one of the members stated that he had a little heater in his house which the laundress at any time connected up with one of the incandescent lamp sockets, and by means of which she ironed all day, the iron getting only so hot and never so red. Cooking is very often done on calorie coals, with all the attendant nuisance of running a furnace or open fires and then getting rid of the ashes. It is quite within the bounds of possibility that at no distant day our hearth will be gently radiator for us from the wall paper, and light supplied to us from a luminescent ceiling—and all by the simple pushing of a small button in some obscure corner of the room.

[Scientific American.]

**EDISON'S EXPLANATION OF THE AMPERE AND THE VOLT.**

During a recent examination a lawyer put the following question to Thomas A. Edison:


> "Mr. Edison, what is the number of volts in an electric current?" To which, he replied:
> 
> "I will have to use the analogy of a waterfall to explain. Say we have a current of water and a turbine wheel. If I have a turbine wheel and allow a thousand gallons per second to fall from a height of one foot on the turbine, I get a certain power. We will say one horse power. Now the one foot of fall will represent one volt of pressure in electricity, and the thousand gallons will represent the amperes or the amount of current. We will call that one amper. Thus we have a thousand gallons of water, or one amper, falling one foot, or one volt, or under one volt of pressure, and the water working the turbine gives one horse power.
> 
> If, now, we go a thousand feet high, and take one gallon of water and let it fall on the turbine wheel, we will get the same power as we had before, namely, one horse power. We have got a thousand times less current or less water, and we will have a thousandth of an amper in place of one amper, and we will have a thousand volts in place of one volt, and we will have a fall of water a thousand feet as against one foot. Now the fall of water or the height from which it falls is the pressure or volts in electricity, and the amount of water is the amperes. We see that a thousand gallons a minute falling on a man from a height of only one foot would be no danger to the man, and that if we took one gallon and took it up a thousand feet and let it fall down it would crush him. So it is not the quantity or current of water that does the damage, but it is the velocity or the pressure that produces the effect."

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**SUBMARINE BOAT.—The French submarine boat "Gymnote" was recently tried at Toulon, and demonstrated its ability to pass through a blocked line and escape attention in spite of systematic efforts to watch, trace, or discover its course. According to the Revue Industrielle, it plunged and remained under water forty minutes. It rose to the surface at a distance of more than two miles and a half from its point of departure, and had passed under the watched line of demarcation without being seen. After having ascended to the surface, it rapidly crossed the line, but this time two of the parties on the lookout for it got a glimpse of it, not, however, sufficiently distinct to enable them to trace and pursue it. The course of the boat was in both instances rectilinear.**

**INDUSTRIAL MEMORANDA.**

**PREPARING HEMP ROPES.—In order to insure greater strength in ropes used for seafaring purposes, particularly in localities where the atmosphere is destructive of hemp fiber, such ropes should be dipped, when dry, in a bath containing 20 grains of sulphate of copper per liter of water, and kept in this solution some four days, afterward being dried; the ropes will thus have absorbed a certain quantity of sulphate of copper, which will preserve them for some time both from the attacks of animal parasites and from rot. The copper salt may be fixed in the fibers by a coating of tar or by soapy water, and in order to do this the rope is passed through a bath of boiling tar, hot, drawing it through a thimble to press back the excess of tar, and suspending it afterward on a staging to dry and harden. In a second method the rope is dipped in a solution of 100 grammes of soap per liter of water.**

**THE CASTING TABLE.—A plate-glass factory is about twenty feet long, fifteen feet wide, and seven inches thick. Strips of iron on each side of the table afford a heating surface, the heat of which is used to determine the thickness of the plate of glass to be cast. The rough plate is commonly 9-16 inch, but after polishing it is reduced to 6-16 or 7-16. The casting tables are mounted on wheels and run on a track that reaches every furnace and annealing oven in the building. The molten glass having been poured on the table, the heavy iron roller is placed on it to cool the glass, and the table is moved to a uniform thickness. In contact with the cold metal of the table the glass cools rapidly. Then the door of the annealing oven is opened and the plate of glass introduced. The floor of the oven is on the same level as the casting table, so that the transfer can be made quickly. When, after several days, the glass is taken out of the oven its surface is very rough and uneven. It is used in this condition for skylights and other purposes where strength is desired rather than transparency. The greater part of the glass, however, is ground, smoothed, and polished.**
The Out-Door World.

Edited by Harlan H. Ballard,
President of the Agassiz Association.
[P. O. Address, Pittsfield, Mass.]

It is the first of April, and we ought to recognize the day—not as a time for practical joking and lying, but as that beautiful season of the year when flowers open their folded buds, brooks open their sealed lips, and the whole earth opens to receive the seed for another harvest. Some of our young Latin scholars may question the commonly accepted derivation of April,—from Aperlo, to open;—but, whatever the decision of the latest philologue may be, there will always—at least in New England—be a pleasant fitness in the old Latin saying, "Aprila omnia Aperit."—

Speaking of opening, suppose we open first this budget of letters from Chapters and members that will agree to answer all letters received. It will be remembered that a month or two ago we printed a complaint from one who had failed to receive an answer to a letter written to one of our Chapters. We said then that that difficulty could easily be remedied by making a special enrollment of all those Chapters and members that could be depended upon in this regard. Those that do not for any reason care to extend their correspondence will not be included in this list, and no one is invited to address them. But those whose names shall from time to time be added may be understood to hold themselves ready at any and all times to return a prompt and courteous answer, however brief, to every communication they may receive, without any conditions except such as may be specified in each case.

SECOND LIST OF CHAPTERS AND MEMBERS AGREEING TO REPLY TO ALL LETTERS RECEIVED.

233, Baltimore, Md.—We desire to correspond with Californian Chapters, situated both on the coast and inland. Address, Chapter 233, A. A., Baltimore City College, Baltimore, Md.

832, Napa City, Cal.—We desire correspondence, and will answer promptly all letters sent. I think The Observer takes the place of Santa Claus. Our special subjects are mineralogy, geology, and paleontology. We will exchange ores, fossils, etc., but everything will be answered.—Urban Lincoln Hertz, Pres.

[This is all right except the thought that any other paper than Popular Science News represents the Agassiz Association. The Observer does not even claim to have any connection with the A. A.—as several unsuspicious journals have done and still do.—Ed.]

Savannah, Ga.—Kindly notice me as willing at any time to answer correspondents.—Charles M. Clark, Madison Square.

Trenton, N. J.—I have always answered, and will continue to answer, all communications that come to me, stamp or no stamp, for the purpose of exchanging minerals. Some members of the A. A. have failed to answer my advices, but many have responded, and I can vouch for the courtesy of all those of the Corresponding Geological Chapter with whom I have communicated. For my part, I have already been more repaid for joining the A. A. It is excellent.—J. Husson, Box 117.

181, Sylvan Lake, Florida.—We hereby agree to answer, to the best of our knowledge, all A. A. letters addressed to us, until notice to the contrary is given. Our special subjects are botany, entomology, and ornithology.—R. E. Wylie, Sec.

Warren, R. I.—I agree to answer all letters or postal-cards sent me by members of the A. A. during 1891, or until further notice. The subject in which I take most interest is botany, although I am interested in all that pertains to the natural history of this town.—Frank D. Esterbrook, Box 413.

Copenhagen, N. Y.—All letters answered, especially in regard to polished specimens of woods, fossils, and crystals.—L. L. Lewis, Drawer 107.

Niles, Mich.—Your plan concerning correspondence is excellent. Please put my name down for ornithology, oölology, and taxidermy.—Ralph Ballard.

342, Haddonfield, N. J.—We will correspond. Our present study is entomology, but we are new to it, and fear we cannot give much information. We have some botanists among us, however, and perhaps may do some good in that way.—H. A. Crawford, Sec.

Mt. Morris, Ill.—I shall be very glad to communicate with any Chapter or member of the A. A. on any topic.—Lewis Snebben, Box 245.

882, Bedford, N. Y.—While we will agree to answer all letters or cards as you propose, we wish it understood that we are learners, not teachers. We are interested in botany and entomology, and particularly in grasses and spiders.—Mrs. Lea Laquer.

Philadelphia, Pa.—I will answer all letters or postal-cards received from Chapters or members of the A. A. during 1891, or until further notice. The subjects in which I take most interest are mineralogy, crystallography, and photography.—Charles E. Friek, 1,016 West Leighth Avenue.

24, Boston, Mass.—Our Chapter would like to add its name to the list agreeing to answer letters during 1891. The subjects on which we will correspond are geology, mineralogy, botany, chemistry, and archeology. We must add the proviso, however, that a stamp be sent for reply, as our treasury is very low.—Ella F. Boyd, 118 Hyde Park Avenue, Hyde Park, Mass.

[The condition that a stamp be enclosed is particularly fair in this case, as most of the members of Chapter 29 are specialists or teachers, and the ad is they are able and willing to give to our younger members is very valuable.—Ed.]

CHAPTER ADDRESSES, NEW AND REVISED.

No. Name. No. of Members.

428 Somerville, Mass. A. 

5 T. M. Dilawary, 25 Clarendon Street.

360 Louisville, Ky. A. 

7 Miss Adelaide T. Smith. Normal Ave.

302 Bloomington, Ill. A. 

7 Ethan Vialit, 1,016 North McLean Street.

155 New London, Conn. A. 

8 William P. Benjamin, 20 Broad Street.

402 Cumberland, Md. A. 

4 E. C. Hammon, Box 226.

411 Andover, Mass. A. 

5 George H. Keletty, Box 480.

192 Boston, Mass. G. 

4 Miss Lucretia Smith, Hotel Harvard, Reubiners Street.

426 Bangor, Me. A. 

7 O. Crosby Bean, Norfolk Street.

424 Nade Damo, I. S. A. 

Francis J. Powers.

AN INTERESTING LETTER AND LIST OF PLANTS AND INSECTS FROM THE HEART OF RUSSIA.

Moscow, Gagarinski 30.

27 November, 1890. [Dear Sir: I am happy to send you herewith a list of the plants of the district of Moschansk (government of Moscow), where, in the village of Parnarevo, I passed last summer, as I had many summers before. My son, Borice Fedchenko, sends you a list of the Lepidoptera and birds of the same place. Nearly all these plants are represented in my herbarium. The sign (*) stands in the list before the names of such plants as cannot strongly be considered as wild, but either are or have been cultivated and now grow wild in gardens. You may publish the list if you like.

Yours truly,
Olga Fedchenko.
Corresponding Member No. 16,008.

[This list will be published in the May and succeeding issues of the Science News.]

THE AGASSIZ ASSOCIATION BADGE.

Inquiries are constantly received concerning the badge of our Association. It is the Swiss cross, and, provided, that fundamental form be retained, details of material and ornamentation may be used. The letters A. A. or the words Agassiz Association must appear upon it, and preferably the number and name of the Chapter also. Mr. W. A. Hayward, Box 278, Taunton, Mass., has been our "official" badge-maker for ten years, and has always served us faithfully. His workmanship is good and his prices are low. The accompanying illustrations show some of the more popular styles, and range in price from fifty cents in plain silver to fourteen dollars, and as much more as one may desire in solid gold set with diamonds or other gems. It is pleasant, particularly when travelling, to meet persons wearing the Association emblem, for it at once establishes a friendly relation like that of all fraternity. The Swiss cross was adopted in honor...
of Louis Agassiz, as it is the emblem of his native land. Orders should be sent directly to Mr. Hayward, whose address is given above.

THE STAR OF BETHLEHEM.
The following note was recently received, and the information given in reply has been kindly furnished by Prof. C. A. Young, of Princeton. It should set the question at rest.

DIEPONIA, N. Y., Jan. 22, 1890.

DEAR SIR: Many heretofore in calling the planet Venus, so brilliant now, the "Star of Bethlehem", and some correcting that name, have written recently followings, "Has the Star of Bethlehem been seen lately?" In "Astronomy with an Opera-Glass" (Appleton) we are told to watch the constellation Cassiopeia, and naming the three stars, Cassiopeia, "Isaw-wah-geun", forming the large triangle, a very fine one at the top and three or four wide—were made of the long, slender leaves of the cut-tail flag (Typha), properly cured and carefully sewed together. When properly adjusted on the frames, with the edges lapping, they made a serviceable roof. Being light and, when rolled up, not inconvenient to carry, they were used for travelling tents. Houses of mats were often used for winter residences in the woods, and were not uncomfortable. The ah-go-been wah-gun was a small summer house for young men. Really constructed of cedar bark, it was an elevated platform resting on posts, reached only by ascending a ladder. Winter houses in the woods were sometimes built of slabs or planks of split timber. They were often cone-shaped, and were made tight and warm. They were called pe-oo-gawn. In the woods, even in winter, they sometimes lived in temporary wigwams of evergreen boughs, which they managed to make comfortable.

The Ottawa houses were without windows. The fire was built on the ground in the center, if the lodge was small; or there was a row of fires down the middle line in a long ke-o-day-oo-gawn. A hole in the roof above each fire served for the escape of the smoke. A raised platform—a foot or a foot and a half high—along the sides of the room, and each of the mats, served for a seat during the day and for a sleeping place at night. The mats, some of them beautifully ornamented with colors, were made of rushes found growing in shallow lakes, ingeniously woven together with twine manufactured from the bark of the slippery elm.

"All these names of Indian houses are pronounced with the accent on the last syllable. In Ottawa words "a" has the hard sound.

THE LEGAL ASPECTS OF HYPNOTISM.
The recent Paris trial has given a new impulse to the study of this important subject. At the February meeting of the Medico-Legal Society, New York, the President, Clark Bell, Esq., requested Prof. E. P. Thwing, M. D., Ph. D., of Brooklyn, to introduce the discussion. The following is an abstract of his address:

The literature of the subject is opulent. The number of reputable investigators increases. Taken the number of hands those whose aims and methods care is obvious, it is hypnotism is studied by members of each of the learned professions, vitally related as it is to the interests of which they are the natural custodians. It is safe to say that these facts are established:

1. Hypnosis, or artificial, trance sleep, is a subjective phenomenon. Here modern science joins issue with old-time mesmerism—the theory of some mystical efficacy from the operator. Hypnosis may be self-induced through expectation alone, through fright, by religious ecstasy, or by any erupting emotion.

2. Hypnosis is a disease in itself. Neurotic conditions predispose one to the trance sleep, but the strongest minds have also been entranced. Their recorded visions have been an open book for centuries.

3. Hypnosis is recognized in three stages—lethargy, somnambulism, and catalepsy. The transition may be immediate. The second is instantly induced by trained sensitive may be induced by an untrained person, in persons of all ages and with the same success and safety.

4. Hypnosis has been serviceable in medical and surgical practice, both as a therapeutic agent and in some cases as an efficient and safe anaesthetic.

5. The illusory impressions created by hypnosis may be made to dominate and tyrannize the subsequent actions of the subject.

The following legal aspects present themselves:

1. Has the sensitive sought the operator, or has the operator used undue influence to gain control of him?

2. Are proper witnesses present?

3. Are possible elements of error eliminated, such as self-deception, simulation, and malinger-

4. Is hypnosis a justifiable quasiresential agent?

No.

5. Do we need a reconstruction of the laws of evidence in view of the perversion, visual or otherwise, created by the trance?

6. Is any revision of the penal code desirable in view of these facts? No.

Finally, should there be legal surveillance over private experiments or public exhibitions? Yes. The Board of Health in Cincinnati did not overstep the bounds in suppressing shows in this line carried on for amusement and gain by travelling troupes.

Letters from Judge H. R. Gibson, Prof. William James of Harvard, and Professor Laid of Yale were read, agreeing in the main with the report of the committee as drawn up by Professor Thwing.

[Our readers will find a contrary opinion in regard to the action of the Cincinnati Board of Health among the editorial notes in the March issue.—Ed. P. S. N.]

THE ANATOMY OF NATIONAL LIFE.

In a recent address on "Oriental Thought," Dr. E. P. Thwing, of the Royal Asiatic Society, discussed the genesis of thought and character in the East, and put as initial elements of the analysis the physical factors revealed in the geographical position of a continent, its climate, scenery, soil, productions, and kindred facts. Some one has said that "the Gulf Stream gave Europe its civilization," and Dr. Cohen, of the Hawaiian Islands, says that the exclusion of the Pacific at Behring Straits has made Polynesia what it is. The presence of volcanic and seismic disturbances as related to the disproportionate development of the imagination is another curious fact, first suggested by Buckle. Thermal extremes as related to geographic interruptions, and so to weird instability, is another suggestive fact entering into the analysis of national character. The need of the study of physical geography and correlated subjects is fundamental. Only a careful analysis is a true synthesis reached, and so a rational science of human civilization.

This is the best time of year to organize new Chapters of the A. L.

REPORTS from the Fifth Century (Chapters 401-500) should reach the President by May 1.

Please put down as one of the Chapters will be notified by letter or postal-card sent by Chapters or members of the Agassiz Association. The subjects in which we are most interested at present are botany and entomology. Letters may be addressed to the Secretary or to Chapter 406, A. A., Box 323, Rye, N. Y.—Mary R. Breekenridge, Sec.

[Owing to the death of a relative of Mr. Ballard, to whom we extend our sincere sympathy, we are obliged to fill the remainder of "The Out-Door World" this month with miscellaneous matter, and have endeavored to select that which will be of special interest to the members of the Agassiz Association.—Ed. P. S. N.]
WATER GLOBULES.

By L. S. FREIHER.

By striking the surface of a pond obliquely with an oar, a shower of drops will be thrown up. Most of them will, when they fall, reunite at once with the sheet of water below. But some of them will not do this, but roll rapidly, looking like little spheres of quicksilver. These globules will, after floating a longer or shorter time, suddenly disappear, and leave no sign save a tiny ripple. Although these water balls are such common objects, yet they are well worth the student's attention. He can manufacture them at will, and in a manner convenient for observation, by taking, instead of a pond of water, a chinaman saucer filled with kerosene oil. The tension of the skin which all fluids seem to exhibit, and which accounts for the floating globules, seems to be greater in the case of the oil than in water. With the aid of a rod of wood the size of a pencil the apparatus is complete. By dipping the rod in and out we may obtain an abundance of the globules whose antics we are to study. The first thing which attracts attention is that often when only one drop of oil has fallen from the end of the rod we see two globules floating, and also, we observe, that one of them is much smaller than the other.

This is accounted for in this manner: As the forming drop receives accelerations from above, it elongates until the accumulating weight becomes too much for the cohesion of the particles of oil, and it breaks away. But it does not break off smoothly, but draws after it a tail like the stem of a pear. This stem then separates from the larger mass below, and both form themselves into spheres. The first and larger drop falls upon the fluid beneath, and swims thereon. The smaller drop falls upon the larger, and rolls rapidly down its side and away. Thus we account both for the two drops and for their disparity in size. We next observe that when two spheres approach sufficiently near they seem to be attracted by each other, and will coalesce into one larger globe. The question naturally arises, Why should the tension of the globules be sufficient to keep them from joining the fluid beneath, but not to prevent them from coalescing with each other? The reason seems to be that each globule swims in the bottom of a cavity, or depression, which is equal in bulk with the globule. Now when two globules approach each other their depressions will begin to coalesce, and the globules will be driven toward each other, or, in other words, will roll down hill to the center of their combined depression. The shock (combined with the fact that the opposing surfaces of the two spheres are very small) forces a rupture of their skins, and a juncture of the two results.

We next observe that a ball will sometimes appear to suddenly shrink to a fraction of its former size. This is a rather uncommon behavior, but diligence will reward the student with this, at first sight, inexplicable phenomenon. If we watch attentively any large ball it will be found that we will see that there is always an attempt to reproduce itself upon a smaller scale, after the following fashion: If we throw a bullet into a pond of water it, in sinking, first sends out a wave, then, as it falls down, it leaves a cavity, and the water, rushing in to fill up the depression, meets at the center, and a column of water is projected upward. The same process happens on a small scale when a water ball coalesces with the fluid below. First a wave is driven outward, then, as the globe shrinks, it forms a depression. The fluid then rushes in; a minute column is projected upward, and divides into one or more fragments, which, upon falling back, sometimes assume the spheroidal condition and float;—all being done so quickly as to leave the impression that the first globe had shrunk to its latter condition.

[N. F. Field's Washington.]

WHERE NATURE PLAYS SCULPTOR.

What looked like the fossil foot of a child, with a little stocking on, was sent in to the National Museum the other day. The most curious thing about it was that the stocking itself showed distinct signs of wear on the heel and ball of the foot. It was with regret, however, that the object was pronounced not a fossil nor a child's foot, nor yet anything else save a concretion of silicious matter which had taken this strange form by pure accident. The imitation was so astonishingly exact that the mistake was not at all surprising.

This is only one of many curiously imitative concretions which have been offered at various times to the Smithsonian Institution by persons residing in various parts of the United States. That it may be understood how they are formed, it should be explained that matter in general has a tendency to separate particles of the same kind gathering together. In the Connecticut River, for example, fine clayey particles are held in suspension by the water and swept along with the stream. Perchance some of them will collect about a pebble, a leaf, or some other object; and slowly, and perhaps not without accident, they will again and again gather themselves about, until the particles of one sort is formed, with the pebble or what not for a nucleus. Such lumps often take very queer shapes, and it is amusing how they sometimes imitate the familiar forms in nature. A favorite shape with them is one which so closely resembles that of a turtle that a specimen of the sort is, as a rule, mistaken for a fossil turtle. Looking at it from beneath, the head, the four legs, and the tail are quite distinct, with the lines of the shell; and yet it is only an accidental concretion of clay. Sphexhes, rings, and Indian arrow-heads are other shapes which such concretions take very perfectly.

But clay is not the only form of matter which takes concretionary forms. There is a mixture of carbonate of iron and clay, which assumes very interesting shapes in the same way. One of these, very common indeed, is easily mistaken for a fossil peanut. Break one of these peanuts open, and you will invariably find a small spiral winkle-shell, which was the nucleus. Even more interesting are the bigger concretions of this "clay-ironstone," as it is called, which, having got in the form of a mass, may be thrown into the water and thus acquire a shape of its own, or may, by chance, be thrown upon a beach and assumed the form of a coral or clast of a rock.

The reason for this is that the rock was once what is called a feldespatite quartzite; but water, percolating through it, dissolved out the alkaline substance, leaving the clayey matter. Thus the grains composing the stones are no longer held firmly together; it is loose-jointed, as one might say. It is found only on the surface of sandstone deposits, and is of no use in building. In Brazil this sort of rock is the matrix in which diamonds are found.

Speaking of diamonds reminds me that the students of the subject have found in South Africa for the first time a substantial clue to the processes by which precious stones were formed. Everyone knows that the diamond is pure carbon; but, although carbon is easily crystallizable, it has been found that it is not so easily crystallized by artifice, though Professors Maskelyne and Cook have produced very minute diamonds in the laboratory. Nature performs her chemical operations on a large scale and, of course, with superior facilities. The rocks at the South African mines are shales of a highly carbonaceous nature, and up through them has been forced in past times a great mass of carboniferous rock in an immensely hot state so as to enshroud the shale. For a long time the mass remained slowly cooled, and incidentally to the process the carbon in the shale was crystallized out in the form of diamonds. Afterwards the rock decomposed and rotted away—for rock will not like anything else—forming the blue clay from which the diamonds are dug today.

Three Chaldean monuments of antiquarian value were recently discovered under the foundation of an old London house. The site was formerly occupied by the dwelling of a Dutch merchant who traded in Persian ports. At the time of the great fire the stones probably fell through the ruins by their weight, and escaped notice when the house was rebuilt. They belong to the pre-Semitic age, and the characters upon them are of the most archaic form.
The history of the metal aluminium is a striking illustration of the way in which the demand for the cheap production of any substance is met, by the inventors and investigators, with the result of a constantly decreasing price and an increasing supply. Six years ago, aluminium sold for $12 a pound, three years ago for $8.50, today it is being sold in England at $8.90, and there is a strong probability that at the present price it will be reduced to $1 a pound. Mr. A. E. Hunt, of the Pittsburg Reduction Company, in a paper recently read before the Society of Arts of the Massachusetts Institute of Technology, in Boston, figured, from theoretical considerations, the lowest cost of a pound of aluminium reduced by the electrical furnace process, at twenty cents, but this has not as yet been practically attained. The prospect for cheap aluminium is very promising, although we doubt if it ever can be made so cheaply as to take the place of iron and steel.

PROFESSOR V. C. Vaughan, who, it will be remembered, was the discoverer of the poisonous alkaloid, tyrotoxine, which sometimes occurs in cheese and milk, announces the discovery of another form of poison which has been found in cheese not containing tyrotoxine. The substance has not been fully investigated as yet, but appears to belong to the class of poisonous albumins. It is quite probable that the poisonous effects of certain samples of sausages and canned meats are due to this or allied substances.

Every student of chemistry is familiar with the strong affinity of the metal potassium for oxygen, which enables it to decompose water and inflame the escaping hydrogen. In the next element of the group, sodium, this affinity, while less powerful, is still very strong. Proceeding in the opposite direction, we come to the rare metals, rubidium and cesium, which possess an affinity for oxygen even greater than potassium. A small quantity of the former, and carefully preserved, in naphtha recently came into our possession, and was placed upon a porcelain tile for the purpose of cutting off a small piece. No sooner, however, was it exposed to the air than oxidation commenced at once, and, strangely enough, continued to continue after the metal was replaced in the naphtha. The liquid commenced to boil, and finally took fire; naphtha, rubidium and all, vanishing in a red-colored flame, which, although very beautiful, was a very expensive chemical experiment, and especially unsatisfactory in the absence of the spectroscope with which it was intended to view the characteristic lines of the metal. A small piece saved from the general destruction has been kept covered with naphtha for several months, and it is charged up with a few molecules of oxygen, and is covered with a light crust of oxide. The action of the hydrate on siliicates like glass also appears to be very strong, as a minute particle pressed between the neck of the bottle and the glass stopper has firmly cemented them together. Cesium is said to have even a more powerful affinity for oxygen than rubidium, but we have had no practical experience with that metal.

HARMONY WITH THE ENVIRONMENT.

The above phrase, which is the cornerstone of the modern evolutionary philosophy, is at the same time a mere truism, as applied to living organisms. Life and the conditions of life must necessarily be co-existent, and the question of the variation of existing forms of life to meet the conditions of a changed environment, or in other words, the manner in which a form of life is fitted to itself, is of definite use to the organism in performing the two great functions of its existence, nutrition and reproduction. Without discussing any of these minor points, interesting and important as they are, it may be interesting to consider certain widespread and universal examples of the adaptation of living forms to surrounding conditions, which are often overlooked from their very universality.

All terrestrial animals and plants are constantly surrounded by a gaseous form of matter, composed of a mixture of nitrogen and oxygen. We have no reason to believe that its composition has been materially different since the time when we note the first indications of life on our globe. It is probable that plants and animals have been born in the earthy air in which they live, and that the air we breathe today is the same as it was at the beginning of all life. Hence it is of interest to consider the effects of a mixture of oxygen and nitrogen, and how these effects may help to explain the nature of the air in which we live.

It is evident that this adaption of the air to the needs of the animal body, which necessarily exist, otherwise all animal life would have perished at the moment of its coming into existence, but every teaching of science shows that the air was in existence before animals, and as it could not have changed its composition to meet the needs of an organized being, however introduced, it is certain that the form and nature of these blends, if modified at all, must have been modified in a way to meet the conditions demanded by the air. The lowest forms of life can better withstand change in the composition of the air, and to account for the harmony between animals and plants and the atmosphere in which they live the inference is almost irresistible that in the gradual development and modification of inferior forms, each succeeding generation, however it might have been modified, allowed the atmosphere to take up the necessary oxygen and functions which were best fitted to utilize the previously existing properties of that mixture of oxygen and nitrogen gases surrounding them. Assuming the existence of life in the first place,—and its origin and nature is a mystery about which we know nothing, and which we fear can never be penetrated,—we cannot but believe that the atmosphere has been composed of chloroform, or even if the present gases instead of being mechanically mixed had been chemically combined into nitrous acid, that organisms would have been developed capable of existing in these corrosive gases, and that the man living under such conditions the chloroform or nitrous acid would
PHOTOGRAPHY IN COLORS.

A noteworthy and remarkable step has been made towards the solution of the most difficult problem of photographing in colors, by M. Lippmann, of Paris, who has actually succeeded in reproducing upon an ordinary gelatine dry plate an image of the solar spectrum in its natural colors. Like many other great discoveries it is of astonishing simplicity, and, with the aid of the accompanying illustrations, (reproduced from La Nature,) the process can easily be understood by any one.

The sensitive plate used in the process must be prepared so that the film of gelatine emulsion shall be very thin and smooth, and entirely free from the slightly granular texture of the ordinary films. The sensitive film should be simply opalescent, and not of the creamy opacity of the films used in ordinary photography. Otherwise the plate does not differ from those in general use, and the emulsion consists of the usual bromide of silver.

In Fig. 1 (b), F is a plate of ordinary glass; C is a piece of hard rubber shaped like a horse-shoe magnet, or the letter U; G is the photographic plate, the sensitive surface being turned inwards. The whole arrangement is fastened together with clamps, and the cell thus formed is filled with mercury (M).

All being in readiness, an image of the solar spectrum is thrown upon the sensitive plate, and the plate exposed to its influence for a period varying from thirty minutes to two hours. The plate is then removed, and developed, fixed, and dried in the usual manner, when it is found that a perfect image of the spectrum—Fig. 1 (2)—has been reproduced upon the plate, all the colors being shown in their natural shades and brilliancy. Curiously enough, if the image is viewed by transmitted light, the colors are reversed, being replaced by the complementary ones—that is, the green appears red, the red green, etc.

The cause of this result is undoubtedly due to the principle of the interference of the light-waves, and the colors formed in the gelatine film are analogous to those formed in a soap-bubble. In Fig. 2 a much exaggerated section of the gelatine film is given, which will aid in the comprehension of the theory.

A light-wave of any color—say red—passes through the glass (Verre) and the sensitive film to the mercury, where it is reflected back again, meeting in the sensitive film other similar waves on their way to the reflecting mercurial surface. These incident and reflected waves interfere with each other, producing in the film alternate layers, as it were, of light (I) and darkness (o), just as two musical notes of nearly the same pitch when sounded together produce the alternations of sound and silence known as beats. Now just as in the film the bromide of silver is acted upon, and, when developed, a layer of metallic silver is formed. As the wave-length of each color is different, a different number of layers of silver will be deposited in the film for each color acting upon it. Thus if the gelatine film is 1-20 of a millimeter (1-500 of an inch) in thickness, the red rays will form 150 layers of silver, the yellow 260, and the violet 250, with intermediate numbers for the other shades.

![Fig. 1](image1.png)

![Fig. 2](image2.png)

Now when the plate is developed and finished it would seem that these microscopic layers of metallic silver will only reflect light-rays of a wave-length corresponding to the distance between them, that is, rays of the same color as acted upon that portion of the film during exposure; or, in other words, the solar spectrum will be reproduced in its original colors and brilliancy.

The discovery of M. Lippmann is certainly a most remarkable one, and, from a scientific point of view, of the greatest importance; but we must admit that it seems as yet to be of little practical value. The actual photographic reproduction of landscapes, groups, paintings, etc., in their natural colors appears to be almost as far off as ever; but a beginning has at least been made, and it is not improbable that this process may contain the germ of future discoveries which shall add the finishing touch to the photographic art, and render it a perfect method of reproduction and preservation, not only of form but of color.

*Special Correspondence of Popular Science News.*

PARIS LETTER.

The two topics of the day are the failure of the Koch anti-tubercular treatment, and Lippmann's researches on the photography of colors. On the first matter we may be allowed to pass quickly—not without expressing, however, our regrets that the loss of the German Emperor has so seriously affected Koch's fame. Koch, at all events, has done good work, and he is not to be blamed if he has not discovered the remedy for tuberculosis; his Emperor alone is to be blamed for having obliged him to speak before time—before his experiments were sufficiently advanced, and before the facts were ascertained. Such is the general opinion. France, proud of her scientific standing, it must certainly be the prevailing one in all circles. In the mean time numerous experimenters are working out the matter, trying to get at some remedy. MM. Richet and Héricourt are at present giving dog's blood serum to their patients. This serum is merely injected under the skin in a dose of one cubic centimeter every two or three days. It seems very probable that some one or other will find out some method by which tuberculosis may
be cured, at least during its first period—and this is all that is required. The man who shall discover this method will certainly be one of the greatest benefactors of mankind.

As to weather, the facts communicated by M. Lippmann are certainly very interesting; but there remains much to be done before we can obtain photographs of ourselves with our natural—or as natural in the case of some ladies (none of which, certainly, are readers of the Popular Science News)—colors. At all events, photographs of the solar spectrum may be had which are a whole new and beautiful feature of life, which we do not observe when exposed to the daylight, as the old photographs made many years ago by M. Becquerel. It is probable that photographs may some day be obtained in which the skin, hair, eyes, etc., will bear their real and natural colors; but it may be questioned whether we will like this much. Waxworks are certainly admirable as concerns likeness, when well made; but nobody would like to have the wax effigy of his friends or relatives. It seems too living. On the other hand, if we do like colors, since oil pictures are agreeable to our eyes, we must not forget that the colors which the painter spreads on the canvas are not the true natural colors of the objects. Experience will tell, but it seems probable that at first, at all events, the public feeling will be against the natural-color photograph.

The very cold season which the whole of Europe has enjoyed, figuratively, from the end of November to the first days of February, has, of course, done a great deal of harm. Mankind has suffered much, many trades or industries being paralyzed by the very fact of the cold; the ill-clad poor have been freezing; the winter vegetables have all perished on their stalks, and the seeds already sown in autumn must be replaced, as none of them can withstand the winter. No doubt many animals have also suffered much; wild ducks and fowl have been seen in Paris, in the middle of the Seine, near the Tuileries; flocks of starlings have immigrated to town, trying to keep body and soul together, the country affording nothing edible worth mentioning; and wolves have been rambling about near the towns, and especially mutton—folk, in a desperate struggle for life, which usually ended in agencies for the sheep. Even under favorable conditions most animals have suffered from the effects of the cold, and in the menagerie of the Paris Museum thirty-two mammals and sixty-six birds have perished. The African elephant has caught a bad toothache,—and it is presumed that when such a tooth as that of an elephant begins to ache it does the thing thoroughly,—the rhinoceros has been afflicted with a skin disease, and the hippopotamuses—an old citizen which has inhabited Paris since 1850—declares that the thing is really unpleasant, as he is as thoroughly frost-bitten as ever an hippopotamus has been. But there is nothing wonder-ful in this toothache; and those that belong to species which multiply in the menagerie are to be subjected to an experiment proposed by M. Milne Edwards. They are to be turned loose in a portion of the Marly forest, in order to see whether they can thrive in a wild state. M. Milne Edwards seems rather hasty when he thinks that

The mean temperature of the past winter has been 1.57° above the average in twenty-one years, with extremes of 2° on December 30, and 20° on February 25. The last two are the only winters in twenty-one years when the mercury has not fallen to zero at the hours of observation.

SKY.

The face of the sky, in 84 observations, gave 38 fair, 9 cloudy, 18 overcast, 10 rainy, and 9 snowey, a percentage of 45.2 fair. The average fair the last twenty-one Favershams has been 36.4, with extremes of 30.6 in 1884, and 77.4 in 1887. Notice how many rainy observations for a short winter month; the average number in twenty-one Favershams is only 4.6. The present February has been the least fair, with only two exceptions, in twenty-one years.

The present, fair the past winter was 45°, while the mean of the last twenty-one winters has been 53.6, with extremes of 38.1 in 1858-59, and 70.7 in 1877-78. The present winter has been the least fair, with a single exception, in twenty-one years.

PRESERVATION.

The amount the past month, including 17 inches of melted snow, was 5.51 inches, well distributed. The average amount the last twenty-three Febras has been 7.38, with extremes of 10.5 in 1887, and 11.72 in 1889. The average amount of snow the previous storm was from the 7th to the 9th, when about 10 inches fell, furnishing good sleighing for about a week.

The amount of precipitation the past winter, including 42 inches of melted snow, was 23.01 inches, the largest amount in twenty-three winters, the average being 13.59, with extremes, of 4.3 in 1877, and 29.0 in 1901. The amount of sleighing has been about twenty-five days.

PRESSURE.

The average pressure the past month was 30.068 inches, with extremes of 29.39 on the 3rd, and 30.55 on the 15th,—a range of 1.16 inches. The mean for the last eighteen Febras has been 29.76, with extremes of 29.31 and 30.18,—a range of .341. The sum of the daily variations was 12.26 inches, giving a mean daily movement of .439 inch, while this average the last eighteen Febras has been .399, with extremes of .162 and .439,—a range of .277. The daily changes the past month have been greater than in any month on my record. On six days the movements averaged .71 inch,—showing great and sudden changes in the atmospheric pressure.

The mean pressure the past winter was 29.971 inches, which is also the exact average of the last eighteen winters. The mean daily movement the last winter was .346 inch, while that of the last eighteen winters has been only .286.

WINDS.

The average direction of the wind the past month was W. 12° 32' N., while the average for the last eighteen winters was W. 39° 25' N., with extremes of W. 5° 5' S. in 1875, and W. 60° 57' N. in 1870,—a range of 66° 2', or nearly six points of the compass. The relative progressive distance travelled by the winds the past month was 50.01 units, and the last twenty-two Favershams 1,076 units, an average of 48.91,—showing less easterly winds than usual.

The mean direction of the last winter was W. 22° 32' N., and for the last twenty-two winters W. 31° 21' N. The distance travelled the last winter was 169.3 units, and the last two winters 2,721, an average of 123.7 units,—also showing less easterly winds than usual.
winds being less northerly than usual is in harmony with a warmer February and winter.

D. W.

NATICK, March 5, 1891.

**ASTRONOMICAL PHENOMENA FOR APRIL, 1891.**

**MERCURY** will be in good position for observation during the month. It is an evening star and comes to greatest eastern elongation on the morning of April 13. It is then 26° distant from the sun, and is not and north, and sets about an hour and a half later. It may be seen as early as April 10, under good atmospheric conditions, and will remain visible as an evening star until nearly the end of the month. It may be found shortly after sunset low down near the horizon, a little north of west. Venus is a morning star, rising about two hours before the sun, and is slowly approaching that body. Venus and Jupiter are in conjunction on April 7, and at the time of nearest approach are only 13° less than half the diameter of the moon—apart. This occurs at 4 P.M., Eastern time, while the sun is up, and consequently cannot be seen in the United States. On the morning of April 7, as they are seen before sunrise in our country, Venus is west of Jupiter about two-thirds of the moon's diameter, and little north. On the next morning Venus will be to the east and north, considerably more than the moon's diameter away from Jupiter. Mars is still an evening star, setting a little more than two hours after the sun. It has faded out so that it is no longer a very conspicuous object, but may still be easily found if looked for. It is moving eastward, and during most of the month is in the constellation Taurus. About the middle of the month it is about 2° south of the Pleiades, and at the end of the month it is north of the Hyades—the V-shaped group containing Aldebaran, the brightest star of the constellation. Jupiter is a morning star, gradually increasing its distance from the sun. It is in the constellation Aquarius, and moves eastward and northward about 6° during the month. At the beginning of the month it rises less than two hours before the sun, and at the end about three hours before. Saturn is on the meridian about 10 P.M. on April 1, and at about 8 P.M. on April 30. It is in the eastern part of the constellation Leo, and is moving slowly westward. The rings are a little whiter open than they were during March. Uranus is in the constellation Virgo, and comes to opposition with the sun on April 19. It is then on the meridian about midnight. There is no very bright star near it, but it lies about halfway between M. Virginis (fifth magnitude) and Kappa Virginis (fourth magnitude). Neptune is an evening star, just north of the Hyades.

**The Constellations.**—The positions given are for the latitude of the northern part of the United States, and for 10 P.M. on April 1, 9 P.M. on April 13, and 8 P.M. on April 30. Leo Minor, a small constellation, is situated very near the south point of the south. Leo is just south of it, the principal group (the Sickle) having just passed the meridian. Hydra is below Leo. Virgo is in the southeast, about half-way from horizon to zenith. Libra is just rising below Virgo. Going from the zenith toward the east we see first Coma Berenices and Canes Venatici; below these, Bootes, then Corona Borealis. Hercules has just risen, a little north of the east point. Lyra and Cygnus are on the horizon, just north of Hercules. Draco and Ursa Minor are east of the pole star. Ursa Major lies between the zenith and pole star, the pointers being very near the meridian. Cassiopeia is below and a little west of the pole star, and Perseus is west of the latter, at about the same altitude. Auriga is a little higher and farther west. Taurus is on the northwest horizon; above it follow Gemini and Cancer, just west of Leo. Orion is setting in the west, and Canis Major in the southwest. Canis Minor is above and between the last two.

**LAKE FOREST, Ill., March 4, 1891.**

**Correspondence**

Brief communications upon subjects of scientific interest will be welcomed from any quarter. The editors do not necessarily adopt all views and statements presented by their correspondents.

Editor of Popular Science News:

DEAR SIR: I noticed in the January number of the Popular Science News an item relating to the finding of an egg within an egg. It seemed to me quite interesting, and I wish to ask whether anything came under my own observation. In preparing some apples for household use, a large one of the variety known as "Northern Spy" upon being quartered disclosed a half-inch store nut with a short screw in it. Both nut and screw were as bright as it just from the manufacturer. The apple was perfect in all respects, and the cavity—in which the nut and screw exactly fitted—looked precisely like the egg. The nut grew on a large tree in the garden near the house, but the limbs did not come in contact with the house. I should be glad to hear any reason for the theoretical subject.

M. W.

**SOUTHPARK, Me., Feb. 29, 1891.**

**QUESTIONS AND ANSWERS.**

Letters of inquiry shall enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

**QUESTIONS concerning the treatment of diseases cannot be answered in this column.**

**PHOTOGRAPHER.**—Why is the metal magnesium so invariably used as a source of illumination in taking flash-light pictures?

Answer.—The light, or, more properly speaking, the photogenic action of magnesium, is very rich in actinic rays, which alone have any action upon the sensitive plates. These actinic rays are non-luminous, but accompany the light rays, from which they apparently only differ in having a shorter wavelength.

J. K. C.—What is the composition of the gun used on the back of postage stamps and envelopes?

Answer.—It is composed of dextrine, a substance prepared by the combined action of nitric acid and heat upon starch. It is not poisonous, but harmless in every way. It has the same chemical composition as (C, H, O,) with which body it is said to be isomeric.

B. M. O., New York.—What is the cause of the fading out of documents written with ink?

Answer.—Nearly all the inks in common use contain a matter as a part of the coloring matter. The great majority of them are principally a combination of iron with gallic and tannin acids, both of which are decomposed by heat, which readily decomposed. The action of moisture, light, and other agents will, after a while, decompose these salts of iron, leaving only the most insoluble oxides of iron, which are precipitated and has been. The only really permanent ink that is prepared from some form of carbon, such as lamp-black, of which the Chinese or India ink is composed. Carbon resists destructive influences to a remarkable degree, and writings made with such ink will last as long as the paper on which they are written.

J. C. W., New York.—When were the metals potassium and sodium first discovered?

Answer.—Humphry Davy first prepared the metal potassium by electrolysis from potassic earth, in 1807, and shortly afterwards succeeded in obtaining metallic sodium, calcium, etc., by similar methods. Previous to this the metallic base of the alkalies was unknown. Metallic potassium is now obtained very cheaply in large quantities by the Caustic process, and is used in the manufacture of aluminum.

**LITERARY NOTES.**


An excellent survey of the subject, while, in some manner practical one, owes more than others to the application of the theoretical principles of chemistry, physics, and mechanics. The present work is not only the judicious way in which theoretical and practical considerations are combined, and the clear and easily comprehended manner in which the beginner in the study of the art is introduced to the subject. There is hardly a section of the country in which there are not other mines or metallurgical works; and we can recommend this volume to all families acquainted with the methods of extraction and reduction of metals from their ores.


The manipulation of India rubber has hitherto been considered as a most impenetrable trade secret, or at the best a branch attended with much difficulty of manipulation. In this work the entire subject is treated exclusively from a practical standpoint. The instruction and the processes are so simplified that any one of fair mechanical ability can undertake to make numbers of different forms of the gum, and recognize that many will not feel inclined to incur heavy expenditure. For such, home-made apparatus, prepared and illustrated which will do perfectly excellent work, and whose cost will be almost nothing.


Only Mrs. Whitney could have written Aacaetne Street, and her army of readers must feel that its charming the lesson which the world needs to learn and practice— that reality, sincerity, usefulness, and noble aspiration make real work; that the work is not infinitely more sane and beautiful than low aims and pretense can make it. The lesson, however, is not only inatory preaching, but by a bright story, with people and events which enlist the reader's hearty interest.


This work, although showing too much the influence of the Delarte era, really contains a great deal of practical value. The gospel of rest cannot be too zealously preached, and repose of body and mind will often do more towards the solution of problems than long work. The judicious perusal of this book cannot but be of benefit to all.

The Cassell Publishing Co., of New York, send us the novel Madame d'Extrey, by Liane Falconer. Although in no sense a scientific work, it is an in- triguely interesting, and the list, told with such strength and power as to hold the reader spellbound.

**Pamphlets, etc., received:** The *Franklin Interrupted Current,* by William James Morton, M. D., New York City: The *New Anaphrodictic Ob- street,* by the *Cassell Publishing Co.*—by Jacob D. Cox; and from the United States Government Departments at Washington, the *Hand-Book of the American Republics, Cassens Bulletin, Bulletin of the Department of Agriculture* (Division of Entomology), *Bullettin of the Coast and Geodetic Survey,* and *Reports of the Smithsonian Institution and the National Museum.*
Medicine and Pharmacy.

[Original in Popular Science News.]

HOMEOPATHY IN RELATION TO THE KOCH CONTROVERSY.

BY CHARLES FESSSENDEN NICHOLS.

Dr. Koch's injection of fluid ("paratoid") has encountered, from the first, strong opposition from medical schools—paratoid—by the great Virchow of Berlin at their head. To summarize the history of the past three months, the autopsies (i.e., twenty-three by Virchow) show general tuberculous infiltration of the bodies of the victims. Virchow states that the substance of the tubercle is not absorbed at its original resting places, and there are eruptions of fresh crops.

Hahnemann, however, in his curative process, which he originally repeats the process which preceded the discovery of vaccination, in which, for the sake of protection from a dreaded disorder, a scab or drop of purulent material from a person sick of smallpox was injected into a healthy man. The man took smallpox; but his physician told him he ought to have it—he could be better cared for if the disease was recognized. For instance, in Boston the horrid disease was often utilized by parties of the inoculated who doted certain islands with tents, in order that they might "have the distemper"—or let it happen. How brutally harsh was this treatment!

Yet science, disciplined by experience, is now accused of employing a method more barbarous than that of inoculation. Strong and healthy persons only, and at a favorable time of the year, were chosen by their physicians to submit to the latter process, and inoculation when once discovered seemed a necessary precaution, though vaccination soon became its substitute. Koch's injections are, however, made under very different conditions: still more of his own horrible disease is forced into an already exhausted sufferer, and the result is now announced. Koch, nevertheless, hopes "to extract from the tubercle bacilli that which is curative substance alone." Meanwhile there is on all sides enduring faith that true curative power dwells in the paratoid.

Whoever, then, like Gallvier shall succeed in coaxing the Liliputian enemy the secret of its poison balm, and can so cultivate or otherwise prepare the paratoid that, retaining still its curative power, yet innocuous, he has solved this difficult problem.

For twenty years or more, a most misunderstood and maltreated body of observers, homeopaths, has recognized this indispensable curative service of the products of disease, and, in addition, the necessity; for their extreme attunement, before that they might be safely administered in sickness. "Phlogistic" and "tartaric" and "acrid" belong with such drugs as arsenic, which develops deadly disease if given to persons in health, but is curative in certain disturbed conditions. The testimony given by these physicians appears singularly fitting, and their experience would be of vital importance at this time of wholesale experiment threatened by the followers of Koch. I will now attempt to describe the culture and professional training of these men who are accused by the dominant school of failure to accomplish anything for medical science, of bigotry, of narrowness and of "having a fixed belief."

The college requirements for students of homeopathy do not differ materially from those of the older school. Many of these students are already graduates of Harvard or of foreign medical schools, who afterward finish their studies at a homeopathic college.

"By their fruits ye shall know them." Among the noteworthy results of a professional education in the methods of this school has been the discovery of unexpected remittal agents, far in advance of similar discoveries by other investigators. The homeopaths have long recognized the life resulting from death in natural growth, and have not hesitated to explore, filth, decay, and disease, for morbid products or nososes. Diseased material from animals and plants and the poisonous secretions of reptiles, fishes, and insects are found to have indispensable curative properties in desperate diseases. They can be used to help them. The question raised when the properties of the organ have been clearly differentiated by a thorough proving. Is it generally known what is meant by a proving or study of a remittal agent? Let me then briefly show you the labor, the research, and the professional skill required to make a proving.

A proving is made by administering to several healthy persons a substance or extract and recording its effects, with the ultimate object of using the proven material in disease. Each agent must be studied with regard to its chemical, functional, and whole pathological effects in the body; study the pulse, the sensations, the heart, lungs, brain, kidneys, liver, systems of nerves, blood-vessels, lymphatics, glands, digestive organs, machinery of the senses, each anatomical part, and tissue; study the connection of the proven material with eruptions, parasites, contusions, climates, influences inherited or acquired; note the resemblance of this to other drugs and its antidotes. Above all there must be perceptions of mental states, to avoid deceit, artistic insight, and quick sight. For all these matters, sought out by stethoscope, ophthalmoscope, sphygmograph, demonstration and description of the internal, blood, etc., and the whole armamentium of a modern physician, enter into the preparation of a proving and must be brought together with laborious, painstaking care before the proving is offered.

Prof. Constantine Hering prepared, in the year 1850, for his colleagues of the medical college at Allentown, Pa., a scheme of twenty closely-written pages pertaining to the subject of proving. The systematized tables of German university training which has given its prestige to German scientists was thus early brought to bear upon students in this matter. A proving is accepted and enters materia medica and text-book only after its characteristics have been confirmed—often by hundreds of independent investigators. At last the proving stands, full of interest, a new learning—behind it,—sometimes a learned—analysis, entirely unknown to old school methods; and one more weapon is ready for use.

The authorized works of homeopathic materia medica are very numerous; fully 1,100 remedies are available. Many practicing physicians carry in memory the chief characteristics of the greater proportion of these. Proving and the repertories founded upon them naturally differ in value; yet a curious observer must, I think, find in the general result the evidence of such persistent industry and scientific research that all statements which assume a lack in either respect obviously proceed from unfitted faculty.

Regarding attainments in literature and the liberal sciences per se, a welcome addition, no doubt, to the real service of medical men, and the supposed lack of which on the part of these practitioners has been made the subject of grave comment, to four bright spirits only in all these two thousand years of physicians, have seats been among the immortals! Hippocrates, Galen, Sir Thomas Browne, and finally Dr. Holmes have, severally, gained a place in letters. Each of these is a rebel and an innovator; for without rebellion and innovation was never yet wrought any good thing. But fifty years have passed since the death of Hahnemann, himself a man whose vast learning was fully recognized in his time. Meanwhile neither poet nor sage has yet produced the "Pamela" in medical literature; the fact is, its founders have been at work so hard that they have had no time to hold up their heads to sing.

Let us now enquire what has been accomplished for medical science by the elaborate provings of the homeopathists; for the axiom dedit of a proving has not been explicitly given in the preceding pages. Hippocrates, Hahnemann and Sydenham hypothesized and finally taught that the testing of medicines upon the healthy would show the exact curative power of each remedy in disease; this doctrine was formulated by Hippocrates in his aphorism in axion similis simili curatur, cure by similars. Jenner by vaccination and Pasteur and Koch by their inoculations, have, more recently, illustrated the effects, under this hypothesis, of a limited class of remedies; but to Hahnemann and his successors alone, with their elaborate system of full, descriptive provings of nearly every known medicinal agent, is due the gradual establishment of a law educated from the original working-hypothesis of Hippocrates.

That the law of similars cannot be explained a priori (i.e., upon any material or mechanical ground), is to my mind, at once to be admitted before we can accept it as a fundamental principle of medicine or starting-point, exact like that of electricity or chemical force. The law is that disease is cured by an influence similar to that which produces it. However during the first assumption of this law of similars, it has now passed through the stages recorded in the history of every established principle that has been submitted to induction, deduction and verification.

More observation of instances is not inductive and does not lead to science until through the study of instances we rise to fixed law. With such a law, prophecy or deduction must be possible and the accuracy of this prophecy, or verification, will be a fresh test of the original law. The medical observer who is being tested in reference both to normal and diseased the human body, has the logical advantage of a double verification, and may thus be said to be rediscovering...
ered every day in the practice and prevarications of each homeopathic physician.

From theory to practice. It is, then, law, not fact, which has enabled the homeopaths to reach their very consistent result in the matter under contention. For the erudite discoveries of Koch be, indeed, a consummated and brilliant blossom of medical science, it is the startling fact that this law of similars plucked th' flower long ago, and, aided by its necessary and safe dilution or attention, has made intelligent use of its discovery.

To confuse our attention by testimony bearing directly on the treatment of tuberculous disease. The proving of this fact shows a course of a deposit of tubercle at the base of the brain. Severe and unbearable headaches are a prominent symptom, with local congestion, delirium and insaniy: more remotely and as later manifestations, cough, paroxysm spate and diarrhea. The remedy tuberculinum has been, for years, helpful given in meningitis, hereditary and invertebrate headaches, hectic fever, night sweat, and with tuberculous expectation and all early stages of phthisical disease.

It would thus appear that in those first stages of consumption, which alone are claimed to be curable by the injection of Koch's Fluid, the homeopaths have made safe yet effective use of the same materia medica as Koch's. Instead of protection by boiling, cultivation, etc., a high attention has been paid, with tuberculous expectation, and all early stages of phthisical disease.

It would readily be seen, however, that treatment by nosodes might soon degenerate into an enthusiastic, thoughtless, and empirical use of these remedies, to the exclusion of others if the inference were drawn that each microbe disease could be annihilated by its own potentized product, and it has naturally been found impossible to remove, by the administration of its nosode alone, the whole ultimate disturbances, in the form of secondary symptoms, sequences and diseases of distant parts of the body. Indeed other remedies might, even from the beginning of treatment, be more serviceable than these. Thus, in faithful treatment, it is sought to accomplish an end far more subtle than the mechanical removal of bacillli. 

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**The bacillli not only maintain its own parasite life in the body, but appears itself to manufacture, or subvert the nutritive and vital substances which are poisonous, though separated from the bacillus.**

*—*From the New England Journal of Medicine, March, 1890, p. 45, quoted from the Medical Journal of New York.*

**CARE OF THE EYES OF NEW-BORN INFANTS.**

**By J. HoRHART EIGBERT, A. M., M. D., PH. D.**

In the process of parturition, the eyes of the child are in danger from two sources, to wit: inoculation by accompanying discharges,—whether specific or non-specific,—and from mechanical injury at the hands of the attendant. Of the latter danger little need he said, as the preventive measures are at once obvious, and the subsequent treatment dependent upon the nature of the injury and the effects to pass. The former is rare, but have occurred from time to time in the practice of some of the ablest men in the profession. The danger from inoculation is very great, and the danger thus incurred is always serious, and sometimes the greatest to which the human eye is ever exposed.

The chief and most important cause of infantile conjunctivitis is this exposure during parturition, although direct communication by the hands of attendants, and indirect by atmospheric dissemination of disease-gene's, are causes not to be overlooked; while had atmospheric surroundings, exposure to intense light, cold air, smoke, dust, irritating gases, and to irritating soap in the first ablutions, are less active and less dangerous factors of causation.

The conjunctivitis of new-born children may be divided into two classes, viz: the specific and the non-specific varieties. The mild or non-specific variety is usually due to dust, smoke, and other irritants, and is apt to prove very obstinate, since the eyes of an infant are difficult to cleanse, and their recuperative power is limited. In these cases there is, as a rule, no discharge, nor marked swelling of the lids, and the conjunctiva of the eye-ball is not much implicated. The eyelids have a tendency to stick together, and there is more or less of a sticky, yellowish, discharge, which is apt to stick to the margin of the lids. There is very little danger to the cornea,—hence to the sight,—and the discharge yields quite readily to the proper remedies, to be considered later on. The severer (specific or purulent) form is a true blessornia, and is the result of a direct infection. It is due to a specific germ—*Microcecca*—which is found in the secretions, and either gets into the eye of the child during birth, or is carried to the eyes after birth by means of sponges or towels that have been contaminated by the secretions containing the infectious germs, or from an eye already affected with purulent ophthalmia.

As a rule, the disease manifests itself in one to three days after birth, the third day being about the given date the discharge is first noticed. But the discharge may not begin so early, and the eye should be carefully and frequently examined during the first ten days of the infant's life. Unless the disease results from subsequent direct inoculation, it is safe to assume that the latter its appearance the milder will be its course, and the less purulent and the more simply catarhal its nature. In the course of its manifestation, leading to and sometimes redness of the conjunctiva soon pass on to intense congestion, with oedema of the subconjuctival areolar tissue, tenaceous inflammatory swelling of the lids, great pain, and discharge. The discharge is at first serous, but soon becomes more profuse and uniformly creamy and yellow, or even slightly greenish. Generally one eye is affected at first, but both eyes also. If neglected, as this disease but too often is, or treated with such useless application as a little mother's milk, the lids swell externally and assume a dark red color, the conjunctival inflammation rapidly increases, and the purulent discharge becomes very copious. The infant keeps the eyes shut. The eyes may continue in this state for a number of days without any serious injury to the transparent parts, and in a certain proportion of these cases no corneal damage occurs; but the risk is great, for not infrequently the cornea becomes dull and hazy, and partially infiltrated with pus in a very few days. At this infiltration extends, the texture of the cornea is thereby greatly destroyed and given way by the pressure of the discharge, and with less of formation. With a small perforating ulcer the iris alone may prolapse, but when a considerable portion of the cornea has been destroyed, the iris is exposed, the lens comes away, the humors prograde through the pupil, and the sight is totally destroyed. In the words of another, it is indeed "melancholy to reflect on the frequency of discovered vision from this disease, especially as the complaint is, in general, completely within control, if taken in time and properly treated." Attendants are not alarmed sufficiently early, and even medical practitioners are sometimes betrayed into the false supposition that there is nothing dangerous in the complaint, till the cornean burst,
and the eyes are destroyed. A pitable sight—for these children do not die, but grow to manhood and womanhood totally blind!

The treatment is both preventive and curative. The first indication is prevention. Whenever there have occurred profuse discharges of a specific nature to the child's birth, the greatest care should be exercised to prevent infection of the child's eyes. Injections of a mild corrosive sublimate solution (one part of the sublimate in from three to five thousand parts of water) should be given during the first stage of labor, and the child should be delivered as quickly as possible after its head has entered the pelvis. As soon as the child is born, the eyes should be washed three times with water, and one or two drops of a two per cent. solution of nitrate of silver should be dropped into them, and clean cloths rung out in ice-cold water should be laid over the closed lids occasionally during the first day. As a rule, it is wise in all cases for a competent attendant to carefully wash the infant's eyes with warm water and apply a nitrate of silver solution to them for a few days—the sponges, towels, cloths, etc., employed being perfectly clean and used for no other purpose, and the hands of the attendant cleansed each time before these ablutions are made.

By these means ophthalmia can be avoided in most cases, but if prophylaxis fails and the symptoms already described come on, active curative measures must be taken in a way, until the discharge is distinctly purulent, the more simple and non-irritating the treatment the better the results. Cleanliness is of the first importance—more valuable than all else. The discharge in severe cases is excessively irritating, and its frequent removal is therefore an urgent indication. For this purpose a solution of boric acid (a teaspoonful of the powder dissolved in a pint of water) should be used every half hour or oftener, both day and night. The pus should be, as far as possible, removed, and the solution should come in contact with the inflamed conjunctiva. This, as well as other mildly astrigent solutions, will cure the mild or non-purulent infantile conjunctivitis. Pure vinegar may be squirted into the eyes to prevent the discharge from sticking together. If the case should prove obstinate, a one per cent. solution of nitrate of silver may be applied to the well-everted lids with a camel's-hair brush, two or three applications in the course of as many days being all that is required to effect a cure. Whenever there is much swelling of the lids, cold cloths, occasionally applied, are in order. The true specific or purulent conjunctivitis requires most careful attention, and its rational and successful treatment is not only beyond the ken of domestic medicine, but occasionally these cases are—either through carelessness or ignorance—neglected by the general practitioner of medicine. It is such a dangerous affection, especially when neglected, that any discharge from the eye of a very young baby should at once receive careful attention. Owing to the little power of resistance of the cornea of such young children, serious complications frequently occur, even during the earliest stages of the disease. Protection of the second eye, if both are not affected at the same time, is a matter of great importance, and also of great difficulty. In cases of the age and restlessness of the little patient. In addition to the free use of the boric acid solution, ice-cold cloths should be applied to the lids for fifteen or twenty minutes through the day and the night, and a one or two per cent. solution of nitrate of silver should be applied to the everted lids, pro re nata, by the surgeon. If complications occur they are to be treated on general principles. It should ever be remembered that the purulent discharge from these eyes is highly contagious, and that serious consequences are pretty sure to result if it is permitted to enter the unwashed eyes of infants. Absorbed cotton is a good article to use in cleansing the infant's eyes, and the pieces employed should be at once destroyed after use, and not be placed where they can get into the hands of other children and thus spread the disease.

MONTHLY SUMMARY OF MEDICAL PROGRESS.

By MAURO D. CLARKE, M.D.

PEROXIDE OF HYDROGEN.—Peroxide of hydrogen is a drug which has been gradually and steadily gaining in favor, and which has yielded, as water did formerly, to its present position. Its virtues are many and deeply rooted. Absorbed cotton is a good article to use in cleansing the infant's eyes, and the pieces employed should be at once destroyed after use, and not be placed where they can get into the hands of other children and thus spread the disease.

—[Specially Compiled for Popular Science News.]

OCTOPHILIOMORPHIC EVIDENCES OF DEATH.

According to Dr. W. W. Gowers, of England, as soon as the heart ceases to beat and respiration stops, the diffused redness of the optic nerve discs, caused by capillary circulation, disappears in a few minutes, and the nerves become white. As the heart's action slowly fails before death, the arteries diminish in size, and when it ceases, the diminution is suddenly increased, and they "quickly disappear from the disc, appearing to commence at its edge." In the retina they remain longer, but during their last agony, the arteries persist longer than the veins; but, like them, may rapidly become invisible on the disc, "appearing to start from its edge." The blood in them then breaks up into fragments, giving them a "beaded appearance." The veins in the retina remain visible, while the "beaded appearance increases." In ten to thirty minutes the arteries are no longer visible in the retina. The color of the choroid remains normal for a few minutes and then undergoes various changes, according to the amount of pigment it contains. Soon the retina becomes opaque, when a red spot in the macula lutea may be seen, because free from opacification, just as is the case in embolism of the central artery. In the course of about six hours the media become so opaque as to be almost black. The reason of the rapid disappearance of the arteries is because their continued contraction, after death, presses the blood out of them.

AMAUROSIS AND AMBLYOPIA.—These words practically mean the same thing—obscure vision, writes Dr. A. D. Williams in the St. Louis Medical and Surgical Journal. Custom, however, makes amaurosis apply to conditions of complete blindness where no visible causes can be discovered, while amblyopia designates partial blindness without any visible or discoverable causes. Some one has aptly defined amaurosis to be that condition in which "the patient cannot see, and the doctor cannot tell why he cannot see." The same definition applies with equal appropriateness to amblyopia: "The patient cannot see well."

At present amaurosis is only rarely used, for the reason that the direct cause of the blindness can nearly always be diagnosed. On the contrary, amblyopia is in constant use, and is made to designate the obscure or imperfect vision in numerous conditions where no actual or visible disease can be discovered. I mention only a few of them: Whiskey, tobacco, quinine, traumatis, salicylic acid and its compounds, uraciam, glycosucr, hemorhugle, and hysterical amblyopia.

In some of these conditions visible lesions may
Antisep tic Surgery has been somewhat bow-
ered in the general estimation of the profession since the publication of Lawson Tait's remarkable success, and another blow given to it was when Lister forewore the spray. Mr. J. Knowsley Thornton, however, has taken up the cudgels for it, and in an address on "Abdominal Surgery. Past and Present," recently delivered before the medical society of London, he said: I am not ashamed still to use the spray, and all the precautions which have advanced my results in ovario-
tomy to 1:88 per cent. mortality, as against Bantock's 4 and Tait's 3:3 per cent., and I find incision for the small vessel methods which have yielded me good results in the past, increase in like ratio my success in all abdominal operations. Every operator of promi-
ence improved his results enormously as soon as he adopted Listerian; then, having loved how to be surgically clean, he has found for himself ways of attaining this end with more or less success by methods differing from these of Lister. The sum and substance of it all is, that if we had never had Lister to teach us true cleanliness, we should never have used antisepsics, flushing, or drainage tubes to attain it. The great advance is due to the antisep tic system; the minor details are merely the different ways of attaining the same end—asepsis. Time alone will show what is worth retaining, and what we may safely cast aside.

The Disinfecting Power of Chloride of Lime.—Contrary to the previous statement of Koch, Sterneburg, and, later, Jäger, found that chloride of lime possesses decided germicidal power. In consequence of these contradictory results, Nissen undertook, at the suggestion of Koch, a new experimental research to decide the question. The result of this shows that, as a matter of fact, chloride of lime has very great disinfecting power. At first microorganisms without spores, and having comparatively little resisting power, were tested, in bouillon culture, by Eschars's method. As chloride of lime solution gives an abundant precipitate with bouillon, the cultures were first diluted. The chloride of lime solution was added, either filtered or not filtered. The result was the same in either case. The bacillus of typhoid fever was destroyed in bouillon cultures, at the end of five minutes, by 0.12 per cent. of chloride of lime; the cholera bacillus and anthrax bacilli without spores by the same pro-
portion usually in one minute. Anthrax spores of moderate resisting power (killed in three minutes by flowing steam), dried on silk threads, were destroyed in fifteen to thirty minutes by a five per

cent., solution of chloride of lime. Patrid duods and faces were very quickly disin-
fected by the addition of chloride of lime. Bouillon which had become putrid was, as a rule, thor-
oughly sterilized in five minutes by the addition of 0.1 per cent. In diarrheal faces an addition of 0.5 per cent. of chloride of lime, either in solution or as a powder, destroyed the typhoid bacillus inside of ten minutes. Nissen thinks, therefore, that chloride of lime is especially suitable for the disinfection of bed-pans.—Zeitschrift für Hygiene.

Von Bergmann on Hemostasis during Operation.—During operation hemostasis is most carefully controlled by means of pieces of gauze, which have been rendered aseptic shortly before. This gauze is not impregnated with any other antisep tic agent, nor is it dipped into any anti-
septic solution; but it is pressed perfectly dry on the bleeding surface and then discarded. All vessels are secured with torsion-forceps or Pécé's forceps, and tied with cat-gut ligatures. The wound must be thoroughly dry and the hemor-
rage completely stopped before the sutures are applied.—Med. Record.

Hunger and Infection.—It is a well-known fact that hunger predisposes to certain diseases, but it has been reserved to two Turin doctors to demonstrate the increased liability experimentally. Their observations were carried out with the virus of bacillus anthrax on pigeons, a disease to which these birds are, under ordinary circumstances, refractory. They found, however, that six days' total fasting rendered the birds incapable to the virus, on condition that food was still withheld. If, however, food was given at the same time as the virus then they still successfully resisted infection. Further, when starvation was continued for two days after the inoculation, and food then given, the development of the disease, though not prevented, ran a slower course. Lastly, the virus proved capable of infecting birds well fed one day, the birds being subjected to starvation subsequently. The line of investigation is evidently one which admits of further research, but the moral is obvious.—Med. Press.

Saccharin in Russia.—Following the example of France and Italy, the Russian Medical Council has prohibited the use of saccharin as an article of food. Henceforward the substance will only be dispensed by apothecaries and druggists only on medical prescription.

Supra-orbital Neuralgia.—An old gentle-
man was admitted to the hospital, suffering from supra-orbital neuralgia so intense a character that he could neither eat, talk, nor swallow, the least movement of his jaws or of the supra-orbital muscles provoking intense pain. Before resorting to the nerve it was determined to try what electricity would do for him, all medical means having been exhausted in vain. Improvement began with the first application of electricity, and within ten days he was entirely relieved of all pain or discomfort.

Tincture and Register.

A New Cure for Lumbago.—Some weeks ago a large hulk of our was washed ashore on the Southern Daccau coast. Those who found it as-
certaining it was not drinkable, did not know what to do with it. One, a fisherman, advanced in years, beheld him to try what effect it would have as a local application in the lumbago of his better half. Animated with this touching impulse, he placed her in position before his cabalistic toilet, and some minutes he held her in the air, with the aid of the fire's heat. He pro-
ceeded indistinctly for a while, the patient only complaining that it was "very cold." However, she had not long to lament on this head, for suddenly the other caught fire, and between the bottle he held in one hand, the painful he had in the other, and what was in supposition about the apartment, there was "a tarr of a noise and the divil of a blaze." Both suffered some capillary searing only, but the lumbago is cured—for the time.
Familiar Science.

PLATINUM MIRRORS.

Nearly all the mirrors in common use are provided with a reflecting surface consisting of an amalgam of tin and mercury. The manufacture of these mirrors is not only injurious to the health of the workmen, but the coating is very liable to injury by accident or by spontaneous crystallization and decomposition often observed in old mirrors or those exposed to strong sunlight.

As it is a comparatively easy matter to precipitate upon a plate of glass a coating of metallic gold, silver, or platinum, many attempts have been made to use these metals as a substitute for the mercury-tin amalgam; but none of the mirrors thus produced are quite as satisfactory or brilliant as the latter. Recently a French firm—the M.M. Dole—has produced platinumized mirrors which are not only satisfactory in point of brilliancy, but are as permanent and unchangeable as the glass itself. A thin film of metallic platinum is deposited upon the glass, by precipitation from a solution of the chlorid, by oil of lavender, and afterwards burnt in by heating the glass nearly to redness in a muffle, thus incorporating the reflecting surface into the glass itself.

Upon the mirror from the front, it will be reflected back again the same as in an ordinary mirror; but if the source of the light is behind the plate of platinumized glass, the rays will be transmitted to the observer standing before it as if it was a plate of ordinary glass. The illustrations (from La Nature) show an amusing application of this principle. The mirror is placed in front of a niche, or chamber, containing a grotesque head, and which can be illuminated or darkened at pleasure. In Fig. 1, the light behind the mirror is extinguished, and the person looking into it sees only his own reflection. If, now, the chamber in the rear of the glass is illuminated, the reflected image disappears, and the victim of the scientific joke sees instead of his own features the less flattering image depicted in Fig. 2.

Under favorable conditions ordinary plate-glass without any metallic coating will reflect nearly all the light falling upon it, and by a similar arrangement of alternately illuminating the front and rear of such a glass most of the "ghosts" and other mysterious illusions of the stage are produced.

THE BALANCED ROCK OF TANDIL.

The so-called "balanced rocks" are not very uncommon, and are found in nearly all countries. Some of these are of glacial origin, having been left in their peculiar position by the melting of the glacier which brought them from some distant locality, while others have been carved out on the spot by the destructive action of the elements, especially by the erosive effect of sand blown by the wind, this natural sand-blast having an almost irresistible power. The strangely carved rock formations of Colorado and the Rocky Mountains are due to this cause, while the glacier-born boulders are more common in New England and sections of the country lying north of the Ohio River.

The remarkable example of a balanced rock shown in the engraving (Fig. 1) occurs at Tandil, South America, near Buenos Ayres, and the illustration was engraved from a photograph for La Nature, from which we reproduce it. From the original description it would appear that the rock was carved out on the spot by the action of the elements, although it would seem from the engraving that it must have been originally brought and deposited on the spot by some ancient glacier. The large rounded boulder shown in Fig. 2 is close by, and indicates even more strongly the action of ice or glaciers.
The most striking peculiarity of this and other balanced stones is the fact that they can readily be made to move, or oscillate, by the application of a comparatively weak force. The stone of Tandfl, for instance, can be moved by pushing it with a single finger; but the center of gravity is so low that only a small amount of vibration can be produced, and it would not be possible to overturn it by any ordinary means.

The cause of the balancing of these rocks is not very mysterious. Nearly all boulders are more or less spherical or rounded in shape, and if such a stone is deposited on a ledge of rock or other flat surface, it will naturally fall into a position of the greatest stability—that is, the center of gravity of the mass will take the lowest possible position. If this position is such that it brings a rounded surface of the stone next to the supporting surface, the whole mass will be supported in stable equilibrium upon a comparatively small point, and an extremely small force will cause it to move upon that point. It is simply a case of natural balancing, due to the shape of the rock and the force of gravitation.

This principle can be well illustrated by taking a large double convex lens,—such as a reading-glass,—and placing it upon a table or other flat surface. When left to itself, it will always take one and the same position, and while the slightest force—even that of the breath—will cause it to move upon its point of support, it cannot be overturned until it is raised up to a perpendicular position. Some years ago an enterprising tourist successfully attempted the experiment of overturning one of these natural balanced rocks in England, but was very properly compelled by the indignant inhabitants of the neighborhood to replace it in its original position, at an expense far exceeding what we presume, the pleasure he derived from gratifying his curiosity.

[Original in Popular Science News.]

STUDIES IN PLANT BIOLOGY.

BY PROF. JAMES H. STOLLER.

III.

A COMMON WATER PLANT.

The plants that grow in water are naturally less well known than terrestrial ones, but some of our common aquatics are among the most interesting plants for biological study. For present examination we choose one of the class Characeae, which are common fresh-water plants, growing submerged in ponds and streams, often covering the bottom with a thick green growth. The plants may be pulled up with the hand or dredged with a rake and placed in a jar of water, where they will live a long time.

The accompanying figure shows the general appearance of any one of the numerous species of the class. They vary a good deal in size; perhaps the most common pond species are six or eight inches in length. It is seen that the general parts of the plant are an axis, or central stem, and appendages borne at intervals along the stem. In early summer the only appendages are leaf-like parts arranged in whorls about the axis, but later branches grow out from the axis of the leaves, and in midsummer the orange-colored fruit appears. The plants are fixed to the muddy bottom by delicate processes which are not true roots, but rather root-hairs.

The Characeae are sometimes called stoneworts, from the fact that they have a hard, stony texture, due to the presence of a coating of carbonate of lime. To the touch they are harsh and rough, like sandpaper. The central stem, it is observed, is made up of a series of jointed parts, exhibiting a structure that is termed serial homology, or repetition of like parts. The places at which the appendages are given off are the nodes, and the parts between the internodes. Each internode consists of a single large cell, while a node is made up of a group of relatively small cells. The plant grows in length by the constant addition of new nodes and internodes formed at the summit of the axis. It is seen that the internodes at the lower part of the axis are of about the same length, but towards the top they are gradually shorter, until at the end (as the microscope shows) many very short nodes and internodes are crowded together into a kind of bud. The terminal point of this bud consists of a single cell, called the apical cell, by the repeated divisions of which new nodes and internodes are constantly being formed. Thus the process of growth of the stem of a chara plant may be represented as follows: Let it be the apical cell; it divides, becoming two cells, a and b, of which a is superior in position and is, in fact, a new apical cell. The inferior cell, b, divides, giving rise to two cells, f and u. Of these, f, which is superior in position, is the new apical cell, and u, which is inferior in position, is a bud cell and does not further divide; a, on the other hand, divides several times, becoming a horizontal row of cells. The latter form a node, and f, which meanwhile has become an elongated cylindrical cell, forms an internode. Thus a new node and internode have been derived from b, and a remains to repeat the process. The leaves have essentially the same structure as the stem, consisting of a short row of alternating nodes and internodes. The leaves are derived from the nodal cells of the stem by a process like that just described. The branches are exactly like the stem in structure.

A single cell of Chara, especially an internodal or leaf cell, when placed under the microscope presents a most interesting spectacle. The protoplasm is arranged in two layers, an outer one, containing chlorophyll grains, and an inner layer of white granular protoplasm, called the prismatic urchle. Now the latter is in a state of constant motion. Streaming up along one side of the cell, crossing at the end and moving down along the opposite side, the motion goes on steadily hour after hour. In young cells the cell-nucleus can be seen carried along in the current; in older cells the nucleus seems to have become disintegrated, but the granules of the protoplasm render the current readily detectible. This phenomenon of the rotary movement of protoplasm within its cell-wall, is one, the cause of which has not been adequately determined. It is probably a process common to vegetal cells, being orangecolored in Chara only because its cells are relatively very large.

We may next notice what is spoken of as the fruit of the Chara. This consists of small orange-colored bodies, about as large as the head of a pin, borne at the nodes. They are of two kinds, differing in regard to the sexual nature of the cells developed in them. One, called the oogonium, contains when ripened a single germ-cell; the other, which is termed the antheridium, develops a very large number of minute bodies which are the male reproductive cell. An examination of these organs with the aid of the microscope is an interesting study. The oogonium is ovoid in shape, and on the outside is made up of elongated and spirally arranged cells. At the free end is a chimney-like process, the hollow of which is filled with a soft mucilage. This mucilage is in contact with the germ-cell which lies within the case formed by the spirally-coiled cells. Thus the germ-cell is securely protected, and at the same time is separated on one side from the external medium, the water of the pond or stream, only by the permeable mucilage. To understand the advantage of this arrangement we must first examine the other reproductive organ, the antheridium. This is spherical in shape, and its exterior consists of eight cells which nicely dovetail into each other, forming a complete cap. Within are other cells which serve as points of attachment for very many long-coiled filaments. In all, each antheridium contains from one hundred to two hundred of these filaments, and
As this period is said to embrace the advent of man, the climatic changes which took place and which gave the higher temperature to the North Pole began over two hundred thousand years ago, and the seasons of the two hemispheres were reversed every ten thousand five hundred years for one hundred and sixty thousand years, so that in place of one or two glacial periods, as generally supposed, we really had fifteen changes of arctic temperature, each change reversing the seasons in the two hemispheres.

As the surface of the earth passed through its greatest disturbance at the close of the Mesozoic or Secondary period, it is out of question to suppose that man inhabited this globe at that time. It is said with some truth that "a thousand years are not more to a geologist than one day from sunset to sunrise." Some are very extravagant in their statements venturing opinions without foundation, and that of man being a denizen of this globe in the Mesozoic period is sheer nonsense and ridiculously absurd.

In order to explain the causes which led to the physical changes of the earth's surface prior to or "contemporary with man," we will briefly mention those which bear directly on our subject. The Cainozoic or Tertiary period embraces part of the following subdivisions: Eocene, Miocene, Pliocene, and modern or recent. The close of the Mesozoic was marked by great geographical changes during which the surface bottom of the cretaceous sea was raised, partly into land and partly into shallow marine and estuarine waters. These events must have occupied a vast period of time, so that when sedimentation was resumed the organic remains of the secondary age entirely disappeared except a few low forms of life, and gave place to others of a more distinctly modern type.

The name Tertiary, given in the early days of geology, before much was known regarding fossils and their history, has retained its hold on the literature of science. It is sometimes replaced by the word Cainozoic (recent life), which expresses the great fact that it is in the series of strata comprised under this designation that most recent species and genera have their representations.

Taking as the basis of classification, the percentage of living species of mollusca found in the different groups of the Tertiary series, Lyell proposed a scheme of arrangement which has been generally adopted. His classification is briefly this: that he takes it for granted that a deposit which contains more numerous species of animals still living than another, may be judged on that account to be more recent. Such a mode of estimation is to some extent arbitrary, but in the main, when it can be tested by the superposition of deposits, it has proved itself reliable.

The older Tertiary formations in which the number of still living species of animals was still small, where, in fact, we seem to see, as it were, the first beginnings of modern life, he named Eocene (dawn of the recent), including under that title those parts of the Tertiary series of the London and Paris basins, wherein the proportion of existing species of shells was only three and a half per cent. The middle Tertiary beds in the valleys of the Loire, Garonne, and Dordogne, containing the primitive Tertiary vegetation of flowers and plants, he named Miocene (less recent). The younger Tertiary formations of Italy were included under the designation Pliocene (more recent), because they contained a majority of from thirty-five to ninety per cent. of living species. This newest series was, however, sub-divided into older Pliocene (thirty-five to fifty per cent. of living species), and newer Pliocene or Post Pliocene (fifty to ninety-five per cent.) This classification with various modifications and amplifications has been adopted for the Tertiary group, not alone for Europe, but for the whole globe.

With regard to the fauna in the Eocene and Miocene divisions, we find the greatest development of mammalian forms. Among the oldest of these Tertiary beasts are the coryphoidea, an animal related to the modern tapirs, and the arctoidea, the latter related to bears and raccoons. These represent, respectively, the pachyderms, or thick-skinned mammals, and the ordinary carnivora. Contemporary with or immediately succeeding these were species representing the rodents or gnawing animals with many other creatures of the former groups, and allied to tapirs and hogs, besides other quadrupeds.

The flora of the Tertiary period is by no means remarkable than the fauna. The geographical and climatic conditions of the northern hemisphere were then entirely different from those of the present day, not only in North America, but in Europe, and northward as far as Greenland and Spitzbergen, an equable climate prevailed, and the abundant plant remains preserved in the Tertiary beds of those arctic regions show a luxuriant vegetation of the tropical temperate zone today. This condition of things was of long duration, for in Europe, as well as in Western America, great beds of coal or lignite are found in both the Cretaceous and Eocene strata.

In the Tertiary epoch a distribution of heat is discernable in zones, but the decrease of heat towards the poles was much less marked than at present, whilst the tropical zone was probably a little warmer than in our day. Central Europe during the lower Miocene period had a climate nearly equivalent to that of the Southern States of America, or that of North Africa. Under the Arctic zone, in latitude 78° N., the island of Spitzbergen was covered with forests of swamp cypresses, sequoia (our Wellingtonian giganta), many kinds of pine, palm, walnut, oak, and lime trees, in fact, the northern hemisphere proper, if the land extended to it. Since then the heat has been diminishing.

During the early glacial period—for two and even more glacial periods are accepted—it sank several degrees below the present mean annual temperature and continued so for thousands of years; then it arose again, and the Swiss lignite beds and the forest beds of the coast of Norfolk were formed, and the elephant and rhinoceros inhabited these regions. It fell then once more, and a second glacial period began; then it arose again, and has continued unchanged ever since.

What was the cause of the greater heat in the Miocene period? Many conjectures have been given, some plausible and some far fetched. The most obvious idea is that this may have been from the sun traversing a warmer region of space than it moves in now, all regions sharing in the great warmth. Dr. Blandet supposes that the sun was larger than it is now, the planets having been thrown off from it in its revolution.

It is supposed that this condition of climate continued far into the Pliocene period, but as this period was not climatically uniform, but characterizes the northern hemisphere prevailed, and gave rise to the glacial phenomena—which will be fully explained in subsequent contributions, and some new points made known on the nature and origin of glaciers, ice-terraced rocks, interglacial beds, submersion and elevation of vast lands during the Tertiary period, volcanoes, etc., which we trust will be interesting to the readers of Popular Science News.
The recent or quaternary period includes the various superficial deposits in which all the mollusca are of still living species. It is usually subdivided into two series: (1) The older group of deposits in which many of the mammals are of extinct species. To this group the name Post Pliocene or Diluvial has been given. (2) A later series, having the mass of ice of which the name Recent or Alluvial has been given. These subdivisions are, however, of necessity artificial, and it is often exceedingly difficult to draw a line between them with exactness.

In North America and Europe a tolerably sharp demarcation can usually be made between the Pliocene and the younger deposits, but in the southern parts of Europe it is more difficult to draw such a line. In the Alps and in the Pyrenees the drift is of mixed character, the deposit of the Pliocene and the younger drift often being interstratified; and in the British Isles it is extremely difficult to say in what sense the drift of the Pliocene and younger periods may be said to differ. They are, in fact, the product of a single system, the mode of which is to be explained by the theory of glacial action and phenomena, which is not, however, that which has been here referred to.

In the Pliocene there was a general rise of the level of the sea; the coastlines and other features of the land are, therefore, of great importance in the study of the Pliocene period. The deposits of the Pliocene period have been found in the Alps, in the Pyrenees, in the British Isles, and in other parts of Europe, and they are of great importance in the study of the geology of the region.

[End of extract]
A CONVENIENT METHOD FOR DETECTING AND ESTIMATING PETROLEUM IN SPIRITS OF TURPENTINE.

BY SAMUEL J. HINSDALE.

Put ten drops of the spirits to be examined in a moderately clean and empty glass, and float the glass on about a quart of water which has a temperature of about 170° F. If the spirit is pure it will evaporate and leave the glass quite dry in seven minutes. If the spirits contains even five per cent. of petroleum it will not have completely evaporated in that time. This experiment will prove the absence or presence of petroleum in the sample.

To estimate the percentage of petroleum adulteration, weigh a watch glass and put into it ten drops of the mixture and weigh again. Put into another glass ten drops of pure spirits of turpentine, and float both glasses on about a quart of water at about 170° F. As soon as the pure spirits has evaporated, take off the glass which contained the mixture and weigh it. The difference between the weight of the watch glass, and the weight of the watch glass of the glass will indicate about four-fifths of the amount of petroleum in the mixture. Knowing the weight of the ten drops the percentage can be calculated.

A bent loop of wire is convenient to place on and remove the watch glass from the water. The hydrometer will detect adulteration with benzine or petroleum, but cannot be used to estimate the amount of adulteration. The specific gravity of pure spirits of turpentine is about 0.855 at 60° F. Petroleum is the usual adulterant.

[Original in POPULAR SCIENCE NEWS.]

AN EXPERIMENT FOR SHOWING DIFFUSION OF LIQUIDS.

BY M. W. EWIN.

On Friday, April 18, 1860, I made the following experiment for a class in physics. I filled a half pint quinine jar with blue litmus water, and applying a piece of paper to the mouth (as in experiments on evaporation), inverted it over a quart jar filled with slightly acidulated water. In slipping the paper out a very small quantity—perhaps two tablespoonfuls—of the litmus water was lost. When finally in position the mouth of the genuine jar was covered by the acidulated water while its neck rested upon the mouth of the fruit jar. For some days the litmus water (except that in the neck) remained unchanged in color. On Monday, April 28, several days, however, intervening without inspection, the color had changed to red. Leaving the bottles in the same position some weeks longer the water of the upper bottle became almost colorless, while that of the lower had undergone no perceptible change.

RENO, NEVADA.

PREVENTION SOCIETIES.

Societies for the prevention of one thing or another are a nuisance. They may do some good, but they do it in the wrong way. It is illogical, it is impertinent, it is unbearable, to have some society or person constantly at our elbows trying to compel us to do what they wish us to do. Men who are cruel to animals are very hateful persons, but they are not nearly as obnoxious as men who make a profession of meddling with other people's affairs and compelling them to do what they do not wish to do. Physical interference with personal liberty is the greatest possible offense that one man can commit against another. Each person should be allowed to commit as many blunders as he likes, so long as he does not interfere with the person, property, or actions of another. When this liberty is not accorded, the whole universe is thrown out of gear, and friction and misery ensue.

EXCHANGE.

SCIENTIFIC BREVITIES.

LIGHTING.—It has been calculated that the electromotive force of a bolt of lightning is about 20,000,000,000 volts, the current about 14,000,000 amperes, and the time to be about 1-20,000 part of a second. In such a bolt there is an energy of 2,450,000,000 watts, or 3,284,182 h. p.

It is reported that the observers at Mount Hamilton have lately kept a sharp eye turned upon the shadow of one of the moons of the planet Jupiter. This shadow seemed double, indicating that the tiny moon which cast it also is double. Since the first hint of the discovery many observations have been made through the Lick glass, all tending to confirm the original impression, to wit: That this particular satellite of the greatest of the planets is double—a dot of a moon revolving around the main moon.

ABBREVIATION OF GOLD COIN.—By careful experiments made at the United States Mint, says The Iron Industry Gazette, it has been shown that $5 are lost by abrasion every time $1,000,000 in gold coin. The coin was impacted with bags containing 85,000 each, and it was shown that the mere lifting of the 200 bags making $1,000,000 to a truck to be removed to another vault, resulted in the loss stated, and that their transfer from the truck again made a second similar loss.

THE HIGHEST INHABITED PLACES.—The highest place on the earth which is regularly inhabited is stated to be the Buddhist monastery, Hale, in Tibet, which is about 16,000 feet above sea level. The next highest is Galera, a railway station in Peru, which is located at a height of 15,035 feet. Near it, at the same level, a railway tunnel 3,847 feet in length is being driven through the mountains. The elevation of the city of Potosi, in Bolivia, is 14,000 feet; Cuzco, Peru, 11,500 feet; La Paz, Bolivia, 10,983 feet, and Leadville, Colo., 10,200 feet.

A NOVEL LAW SUIT recently came before the court of Petersburg, Virginia. A short statement of the facts is as follows: Davis, a photographer, some time ago sold to a florist a lot of refused negatives, which he wanted to use to cover his hot-house. Foster, a rival photographer, bought some four hundred of the negatives from the florist, and from these printed photographs and exposed them as specimens in his gallery. Davis obtained an injunction to prevent Foster from so using the negatives, and the court passed the injunction.

THE WORLD'S POPULATION IN 1886.—In the proceedings of the Royal Geographical Society for January, 1891, it is estimated that the population of the world in 1880 was 1,487,000,000, representing an average of 31 to the square mile and an increase of 8 per cent. during the decade. Of the continents, Asia has the largest population, 850,000,000, and the lowest percentage of increase, 0 per cent. Australasia has the smallest population, 4,730,000, and the smallest average per square mile, 1.4, but the highest rate of increase during the decade, 30 per cent. Europe is the most thickly settled continent, with a population of 380,200,000, which is 101 to the square mile. The population of North America is estimated at 89,250,000, which is an average of 14 to the square mile, and represents an increase of 20 per cent. during the past decade.

It is interesting to observe Siepen at work. He draws free foot, and paints, seated upon a low stool, which is raised to the height of his left foot. He is quite independent in his mechanical work, and declines all aid that can be dispensed with. He mixes his own colors, screws and unscrews his tubes, etc. The only assistance he asks of the servant in constant attendance, is the proper adjustment of his easel. The ground Savonarola Siepen in a low carriage. This has created the impression that his feet are unfit to serve him in their normal capacity. On the contrary, he is a graceful and rapid pedestrian. He rides only, to better preserve the ability of his feet for their, to him, more important mission. Obviously, overtaxing the strength of these members in walking, renders them notably less pliable. The artist is now in his 40th year. He enjoys perfect health, is active and ambitious. Above all he is anxious to have his productions prized from a purely artistic standpoint. That they shall be judged entirely upon their merits as works of art, regardless of the slightest consideration for their marvelous means of execution. He did all in his power to conceal his wonderful mode of workmanship, fearing his paintings would find admirers and purchasers, merely because of this unique peculiarity. His subject, "The Two Sisters," assured his fame, ere the deficiency in his physical development was known to the public. Consequently his cherished wish was happily fulfilled.
The present outlook for the Agassiz Association is brighter than for years past—which is saying a great deal. Without any advertising or "pushing," a knowledge of our work is spreading among the people, and every mail brings earnest letters of inquiry. New Chapters are not formed so rapidly as in some former years when our efforts were limited to New England; but with its circulation of a hundred thousand, but the character of the Chapters founded is, on the average, far higher, and of a much more enduring nature. The Agassiz Association is in no sense a children's society,—though the youngest are still as welcome as ever,—but our Chapters are mainly composed of young men and women of from sixteen to twenty-five, while fully one-quarter of our membership is adult.

Our Official Organ.

It is more and more apparent that in Popular Science News we have found very nearly an ideal paper for our Association. The very low price—one dollar a year—brings it within easy reach of every member. The character of the paper, outside of our special department, admirably meets the requirements of our students. Its richness of illustration adds greatly to its interest and value. The personal interest taken in our work by the editors and publishers is a chief factor in promoting our steady growth; and, particularly, the intelligent and philanthropic class of readers to whom our journal goes each month brings the A. A. to the favorable notice of those best able, and most likely to render it the highest service.

In view of all these facts, it becomes the plain duty of every Chapter and member of the Agassiz Association to make diligent and constant exertion in behalf of Popular Science News. No efforts toward the permanent upbuilding of the A. A. can result in so evident and speedy advantage as those directed toward the extension of the circulation of our official organ. Every new subscription obtained for this paper introduces our Association to the notice of a new circle of helpful friends, and brings new members and new Chapters into our ranks. There is not a member of the A. A. so poor or so far removed from city life that he cannot during the year induce from one to a dozen acquaintances to subscribe for Popular Science News. Every A. A. member should always carry a copy of this journal in his pocket, and have it ready to show to each friend he meets. That our subscription list is not six times as large is the most serious hindrance to our prosperity; and that it is not is wholly the result of thoughtlessness. The whole Association must make the most of this year only one hundred new subscriptions to our journal. Every boy of these years have been due to the exertions of less than twenty individuals. If every member would do what twenty members have done, we should have thousands of readers where we now have hundreds, and scores of new Chapters where we now have one. "A word to the wise is sufficient"—but, unfortunately, most of us are not wise, and so many words must be used, and those repeated often.

Now let each one who reads this note make today, and tomorrow, and on each tomorrow, one definite attempt to secure one new name, and our list will be doubled before the first of June. One boy has guaranteed this year the three hundred new subscriptions necessary to secure the continuance of our department in this journal. Will the A. A. allow one member to pay two dollars from his own pocket? Shall it long be true that an Association numbering thousands of members and subscribers all told have less than fifteen representatives, old and new, to its own official organ—when that organ is as excellent as Popular Science News, and costs only one dollar a year?

To show what a little effort can accomplish, we add a few letters which have lately been received from members of the A. A. loyal enough to work for its interests.

First of all must credit be given to Chapters 96, New York, (Z); 27, Pittsburg, (A), and 29, Boston, (B), which have united in issuing at their own expense a circular urging all Chapters and members of the A. A. to work for their paper. Two thousand of these circulars have been printed and mailed, and if in response thereto fifty subscriptions have been received, it is not the fault of these three Chapters.

Stratham, Lond., Eng.

Dear Sir: I have sent three new subscriptions from our Chapter for the current year to Popular Science News. A. N. Cowley, Sec.

Boise, Idaho, Feb. 9, '91.

Dear Sir: Included please find check for six dollars, to cover one year's subscription to Popular Science News, to be sent to the following addresses:

A. and C. C. E. A.

New York, Feb. 9, '91.

Please find enclosed check for six dollars, for new and renewed subscriptions to Popular Science News. We who take the paper have been well repaid, and hope the A. A. members will exert themselves to secure the continuance of our department, "The Out-Door World."

C. L. McCord, Sec. Chapter.


Dear Sir: I have just secured four new subscribers to Popular Science News, and have asked Dr. Nichols to credit them to the Agassiz Association. I shall be on the lookout for more.

FRANCIS ZIRKLE.

Chapter 96, Boston, (D).

Selected Reports from the First Century (Chapters 1-100).

1. Pittsfield, Mass., [A].—The condition of our Chapter is the same as last year. Various reasons of a domestic and personal nature have prevented us from making the usual monthly reports, but our members have followed their individual lines of study, and we have enrolled during the year no fewer than seventy-five corresponding members. We were represented at the State Convention last May, and expect to send one or more delegates this year.—L. Walker, Sec.

2. La Crosse, Wis., [A].—Our family Chapter has had a large number of outings this year, but, although it has made many smaller "finds," it has made but few valuable discoveries in our specialty—archeology. One of these is a black stone "the size of an English walnut, ground that on one side, which has in it two small holes, or depressions; the other (convex) side has carved on it a figure representing a bird. We have one new member.—Mrs. D. S. McArthur, Sec.

3. Mobile, Ala., [A].—We have been organized only a few months, and have gained only one new member, Nellie T. Friend. Our meetings have been few but informal, as nature has been busy, and two of our members live at a distance from the other three. One of our members has a beautiful collection of ferns—some native to Alabama, and others collected in Indiana and Illinois. Our President has some curiosities from the deep—a fine starfish, a sea-nettle, and some branches of coral. Our boy member has quite a large collection of our native birds' eggs,—more than a hundred specimens,—and also a number of birds' nests. He has studied the habits and the presentation of birds, and has made some interesting observations on the attempts of the English sparrows, when captured, to feign death in order to effect a release. Our other members—one of whom is only seven years old—have devoted their attention to flowers, especially to potted plants, including geraniums. We have had some specimens of the fly-catching plant, which grows at Mount Mobile. We have some fine semitropical plants growing in the open air—orange, lemon, and pecan trees, banana plants, a large aloe which blooms once in twenty-five years, camellia japonicas, magnolia grandiflora and fuscates, and sweet olives. We have a continuous succession of flowers in our genial climate. I did not mention our azaeleas and azaleas in bloom which are quite remarkable. Our wild flowers are very abundant and beautiful.—Yellow jasmines, honeysuckles, azaleas, mountain laurel, pond lilies, bay flowers, and many other species.—Miss Mary Minga Friend, Sec., 359 Government street.

12, Forest Hill, Ill., [A].—Our retrospect of the year 1890 is, on the whole, very satisfactory. Of our absent members, one in the South reports himself as trying to give instruction in science to a company of soldiers, while another farther north than we is doing the same for a class of girls; and another asks for specimen copies of the Popular Science News, that, though deep in business cares, he may prove his loyalty to the A. A. by attempting to gain some subscribers. Here let me say that I have sent my renewal, with the name of one new subscriber. I have also requested that a copy be sent to a young man who was for one year a member of our Chapter, as of our family school, and shall also write to him, urging that he add his name by giving us a subscription. Charley and Alice during the summer carried on their study of plants, and have an herbaceous garden, extending many feet, which is the result of their labor. At present Charley is making sketches of twigs from different trees and shrubs, in which he shows, as well as his skill in drawing will allow, not only the arrangement of leaves and buds, but the extent to which the latter are developed by the exceptionally mild weather of the past two or three weeks. I enclose one as a proof that we do not entirely lack natural objects. Our museum cabinet has been enriched by exchanges and by our house collections beyond our expectations. Our catalogue now reaches (not counting duplicates) to No. 301, of which, all excepting about twenty, are named as well as numbered. At intervals in the construction of forts and castles, the children have been delighted to find in the"sand-pile" not only entirely destroying fragments of ancient shells. One of the latter, with every line and curve complete,—a species of orthis, probably,—is among our most valued possessions. The same watchful eyes also detected a curious stem in the rough stone foundation of a building two blocks away, and some one having good-naturedly knocked off the fragment for them, they brought it to my triumph. We still admire the many-hued felispears, the silky ashes.
tos, and the sparkling crystals that come to us from a distance; but we no longer envy those homes among such surroundings, for every dull gray quarry is a volume, richly illustrated, on whose pages are recorded the wonderful story of the life that surged, and beat, and throbbed in the restless tides of the old, old sea, "before the mountains were brought forth,"—and, albeit slowly and ploddingly, we are learning to read the record. A rough stone lies before me without any semblance of a careful eye—but look more closely! Here is a hasty pebble—of a species of zephyrants, doubtless—and turn the stone—just on the opposite side are three—yes, four—more. A colony of cup-corals are entombed here. An inch from the first observe this tiny ring raised just above the surface. When the corals were living, a dainty stone-built sway in the current and waved its petal-like arms beside them. Do you see this delicate lace-like pattern? A little space, not more than one-fourth of a square inch in extent, is marked as with pin-holes, but—take the lens—arranged in regular parallel rows—not straight, but curved. Is it some other form of coral? Here is a deep groove several inches in length. Looking carefully you may trace faint lines crossing it, like the mark of a screw. I think our botanist has left this one sign to prove to us that he lived. Turning the stone again, a curious impression attracts us. Another orthocorals? Possibly, yet a second glance suggests a trilobite. Which is it? It is faint and imperfect. A block of stone, roughly cubical and three or four inches in dimensions, lay for a long time among our unclassified treasures. Occasionally some one would take it up, look curiously at an odd circular opening in one side, and, turning it at different angles, try to see farther and fathom the mystery of its structure, but in vain; something projected so as nearly to fill the space, and only a glimpse of a solated surface could be obtained. At length we resolved to imitate Alexander—invoking, however, a hammer instead of the classical sword. Several stout blows, and then a crack! The stone opened. A hole was found which I presume to be an orthocorals, but do not know its individual name. In conclusion, I can only express our appreciation of your work for the A. A., and subscribe myself, gratefully your friend, C. M. Winston, Pres.

26. Phillips, Me., [A].—We have held thirty-six meetings since our last report, and have eight members. Our work the past year has been varied. We have accomplished the most, perhaps, in botany. This year we have noted 356 plants. They are carefully written out in our "Flora of Franklin County." We have found twenty-four ferns. These and the club-mosses, of which we have five varieties, are included in our "Flora." Our flower garden, with nearly ninety varieties of ferns and mosses, is well developed in it. There are many grasses, mosses, and lichens which are old friends, and for which we have names of our own. We hope for a formal introduction by means of a text-book some day. We are interested in all we see. Next to botany in our Chapter work comes ornithology. Perhaps I should say ornithology. The members of the Chapter found twenty-three species of birds passing the winter in Franklin County. Many new species have been found breeding in this vicinity this season. Many formerly considered rare have been found to be common. The first arrival was the bluebird, March 1—usually early. The birds did not arrive for the summer until about the first of April. The first nest

found was that of the bluebird, April 29. It contained one egg. During the winter the Chapter worked diligently. Two pairs of old original work and presented pages of the members, and the reading of many articles bearing on our work, viz., Gibson's charming little sketches, Maurice Thompson's "By-ways and Bird Notes," and other books. An article on "Todonts" interested the Chapter, and at the following meeting a variety of these curious creatures were brought in by members. An article on the structure of the eyes of some of the members, and accordingly cocoons were a feature of the next meeting; and during the summer, also, we watched for each new fungus, and were much interested in the structure and color of those we found. The drumming of the partridge, the habits of our little gray rabbit, the finding of gold in our locality, oak galls, the abnormal growths on some of our common plants, microcopy, and even entomology interested the members and made them think for themselves. "General Conversation" was a part of each meeting. Astronomy is a school study with all save two of the members, and this, of course, was more or less a part of the work. So, on the whole, as our well-filled report-book would indicate, this has been the pleasantest and most prosperous year of all since our Chapter's organization.—Daisy M. Dill, Sec.

37. Pittsburgh, Penn., [A].—President, Prof. Gustave Guttenberg, Central High School. Membership, forty-eight—a net gain of four during the year. We have held ten regular meetings, two of which were in the High-School Chapel. For this special occasion, the school was invited. The Chapter is divided into three sections—botanical, zoological, and mineralogical. The botanists meet every week. They have collected and mounted one hundred different species, and have exchanged fifty species with Chapter 562, in France. Specimens of different kinds of wood have been added for the School of the Country. The pupils meet twice a month. They have collected, mounted, and studied the principal insects. One member alone has five cases of butterflies and moths, nicely mounted. About a dozen birds have been added to our collection. The mineralogists study Professor Guttenberg's course, several members having advanced to the third grade. The Chapter hopes that a general effort will be made to have the A. A. represented at the World's Fair in Chicago. In selecting our badge we made a little change from the Swiss Cross. It represents a cruciferous flowee with four silver petals, thus preserving the form of the cross. On the petals, in black enamel, are the letters H. N. A.A. (High School Naturalists Agassiz Association). On the gold center is the number of our Chapter, 27. A. A. Members of Chapters will recognize it.—J. S. Scully, Jr., Sec.

63. Portland, Me., [A].—This Chapter was organized February 10, 1890, and received its certificate of affiliation March 6. The charter members were: D. E. Kerr, A. S. Goody, S. B. Hibborn, W. P. Dunham, and W. F. Smith. The officers are: President, W. P. Smith; Treasurer, W. L. Fisher; A. S. Goody, Secretary and Treasurer, 18 Howard street. During the summer we transformed an old shed into a neat little Chapter house by putting on a square roof and shelving it all over. The house is 6 x 13 feet, and is large enough to accommodate us. There are two small windows. Along one side we have three shelves about half the length of the house; we have three small ones at one end. We have our certificate of affiliation framed. We have a bead painted on a 10 x 14 inch glass; the letters are white on a red cross, with a yellow background. We have a small cabinet for eggs. Our specimens number nearly three hundred. Our minerals occupy the three small shelves. The large shelves are devoted to botany and shells. The inside of our house is papered—on the roof with wall paper and on the sides with heavy carpenter's paper. We have an oil stove. Among our insects the most curious are some very small and very brilliant steel blue, but not of the water it is green, while the under side is of a flesh color. The length varies; our specimen is seven inches long. The sides are thickly set with fin-like projections, a pair to every ring of the body. Its motion is a beautiful, regular, wavy one. On what appears to be the head there are three pairs of antennae and two large pairs of compound eyes. One pair can be pushed out and drawn in like those of the small. On the upper side of the head is what appears to be the mouth, which contains an apparatus capable of being drawn in and pushed out, in which is set a pair of strong black forceps, or jaws, resembling those of some of the beetle family. The head and sides are very sensitive. Should anything—a leaf, for instance—press lightly against the head, the worm wriggles and twists, and almost ties itself into knots. If merely touched on the head, it draws back very quickly. It is capable also of lengthening and shortening its body to quite an extent. It is apparently sightless.

The Sea-Flea.—This extremely numerous scavenger of the shore is very common. It has a number of legs, a pair of long antennae, a six-pronged horn-like tail, and an articulated body. In the water it is a good swimmer, lying on its side and propelled by legs and tail. On the shore it may be seen sprawling in short loops wherever the drift stuff or sea-weed is lifted. Its color is generally a dull gray. It disappears in the fall—and where does it go? I one day discovered on a sandy beach a large number of small elliptical holes, and being curious as to the cause of them, I began digging, expecting to find a "razor-shell" or some other shell-fish, but instead I dug up a large number of these little holes, several times, and found another large and several small ones of the same color. To make sure that these creatures made the holes, I placed the two large ones on a soft spot of sand, and after remaining quiet for a second or so they began rapidly to burrow into the sand, making holes similar to those I had noticed. The process of burrowing is a slow one. The Sea-Flea enters the sand, they dig in and throw the sand up under them, and with their tails throw it clear out of the hole. Some of these holes I found to be three inches deep.—Daniel E. Kerr, Pres.; A. S. Goody, Sec.

29. Boston, Mass., [B].—Another year has passed away, and Chapter 29 still lives. Our determina-
tion to do work of real scientific value increased with each year. On January 1, 1890, we had thirty-seven members; now we number fifty. We held fourteen meetings before the summer vacation, and finished our course in botany.

We had papers on hornblende, mica, disintegration of rocks, low granite made, eruptive rocks allured to granite, gyspum, limstone, dolomite, salt, iron, copper, gold, silver, zinc, and tin. The papers, read and dictionaries printed, follow:

"That a committee of three prepare a report on the geology of Middlesex Fells, Mass., with suitable specimens and maps for illustration; said articles to be properly boxed for shipment and placed in the care of the Corresponding Secretary, who shall be authorized to loan them to any Chapters of the Massachusetts Assembly, or, in their absence, on condition that such Chapters shall pay charges of transportation." This has been done, and they are at the disposal of any Chapter that cares to study them. Our by-laws, made when we were seven only, were found inadequate for the needs of fifty, and so we revised them. A few improvements are as follows: 1. An applicant for membership has to sign a printed application, binding himself to work in his department as one general business meeting a month. The section meets on alternate Monday evenings at Hotel Pelham. The botanical section has held six meetings, with an average attendance of sixteen, all enthusiasts in their work. Through the winter they are taking up structural, physiological, and cryptogamic botany, one paper to be read in each department at each meeting of the Chapter. Essays have been read on protophytes, zygoptera, pterophytes, carpophytes, morphology of roots, stems and branches, buds and leaves, growth, absorption of liquids, assimilation, movements and evaporation. Each paper is followed by general discussion, and as this has been carried on in a conversational way, it has been very interesting. Papers are illustrated by specimens when possible. The geological section has held five meetings, with an average attendance of twenty-two. This section is taken up historical geology, and the papers so far have been on the Azetic, Eozoon, Taconic, Cambrian, and Ordovician or Lower Silurian Age. The general session of each evening is given to different members of the section, with instructions to the committee to divide their subject into the chapters and articles, to make as many as possible, animal and plant life of their age or period, and to give these sub-divisions to other members to study and write about, and so create a general interest and divide labor. The papers are illustrated with specimens of minerals, rocks, and fossils, as well as by blackboard and diagrams. The papers of both sections are bound and distributed among those members of the Chapters for closer study. The Chapter has had twenty-nine outings during the year—fifteen in the spring, divided into geological, zoological, and botanical trips, with one of archaeological fame to Professor Horsford's Norumbega settlement of the Norsemen. One worthy of special mention was to historical Plymouth, after trailing around it; another was on a winding kame through scrub oaks and bracken, a weary way, but rich in spoils, to "Purgatory," one on July 212, will ever remain a red-letter day in our calendar. We visited Reading and were most hospitably entertained by the Chapter there. On September 6 we began a series of geological trips preparatory to our winter's work. We studied limestone and granite quarries, dikes and overflows, kames and drumlins. One of the observations given in answer to the roll-call may be of interest: "If one wishes to ascertain the points of compass, take out your watch and point the hour-hand directly to the sun, and half-way between that and the figure twelve will be due north."—Ella F. Boyd, Sec.

ANOTHER MICROSCOPE PRIZE.

In order to indicate their interest in the Agassic Association, the proprietors of the Popular Science News have decided to repeat their offer of last year, and offer a fine student's microscope, valued at twenty-five dollars, to the member or Chapter of the A. A. sending the best record of personal observations to the President of the Association before October 1, 1891. This record may be in the form of a note-book, or it may be on separate sheets. It may be illustrated by sketches or photographs, or it may be a simple statement of what has been observed, without illustration. In awarding the prize, due weight will be given to accuracy, neatness, and beauty of style, but the main idea is to award the prize to the person showing the most originality and scientific ability in his methods of observation, and in the results secured. The observations may be made in any field, according to individual preference, whether botany, mineralogy, entymology, or any other department of natural science. All observations must be original and new—that is, made after reading this announcement. Unsuccessful competitors of last year will have an equal chance with all others. There are five months in which to use your eyes and brains, and in that time many interesting things should be discovered. Further particulars will be given in the June number. Correspondence on this subject should be addressed to the President of the Agassiz Association, at Pittsfield.

AN IMPORTANT WORK.

A work which will be of interest to all members of our Association is the "Journal of Proceedings" at the third annual convention of the Massachusetts State Assembly. This is an octavo pamphlet of forty pages, containing the full texts of the papers read by Professors Beal and Hartwell and Mr. Ballard, the annual reports of the chapters in the Assembly, and the constitution of that body. The whole publication was met by advertisements and a limited subscription, and a copy is furnished to every member without charge. Beside being a pattern to our other Assemblies, the pamphlet will be of value to any Chapter, as the papers—on "Vertebrate Embryology," on "Botany," and on the "Purpose of the Agassiz Association"—can be well read at the holding of the meetings, will be of interest, and will aid in the reception of twenty-five cents by Mrs. E. F. Boyd, Hyde Park, Mass.

All are cordially invited to join the Agassiz Association. Illustrated circulars sent free on application. Address Harlan H. Ballard, Pittsfield, Mass.

REPORTS FROM THE FIFTH CENTURY (Chapters 401-500) should reach the President by May 1.

LIST OF THE PLANTS OF THE DISTRICT OF MOSCHAI, GOVERNMENT OF MOSCOW, RUSSIA.

BY MRS. OLGA FEDICHEKO.

This valuable and complete list of Russian plants was referred to in a previous number, and will be continued in subsequent issues until completed. The sign (*) stands in the list before the names of such plants as cannot strongly be considered as wild, but either are or have been cultivated and now grow wild in gardens.

RANUNCULACEAE, JJS.


PAPAVERACEAE, DCC.

Papaver rhoas, L. Chelidonium majus, L.

FUMARACEAE, DCC.

Corydalis solida, Sm. Fumaria officinalis, L.

POLYGALACEAE, JJS.

Polygala vulgaris, L. P. amara, L. P. comosa, Schk.

CRUCIFERAE, JJS.

Nasturtium officinale, DC. E. odoratum, Ehrh.

C. ams., L. C. neriifolium, L. C. palustris, DC.

E. viridis, DC. C. ams., L. C. palustris, DC.

E. viridis, DC. E. viridis, DC. C. ams., L. C. palustris, DC.

Camelina sativa, L. Cardamine impatiens, L. Taraxacum officinale, L. C. sativa, L. C. pratense, L.

Coseeoa, L. Euphorbia helioscopia, L. L. rugosa, L.

E. viridis, DC. C. ams., L. E. rustic, L.

Camelina sativa, L. Cardamine impatiens, L. Taraxacum officinale, L. C. pratense, L.

Coseeoa, L. Euphorbia helioscopia, L. L. rugosa, L.

E. viridis, DC. C. ams., L. E. rustic, L.

Camelina sativa, L. Cardamine impatiens, L. Taraxacum officinale, L. C. pratense, L.

Coseeoa, L. Euphorbia helioscopia, L. L. rugosa, L.

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Camelina sativa, L. Cardamine impatiens, L. Taraxacum officinale, L. C. pratense, L.

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Camelina sativa, L. Cardamine impatiens, L. Taraxacum officinale, L. C. pratense, L.

Coseeoa, L. Euphorbia helioscopia, L. L. rugosa, L.
The price of illuminating gas supplied by various private companies in England during the year 1859 varied from 43 cents to $1.87 per thousand feet, while the price of gas supplied by city and town government works was from 25 to $1.25. It is worthy of particular notice that the returns show that in the works of private companies 267 cubic feet more gas are obtained, on an average, from a ton of coal than in those under the management of local authorities. These figures do not give much encouragement to the rather numerous class of persons who think that all industrial enterprises should be under government control, and particularly that the manufacture of gas and electricity should be undertaken by municipal or town authorities.—especially when it is remembered that, on the whole, the political affairs of English cities and large towns are more efficiently and economically managed than with us.

At a scientific meeting recently held in Lyons, it was stated that an alkaloid identical with or closely allied to quinine has been produced in Germany, and that in doses of 25 to 50 cegons, it had been successful in eradicating intermittent fevers of long standing, but that it did not seem to possess the same success in reducing the temperature in cases of pneumonia or of phthisis. The empirical formula of natural quinine is C_{60}H_{49}N_{10}O_{5}, and every one familiar with organic chemistry can see how many possible isomers could be issued from this formula is capable of producing. The chemical constitution of the artificial alkaloid is expressed by the term metamethylphenyleneparametlyphenylalin; and, although it is probably an isomer of the true quinine, it may prove an efficient substitute in many cases, provided the cost of manufacture is not greater than that of the natural alkaloid.

Pyroglauc is a new art process recently perfected by a French inventor, and is a modification of the old-fashioned “hot-poker” drawings. The graving tool consists of a hollow pointed platinum tube raised to incandescence by the combustion of a mixture of gas and air in its interior. With this white-hot point any desired design may be drawn on wood, fabrics, leather, etc., giving a most beautiful effect. The shading in rich browns or black, due to the more or less perfect carbonization of the material. The manipulation of the tool is easy, and anyone with sufficient talent to draw at all can easily learn tomanage it and produce beautiful and artistic work.

Investigations carried on in England during the past winter upon the effect of fog upon plants, have shown that in the country the fog has no direct injurious effect upon vegetation, but in London and other large cities the reverse is the case. At Kew and at Chelsea scrapings were taken from twenty square yards of the roofs of glass houses which had been well washed down before the commencement of the spell of fog. In both cases the weight of deposit was about the same—thirty-one grains per square yard, or six tons per square mile. An analysis of the deposit from Chelsea shows about 40 per cent. of mineral matter, 36 per cent. of carbon, and 15 per cent. of hydrocarbons, which last item explains the oleaginous character of London fogs. The sulphuric acid was found to be nearly 5 per cent., and the hydrochloric acid 1½ per cent. From 2 to 3 per cent. of metallic iron in minute particles was also found—a fact of some importance, for iron salts deposited on foliage are known to be injurious. The above analysis well explains the offensive nature of the Celebrated London fogs, both to plants and animals; and the only method suggested to obviate the injury to plants in greenhouses is the rather impracticable one of covering the house with canvas during the prevalence of fogs, or making it as nearly airtight—as possible. Fortunately there are few or no localities in this country which can be compared with the British metropolises, either in regard to the quantity or quality of precipitated atmospheric moisture and impurities.

An interesting application of the well-known principle of the variable electrical conductivity of the element selenium under the influence of light, has been made by Professor Barton, of the Lick Observatory, in the construction of an automatic comet-seeker. A prism is placed in front of the object-glass, but instead of the ocular there is a metallic diaphragm with slits in the position of the three hydrocarbon hands in the yellow, green, and blue. Light passing through these slits falls on a plate of selenium, which forms one side of a Wheatstone bridge, connected to a battery and an alarm. The telescope is made by automatic machinery to sweep the semi-diurnal arc in about ten minutes, and then, after shifting northwards about two-thirds of the “field,” sweeping back again. The light of the continual spectrum of Sirius is insufficient to disturb the “bridge”; but with the faintest comet, the prism analyses the light into bright lines which disturb the balance of the Wheatstone bridge, and a current is sent to the alarm bell. Further particulars of what promises to be a very valuable invention will be awaited with interest.

The New York legislature has been devoting its attention once more to the much-abused oleomargarine, and has succeeded in passing a law absolutely prohibiting its use by keepers of hotels, boarding-houses, restaurants, etc., not only for their guests, but for their employees as well. It is but a step from this to a law forbidding any person to knowingly make use of artificial butter in his own home; and the day may not be far off when the daily diet of the happy citizens of the Empire State may be regulated by an obligatory bill of fare, prepared every twenty-four hours by a political “Commission” at Albany, and telegraphed on the previous evening to the various cities and towns, in the same way as the daily weather predictions are now distributed. But How We Owe to Gas Works.

The first instance of practical gas lighting on record occurred in the year 1792, when one William Murdoch lighted his workshops at Redruth, in England, with gas obtained from coals, but it was not till twenty years later that the streets of London were lighted by gas, and it is only within the last half century that this cheap and convenient means of lighting streets and buildings has come into general use. The most important product of the destructive distillation of coal is, of course, the illuminating gas, the manufacture of which has already been described in these columns, (July, 1888); but there are many by-products which are almost equally valuable. The residuum left in the retorts, known as coke, is a most excellent fuel, and in regions where soft coal is abundant, it is a regular article of manufacture, part of the resulting gas being used to heat the retorts, while the remainder is burnt or allowed to escape into the air. The ammoniacal liquor condensed from the hot gases as they come from the retorts contains no less than five different salts of ammonia, and is the chief source of supply of this invaluable alkali. In all, there are, at least, seventy different chemical compounds produced from the coal in the process of distillation, of which, perhaps, ten are useful as illuminating substances, while the remainder are either thrown away as impurities or saved for use in other ways.

The most important of all the by-products is the coal tar, which was formerly thrown away, but is now almost entirely utilized. This coal tar is a black, viscous fluid, composed of about forty different hydrocarbon compounds. The discovery in 1858 of the aniline colors, first called attention to its value, and since then an immense number of chemical and medicinal substances, artificial flavors and perfumes, insecticides, disinfectants, explosives, photographic developers, as well as four hundred or more different colors, have been obtained from an ill-smelling, repulsive liquid, which at first sight would appear to be the most useless thing on earth.

Prominent among the substances contained in coal tar is a liquid known as benzol, sometimes less properly written benzene, as it is entirely different from the familiar cleaning agent known by that name. Benzol has the chemical formula, C_{6}H_{6}, and is important as being the starting point or foundation stone, as it were, for a long list of compounds known as the aromatic series of hydrocarbons. To account for the chemical phenomena presented by the substance, it is supposed that the atoms forming the molecule of benzol are arranged in the form of a hexagonal ring, as roughly represented in the following diagram. The lines connecting the letters represent the quantivalence or chemical affinities of the carbon and hydrogen atoms:

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H
\--C
C \   \C--H
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To thoroughly explain the theory of the benzo\- ring, as it is called, would lead us too far into the mysteries realm of organic chemistry, and the above diagram is only given to roughly indicate the supposed structure of a single molecule of benzol. In all the innumerable derivatives from this substance, the inner ring of carbon atoms remains intact, but, by replacing the hydrogen atoms by other elements or radicals, both simple and compound, or by adding to the number of elements or radicals held to the ring by the carbon affinities, an immense number of substances may be obtained, some of which may be directly obtained from the tar, while others are produced in the laboratory from the benzol itself, and as the only important source of benzol is from this by-product of the gas works, a perusal of the list given below will show how much we owe to this
POPULAR SCIENCE NEWS. [May, 1891.

Industry aside from the illuminating product for which it was first undertaken. In a billion of the foregoing or more brilliant alkali, alizarin, and napthalaaline colors, we also derive from benzol, carbolic, benzoic and salicylic acids, anthothin, anthopurin, andanthrocin and thymol, all important medicinal agents; artificial oil of almonds and oil of wintergreen, the powerfully explosive picrotes, the invaluable photographic developers, hydrochlorine and eliogenon, besides a host of other substances interesting to the chemist only of the human eye, and producing a picture and as we look successively at every part of the tree, every part of it is seen with perfect distinctness, and every leaf and twig impresses itself upon the retina in its natural form. The case of the photograph is identical—as the eye passes over the different parts of the picture it should see all the details as distinctly as in looking at the object itself, and the eye and camera of "fuzzy-type" is not a correct representation of anything on earth as seen by the human eye, unless, indeed, said eye is in urgent need of a pair of spectacles or a surgical operation.

When we see an oil or water color painting, apparently executed with a whitewash brush, a steam atomizer, and a spurt gun, described as a wonderful work of art denoting extraordinary gifts on the part of the artist, we are willing to allow the critics all the pleasure they can obtain from it, but we, nevertheless, hold to a private opinion that it simply denotes more affectation or, more likely, lack of ability on the part of the artist to produce anything better; and when we see a distorted, badly focussed photograph upheld as an example of the "impressionist" school of art, a very strong indication of the result is readily due to the combination of a five dollar outfit, and an inability on the part of the alleged photographer to properly focus his pictures. If anyone desires an astigmatic lens they can easily be purchased at extremely moderate prices, but our advice to the amateur photographer would be to procure the best lens that he can afford, focus it down to the greatest possible sharpness, and then in addition use the smallest stop that the circumstances will admit of. There are no "hard" lines in nature, and it is useless and presumptuous to attempt to improve upon them by intentional distortion, or by a blurred and indistinct image which no normal human eye has ever yet formed upon its retina.

[Original in Popular Science News.]

EARTH-STAINS.
BY FREED'K LEROY SARGENT.

Among the many old plants which have become adapted to live under the trying conditions imposed by arid and sandy localities, few are more curious than certain species of the genus Geaster, which are common in dry places throughout the greater part of North America, Europe, and Asia. The name of the genus is derived from the Greek geaster, earth, and aster, a star, and is thus a translation of the popular name, "earth-star," which was applied to these plants from their form when expanded on the earth, as shown in Fig. 2.

Since the earth-stars are leafless and destitute of chlorophyll (the green coloring matter of old age), they belong to the great group of Fungi, which includes mushrooms, puff-balls, mounds, and innumerable microscopic sorts. We know that all plants from which chlorophyll is absent must depend for their nutrition upon a supply of organic material, and it is therefore something of a puzzle at first sight to know how the sand-loving earth-stars obtain enough food in the localities they frequent. What we see above ground, however, is not the whole of the plant, but only the fruit, which is developed from a mass of delicate subterranean fibers constituting the plant's vegetative apparatus. By carefully scraping away the earth at the base of a young Geaster, these fine white threads, or hyphas, may be discovered ramifying in all directions. A few species of Geaster grow in rich, moist woods, and with these it is easy to understand how the hyphae can obtain an abundance of organic food from the surrounding leaf-mold or decaying wood. In the case of the sand-loving forms we must assume that decaying pieces of roots from neighboring grass plants and shrubs, along with the remains of dead leaves and animal debris which become buried in the sand, supply all the food necessary. It takes a considerable time, however, for the subterranean hyphae to obtain a sufficient store of nutriment to build the elaborate fruit; and, although the hyphes are at work all the spring and summer, or perhaps even longer, it is August or later before anything is seen of them at the surface of the ground.

The first sign of the fruit is an egg-shaped body of compacted hyphae. In a comparatively short time this enlarges to the size of a robin's egg or larger, and then is developed a thick outer wall enclosing rather soft content. In the subsequent process of ripening, the pulpy interior becomes almost entirely transformed into an immense number of exceedingly minute bodies, known as spores, each of which—under proper conditions—may give rise to a new plant like the parent. An average size earth-star is estimated to contain about 10,000,000,000 of these spores, which are, of course, so excessively tiny that a powerful microscope is necessary to see a single one of them by itself. When viewed in the mass they appear as a brown impalpable powder which a breath of air will blow away. In the way their spores arise within a cecized cavity, the earth-stars are quite like their nearest allies, the puff-balls, and differ from the mushrooms, whose spores are developed on the surface of external gill-like plates. It is a well-known fact that the heat of the sun, the strength of the wind, and the desire of the fruit to germinate, all aid in the development of the spores of the earth-stars. A field or meadow is said to be "earth-star seed" when it is infested with them. The earth-star is remarkable in that the fruit is developed in the ground, the earth-star is remarkable in that the fruit is developed in the ground, the earth-star is remarkable in that the fruit is developed in the ground.
due to the presence of a spongy layer, which, under the influence of moisture, swells more than the other layer of the outer rind. In some species this rind is so thin that the outer surface of the spore case is as small as a spongy balloon, the excess of the water which the segments expand when this layer shrinks by drying. In other cases the spongy layer is the inner one, and the segments expand when wet. Some species in which this layer is particularly well developed are so sensitive to the effect of moisture that the segments will contract and expand a number of times in response to alternate drying and wetting. This hygroscopic sensitivity allows the spores of certain species here figured, which on this account was named by the mycologist Persoon, Geaster hygro-metricus (Greek hygr, moist, metron, measure).

The question now suggests itself, Of what use to the plant is its peculiar sensitiveness to moisture? In the first place it is to be noticed that the hygroscopicity is first manifested at the time when the spores are ripe, and this points to the conclusion that it must in some way facilitate the proper dispersion of the spores. We have seen that certain species of Geaster live in the woods. So little wind can reach plants thus situated that if the spores were to be scattered during a rain they would be likely to be brought to the earth very near the parent. If, on the other hand, the spores are air-borne with the wind when they are dry, they may be carried to a distant part of the wood, and there is but little danger of their having to wait long for the moisture necessary for germination. Accordingly we find that the earth-stars which frequent such localities expand on being dried, and if they contract at all it is when wet. The woodf lours are, as a rule, but little sensitive to differences of humidity—which is what we should expect under conditions which are so little variable in this respect. It is a common thing for the seed capsules of flowering plants which grow in moist situations to close tightly during a rain and expand for the liberation of the seeds when the air is dry. In dry situations the reverse is the rule, and, since the extremes of moisture and dryness are more marked, there are a greater number of interesting examples of hygroscopicity. Among flowering plants a well-known case is the so-called "rose of Jericho" (Anastatica hierochuntica, one of the mustard family), which is often brought to this country as a curiosity. Its home is the arid region around the Dead Sea. When mature, the plant consists of numerous short, woolly branches which diverge widely from the top of a conical root. By the time the seeds are ripe the leaves have fallen, and as the branches dry they curl inward until finally the plant looks like a little ball of wicker-work. The wind now loosens it readily from the soil, and it may be rolled for a long distance over the sandy country. If at last it comes to a pool of water, the branches soon expand, and the seeds are scattered upon the surrounding soil. On the steppes of Southern Russia and on our own western plains there occur not a few plants which behave in the same way, and have received the names "wind-witch," "leap-in-the-field," and "tumble-weed." The curious "resurrection plant" (Oschiganella conulata), one of the club mosses, which inhabits the sandy flats of Texas, receives its name from an exactly similar habit, which helps it to carry its spores to a distance, while reserving them for distribution at the most favorable time.

Turning now to our Geaster hygrometricus, we find that it agrees with the desert plants just described, not only in the way it responds to moisture, but also in breaking easily its connection with the soil as soon as mature. During the period of dryness it is contracted into a ball (Fig. 1), and if the wind blows lightly over the sand, soon as the rains bring enough moisture for the germination of its spores, the little plant becomes anchored by the expansion of its protecting arms. At the same time this exposes the thin-walled spore-case and uncovers the mouth, so that every gust of wind will carry away hundreds of its tiny offspring. Some of these are now very sure to find a resting place where there is food and moisture and begin to thrive and grow into a mass of hyphae.

**THE PHENICIANS IN BRITAIN.**

During the past year there has been considerable discussion in the columns of the Science News regarding the settlement of ancient Phoenician colonies in that part of England now comprising those of the counties of Cornwall and Devon, and the possibility of the survival of their descendants to the present time. Mr. Harry Hems, of Exeter, England, has taken the trouble to obtain an opinion on this point from a gentleman residing in Exeter who is a well-known archeologist and one of the highest authorities on the antiquities of Devonshire. Through the kindness of Mr. Hems we are enabled to publish Mr. Andrew's letter, which we think our readers will find of unusual interest.

**SOUTHERNAY, ENGLAND, 6th March, 1891.**

DEAR MR. HEMS: Thank you for your kind note, and for a sight of Dr. Chamberlton's post-card. The astonishment of people who have been described, as representing a variety of Phoenician origin of Cornish people. Whittaker, the learned historian of Manchester, maintains that Britain was peopled from Gaul, within about 1,000 years before the Christian era, and that the Belgae, whose Caesar mentions, followed more than 500 years later. It is impossible to speak with any assurance on this matter, but the aboriginal inhabitants of Britain were probably of Celtic origin and of Phoenician descent. The most evident of the Phoenicians; but that they peopled Cornwall, or largely mixed with these Celtic races, cannot be, I maintain, reasonably argued.

The principal writers on the antiquities of Devon and Cornwall are Poulshene, Dr. Burese, Pryce, and Rev. Samuel Rowe; but I believe it is Dr. Bursole who describes a small bronze Phoenician dew dropping found in Moon's bay. Mr. Puleshene refers more particularly to the stone monuments of the ancient Britons which are to be found near St. Michael's Mount in Cornwall, and near Dartmoor in Devon. Mr. Poulshene also describes the old tin streams of the two counties. After hearing my lecture on the tin mines of Devon and Cornwall, the late Mr. Bishop of Cornwall, gave me a large block of black tin left in the workings of the Phoenicians, and which in Cornwall is termed the "Mount" as a place of safety. The old men who lived in the last century on the moor worked the streams, and then removed the tin to the tinners, the traders' port. Cornwall, however, was always carefully preserved and not removed to Michael's Mount, their deped and place of safety.

Diomann Sneath, E. B. C., refers to the mining operations in the southwest of Britain. He says: "When they had cast it into ingots they carry it into an adjacent island, which is called Tintagel. For when it is low water the inter- vening space is left dry, and they carry into that island great quantities in wagons. Every 15 years, at Michaelmas, they give a holiday at Marazion, I can swear that at every low tide we may easily walk to the island or to Michael's Mount, and most of the countrymen of these seas, if desired by these islanders are to this day carted to the Mount. The best library on these old matters is on the book shelves of the museum at Fowey. Yours very truly,

JAMES ANDREW,
F. G. S. (London).
the northerly exceeded the southerly by thirty-five.

D. W.

NATICK, April 6, 1891.

[Specially Computed for POPULAR SCIENCE NEWS.]

ASTRONOMICAL PHENOMENA FOR MAY, 1891.

There will be a total eclipse of the moon on May 29, and it will not be visible this country as the middle of the eclipse occurs at about 1:30 P. M., eastern time. It will be visible in the eastern hemisphere. Mercury will be an evening star, at the beginning of the month, but rapidly approaches inferior conjunction with the sun, passing between the earth and sun on May 9—giving us a transit. It then becomes a morning star, and moves rapidly toward western elongation. By the end of the month it is over 20° distant from the sun, but it is at the same time very far to the south, so that it will not be easily visible. The transit occurs on May 9th, and only its beginning can be seen in the eastern part of the United States, the first contact coming just before sunset and the other phases occurring after sunset. Transits of Mercury occur on or near May 9 or November 11. Nearer still is the point on the meridian, and nodes of Mercury's orbit, and there are usually six in a period of forty-six years—two May transits and four November transits. The next will come on November 16, 1894. They are of no great astronomical importance. Venus is still a morning star, and rises about two hours before the sun. It will be considerably less bright than it was during the winter. Mars is slowly approaching conjunction with the sun. It is still an evening star, and sets about two hours after the sun at the beginning of the month and somewhat earlier at the end. It has fallen off so much in brightness as to be no longer a conspicuous object. It will be occulted by the moon on the evening of May 3, but the occultation will not be visible in the United States, except possibly, in the extreme southwest. Jupiter is getting into better position for observation. It is still a morning star, but by the end of the month rises about midnight. It is moving eastward in the constellation Aquarius, and on the morning of May 29 passes very close to the fourth magnitude star Phi Aquarii. Saturn is on the meridian shortly after 8 P. M. on May 1, and shortly after 6 P. M. on May 31. It is in the constellation Leo, and is not a particularly bright star. It is in quadrature with the sun on the morning of June 1. Uranus is in the constellation Virgo, and is on the meridian at about 11 P. M. on May 1, and at about 9 P. M. on May 31. No very bright star is near it.

The Constellations.—The positions given are for latitudes differing not many degrees from 40° north, and for 10 P. M. on May 1, 9 P. M. on May 16, and 8 P. M. on May 31. Cepheus Venecaliel is in the north. The Harps, or doubles, are Coma Berenices, Virgo, and Corvus. A few of the most northerly stars of C turnaurus are on the south horizon. In the southeast is Libra, and below it, just rising, is Scorpius. Bootes is high up, east of the zenith, and below it are Hercules and Ophiuchus. Lyra and Cygnus are low down in the northeast. The principal stars of Draco are well above the horizon, as are the tail of Cepheus. Castorpela is on the north horizon. Perseus and Auriga are setting in the northwest. Ursid Major is high up, near the zenith, most of the stars being west of the meridian. Gemini is near the western horizon. Cancer and Leo follow, above, to the left. Canis Minor is below Cancer, near the southwest horizon.

M.

LAKE FOREST, Ill... April 5, 1891.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will be acknowledged.

Questions regarding the treatment of diseases cannot be answered in this column.

A. H. L., Penn.—I have a battery of cells upon which they have added together the galvanometer shows no stronger current that it does when one only is used. What is the matter?

Answer.—The trouble probably lies in the way you have come to use the cells. Unless you have added together the greatest electromotive force, you must connect the zinc of one cell with the carbon of the next, and to connect all the zincs and all the carbons together.

J. L. M., N. Y.—Is it not possible that there is a stratum of hydrogen or other light gases, expelled from volcanoes or gas wells, resting on top of the earth's atmosphere?

Answer.—The law of diffusion of gases would forbid this being the case. When a light and a heavy gas are brought into contact, even if the lighter gas is placed uppermost, the two gases will, in a short time, become uniformly mixed, without regard to their different specific gravities.

To the Editor of POPULAR SCIENCE NEWS.—The air in the air would settle to the surface of the earth, forming a layer several feet in thickness, and animal life would cease to exist, except on the summits of hills and mountains.

E. G. K., New Jersey.—How is vanillin, or artificial vanilla flavor, procured from pine trees?

Answer.—A substance known as coniferin is found in the gummy liquid which is formed in coniferous trees. This substance is used in vanillin, identical with the stuff occurring in vanilla bean. It is at present also largely prepared from eugenol, a substance occurring in oil of clove. Although artificial vanilla is quite extensively manufactured, it is much inferior to the natural product.

R. M. D., Mass.—The "Japanese filter paper" mentioned in a recent issue is the same as that of which the "chrome" paper is made. They can be obtained by any stationer at a very small cost.

J. D. M., Mass.—How is the paper prepared which is used in the toy barometers, so called, and which changes color according to the state of the weather?

Answer.—The paper is soaked with a strong solution of muriate of cobalt (cobaltous chloride), and is allowed to dry. In damp weather it is of a pink color, which changes to blue in dry weather or when the paper is warmed. Although an interesting scientific toy, these "barometers" are utterly worthless in forecasting changes in the weather.

N. D. B., Boston.—What is "fuming sulphuric acid," and how does it differ from the ordinary kind?

Answer.—Fuming sulphuric acid is a mixture of two parts of ordinary sulphuric acid (H₂SO₄) with one part of fuming nitric acid (HNO₃). It was first made by Basil Valentiou over four centuries ago, and was for a long time the only "oil of vitriol" known. The fuming in the air is due to the presence of fuming nitric acid, prepared by the distillation of ferrous sulphate (FeSO₄) and is now made in considerable quantity at Northampton in Saxony. Its principal commercial use is as a solvent of indigo for use in dye works.

W. G. H., Penn.—How are the "magic papers" made which, when touched with the end of a piece of glowing coal, give the color of the gas given off by the passage of the burning spark through the paper?

Answer.—They are made by tracing the desired words in a black ink, very weak solution of nitrate of potash (K₂SO₄). When touched with a piece of glowing charcoal, the paper will ignite and smoulder without bursting into flame, and the oxygen in the sulphate will support the combustion, which will follow the lines traced by the solution, but will not extend to other parts of the paper.

LITERARY NOTES.

Petroleum: An Introduction to the Study of the Igneous Rocks and Its Most Prominent Constituents and Historical Structures of the igneous rocks, their mode of occurrences at the surface, and their origin beneath the crust of the earth, has long been a subject of much study and discussion. With the view of filling this gap this little book has been prepared, and we can recommend it, not only as a useful text-book on the subject, but also as a handy work of reference.

Appleton's School Physics, prices, octavo, Advanced Lessons in English Grammar; price, 60 cents.

The above are among the latest publications of the American Book Company, of New York, and, like all the other text-books published by this firm, are original, well written, and thoroughly reliable and complete. In the study of physics, especially, a work comprising the results of the recent investigations of the Rochester Union and Advertiser, in which they were originally published; and a glance over the pages of the advanced grammar shows how many commendable changes have been made in the teaching of this rather dry subject, within the past few years.

Simple Lessons in Astronomy, by Dr. Louis Nettleship. N. Y., is a collection of fifty-two popular articles in astronomy, reprinted from the columns of the Rochester Union and Advertiser, in which they were originally published. This book will have several new features that demand consideration, namely, its combined authorship that guarantees the accuracy of matter, the usefulness of matter, and its practical character that offers directly to the practical physician many important details in the treatment of diseases that the usual text-books omit.

The Casell Publishing Co. have issued another volume in their series of popular literature, the story of Eleanor Lambert. Price, 50 cents, cloth.

Pamphlets, etc., received: The Relation of Life Insurance to Inheritance, by T. D. Crotts, M. D., Hartford, Conn.; Resolution of the Optic Nerve, by L. Webster Fox, M. D., Philadelphia; Copy, copyright, Laws of the United States, (including Act of 1891), by the F. H. Gibson Co., Boston; Education at the Michigan Agricultural College, by President Dr. Chute; Camera Notes for Ornithologists, by R. W. Shufeldt, M. D., Washington; and the Proceedings of the Thirtieth Annual Meeting of the Empire State Association of Deaf Mutes.

To Locate the Deficient Working of Machinery with numerous points of friction, causes often both annoyance and waste of time, owing to the surrounding noise interfering with the observation. The Device "Industrielle" mentions an effective and exceedingly simple means of overcoming this difficulty, the use of a rubber tube about a yard long, one end of which is placed in the ear and the other passes over the suspected spots. The vibrations from all other parts than the one covered being excluded, it is an easy matter to locate a jarring noise, and, if found, to observe the intensity and periodicity with which it occurs.
The following shows that some very desperate cases were cured.

A man came to the god as a suppliant who was so blind in one eye that he had only his eyelids and nothing at all in them, but only an empty void. And some of those in the sacred place said that he was foolish to expect to see when he had absolutely no eye at all, but only the place where the eye ought to be. Now when he went to sleep a vision appeared to him. It seemed to him that the god prepared a drug, and then, separating his eyelids, poured it between them. And when morning came he went away seeing with both eyes.

The success of the god was not confined to living beings:

A porter was on his way to the shrine, and when he was about ten stadia away, he fell. And when he got up and opened his wallet he saw that its contents were shattered. And when he saw that the cup from which his master was wont to drink was broken, he was grieved, and sat down and tried to fit the pieces together. And a wayfarer seeing him said: "Why, foolish fellow, do you vainly try to put that cup together? Why, not even Esculapius at Epidaurus could make that whole!"

Now when the boy heard this, he unloosed his belt and put it upon his head in the shrine. And when he got there, he opened his wallet and took the cup out safe and sound. Then he told his master what he had been and done. And when his master heard it, he dedicated the cup to the god.

Curiosity is punished:

Esculapius, when the suppliants had gone to sleep, climbed on a tree and peered over into the sacred precinct. But he fell from the tree and dashed out his eyes against some stakes. And being in a pitiful plight and blind, he prayed to the god, went to sleep, and woke up cured.

Euplius carried a spear-head in the side of his face for six years. And when he had gone to sleep, the god took out the spear-head and placed it in his hand. And in the morning he went out into the sacred precinct and blind a fillet around his head.

Hermódes of Lampæus, paralyz. When he had gone to sleep, the god cured him, and bade him go and bring into the sacred enclosure the largest stone he could find. And he went and brought the one that lies before the sacred enclosure.

Even the most skeptical must have believed this, for there was the stone to prove it!

Neanor, lame. When he lay down, a boy seized his staff and ran off with it. He rose and pursued him, and thereupon was cured.

A man's toe was cured by a snake. This man—whose toe was severely afflicted with a malignant ulcer—was carried out by the attendants one day, and placed upon a seat. When sleep had come to him, the god came and laid him down, and thereupon saw the tree in the sacred grove. And in the morning he went away cured.

I have never heard of a case in modern times of a cure of baldness by faith, but the god at Epidaurus was equal even to that. We see incidentally that baldness was rare among the Greeks:

Heraclus of Mitylene. He had no hair on his head, but a great deal on his chin. And being
ASHAMED, as much as he was laughed at by the rest, he went to sleep. And the god anointed his head with a drug and made him wonderful. While laying his eyes licked by one of the dogs belonging to the sacred place, went away cured.

All these inscriptions, with several others, are on one slab. The following is of later date and shows a very different method of cure. The god seems to have presided with excellent judgment.

M. Julius Apelles, of Mylasa, was sent for by the god because I often fell ill and suffered from dyspepsia. And on the voyage to Aegina he advised me never to get very angry. And when I came to the Hieron he made me wash my head for two days, during which it itched; to take cheese and bread, with lettuce; to take my bath without an attendant; to exercise myself by running; to drink water in which lemon-juice had been soaked; to walk in the open air; to take sand baths; to walk barefooted; before entering the bath, to pour wine into the warm water; to bathe alone, and to give a fee to the attendant; to sacrifice in common to Eosinupis, Epeione, and the Eleusinean deities; to take milk mixed with honey. And one day, when I was at the bath, the god said: "Put honey into the milk, that it may act as an aperient." And when I begged the god to cure me more quickly, I dreamed that I went out from the sacred enclosure to the baths anointed all over with mustard and salt, and that a boy led me, holding in his hands a steaming censer, and that the priest said: "You are cured; you must pay the fees." Accordingly I did what I had dreamed, and when I was anointed with the mustard and salt I felt no pain. These things happened within nine days after my arrival. And he touched my right hand and breast. And the next day, as I was sacrificing, the flame blazed up and burned my hand, so that blisters arose on it. But in a little while the hand was cured. And when I remained, he touched me with olive oil for seven days.

But I did not suffer with headache. It happened, however, that, engaging in study, I had a rush of blood to the head; but when I used the oil I was freed from the headache. He told me to gargle with cold water for sore throat (for I consulted him also about this) and for tonsils. And he bade me record these things. I went away healed and full of gratitude.

[Medical Record.]

BEAUTY AS A MEANS OF HEALTH.

BEFORE one of the New York Working Girls’ Clubs, Dr. Louise Fiske Bryson recently gave an address upon this subject, reversing in more ways than one the usual copybook definitions, acknowledging the impossibility of any preordained happiness without virtue, and the maintenance of beauty’s fine edge without goodness, the doctor affirmed that systematic efforts to be beautiful will insure a fair degree of health, and that happiness is the best safeguard against vice. The difference in appearance between one woman and another, it was stated, is more than anything else an affair of style; that beauty of beauty lies in the perfect body. The eyes, the lips, the expression of the New York child, “Lord, make us very stylish,” when viewed aright, is recognized as an aspiration based upon sound scientific principles and worthy of universal commendation.

Proper breathing is the first art to cultivate in the pursuit of beauty. The lungs have their own life, independent of the heart’s. The chest must be enlarged by full, deep breathing, and not by muscular action from without. Inflate the lungs upward and outward, as if the inflation were about to lift the body off the ground. Hold the shoulders on a line with the hips, and stand so that the lips, chin, chest, and toes come upon one line, the feet being turned out at an angle of sixty degrees. It is wrong to make the bony structure do more of the work in keeping the body upright. The muscles should hold it in position. In walking, keep face and chest well over the advanced foot, and cultivate a free, firm, easy gait, without hard or jarring movements. It is impossible to stand or breathe aright if the feet are pinched. When correct posture is cultivated, with the circulation is impeded, and deleterious substances in the blood tend to make the complexion bad. This is one of the many evils of tight shoes. To be well shod has a marked influence on style. The feet symbolize the body in their way as much as the hands. A clever shoemaker says that in a well-fitting shoe the human feet feel as a duck’s foot in the mud. It is held firmly in place, but nowhere cramped. Nothing can excite a vagueness and nervousness. A shoe that is manifestly too tight. For misery-producing power, hygienically as well as spiritually speaking, perhaps tight boots are without a rival.

Next to the search for style pure and simple as a means of health, the care of the complexion and the cultivation of the right kind of expression are more indispensable. Exercise can expect a number of bathing and the general hygiene of the skin, while the second—a good expression—is best secured by the constant preference of higher thoughts over lower ones. This is the essence of intellectual living, and is fortunate within reach of all.

Beauty that is lasting and really worth while is more or less dependent upon a good circulation; while a good circulation is made possible by correct pose, proper breathing, and the judicious care of the skin, something else is necessary to insure the normal quality and activity of the blood. And this something consists in a combination of sunshine and exercise in the open air. Town-dwellers have too little of these blessings, partly from circumstances and partly from lack of care and use. Exercise is the best compensation for waste of the body. Without it there can be no large, compact muscular frame. "It is as essential to physical development as air is to life, and an imperative necessity in the maintenance of beauty.

To keep the complexion and spirits good, to preserve grace, strength, and ability of motion, there is no gymnastics so valuable as the daily round of exercise, performed in the open air under the beneficent influences of the sun, the rain, and the wind, results than sweeping, dusting, mopping, beds, washing dishes, and the polishing of brass and silver. One year of such muscular effort within doors, together with regular exercise in the open air, will do more for a woman’s complexion than all the lotions and powders that ever were invented. Perhaps the reason why housework does so much more for women than games, is the fact that exercise which is immediately productive cheers the spirit. It gives women the courage to go on with living, and makes things seem really worth while.

In a general way the great secrets of beauty, and therefore of health, may be summed up as follows: Moderation in eating and drinking; short hours of labor and study; regularity in exercise, relaxation, and rest; cleanliness; equanimity of temper, and equality of temperature, and to this, physical well, one must in general be happy. And to be happy it is necessary to carry out ideas of personal taste and preference, as many of them as can be put into definite form without infringing upon the rights of others. Happiness has a distinct aesthetic and hygienic value. In itself it will secure perfect poise and respiration. To be unhappy is a duty just as style is a duty, and if we are in great measure an affair of intellect and management. The old order put the cart before the horse; it said: "Be virtuous and you will be happy"—a rule with many exceptions. But the old order changed. And the modern gospel postulates happiness and material prosperity as the basis of morality. Other times, other manners.

The idea of beauty as a branch of education which is in hygiene, and becomes a legitimate and praiseworthy means of health. The whole world has yet room for two or three truths, of which not the least is the fact that the desired life is the true life—one which was in the beginning, is now, and ever shall be—constitutes in itself a perfectly proper and meritorous inspiration to effort, especially in a country where the shades of Puritan linger as a salutation, and where disinterested Buddhist claims too often the frail neeatrusthe for its own. [Original in Popular Science News.]

THE RATIONAL TREATMENT OF PNEUMONIA.

In the February number of the Popular Science News, appeared an excellent article on the subject above. Permit me to suggest a very simple but perhaps specific remedy for pneumonia tested in my practice for many years with uniformly good results, and in my own case of double pneumonia September, 1879. The severe attack came at midnight, and made good progress until the next morning at 10 o’clock. Used Faradic current with electrodes; result, very little good. A member of my family began treatment using the hand as electrode, (positive) ; negative, flat short metal sheet (circular, 2½ inches), covered with cotton cloth and wet in quite warm water and placed on fourth dorsal, the hand also wet in warm water and placed over the left lung. I shall never forget the immediate sense of relief and feeling of air passing through the suffering organ; in thirty minutes could breathe very comfortably, and in three days all right. Improvidently entered the office sixth day, gave treatment, and next day after had serious attack on right side, much more severe, but the same mode of treatment again commenced in four and a half days, and I was somewhat weak but well enough to work after one week’s rest, three weeks in all, to stay, and remain in good health yet. Next month will close up my “fourscore.” This seems to myself and friends an remarkable case to rely on electricity alone. I desire this treatment to be tested in pneumonia by physicians generally, and report results. In general practice I never supposed electricity to be “contradistilled” in any case.
A CONVENIENT FILTER.

BY WILLIS CUMMINGS, M. D.

I send a description of a portable water filter which I have found convenient for a variety of uses. For filtering ordinary hydraulic water it is immersed in a vessel containing the water, and, enough suction made on the tube to make a siphon action, and, by allowing the vessel to remain under the hydraulic, an unlimited supply can be obtained, though of course not in a large stream. For carrying in the pocket or satchel it is very handy, as it can be used by dropping it in a spring or other water, and by suction a fair drinking stream can be obtained. Railroad water is notoriously bad, and as a cleanser this seems to be perfect. Its simplicity is its chief advantage. A rather wide-mouthed bottle containing an ounce or two is the best. A piece of glass tubing sufficiently long to reach the bottom and extend to the top or above about one-half an inch. A piece of black rubber tubing such as is used on nursing bottles is drawn over the end of the mouth of the bottle. Abundant cotton is then tightly packed around the glass tubing which rests on the bottom of the bottle. Pack the bottle to the top. If desired, when about half full, a layer of charcoal can be put in and the cotton packing continued. A small package of cotton will last a long while for repacking as only the top layers of cotton need be removed and replaced by new for a considerable period. About two feet of rubber tubing is all that is necessary. The variations that can be made are obvious. A much larger one containing cotton, gravel, and charcoal has been in use successfully for several months. It is first of all clean, for we can see when it becomes foul; its portability is unquestioned, and its ease of renewing is quite apparent.

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARKE, M.D.

ABSORPTION AS AN IONTOXANT.—As commonly met with, absorption only contains about thirty minutes of essence of absinthe to the litre, the remainder consisting of alcohol together from 16 to 100 drops each of the essences of anise seed and star anise seed, coriander, fennel, peppermint, angustica, hyssop, and melisse; and the color is given by the coloring matter of the latter. M. Cheadle and Meunier recently undertook to investigate the action of the various components of absinthe, in order to ascertain to which of them its peculiarly intoxicating effects were due. They found that hyssop induces epileptic attacks in ten grain doses, while fennel induces visual troubles and languor. Poisonous doses of coriander give rise to thirst and muscular convulsions. Mielesse determines a peculiar state of the bowels, followed by insatiable and sleeplessness. Both varieties of anise seed possess powerfully stimulating properties, with conspicuous visual troubles, muscular incoordination, dulness of sensation, with agetonization of the will, and heavy sleep.

Although not, strictly speaking, poisonous, anise seed is a most exciting of the nerve centers, even in the relatively small quantities contained in the usual allowance of the liqueur. If the dose be increased, epileptic attacks are incurred. A litre of ordinary absinthe only contains about thirty drops of the essence—a dose which, if taken all at once, only gives rise to powerful mental stimulation, increasing the appetite and facilitating digestion. Moreover, it leaves behind it both depresive nor sonnolence. The sum total of the effects of the blend is a sensation of comfort and physical and mental activity, followed by lassitude and indisposition to exertion, and in large doses, sleep. The authors are disposed to treat the major part of the lazierious effects to the collateral essences, and seriously recommend manufacturers to discard the use of several of these, and of anise seed in particular.

THE TREATMENT OF WHOOPING-COUGH BY VACCINATION.—Dr. Cheadle noted in a case of whooping-cough the success of vaccination immediately after vaccination there was a striking relief in the whooping-cough, and this observation led him to test the action of the vaccine virus in five extremely severe cases of whooping-cough, and his results are published in the Wiener Medizinische Blatter, October 16, 1890. Of these five cases four were of such extreme severity as to threaten life. The convalescent state were accompanied by threatening suffocation from vomiting and bleeding from the mouth and nose. Dr. Cheadle vaccinated each of these, and, as soon as the febrile symptoms of the vaccination commenced, the situation was entirely altered. The coughing almost entirely ceased, and was then simply of a catarrhal character, and disappeared entirely after eight or ten days. And were accounted for by the suddenness of the vaccination the patients were treated with inhalations of one per cent. carbolic acid solution, a procedure which he thinks is warranted, on account of the observation of Thelle, that the microbes in this disease do not exist deep in the mucous membrane, but are superficially located in the mucus, so that the antisep der readily reaches them and causes their death.

As regards the manner of action of the vaccine microbes, the author has very little definite to suggest. He calls attention to the two possibilities that either the febrile symptoms in vaccination are due to the distribution through the body of the vaccine microbes, or that the action of these microbes terminates in the development of certain products which themselves produce the characteristic effects of vaccination. But as to how the whooping-cough is affected he has nothing to suggest. — Ther. Gazette.

NEW MODE OF EXHIBITING SULPHONAL.—Just before retiring the sulphonal powder should be well stirred in a glass twofourths full of boiling water (about six fluid ounces) until entirely dissolved. The water must be boiling, and to insure that it is at the boiling point when brought in contact with the sulphonal, it had better be heated on the spot. It can be boiled in a tin cup over the gas or over a spirit lamp. After the sulphonal has entered into solution, which will occur in a moment or two if it be well stirred, cool water must be slowly added to reduce the temperature of the drug to a drinkable temperature, which, if the patient is accustomed to taking hot fluids, will be one not sufficient to cause the slightest precipitation of the drug; or the hot solution of sulphonal may be permitted to cool to this temperature, the cooling process being facilitated by the continued stirring. To insure success the sulphonal must be taken wholly dissolved, and the hotter the溶液 several hours before bedtime, to allow for what has been called the period of therapeutic incubation, to note the prompt and satisfactory result of this simple manoeuvre. The hot solution dilutes the gastric vessels and stimulates them to rapid absorption, so that diffusion takes place from the stomach probably before slight or any precipitation of the drug occurs; entirely unlike the result that follows when the sulphonal is ingested in a state of simplicity. Intestinal absorption of a large and rapid rate may so far as can be estimated, can scarcely occur, and hours are perhaps consumed before the whole amount taken enters the blood. The period of therapeutic incubation is practically done away with. Sleep results in most cases in a very few moments, and seems to be more profound and dreamless than that from a larger dose taken in the ordinary way. The fact of the subsequent nausea usually present on the subsequent day is scarcely felt if the dose be properly graduated. The hot solution, which has a slightly unpleasant taste from the dissolved sulphonal, may be rendered deliciously palatable by the addition of a tablespoonful of some such liqueur as crème de menthe ("green mint") which, apart from its efficiency in this direction, will probably tend to promote still more rapid absorption of the drug. To obtain an immediate and altogether satisfactory result from this method it is desirable that the stomach be empty, or at least comparatively free from food so that precipitation be not favored and absorption delayed by the entanglement of particles of sulphonal and undigested food, but as it is unnecessary to take the dose until the retiring hour there will usually be no difficulty from this. Med. News.

REUNION OF CUT-OFF TONGUE.—Dr. N. C. Davis, of Good Thumber, Minnesota, was summoned to see a boy seven years of age who had been kicked by a horse on the right cheek, breaking off the first bicuspid tooth. The tongue was cut entirely off at the junction of the tip with the base, or the posterior portion of the frenum linguae, with the exception of a few fibers of the tongue and mucous membrane on the right side. When Dr. Davis arrived the end of the tongue was protruding from the mouth. The hemorrhage was controlled by a dilute solution of persulphate of iron. Dr. Davis drew the base of the tongue forward with a tenaculum. Then the apex was brought into apposition with the base, and secured with five silk ligatures above on the dorsum and seven below. The boy stood the operation well, and the hemorrhage was trivial. The balance of the treatment consisted in syringing out the mouth twice daily with a solution of boracic acid and putting patent upon a liquid diet. The tongue healed nicely, with the exception of a small portion on the left side, which was nearly replaced by the tongue. The boy was discharged the patient in about three weeks, with the tongue in full length and articulation good. — Northeastern Medical Journal.

FOREIGN BODY IN THE ORBIT FOR FORTY-SIX YEARS.—A man aged 52 years applied for treatment complaining of an exposure of the upper lid by electric shock to the roof of orbit in the center of which was a sinus. At the outer margin of the orbit was the scar of a wound made by falling on a knife blade when six years of age. The only trouble experienced since was a purulent discharge. Explorations revealed the corroded remnant of the blade nine-sixteenths inch long, seven-sixteenths inch broad at one end, and five-sixteenths inch at the other, lying partly in the orbit and partly in the frontal sinus. A
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AND

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[Publisher's Column.]

The United States government recently purchased one lot of 80,000 pounds of baking powder from the Royal Baking Powder Co.

"Take away the sword, States can be saved without it, bring the peace but not the war letter. They are made in every style to suit every hand.

New subscribers to the Popular Science News sending one dollar before December 1, 1892, will receive, July, 1892, thus receiving the May and June numbers free.

It is not yet too late to order an Artificial Ice Machine from David Bottle, of Chicago, for use during the coming summer. He has unequalled facilities for promptly filling all orders.

Physicians are invited to correspond with the C. H. Phillips Chemical Co., of New York, in regard to their medicinal specialties, which have stood the test of time and are now regularly prescribed by many of the most eminent members of the profession. Their preparations are in no sense "patent medicines," but are standard remedial agents of known composition.

At the recent meeting of the Massachusetts Pharmaceutical Association, Professor's Exculsor Apathy was referred to, in a debate on patent medicines, as an illustration of a proprietary article that was free from the objections usually urged against the class of remedies, and which could be safely recommended by both physicians and druggists. If your druggist does not have it in stock, send fifty cents for a bottle and receive it by express, prepaid.


Dr. WM. Alex. Greene, Mecan, Ga., writes: "I cheerfully state that I have received the virtues and efficiency of Glenn's Liquid in my private practice, in cases of general debility, weakness, depression, dyspepsia, loss of appetite, and nervous affections where medicines had proved more than useless. I have found it the best remedy I ever used in chronic alcoholism, when the stomach is always irritable, and food is required to nourish and invigorate the drooping strength and nervous depression, also appeasing the thirst for more alcohol."

quantity of rust and pieces of rough bone were removed when the sinus healed perfectly.—Lancet.

A SIMPLE METHOD OF REMOVING A NEEDLE.—Dr. Charles Steele, of Clifton, mentions in the British Medical Journal, the case of a young girl who got a needle in her heel, and as it broke it could not be extracted. He directed her to wear a large thick corn-plaster round the spot with a little wet cotton-wool in the center, and to tread freely on the heel. Within a week afterwards the needle protruded, and was easily withdrawn.

In the TREATMENT OF COLLES’S FRAC.TURE, I lay great stress on not confusing the fingers in a bandage. The fingers should be left free so that the tendon can play in their sheaths and the little joints remain flexible. If the joint of any aged person be confined for a certain length of time—even though it be not injured—the joint thus confined will become stiff. The fold of the capsular ligament will assume such a strangled position that as soon as the patient makes an attempt to move his joint the very act will elicit pain.—Gerster.

A CASE OF ABNORMAL POSITIONS OF THE HEART.—In Lyon County, Kansas, lives L. W., age ten years, general health good, and fairly developed. His heart is nearly normal in size, sounds, rhythm, etc., except a slight increase in the volume of sound. The apex beat is very distinct, and situated between the sixth and seventh ribs, and one and a half inches directly below the right nipple. The radial pulse is 84 and quite strong. The chest wall over the natural location of the heart is markedly depressed, and is free from any heart sounds, except a slight transmission from the other side. The boy is well and active, no dyspepsia or other symptoms of an imperfect heart. The family history is one of imperfect development. One sister has cleft palate, also three or four aunts and uncles have had cleft palate or hare-lips.—Kansas City Med. Index.

Pest of Disease a Prevention of Mortality.—Dr. R. G. Eclees, in the Popular Science Monthly, says no one fails to send for a physician in typhus, yet only six persons in a million die of this disease. Twenty five die from the smallpox. Four hundred and eighty-two in a million die of whooping-cough because it seldom frightens patients, and neighboring old ladies of both sexes give advice. Three hundred and forty-one in a million die of measles because it so frightens as to induce the friends to send for a doctor. Two hundred and twenty-two in a million die of scarlet fever, for medical advice is sought sooner and more implicitly obeyed. One hundred and sixty-eight in a million die of diphtheria, because it frightens more than most other diseases, and induces people to send for a doctor quickly. Thus we may class diseases as more or less fatal as people are afraid of them and seek proper advice to both prevent and cure.

Bromide of Ethyl as an Anesthetic.—A series of recent publications demonstrate the value of bromide of ethyl as an anesthetic in minor surgery. M. Leon Szuman, of Thorn, (Therapeutische Monatshefte,) confirms the observation of MM. Aesch and Pauschmeirg, (Gazette of December, 1888), made in the use of this drug in minor operations and in practical obstetrics. He recommends the use of a mask such as is used in chloroform anesthesia, and to pour upon the mask from five to six draehmens. The effect is rapid and satisfactory for minor operations, but in capital surgery M. Szuman advises against its use.

M. Gilles (Deutsch Monat. Fur Zahnheilkunde) has used it in more than 450 cases for the extraction of teeth, and commands its employment as being prompt in action and free from danger if properly used.

M. Szuman and M. Gilles both agree that for complete anesthesia it should not be used drop by drop, but that the mask should be wet with it and placed over the nose and mouth, since the simultaneous inhalation of air diminishes the anaesthetic effects. The quantity used for complete anesthesia is commonly about three lo four draehmens. The effect is complete in from one to one and a half minutes, and in children in one-fourth minute. No untoward symptoms were noticed during its use.—Repettoire de Therapeutique.

MECNICAL MISCELLANY.

A LARGE FEE.—Professor Grube, of Charlow, has received a fee of $5,000,000 (nearly $4,000,000,) besides heavy travelling expenses, for an operation which he performed on a rich fish-monger of Astrakhan.

Dr. Grube was in Astrakhan one day and one night.

ECZEMA FROM THE VIRGINIA CREEPER.—The Lancet (London) relates a number of unmistakable cases of eczema produced from gathering leaves of the Virginia creeper. The effect, rash, heat, and irritation of the skin is the same as that caused by ivy and dogwood on some persons.

A Mohammedan Female Physician.—Dr. Razie Khatirborff-Hannum, a young Mohammedan woman, who was born in the Crimea, recently passed a creditable examination as physician and surgeon at Odessa, and now enjoys the distinction of being the first woman of her creed to engage in the practice of medicine as understood by western nations.

The Lady and the Sign.—Some unusual incidents in connection with doctors’ signs are reported from Chicago by the North American Practitioner: “A physician of the feminine gender caused her sign to be stolen lately and then offered a reward of $500 through the daily press for its return. The sign is said to be worth about $174, hence there must be $498.20 of advertising in the affair.”

An Eye to Business.—A certain doctor, who was noted for a keen eye to business, was driving along the street of a country town, when his horse took fright and ran away. He was thrown violently out of his trap and rendered senseless. Presently he recovered a little from his unconsciousness, and, noticing the crowd which had gathered about him, asked, “What’s the matter, gentleman? Anybody hurt? I am Dr. X. Can I be of any service?”

POISONING in INDIA.—The following cheerful notice has been issued by the Bengal police, warning passengers on the Eastern Bengal Railway: “Passengers are hereby cautioned against taking anything to eat or drink from unknown persons, as there are many who live by poisoning travellers. They disguise themselves as beggars, or murder men in a sarai or some other place, and then gain their confidence on the plea of being fellow-travellers going to the same place. When they reach a place convenient for the purpose, they poison the water or food of the passengers, who become insensible, and then they decamp with all their property. They also, at times, poison the passenger’s water when being drawn out of wells, or sweetmeats brought from the bazaar, or food when being cooked.”

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[May, 1891.]
A NEW THEORY OF THE GREAT PYRAMID.

There has always been more or less mystery surrounding the origin and purpose of the pyramids of Egypt, which is in no ways lessened when the peculiar arrangement of their interior chambers and passages is studied. That their ultimate use was for the burial place of some ancient Egyptian monarchs seems to be beyond question, but that this may have been combined with other uses seems equally probable. The dimensions and angles of the largest, known as the pyramid of Cheops, have been a fruitful source of speculation to philosophical and religious cranks, and countless theories have been advanced to explain the esoteric and mystical relations of the measurements of the various chambers, all of which are too preposterous for a moment's consideration. One of these enthusiasts, for instance, claims that in the external and internal dimensions of the pyramid a complete system of prophecy may be detected, leading up to the final destruction of the world and the last judgment—and this without any reliable knowledge whatever of the standard of measurement used by the ancients in the construction of these structures.

Leaving these vagaries of a disordered imagination, we may turn to certain facts which indicate, at least, that the builders of the pyramid of Cheops were possessed of a certain amount of astronomical knowledge. In Fig. 1 a vertical section of the pyramid in a north and south direction is given. From the entrance C a passage leads to a chamber (A) excavated in the rock underneath. The sides of the pyramid exactly face the four cardinal points of the compass, and an observer standing in the chamber A, about 3500 B.C., and looking through the passage AC would see at the end the pole star—or rather the star Alpha Draconis, which was the pole star at that time, but which, owing to the precession of the equinoxes, has since been replaced by our present pole star, Alpha Ursa Minoris. The construction of this passage thus not only indicates the astronomical knowledge of the ancient Egyptians, but gives an approximate date for the erection of the pyramids which agrees with that established by the best authenticated traditions.

Branching off from the descending passage CA is an ascending passage, BD, leading to the grand gallery, D E, which in turn leads to what is generally known as the King's Chamber. A novel and interesting theory has recently been advanced by F. de Ballone, in La Nature, which assigns an astronomical use to the grand gallery as well as the passage CA. According to this theory the pyramid was only completed during the life-time of the reigning monarch as far as the fifteenth course of stones (Fig. 2), thus forming a platform of observation upon which the astronomers according to M. Ballone's theory the grand gallery was originally intended for a place of observation, where the priests might stand to make observations, the sides of the gallery forming a rude substitute for the micrometer threads which in our modern telescope indicate so precisely the passage of the stars over the meridian, as illustrated in Fig. 3. M. Ballone calls especial attention to certain holes, or notches, in the walls of the grand gallery, (c, d, e, f, Fig. 3), which he considers to indicate the proper place to stand to observe particular phenomena. In Fig. 2 this is illustrated by the lines showing the relation of the sun's positions at the solstices and equinoxes to certain points on the floor of the gallery.
AERIAL SPIDERS.

Not content with living upon the earth, as their structure especially fits them to do, the family of spiders seeks also to conquer both the air and water. The peculiar aquatic spiders which spin their webs at the bottom of bodies of water have already been described in this paper (December, 1890); and in a recent number of *La Nature* we find an interesting description from the pen of Dr. II. de Vaniay, of the aerial, or balloon spiders, which, spinning their web in a tassel, or balloon of fibers, rise into the air, and are sometimes wafted immense distances by the wind, much as the seeds of dandelions or thistles are scattered over the land by the feathery plumes with which they are provided.

The studies of careful observers have shown the way in which these little balloons are made. The spider climbs to the top of a shrub or some other elevated position, to avoid collision with surrounding objects, and spins a thread, which, as it is formed, rises into the air, probably lifted up by the current of heated air ascending from the ground. After the first thread reaches the length of a foot or two, the spider cuts it off, and, attaching it to some neighboring object, proceeds to spin another. The process is repeated until a sufficient number have been formed to give sufficient buoyancy to carry the spider on her proposed journey, when, gathering them together, she lets go, and is wafted by the currents of air for many miles. These flying spiders have been observed at a height of 2,000 feet, and it is believed that their journeys often exceed one hundred miles.

The buoyancy of these little spiders' web balloons is not thoroughly understood. Apparently the separate threads are charged with electricity as soon as formed, and thus repel each other, to form a light, bulky phœnix, instead of adhering together in a heavy mass. Their buoyancy is most probably due to the currents of heated air which surround them, and, in fact, the fibers themselves would become sufficiently heated by the sun's rays to warm the surrounding air and create an ascending current. It has been noticed that the spiders only take their aerial journeys on bright, sunny days, and that the shadow of a passing cloud, or the cutting off of the sun's rays by an artificial screen, causes the threads to droop and collapse.

A remarkable observation upon these spiders has been reported by M. Garry, of Valence, France, who states that he found one of them spinning her web into the form of two little hemispherical cups, or miniature hot-air balloons. They were connected together by separate threads, and the spider could pass freely from one to the other while *en voyage*. M. Garry believes that in this way the spider was able, in a small degree, to change the direction of her motion through the air, the same as with the gas balloons constructed by human beings, which can sometimes be steered in a course slightly varying from that of the prevailing wind.

This remarkable instinct of the spiders, which causes them to make such extended aerial journeys, is undoubtedly of great advantage to them in the struggle for existence, and not only tends to spread the species over wide areas of country, but furnishes a quick and easy means of emigrating in those cases where they are or, in fact, to satisfactorily define at all the difference between the two manifestations of the animal intellect. It is not probable that the spider spins her threads and constructs her balloon by the operation of the same mental processes that a man uses in constructing his larger and more perfect aerial vehicles, but the exact way in which they differ is something that is left for future students of biology to discover.

Forms of Beauty—Submersion Figures.

By E. Rattenbury Hodges.

People widely differ with regard to theological and political forms, but all agree in their admiration of the shapes and hues which Nature gives. Even in a falling drop there is more of wonder and beauty than most persons imagine. When we for the first time see the phenomena referred to, Shakespeare's familiar lines,

"There are more things in heaven and earth
Than are dreamt of in our philosophy,"

come to us with abiding emphasis.

Let us make a brief study of a falling drop. If we fill a clear glass vessel with ordinary drinking water, and allow this to settle for about ten minutes, then deliver to the surface or let fall from an inch or so above that surface, some colored fluid,—such as blue or, best of all, magenta ink, or a clear solution of cochineal,—we shall note that the drop not only descends, but as it sinks becomes flattened horizontally and then changes into a beautiful rolling ring. Presently its downward course almost ceases; the ring then becomes somewhat vertically flattened and wavy in outline; the finer portions of coloring matter stream upwards, while the denser accumulates along the lower edge of the ring. In another moment this heavier matter is drawn to three or four points; at each of these a fine tube with a thickened, and at first trumpet-shaped mouth, is let down; the thickened end of each tube then gets wavy like the original ring, and sends down smaller streamers, each of which displays ringed edges like the secondary rings. One might roughly compare these curious changes to an umbrella (without the stick) opening, and then from each of its points sending down a cord, out of the end of which grows another expanding umbrella, until we get a whole series of secondary and tertiary umbrellas, each set being smaller and more delicate than the preceding series. In some cases, however, the heavier portions of coloring matter collect at four, six, seven, or even eight points of the ring, heading it upwards in so many curved lines and letting drop as many rings, each of which becomes the seat of manufacture of two, and in this polytopus method of division and subdivision the coloring matter gets diffused throughout the water or other fluid.

So much for a general description of what takes place under the above conditions. It is now only necessary to remark before going further that very homely apparatus will suffice for the production of these "submersion figures," as Charles Tomlinson, F. R. S., their discoverer, has named them. A few tall and clear glass jars (such as some confectioners use), two or three glass tubes (eight or ten inches long, and drawn out at one end to a jet, with an opening about one-eighth of an inch in diameter), and various inks and oils; these are all the essentials for an ordinary experimenter.

There is a close analogy between the formation of these rings, or those formed sometimes in still air by a steam puff from a railroad engine, and these liquid primary rings. (See Fig. 1.) In the case of a ring of smoke, the forces are precisely the same, only gravity causes it to ascend and fric tion hinders the ascent.

"The ring of smoke or liquid acts as if rolling up or down the inside of a hollow cone, and the direction of rotation of the particles will be found according to this view." In both cases the tendency of the ring is constantly to enlarge by diffusion, and the rate at which it does enlarge is regulated by the resistance of the air or liquid column. As may be surmised, the resistance of the liquid column is greater than that of an air column, and consequently liquid rings do not expand much, while those of vapor or smoke expand greatly.

But to return to the "submersion figures." If a strong solution of common salt is colored and then passed through a paper filter, as it falls drop by drop into clear water while it is so settled, a ring is formed whose outer surface is seen rolling towards its inner vertical axis. While such rings are falling, sometimes one will overtake its predecessor, shoot through it, and then spread out beneath it without disturbing it. In Fig. 2, a, b, c, d, is illustrated the several stages of change which a drop of cochineal undergoes in falling through a dilute solution of alum with A strong solution of permangante of potash (Cosely's fluid) yields some exceedingly fine figures. Some colored substances, especially the aniline dyes, serve well to illustrate these beautiful changes of
form. Aniline red or magenta (a derivative of rosinamine) gives a very well defined figure. (See Fig. 3.) A solution of fluorescein, as it is commonly termed, gives a truly splendid submersion figure. In each of these cases the phenomena of fluorescence which these substances exhibit—i.e., a color which may be described as an apple-green glow—greatly heightens the effect of the experiments. But here it is necessary to say that only on a bright sunny day can the latter effects be best seen, although, of course, the lime light, the electric light, or that obtained by burning a piece of magnesium wire are for this purpose good substitutes for daylight.

![Fig. 2](image)

Necessarily, for each experiment with color matters, a fresh column of water would be required, whether varied by the presence of a chemical salt in solution or otherwise. If, instead of coloring bodies, liquids are used for these experiments,—such as the essential oils (e.g., lavender, cajeput, coriander, bergamot, etc.),—and in place of a water column any of the following fluids: benzol, naphtha, methylated spirit, common kerosene oil, etc., a great variety of submersion figures may be obtained. Some of these are of extraordinary beauty; moreover, it is a beauty strictly characteristic of the substances so used. The most remarkable of any is one which, when fully developed, displays an architectural symmetry quite surprising. A drop of common fusel oil (or amyl alcohol, as chemists term it) in its descent through a column of kerosene oil produces this effect. Moreover, the duration of the figure is considerable, notwithstanding its delicate and gauze-like texture. (See Fig. 4, a, b, c, d.) The common and not refined kerosene oil must be used to ensure success with this experiment. This class of figures varies greatly with considerable changes of temperature, and not only with substances which require to be melted, but with oils which are fluid at ordinary temperatures.

A little sketch of the history of the subject is here necessary. As the result of his researches, Prof. W. B. Rogers contributed a paper to the American Journal of Science, in 1838, entitled, "On the Formation of Rotation Rings by Air and Liquids under Conditions of Discharge." About four years later Professor Tomlinson, in England, made an independent series of observations on these fluid rolling rings and their allied phenomena. In the case of the liquid ring he concluded that the forces are (1) diffusion, which forms the ring, and (2) gravity, which causes it to sink. The resistance is due to friction retarding (1) the descent of the ring and (2) its diffusion. In the case of a ring of smoke or other vapor the forces are precisely the same, only gravity causes it to ascend and friction retards the ascent. Most attention has been given to the subject by Tomlinson and Denison. While the former regards the fully developed figures—which he terms "subemergence cohesion figures"—as due to diffusion, the latter is of the same opinion as Professor Roberts, viz., that they are true cases of vortex motion, not from diffusion, but from the ordinary motion which follows the impact of two bodies. By way of illustration he refers to the cold metal ring formed around the top of a snuff's chisel by long continued hammering. Moreover, he thinks, though it may modify and thus in one sense be said to create these phenomena, yet diffusion is the cause of their destruction.

Lastly, as to the utility of submersion figures. In this intensely practical age, when persons meet with scientific novelties they are apt to ask, "Of what use are these?" In view of the fact that each liquid or set of liquids above named, and many more which have not been mentioned, furnishes its own characteristic figure, Professor Tomlinson considers they are capable of serving for purposes of "rough qualitative analysis."

Those who care to pursue the subject systematically and exhaustively—if we may apply the latter term to any branch of scientific investigation—are referred to Tomlinson's contribution to the Philosophical Magazine for June, 1844, entitled, "On a New Variety of Cohesion Figures." Not less full of interest and value are the numerous papers on kindred subjects published by this distinguished scientist, whose years are now four-score, the friend of Faraday and other world-renowned students of Nature.

**SPECTRUM OF THE SUN AND ELEMENTS.**

The Johns Hopkins University Circular, No. 85, issued in February, contains Professor Rowland's report of progress in spectrum work. The spectra of all known elements, with the exception of a few gaseous ones, or those too rare to be yet obtained, have been photographed in connection with the solar spectrum, from the extreme ultraviolet down to the D line, and eye observations have been made on many to the limit of the solar spectrum. A table of standard wave lengths of the impurities in the carbon poles extending to wave length 2,000 has been constructed to measure wave lengths beyond the limits of the solar spectrum. In addition to this, maps of the spectra of some of the elements have been drawn up on a large scale, ready for publication, and the greater part of the lines in the map of the solar spectrum have been identified. The following rough table of the solar elements has been constructed entirely according to Professor Rowland's own observations, although, of course, most of them have been given by others:

**ELEMENTS IN THE SUN, ARRANGED ACCORDING TO INTENSITY AND THE NUMBER OF LINES IN THE SOLAR SPECTRUM.**

<table>
<thead>
<tr>
<th>According to Intensity</th>
<th>According to Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>Zirconium</td>
</tr>
<tr>
<td>Iron</td>
<td>Palladium</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>Lanthanum</td>
</tr>
<tr>
<td>Sodium</td>
<td>Titanium</td>
</tr>
<tr>
<td>Nickel</td>
<td>Palladium</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Lanthanum</td>
</tr>
<tr>
<td>Cobalt</td>
<td>Copper</td>
</tr>
<tr>
<td>Silicon</td>
<td>Zirconium</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Calcium</td>
</tr>
<tr>
<td>Titanium</td>
<td>Cerium</td>
</tr>
<tr>
<td>Manganese</td>
<td>Cerium</td>
</tr>
<tr>
<td>Strontium</td>
<td>Cerium</td>
</tr>
<tr>
<td>Vanadium</td>
<td>Silver</td>
</tr>
<tr>
<td>Barium</td>
<td>Thallium</td>
</tr>
<tr>
<td>Carbon</td>
<td>Lead</td>
</tr>
<tr>
<td>Scandium</td>
<td>Erbium</td>
</tr>
<tr>
<td>Potassium</td>
<td>Natrium</td>
</tr>
</tbody>
</table>

**DOUBTFUL ELEMENTS.**

Iridium, osmium, platinum, ruthenium, tantalum, thorium, tungsten, uranium.

**NOT IN SOLAR SPECTRUM.**

Antimony, arsenic, bismuth, boron, nitrogen, cadmium, gold, haldium, mercury, phosphorus, rubidium, selenium, sulphur, thallium, praseodymium.

With respect to these tables, Professor Rowland adds: "The substances under the head of 'Not in Solar Spectrum' are often placed there because the elements have few strong lines or none at all in the limit of the solar spectrum when the arc spectrum, which I have used, is employed. Thus, boron has only two strong lines at 2,407. Again, the lines of bismuth are all compound, and so too diffuse to appear in the solar spectrum. Indeed,
some good reason generally appears for their absence from the solar spectrum. Of course there is but little evidence of their absence from the sun itself; were the whole earth heated to the temperature of the sun, its spectrum would probably resemble that of the sun very closely."

The powerful instrument used at Baltimore for photographing spectra, and the measuring engine constructed for that purpose, gave the following readings: a wave length of lines directly within 1-100 of a division on Angström's scale, give the foregoing results a weight superior to many others published.

**CHISELLING GUN COTTON.**

Gun cotton, said Professor Munroe, in beginning his lectures, at the Lowell Institute, recently, is pure cotton dipped in a mixture of pure nitric and sulphuric acids. In seeking a method by which these ingredients might be obtained absolutely pure and the cotton thoroughly treated with the acids, many years have been spent and serious accidents have occurred.

According to the *Boston Journal of Commerce*, the lecturer traced the experiments with the explosive from its discovery, in 1833, up to the present time, and spoke of several of the most fatal explosions which attended the experimental stage. After experiments by Professor Hill, of the United States torpedo station, gun cotton was adopted as an explosive for use in the navy in 1844. In preparing for this service the gun cotton is, by successive pressings in hydraulic presses, the last of which has a pressure of 6,900 pounds to the square inch, made into little blocks measuring 2½ inches each way. It now contains from 10 to 16 per cent. of water, but when issued to the service contains 33 per cent. Before being made up into blocks it is carefully tested.

Professor Munroe declared that gun cotton, correctly prepared and handled according to directions, was the safest of the explosives to use. It was dangerous only when the materials had not been thoroughly purified, or the union of acid and cotton incomplete. In proof of what could be done with it, a picture was thrown upon the screen showing the workman cutting it with chisel, jig saw, and later to fit it into a shell. Another showed the explosion of one part of a block that was burning by pouring water upon it. Two thousand pounds of it had been burned in a bonfire without an explosion.

One volume of the explosive gives 829 of gas, and the pressure developed by combustion is eighty-one tons to the square inch, and by detonation 157.5 tons, the latter being in contact, however. The velocity of the explosion of one part of a block on another is so rapid that it would take only one second for it to pass through 19,000 feet of the explosive.

It was shown by the stereopticon that the letters U. S. N., with the date of manufacture, that are on the bottom of each block, are impressed upon an iron plate upon which the gun cotton may be. The object of this is a curious fact, that if the marks on the block are in relief, the reproduction on the iron will be raised, and, if cut in, there will be an indentation on the plate. Professor Munroe's theory is that when the letters are cut into the explosive, the gases generated in the detonations are hurled from them as a projectile from a gun. If a leaf or a delicate piece of lace be laid between the gun cotton and the iron, its images will be left in all the perfection of outline of the original, though the article itself is absolutely annihilated.

**ALLOTROPIC FORMS OF METALS.**

In connection with Mr. Carey Lea's remarkable discoveries of the allotropie forms of silver, the different forms of other metals, as described by Mr. W. C. Roberts-Austen in the *Engineer*, are worthy of notice. He remarks that the impor-
tance of the isomeric and allotropic states has been much neglected in the case of metals. Joule and Lyon Playfair showed, in 1846, that metals in different allotropic states possess different atomic volumes; and Matthiessen, in 1890, was led to the view that in certain cases where metals are al-
loyed they pass into allotropic states, probably the most important generalization which has yet been made in connection with the molecular con-
stitution of alloys. Instances of allotropy in pure metals are: Boyle's lead, which oxidizes readily and leaves two-necked pure metal; and a tube of a pint of water, and then mix with them one and a half ounces of butter, a yolk and a half of eggs, one ounce of grated Parmesan cheese, a pinch of salt, and a little cayenne pepper. These ingredients must be added to each pound of potatoes. Mix all together, and when cold roll the mixture into little rolls, using a little flour while doing so to prevent the mixture sticking. The rolls should be round about so that all parts of the internal surface are treated by the acid, it will be found that a good rinsing with plain water will leave them as good as new.

**LABORATORY NOTES.**

To Deodorize Bottles that have contained benzine, benzene, thymol, naphthalin, and other similar strong-smelling substances, a simple and effec-
tual plan is to pour into each a small portion of a mixture of sulphuric and nitric acids, and allow it to flow over all parts of the interior. After it has been left for about an hour in the bottles, which are occasionally turned up and turned about so that all parts of the internal sur-
face are treated by the acid, it will be found that a good rinsing with plain water will leave them as good as new.

A SUBSTITUTE FOR STARCH-PAPER.—A writer in the *Chemical News* says: "While analyzing qualitatively a mixture containing loddies and bromides the other day, it occurred to me, as my starched paper was gone, and I was disinclined to break off my work to make more, that I might find an efficient substitute in ordinary white writing-paper. I tried this after moistening with water, and found to my delight that it did as well as the best starch-paper that ever was prepared; and why not, seeing that in the process of manu-
facture, writing-paper—or, indeed, any common paper—is finished with size which contains a notable quantity of starch?"

**LABEL VARNISH.**—Among the numerous formulas for this article, the following is deserving of a high place: Reduce 6 parts of African copal to fine powder, and mix with it an equal weight of powdered glass; place the mixture in a bottle capable of holding 50 parts, and add 1½ parts of camphor and 25 parts of ether. Allow to digest during a month with occasional agitation. Then add 6 parts of absolute alcohol, shake well, and set aside for a fortnight; pour off the clear super-
"Paper to which this preparation is to be applied should be first coated with a solution of isinglass in a mixture of spirit and water (1:3, respectively)."

**AN IMPROVED MELTING-POINT APPARATUS.**

This apparatus has been devised, consisting of a two-necked bottle containing mercury, which can be heated in an air-bath. Through one of the openings a ther-

ometer passes, and also a wire from a voltaic cell. Through the other passes the drawn-out end of a glass tube. The substance to be ex-
perimented upon is placed in this funnel in the fused state, and allowed to solidify. The space above it is filled with mercury and the fuz-
nel is introduced in the bottle. The second wire
from the battery connects, through a vibrating bell, with the mercury in the funnel. Upon raising the temperature of the bottle to the fusing point of the substance, contact is established between the two portions of mercury, and the bell is made to ring. The temperature of the mercury in the bottle is then noted.

To Weld Metals to Glass.—M. Cailliet has communicated to the Société de Physique a method of welding glass and porcelain with metals, which may prove extremely useful for instruments of research, or for any metallic fitting; such as taps, communication tubes, conducting wires, etc., so as to avoid all leakage even under high pressures. The process of welding is of the simplest. A portion of the tube that is to be welded is covered with a very thin coat of platinum. To obtain this deposit, it is sufficient to paint, by the means of a small brush, the slightly warmed glass with completely neutral chloride of platinum, mixed with essential oil of camomile. The essence is made to evaporate slowly, and when the white and colored vapors have ceased to be given off, the temperature is raised to dull red heat, and the platinum being reduced covers the glass tube with a brilliant metallic coating. Connecting the tube thus metallically coated to the negative pole of a battery of suitable energy, it is placed in a bath of sulphate of copper. A ring of copper is deposited upon the platinum, and strongly adheres thereto if the operation has been properly carried out.

Scientific Brevities.

Parasitical Plants.—Chatin has proved that a parasite growing on plants of the Strophos genus contains neither strychnine nor brucine. The mistletoe growing upon the oak does not contain the blue tannin of the latter, but exclusively a green tannin. In like manner other parasites are shown not to absorb the peculiar principles of their hosts.

Uses of Selenium.—Up to the present time very little use has been made of the remarkable property of selenium in changing its electrical conductivity upon exposure to light. At a recent meeting of the Physical Society, Mr. Shelford Bilbwell read a very interesting paper on selenium, and exhibited a selenium cell controlling an electrical relay which could be adapted to a variety of purposes. In one arrangement it was made to work an automatic watch-light, turning on a little lamp on the approach of darkness, and extinguishing it again at dawn of day. By another arrangement the cell could be used to give notice if a railway signal light or a ship's side lantern should happen to go out.

Ocean Temperatures were the subject of discussion at a late meeting of the Geographical Society in London, says the Engineering Times. Dr. Buchan, who has been for years investigating the meteorological aspects of the "Challenger" expedition, reported upon this subject. In the expedition mentioned, hourly or two hourly observations were taken of the temperature of the water; and other observations were made of sea temperatures at various depths. The result shows that the diurnal range of temperature at the surface of the ocean is a little less than F. E.; while the temperature of the air over the sea was about three times greater than that of the water surface, with greater diurnal variations. As to thunder-storms, it was found that on land the maximum number occurred at mid-afternoon, when the air temperature was highest. On the open sea 70 per cent. of these storms occurred when the temperature was lowest.

The Out-Door World.

Edited by Harlan H. Ballard, President of the Agassiz Association. [P. O. Address, Pittsfield, Mass.]

The importance and the duty of supporting our official paper, to which reference was made last month, cannot be urged too often or too strongly. The Association is bound to furnish three hundred new subscribers to Popular Science News during 1891. Of this number only one hundred have thus far been credited to us. It seems incredible that the actual number is so small. It may be that some persons have sent their subscriptions this year, owing to their interest in the Agassiz Association, without stating that fact in their letter to the publishers. If there are any such, they will do a simple act of justice, and at the same time confer a substantial benefit upon our society, by informing the publishers at once, so that their subscriptions may be properly credited.

Nearly one thousand members are now taking our A. A. course in mineralogy by correspondence, and are doing very creditable work. The course is still open, and any who desire to enter it may address Prof. Gustave Gutton, Central High School, Pittsburg, Penn.

The President of the A. A. has undertaken to prepare a series of books to serve as guides to home study in the natural sciences, with a particular view to encouraging personal observation and laboratory work. Each book will constitute a course of twenty-six weeks, with full details of such observations and experiments as can be made at home with homemade apparatus and with practically no expense. The first volume will be ready, we hope, by October 1st. It treats of the World of Matter, and includes studies in elementary chemistry and mineralogy. It is intended to obviate the necessity for a teacher, and will miss its aim if it cannot be read understandingly and with interest by anyone possessed of an ordinary school education.

On May 13th was held the quarterly meeting of the New York City Assembly of the A. A. Mr. G. S. Stanton discussed the "Geology of Manhattan Island and Vicinity," and illustrated his lecture with the stereopticon. Mr. T. W. Demarest spoke of "Popular Science." Both these gentlemen are members of the A. A., and the example of depending upon talent inside the society on this occasion is worthy of imitation and commendation.

The Hyatt Chapter, 490, New York City, has issued an attractive programme of its meetings for the coming summer and fall. It will be helpful to any who may be considering how to outline a similar plan of work, and may be obtained, until the edition is exhausted, by addressing, with stamp, Mr. G. L. Hake, 3rd and Third avenue.

A new Chapter is forming in Christ-Church, New Zealand, and another in Hobart, Tasmania. There is already a strong Chapter in Port Chalmers, New Zealand.

The spring programme of the Baird Memorial Chapter, 411, Anadover, Mass., covers the three months ending July 1st, and includes a large variety of interesting subjects. Practical analysis and dissection are carried on at the meetings. Copies of this programme may be had from the President of the A. A.

The first photographic exhibition of the Manhattan Chapter, 88, New York, (B), was held the first week in March, and was a brilliant success, attracting the attention and winning the commendation of professional artists. About five hundred visitors were present. Encrusted diatoms were awarded as follows:

Best Exhibit—Mr. H. T. Bowly.
Best Landscape—Mr. H. Boccher, Jr.
Second Landscape—Mr. H. T. Bowly.
Best Portrait—Mr. F. Albers.
Best Group—Mr. W. T. Demarest.

Chapter 949, New York, (Z), held its Fifth Annual Exhibition on April 16. Its fourth course of lectures has also been given at its rooms, 49 W. 20th street, as follows:

April 17, "People and Scenery of the Bahamas."
Dr. J. L. Northrop
April 24, "Gems and Precious Stones."
Prof. Sanderson Smith

We Will Answer All Letters.

The list of Chapters that can be depended upon to answer all communications is rapidly growing. Chapters that do not send in their addresses will soon be left "out in the cold." The following are added to the lists previously given:

218, Cornwall, N. Y.—Correspondence with new Chapters preferred, but will answer all letters.—Miss E. Evelyn Breed, Box 88.
365, Montreal.—Mineralogy and chemistry. No stamps required.—A. H. Ferguson, Box 656.
537, Mansfield, O.—Any branch, especially entomology, botany, and herpetology.—E. Wilkinson, 78 West Bloom Street.
871, Grand Rapids, Mich.—Mineralogy, botany, ornithology, and entomology. All letters answered.—Edward B. Boles, 23 North Lafayette Street.
830, Beacon, Ont.—Kindly say that I will answer as fully as I can all questions on the mineralogy, geology, and botany of this region. Our boulders and lake terraces are very interesting.—George C. Albery.
729, Binghamton, N. Y.—Botany and entomology are our specialties, but all letters promptly answered.—Willard X. Clute, Sec.
634, Erie, Penn.—I will answer all letters or cards from members of the A. A. I take special interest in botany.—William Evans, M. D., 2/20 Peach Street.
647, Waterbury, Conn.—I will correspond on geology, especially Connecticut geology.—H. N. Johnson.
820, West Bridgwater, Mass.—I will answer all letters on entomology. Correspondence and exchange particularly desired from the South and West.—William D. Tower.
628, Niles, Mich.—Ornithology, entomology, archaeology. Also, wanted, to exchange, a few rare moths from India, Italy, and United States, for books or taxidermist's instruments.—Ralph Balfour.
655, Mesopotamia, R. I.—Should be very glad to correspond with members of the A. A. interested in botany.—S. E. Kennedy.
194, Islip, N. Y.—Will reply to any A. A. letters on ornithology and entomology. The plan is excellent.—Johnston Livingstone, Jr.
At the close of the season, Mr. Roper spent some time in the early part of the season searching the ponds and streams of Eastern Massachusetts, principally for the genera *Sphaerium* and *Pistillium*. He was rewarded by finding reliable specimens of nearly all the New England species. Later he was engaged in the study of specimens of these genera collected in California, Oregon, Washington, Nevada, Idaho, and Minnesota, sent him by Messrs. W. J. Raymond and Henry Hemphill. He thinks it conclusively proved that several species of the family under consideration range from ocean to ocean through the Central and Northern tiers of States. A *Pistillium* from Idaho, sent by Mr. Hemphill, is described by Mr. Roper as a new species, under the name *P. echinata*. (See *Nautilus* for December, 1899.) In September Mr. Roper spent a week dreiging in the harbor at Eastport, Maine, with interesting results. Specimens of *Littorina palliata* (Say), from Eastport, he is unable to distinguish from specimens found by himself at Victoria, B.C., in 1889. This is not strange, he thinks, as other shells found on the Atlantic coast are found also in Europe and in the North Pacific.

During the past summer Professor Kepple kept alive the interest in the study of local molluscan fauna in the country—one belonging to Amherst College, the collection of the Academy of Natural Sciences of Philadelphia, that of the Smithsonian Institution at Washington, and a fine local collection in the museum of the Natural History Society of Worcester, Mass. Professor Kepple's account of these visits, with some suggestions concerning them, is contained in his report valuable for its facts and interesting to everyone of this branch of natural history.

Mr. Stanton gives an interesting account of collecting trips to Marblehead and Nahant, Mass., for marine forms, and, in company with Mr. Roper, through Watertown for land and fresh-water shells. Later he spent about four weeks at the Biological Laboratory at Cold Spring Harbor, Long Island, and two weeks at Jessup's Nook and Shelter Island. At the laboratory he had the use of a naphtha launch, and did considerable dredging. A sketch map of Cold Spring Harbor is given, and also a systematically classified list of the shells dredged and otherwise collected there.

An interesting feature of Mr. Stanton's report is a list of photographs showing the harbor, the laboratory, and specimens at work.

Miss Goodsell's report consists mainly of an interesting account of collecting at Saulst Ste. Marie, Mich., and Lake Minnetonka, Minn. At each locality a good number of valuable specimens were obtained. Miss Goodsell mentions some facts that fell under her observation worthy of note. At Saul St. Marie, where *Littate sphenoides* was found in great numbers, the outer lip of the shell, back for a quarter of an inch from the edge, was as thin and flexible as a membrane, while in the few specimens found in Lake Minnetonka it was as hard as the rest of the shell. (The delicate portion was shell in the process of formation, an addition being made to last year's growth.—M. L. Leach.) In Lake Minnetonka she found great numbers of living specimens of what she supposes to be *Littate strophio*. Often when attempting to remove the snail from the reeds to which it adhered, it was found that the animal was so firmly attached to the reeds and so loosely to the shell that the latter came off empty in the hand of the collector.

Miss Coolidge's work has been chiefly classifying a collection of shells, presented by the collector, Mr. Plym Earl, to the Leakey Academy. The collection contains about a thousand varieties. She was much aided in her work by the Appleton Museum and the library of Amherst College, and by study and comparison of species in the rooms of the Boston Society of Natural History. In London, while on a European tour during the past summer, Miss Coolidge had an opportunity to see the splendid collection of the South Kensington Museum. She calls attention to the important part which shells play in ancient as well as in modern architecture and house ornamentation. Some of the most valuable and exquisite of Florentine mosaics are wonderfully perfect representations of the molluscan and other sea forms, while the delicate carving of Chinese porcelain is largely due to shells. Among other fine buildings includes beautiful adaptations of various shells.

Mr. Gardner gives a list of land, fresh-water, and marine shells collected and observed by himself within a radius of twenty miles of New York City. The list is scientifically classified, and it is especially valuable for the exactness with which localities and environment are noted. The geo-logical character of the district is not favorable to the production of land mollusks, while the sewage that finds its way to the rivers effectually restricts the number of freshwater species. In fact, therefore, the short list of land and fresh-water shells, which cannot be compared with that of a more favored locality.

Dr. Leach's report consists of a list of such of the land and fresh-water shells of the lower peninsula of Michigan as have been collected by himself during the few years in which he has been specially interested in conchology. Localities are carefully noted, and the report is interspersed with notes on such points as were of interest to the collector. There is no attempt at elaborate scientific arrangement.

M. L. Leach,
Secretary.

Reports from the Seventh Century (Chapters 601-700) should reach the President by June 1.
read the pages of Nature’s book intelligently and rapidly.—E. Adams Hartwell, Cor. Sec.

71, Plainville, Conn., [A].—Chapter No. 71 still lives and is prospering. We have added fourteen new names to our list of members during the year, and we now number thirty-eight. Have held fifteen meetings, all of which have been very interesting and quite well attended. An excursion was made November 1 to Middletown for microscopical study of the mineral brittle star...om dom arises, possibly, from the fact that our President is a mineralogist, and is very instructive and entertaining in and out of our meetings. He has a large cabinet, and invariably brings into our meetings some specimens about which he can always give a deal of information. We have a cabinet consisting mostly of minerals, but during the year have received eighty-one specimens of wood. Different varieties of plants have been brought in. This is our first year, and we have enjoyed it immensely.—Sec. Chapter 71.

81, Brooklyn, N. Y., [J].—During the past year we have held ten business meetings, and have met once a week for study. In the beginning of the year, realizing the great need of a microscope, we decided to have an entertainment, which was given on the 6th of March. The proceeds of this entertainment enabled us to procure a very good microscope and some books, which aided greatly in the study of Coleoptera. We are now devoting ourselves to the study of ants, in connection with which we are reading Lubbock’s book on ants, bees, wasps, and are looking forward with pleasure to a lecture on this subject to be given by Prof. John Mickleborough. Grace L. Newcomb, Sec., 133 Jerdier street.

83, Canaan, Conn., [A].—In the issue of February 19, 1890, of our local paper an article appeared in which it was the intention of the writer to draw out some expression of opinion from the people of this village on the subject of organizing a scientific society. It had the desired effect, and on Friday evening, February 25, an informal meeting was held at the residence of one of our citizens, at which it was voted to establish a Chapter of the Agassiz Association. At the next meeting, March 7, a constitution and by-laws were adopted, and officers elected as follows: President, Vice-President, Treasurer, Recording Secretary, Corresponding Secretary, and Curator. Since that date we have held meetings monthly. On October 7 a committee was appointed to arrange for a course of lectures during the winter. At the next meeting a programme comprising eight lectures was submitted and adopted. Over 120 season tickets at one dollar each were sold. This is the first course of lectures ever held here, and it was a success in every respect. Last spring we had a committee to attend to the organization, and, at the last meeting, our number is a member of the Buffalo Corresponding Chapter of the A. A.—Joseph S. Adam, Sec.

87, New York, N. Y., [B].—Eighteen hundred and ninety was rather a dull, quiet year. But this has not brought us to a standstill by any means. Newbury, and Warner ledges of the same composition, during their summer vacations, the oblong crystals of feldspar making identification easy and accurate. The geology of this locality is hard, and we amateurs must of necessity work slowly; and we sincerely hope that the facts we collect may be useful to those who, having made geology a study, are able to

The Board of Trustees have been multiplied. Through the kindness of Mr. William S. Miller the Chapter was able to conduct a successful campaign in the basement of the Chamber, 16th Street, quite large enough for the museum and library, and the dark-room and workbench for the photographers. The Chapter meetings were held monthly, and generally informally. Of the regularly announced subjects, we remember particularly the talk about the trap-floor spider, when we were shown a curious little mud-house filled by interesting pictures of Conus fidelis and its relatives; the practical demonstration of several of the photo-printing processes; the sermon on “Ethics in Photography”; the amusing scientific experiments, done after the instructions given by the Popular Science News; and the lecture on “Wood and Its Formation,” illustrated by specimens and sketches. On December 10 Mr. H. Bacher delivered a public lecture at Union Square Hall under the auspices of the Chapter. “The Swiss Glaciers” was the subject of the lecture. The stereopticon views exhibited showed excellent work in picture-taking and picture-making by this member of the Chapter. Two Chapter excursions were held last season. The first, on Decoration Day, was to Little Falls, N. J., our old stamping-ground. Little Falls has never been the giver of much account for collecting, but its romantic scenery and wild flowers will assure it a thirteenth year after year. Of the many interesting observations made, I may recall what interested and amused the entire party for a while. It is not often that the leaping of fish is to be observed by city folk, and on this occasion there was a fine display of the phenomenon. The fish were bass of varying sizes; the “jump” was one of six or seven feet. The second excursion was a stage ride from Fort Lee to Alpine, N. J., over the Palisades Mountain road. This proved a most delightful sort of excursion. Frequent halts were made during the journey to allow the excursionists to wander about for pleasure or in quest of new things.” The camera did the work that day. Several good pictures were obtained of a big boulder, set high upon a rocky pedestal, on the Palisades, and the President will present a summary of the Treasurer’s report: The receipts during 1890 amounted to $265.45; expenditures, $251.28; we carry forward a balance of $11.18.—C. F. Groth, Sec.
saw a downy woodpecker and a muskrat. On April 19 we found saxtrax, hepatica, and eye-

d- and girl in bloom. The week before, one of

members had gathered all three of these, besides blood-root and spice-bush. On April 26 the sea-

son was so well advanced that we found white

violets, bellwort, dog-tooth violets, the two anem-

ones in full bloom, and buds of wild fly-of-the-

valley and jack-in-the-pulpit. Ferns were unroll-

ing, and so we crept, for we found a fine speci-

men of the Coltsfoot arista. We also discovered a "P"

slender chilli. On May 10 two moths were brought in (a cerceis and promethia), and bobol-

inks, warblers, and thrushes were reported. On

May 17 we went to an old Indian fort in East

Hartford in search of arrow-heads, and found one

made of quartz. The next day wild geranium

was in bloom. On May 24 we found a rose-

breasted grosbeak's nest in the woods, and on the

25th the hermit thrush and wood thrush were

heard there. On Decoration Day we kept Agas-

siz's birthday at the Tower at Tariffville, six

miles away. We saw eight kinds of ferns, a scar-

let tagan, an oven bird gathering sticks for her

nest, several Turner's butterflies, and lady-slip-

pers. On June 28 we saw a Maryland yellow-

throat. Early in October we paid a visit to a

dew pond that had been dug out from dogs in a lake in the Adirondacks. On October 11 we saw a white-

bellied nuthatch and a white-throated sparrow, and

and found eighteen varieties of fungi. Since Oc-

tober we have met in-doors. We read new maga-

azine articles like Olive Thorne Miller's; also her

books, or Dr. Abbott's and Bradford Torrey's.

One member collected, preserved, and named 155

varieties of wild flowers in his summer vacation.

—Anna Westcott, S.
The artifical production of naturally occurring minerals forms the subject of an interesting paper by Dr. KROUSCHEF in the Comptes Rendus. His latest work has been the production of crystals of artificial hornblende which were identical in every respect with the natural ones. The process consisted in placing the various oxides, mixed with an aqueous solutions of silica, in small glass vessels from which the air was exhausted, and digesting the mixture for three months at a temperature of about 1,000° F. In addition to the hornblende, crystals of the augite, zoelite, and feldspar families were formed in the flask, as well as small quartz crystals with cavities containing liquids and gases similar to those found in nature.

We hope for the sake of the reputation of the New York City Board of Health, that a recent alleged interview with its President, as reported in the daily papers, was an imaginary one. A man was recently arrested in that city charged with a most atrocious murder of a woman, and particles of dried blood were removed from his hands and clothing and submitted to a microscopical examination. According to the newspaper report, the gentleman above alluded to was made to say that the microscope showed that the blood on the hands of the man arrested for the crime, was not only that of a female, but that of one in her last days of pregnancy. We have every reason to believe that this is the special characteristics with that of the particular woman who was murdered. It is hardly necessary to say that there is not only no difference whatever between the blood of different individuals or sexes, but that it is an extremely difficult matter to distinguish between human blood and that of many other mammalian animals, populay after it has dried. This reported interview was a fine example of newspaper science, but no physician with even an elementary knowledge of the subject would have made such ridiculous statements, and it is most probable that the whole story originated in the brain of some enterprising reporter anxious to contribute his share to the sensation of the hour.

Readers of the SCIENCE NEWS will be pleased to learn that, at the annual commencement of the Jefferson Medical College, Philadelphia, on the 15th of April, the honorary degree of Doctor of Laws was conferred on Dr. DANIEL G. BRINTON of Philadelphia, in recognition of his researches in anthropology and ethnology.

[Special Correspondence of POPULAR SCIENCE NEWS]

PARIS LETTER.

It is a curious but well-ascertained fact that no living being can live over a certain time in a given medium, and that the environment must be re-arranged every 24 hours. Everybody knows that a rabbit, or a bird, or any animal, dies quickly when breathing in a confined space. It dies because there is not oxygen enough left in the air, or because carbonic acid is becoming too abundant. Some physiologists have believed, however, that there may be something more, and that the animal poisons its own environment in a manner which can be eliminated. The last instance, has performed experiments from which he has drawn the conclusion that the air expelled from the lungs, in addition to the deleterious effect it produces by being poorer in oxygen and richer in carbonic acid, is a poison through some substance which is expelled, or which per-
ANT LIFE IN HONOLULU.

By Ruth Ward.

Of the thousands who frequent the parks and squares of Honolulu, passing to and fro in endless succession, intent on business or pleasure; of the scores of tourists who lounge on the grass under the palms or the wide-spreading alabamas, how many ever give a passing thought to the inhabitants around them who dwell there, some as permanent residents, others like the human beings around them—only there for a season, or resting for a few days on their way to a new home? There is more ant life in Honolulu than most people are aware of. Little companies are at all times at work, hunting out their homes, building their homes and burning their homes in a constant package, going for and paying no attention to the outer world. Astronomy has made the mass of mankind familiar with the conception of the world overhead; but few realize the existence of the worlds at our feet,—worlds which we leave as completely alone as if we belonged to another planet; worlds that our clocks do not regulate; worlds full of chftar, which is dead silence to us, but across which our loudest cannon roar breaks not in the faintest whisper; seemingly dumb worlds, yet possessed of a kind of unknown language; worlds full of inexplicable strangeness and governed by mental laws to which our own give us not the faintest clue. True, the lower life completely shuts out the higher, but the crickets, bugs, and air insects are noiseless only with the greatest difficulty. Our keys are too large for the locks, and our hands are too clumsy to open the tiny apartments into which we would enter. Only by the sense of sight can we enter these worlds of sentient life. We stand as spectators, wondering what is the meaning of all this show that is so meaningless to us. Michelo and I, one day, while we were out in the silent valleys, we would search the hill for insects, who have a physiognomy we know, but who feel the most averted faces, and that nearly always we can detect some reflection of the intelligence within—some gleam of the inner existence—some answering look. Turn the ant on its back, and look straight in its face, with its mandibles moving horizontally, its vibratin and mobile antennae all fixed in a horsey case, and you find yourself confronted with a sort of mask rather than a living physiognomy. In that maild insect face there is no expression—no windows through which can be discerned a light from the insect world. What knowledge is gained must be gained by patient observation, and all inferences must be verified by experiments that are carefully repeated. To this patient observation of this lowest life and the prying and prying which is, with limitation, the great modern doctrine of evolution has given an additional incentive. Although we have learned a great deal of the inner life of these insects, many things still perplex us in regard to their inner nature; and we shall yet live, no doubt, to see metaphysicians solve nature's most difficult problem simply by studying the animal life, and thus prove Cuvier's theory to be a corruped one.

The order and industry of the ant have been cited as an example for man of the earliest ages. That some are winged among swarms of their wingless fellows is a fact that could not escape the notice of the most careless observer; but so little has mankind been interested in this world of sentient life so closely imitating our own, that it is continually supposing that a Dutch naturalist first ascertained that the winged ants were males and females, and that the others were sterile females. It almost seems that suppressed instincts of sex in nature supply the greatest amount of force or potential energy. The organs of reproduction in these sterile females remain in a rudimentary state. Some of these, however, prove fertile; but these strange to say, only produce males. The queen is probably fed on different food, as in the case of bees, but I have found no absolute proof of the fact. In my nests there have been raised hundreds of ants, but not one queen—due, I suppose, to the fact that I furnished them only one kind of diet.

Upon the sterile females devolves the work of building, repairing, excavating, and sometimes even fighting for the others. Some, like the Formica rufa, build structures of all kinds of alien matter; but they are then covered with little pieces of wood in to make secure partitions. Others, like the mason ant, build of tiny bricks made from earth and rain-water alone; while the mining ants make use of a flat stone, into which they excavate subterranean galleries and chambers. Others build cities in the hearts of trees, which consist of innumerable stores separated by extremely thin ceilings, supported sometimes by slender partitions, and sometimes by concentric rows of slender pillars, the whole imbedd with a black tint, which is supposed to be a sort of strengthening fluid, but by what agency it is produced is not known. For all this work they have no other chisel or rule than their teeth and their antennae, and no trowel except their fore feet, and yet they are so skilful that it is not possible to describe all the many cunningly constructed machines and cities which are found in the wood and are described by the expert. For all these, the paths leading to the queen of life, none of which is well known, are unknown to us, so much so that we are not aware how they are produced. If we do not know how the queen is produced, we are not aware that the queen is produced.
is conducted with great excitement in the ant house, the ants relieving each other with great alacrity. After the cocoon is rent asunder the insect is still enclosed in a flimsy covering, from which it has to be rescued, when it is able to walk a little and receive nourishment. The process of education is then carried on, and reminds one of a new servant being made acquainted with the house and its workings. Then comes the difficult task of extending the delicate wings of the male and female, and feeding it, and the workers seem to be of great importance, but the male plays but a small part, as he does in the rest of the insect world, and one almost pusses to wonder how he developed his great pretension in higher circles. It has no weapons of offense or defense,—no teeth, sting, or ovipositor;—and Huber mantains that his life is very short after he has fulfilled his office of reproduction. His privileges in the ant world are purely negative. Nature seems to dismiss him from life without any ceremony.

The workers remain six weeks in the egg, a month in the larva state, and from twenty-five to twenty-seven days a pupa.

I was fortunate enough to discover a species of ant here that I had been looking for for months—namely, a species which supplies its own nest with a young, or of feeding itself when it is provided. They are known to scientific men as slave-making Amazon ants, and have fine-pointed mandibles, fitted for scimiters, but useless as instruments of labor; weapons with which they attack the nests of other species, and carry off the larve and pupae to swell the reline of their slaves, who feed and clean them, nurse their young, build their nests, and carry off their slaves they phirish in a short time. In a few experiments, I furnished them with honey, but they would merely smear their legs with it and die of starvation.

I have an ant that I have allowed a slave for an hour to feed and clean her, and now after two months she is still well. The warlike expeditions of these ants are indeed interesting, and I witnessed a party starting between three and four o'clock in the afternoon, in a column six or seven inches in width, the signal to start being conveyed by striking the foreheads of their companions with their antennae. They marched along till they reached a nest of the negro ant (Formica fusca), which they attacked with the utmost fury, carrying off the larve and pupae of the workers alone, which are easily distinguished by their small size; these they carried away with all the energy of a Homeric hero.

Poets of all ages have sung of the ant storins up seeds for future use, but the naturalists pronounced the poets in the wrong; that ants did not garner grain, that it was impossible for them to eat such hard substances, and, moreover, that since these grains are so hard, they had no need of stored-up provisions. But it is another matter, with his poetical insight, suggested the true solution: that the naturalists had been observing the ants of the north, and that the harvesting ants chiefly inhabit the shores of tropical countries. From careful observation he learned that they store seeds, and their object is so doing. The seeds in germinating produce a certain amount of starch, sugar, and other substances, which are obtained from the seed by a strong adhesive glue, which is secreted by two glands at the back of his head, and mingled with his saliva. This glue soon becomes hard as the twigs themselves. The nest is fastened by its sili, or edge, to the inside of the chimney or tree. It is quite small, and has no soft lining of hay, moss, or feathers. The little white eggs, four in number, are laid upon the hard, rough glue of the nest. They are, nevertheless, very precious to the parents, who, when the fledglings come forth, so devote themselves to the care of the blind, helpless creatures that they continue feeding them all night long. If a heavy rain softens the glue with which the nest is fastened, and it falls down the chimney, the young birds, though they may still be blind, creep up the walls, holding on by their sharp little claws as deftly as so many squirrels, and are fed in this position for some time. When the little ones at last are grown quite beyond the parents' care, four more eggs are laid and a second brood raised later in the summer.

All the chimney swallows of a whole district, on their first arrival in the spring from their southern winter home, associate together in a common sleeping or roosting place. When the country is thinly settled, as was the case in New England many years ago, a large hollow tree, open at the top, was the place they usually chose. These trees were called "swallow trees," and were observed with interest by the earlier settlers. In Middlebury, Vt., there was such a tree, of which Mr. Williams, in his history of Vermont, tells. He says it was one of the largest swallow-hollows in the country; it came out of it in large numbers in the middle of the day, and soon returned. As the weather grew warmer they came out in the morning with a loud alacrity, no roar, and were soon dispersed. About half an hour before sundown they returned in millions, circling two or three times round the tree, then descending like a stream into the hole. It was customary for persons in the vicinity to come to observe the motions of these birds; and when any person disturbed their operations by striking violently against the tree with an axe, the swallow would rush out in millions, and with a great noise. In November, 1791, the top of this tree was blown off, twenty feet below where the swallows entered; there has been no appearance of the swallows since.

Another swallow tree — near Bridport, Vt. From this tree, Mr. Williams says, "half an hour after sunrise they rushed out like a stream, as big as the hole in the tree would admit, and ascended in a perpendicular line until they were above the tops of the adjacent trees; then assumed a circular motion, performing their evolutions, two or three times, but always in a larger circle, and then dispersed in every direction. A little before sundown they returned in immense numbers, forming several circular motions, and then descended like a stream into the hole, from whence they came out again in the morning."

At Easton, Pa., Wilson, the ornithologist, hearing that they used the chimney of the courthouse for a sleeping place, watched them one evening. He writes: "There could not have been less than four or five hundred of them, keeping up a regular circumambient sweep, the whole of the court-house, and about fourteen or fifteen feet above it, revolving with great rapidity for at least ten minutes. Some as they passed made a feint of entering, which was repeated by the whole circling multitude in succession; in this feat they approached nearer and nearer at each revolution, dropping perpendicularly, but still passing over; the circle becoming more contracted and the rapidity of its revolution greater, until at length one and then another dropped in; and another and another followed until the whole multitude had descended, except one or two, who flew off as if to collect the stragglers, and soon returned with six or eight more, which, after one or two rounds, disappeared within the chimney, and all was silent.
As to the action of acids on chrysotile, Dana says that it is decomposed by hydrochloric and sulphuric acids, the silice being left in fine fibers. I have found that if finely-divided chrysotile be boiled with hydrochloric acid, the iron is quickly and completely removed, the remaining substance being perfectly white in color. The remaining silicate of magnesia is but slowly decomposed on continued boiling. Sulphuric acid has even less action than hydrochloric. Other acids have but little or no effect on the mineral.

The above facts lend themselves readily to the utilization of "asbestos" fiber for filtering purposes. We boil the finely-divided fiber for about five minutes with hydrochloric acid. By now washing the pulp with water, and packing in the throat of a furnace, we obtain an excellent medium for the filtration of such solutions as are too strongly acid to allow of its filtration through paper.

By first igniting the "asbestos" fiber, and then grinding finely, we find that it is much more rapidly acted upon by boiling hydrochloric acid; so rapidly, indeed, that I have no doubt the mineral could be decomposed for analysis in this way. I have hiiberto, however, preferred to fuse the fine powder with sodium carbonate, as I fancy the silice thus obtained will be purer than that obtained by simple solution in hydrochloric acid and evaporation. I intend, later, to compare the two methods, and, if the results obtained are of any value, I shall be happy to communicate them.

The average pressure the past month was 29.935 inches, with extremes of 29.12 on the 3d, and 30.45 on the 9th and 10th,—a large range of 1.33 inch. The mean for the last eighteen Aprils has been 29.306 inches, with extremes of 29.767 in 1884, and 30.078 in 1885,—a range of .311 inch. The sun of the daily variations was 5.81 inches, giving a mean daily movement of .194 inch. This shows the last eighteen Aprils has been 1.75 inches, with extremes of .339 and .286. The largest daily movements were .38 on the 3d, and .51 on the 22d. The movement on the 3d was remarkable, nearly one inch in twenty-four hours, the mercury then standing at 29.12°. It continued to fall after the hour of observation till it reached 28.90—a fall of 1.20 inches in about twenty-seven hours! The occasions are quite rare when the pressure falls below 29 inches.

The average direction of the wind the past month was W. 18° 48' N., while the mean for the last twenty-two Aprils has been W. 30° 22' N.—showing less northerly winds than usual in April. The extremes in twenty-two Aprils have been E. 15° 0' N. in 1877, and W. 15° 42' N. in 1880,—and quite uncommon range of 17° 32' or nearly a whole semi-circle. The relative progressive distance travelled by the winds the past month was 49.05 units, and during the last twenty-two Aprils 72.82 such units, an average of 33.10,—showing less easterly winds the present April than usual. Being less northerly, also, contributed to the high temperature of the month.

The lowest point reached by the mercury the last month was 28° on the 6th, and this was also the coldest day, averaging 34.6°; the 5th and 7th averaged 35° each. The first week was quite cool, ranging from 28° to 40° at the hours of observation. The highest point in the month was 76°, on the 14th and 30th. The 22d was the warmest day, at 65°. Several other days reached 62° and upwards. The entire month was 3.72° above the average of twenty-two Aprils, and has exceeded but twice in this period, viz., in 1878 and 1886. The coldest point in these twenty-one Aprils was 10°, in 1874, and the warmest 83°, in 1885. The mean temperature since January 1 has been 35.75°; but the mean for these four months in twenty-one years has been only 32.20°, or 3.56° warmer this year than usual, causing the season to be ten or twelve days in advance of the average.

Each month this year has been from 1° to 3° above the average, giving a surplus of 472.2° of unusual heat.

The face of the sky, in 30 observations, gave 53 fair, 15 cloudy, 15 overcast, 3 rainy, and 1 snowy,—a percentage of 58.8 fair. The average fair the last twenty-one Aprils has been 52.4, with extremes of 32.2 in 1878, and 70.0 in 1872 and 1890. The 16th was foggy in the morning, and the evening of the 18th was attended with sharp lightning and one-tenth inch of rain. There were several fine days, especially the 5th, 13th, and 29th to the 22d.

The average precipitation for the last month, including half an inch of melted snow, was 4.91 inches. This was mostly on the 3d—a heavy rainfall of 3.40 inches, mingled at times with snow. On the 11th 0.72 inch and 0.61 inch fell, leaving one-half the month almost entirely destitute of rain, which is now much needed, especially to secure a good hay crop. The average amount of precipitation the last twenty-three Aprils has been 3.01 inches, with extremes of 1.70 in 1886, and 8.30 in 1870. The amount since January 1 is very large, being 27.08 inches, while the average for the thirty-one years in twenty-three years has been only 19.41 inches.

We have no records of snow. The temperature of the last three Aprils has been quite unusual, having an average of 3.56 above normal.

WINDS.

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At Natick, May 5, 1891.

[Text-Book for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR JUNE, 1891.

The sun reaches its greatest northern declination and summer begins about noon June 21. There will be an eclipse of the sun on the morning of June 6, invisible in the eastern part of the United States, but it may be seen as a partial eclipse west of a line running from Lake Erie to Texas. At Chicago it begins at 9 A. M., and is not total. At 10 A. M. the central shadow line last exists about twenty-five minutes. As the apparent diameter of the moon is less than that of the sun, the eclipse will not be total at any place on the earth, but it will be annular in the Arctic Ocean north of Siberia.

Mercury is at greatest western elongation on the morning of June 5, but it is too far south to be easily seen. Venus is still a morning star, but is gradually getting nearer the sun. It rises about an hour and a half before the sun.
moon passes just south of Venus on the morning of June 4, and for some countries south of the United States there will be an occultation of the planet. Mars is still an evening star, but is almost too near the sun to be easily seen; at the end of the month it sets less than an hour after sunset, and the morning of July. Jupiter rises at about 1 A.M. at the beginning of the month, and at about 11 P.M. at the end. It is in quadrature with the sun on June 7. During the summer and autumn it will be in much better position for observation than it was in 1900, on account of its more northerly position. During June its declination is about 6° south; last year it was 10°. Jupiter's transit is a good position in the western sky in the evening, and is in quadrature with the sun on the morning of June 1. It is in the eastern part of the constellation Leo, and moves slowly eastward about three times the moon's diameter during the month. On June 30 it sets at about 10 P.M. The rings are a little less open than they were in May. Uranus and Neptune are in the constellation Virgo, and passes the meridian at 1:30 A.M., and 10:30 P.M. respectively, on the beginning of the month, and two hours earlier at the end. Neptune passed conjunction with the sun at the end of May, and is now a morning star, but does not get far enough away to be easily seen.

The Constellations.—The positions given hold good for latitudes differing not more degrees from 40° north, and for 10 P. M. on June 1, 9 P.M. on June 13, and 8 P.M. on June 30. Boötes is in the zenith. Libra is on the southern meridian, about half-way up, and Scorpius is a little below, and to the east of Libra. Southwell is in the southeast horizon. Corona Borealis is near the zenith, to the southeast. Hercules is high up in the east, and Aquila is below it. Lyra is about half-way from horizon to zenith, a little north of east, and Cygnus is below Lyra, in the northeast. The bright stars in the head of Draco are in the northeast, high up. Ursa Minor is on the meridian, mainly between the pole and the zenith. Cepheus is a little below and to the right of the pole star, and Cassiopeia is near the horizon, a little east of north. Auriga is just setting, about 20° west of the north point. Ursa Major is in the northwest, high up. Gemini is setting, a little north west; Cancer is a little above, to the left; Leo is above Cancer, and nearly due west. Virgo is in the southwest, about half-way up.

Lake Forest, Ill., May 2, 1901.

Questions and Answers.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

L. A. K., Cin-Cin:auta.—How can pencil and crayon drawings be prevented from rubbing and becoming defaced by handling?

Answer.—A weak solution of shellac in alcohol may be sprayed over the drawing by means of a perfume atomizer. Dealers in artists' supplies sell a similar liquid under the name of "fluid shellac." Staccato—What was the composition of the malleable glass described by classical writers, and is it made at the present day?

Answer.—We do not believe it is possible to make a pure malleable glass as described by the writers who have described it, were, undoubtedly, either deceived by some clever imposter, or merely repeated some story that they had heard from others.

E. O. L., Minn.—Can shellac be dissolved in water?
To sum up, the greatest danger to the aged from surgical operations lies in shock, and if the patient rallies the prognosis may be considered good, so far as repair is concerned.

**Effect of Light on Acuteness of Vision.**—Inasmuch as the battle between gas and electric lighting is still on, it will not come amiss to contrast the hygienic qualities of the three principal sources of light,—daylight, gaslight, and the electric light,—with regard to their influence upon the acuteness of vision. A paper by Dr. von Pettenkofer (Munich. Med. Woch.) considers the question in a very practical manner. By gaslight the acuteness of vision is lessened by about one-tenth, as against daylight, while it is increased with the electric light, especially as regards the distinction of colors. The effectiveness of the electric light, however, is much diminished by fog, but this can be easily offset by increasing the intensity of the light. The glare of the electric light finds many objects, but this can be avoided by means of a half bored. The brightness of the light being lessened by about twenty per cent. The brightness of the white and violet rays of the electric light is best overcome by a yellow shade; the yellow and red of gaslight, by a blue shade. In using gaslight it must be kept at a certain distance, on account of the immense amount of heat evolved; while in using the electric light it may be brought near by, the disagreeable intensity of the light being lessened by the investigations of Renk, a gas-jet furnishing as much light as an Edison burner will give off twenty times as much heat as the latter. The Munich Court Theatre was the scene of some interesting experiments to prove this point. The theatre, while empty, was lit up with gas, and in an hour the temperature in the gallery was raised from 16° to 27° C.; with electric lights of the same power the change was from 16° to 17°. When the house was filled the difference was not so great, for human beings also produce a great deal of warmth; with gas the final temperature was 22.8° R.;—a distressingly warm temperature,—while with electricity the last temperature was 17.6° R. (72° F.), a temperature which is easily borne.

**Bassorin Paste.**—This is a new base, for use in dermatological practice, which is highly extolled by Dr. George T. Elliot (Journal of Cutaneous and Genito-Urinary Diseases). It is composed of bassorin, water, glycine, and dextrin. The advantages of this paste are thus summarized by the author:

1. Bassorin paste is a perfectly neutral substance which of itself produces no irritation whatever, and when used alone it acts simply as a protective to the skin. It does not become mucilaginous, or decompose, or undergo change when kept for a length of time, unless it be exposed in an open vessel. When this is done it becomes dry and hard, and even then rubbing it with a little water renders it again as serviceable as at first.

2. It is easy and simple in application, requiring to be spread upon the skin with the finger or a brush. It dries in the space of a few minutes if so applied, adheres closely, does not rub off and soaks the linen, but forms a flexible coat, which does not interfere with the movements of the body. When its removal is desired, the preparation can be washed off with a little water, or a damp cloth or sponge. It remains in situ without change for a variable length of time, depending upon the condition of the surface on which it has been applied.

3. With the bassorin paste almost any drug can be incorporated; those which exist in the form of powders or in solid forms in any amount desired, the tars, kehtyds, and oily substances in smaller per centages, but sufficient for all practical purposes.

4. The action of drugs incorporated with it and their effect upon disease appears to be as good as when such are used in other oculists,—or perhaps better in some cases.

5. It is of wide applicability, and of value in both acute and chronic forms of disease, its use being limited only by the degree of moisture on the surface being treated or to which it may be exposed.

**The Electric Light as a Therapeutic Agent.**—In the Revista de Ciencias Medicas, Dr. Estanislao von Stein reports a number of neurasthenic, hysterical, and rheumatic affections successfully treated by illuminating the surfaces with the electric light. His apparatus consists of an incandescent light of twelve volts, supplied with an infundibuliform reflector and a handle. Illuminating a painful joint or nerve, as seltanum, for two to five minutes, has yielded him surprising results. The alterations, especially of the nerves, which take place are probably of a molecular character.

**The Gastric Juice.**—Dr. Klinowski, in an article on the "Microbic Action of the Gastric Juke," comes to the following conclusions: The empty stomach of a healthy man contains innumerable organisms. The gastric juice, and principally the hydrochloric acid, possess microbicide properties. The microbes take no active part in digestion. Persons who, on account of some affection, secrete little hydrochloric acid, are easily intoxicated, by means of the microorganisms in the stomach. Therefore, the stomach should not remain in an empty condition for any length of time, and during an epidemic, food should be taken at frequent intervals, and, if possible, sterilized.

**Hypnotism in Its Relation to Surgery.**—Dr. Laupher, of Kansas City, reports a case of double talipes, in which the subject had chronic Bright's disease which contra-indicated the use of ether, and at the same time he had an organic heart trouble which prevented the safe use of chloroform. The patient wanted to be operated upon, and Dr. Laupher hesitated to give the ordinary anaesthetic, and so hypnotized him. Contrary to the generally accepted idea that at the first seance a sufficient degree of anaesthesia cannot be produced to perform an operation, the doctor got a sufficient degree of anaesthesia by suggestion, which sufficed for the operation for talipes, and the patient lay upon the table as fixed and immovable as marble during the whole operation.—Cincinnati Medical Journal.

**Vaccination.**—Surgeon Parke, who accompanied Stanley's Emin Pasha relief expedition, comes back with him an additional proof of the value of vaccination. Before the expedition started, the majority of the men were vaccinated by the doctors. In the wilds of Africa, an epidemic of small-pox broke out, and only four of the vaccinated men were attacked by the disease, and none died, while the camp followers, who had not been vaccinated, took the disease in its most virulent form and died in great numbers.—Am. Lancet.
In connection with this celebration of a century’s work of the American Patent System, I have requested by the Advisory Committee to prepare a brief paper upon inventions and discoveries in medicine, surgery, and practical sanitation, with special reference to the progress that has been made in this country in these branches of science and art. It would be impossible to present on the departments of patent legislation that has been made in these branches in connection with mechanical inventions and chemical combination, activities, devised by American inventors, which will require much less time.

The application of the patent system to medicine to this country has had its advantages for certain people, has given employment to a considerable amount of capital in production (and to a much larger amount in advertising), has contributed materially to the revenues of the government, and has been a great deal of work for the medical profession.

So far as I know, but one complete system of medicine has been patented in this country, and that was the steam, Cayenne pepper, and lobelia system,—commonly known as Thomsonianism,—to which a patent was granted in 1836. The right to practice this system, with a book describing the methods, was sold by the patentee for twenty dollars, and perhaps some of you may have some reminiscences of it connected with your boyish days. I am certain I shall never forget the effects of “Composition Powder,” or of “Number Six,” which was essentially a concentrated thiourea of Cayenne pepper, and one dose of which was enough to make a boy willing to go to school for the rest of his life.

From a report made by the Commissioner of Patents in 1849, it appears that eighty-six patents for medicines had been granted up to that date; but the specifications of most of those issued before 1836 had been lost by fire. The greater number of patents for medicines were issued between 1830 and 1839. The total number of patents granted for medicines during the last decade (1880-1890) is 540. This, however, applies only to “patent medicines,” properly so-called, the claims for which are, for the most part, presented by simple-minded men who know very little of the ways of the world. A patent requires a full and unreserved disclosure of the recipe, and the manner of compounding the same, for the public benefit; but for medicines the patent shall have expired; and the Commissioner of Patents may, if he chooses, require the applicant to furnish specimens of the composition and of its ingredients, sufficient in quality for the purpose of experiment. The law, however, does not require the applicant to furnish patents to be experimented on, and this may be the reason why the venomous inventions and denominated samples of the ingredients. By far the greater number of the owners of patent medicines and nostrums are too shrewd to thus publish their secrets, for they can attain their purpose much better under the law for registering trade-marks and labels, designs for bottles and packages, and copyrights of printed matter, which are less costly, and do not reveal the recipe.

These proprietary medicines constitute the great bulk of what the public call “patent medicines.”

The trade in patent and secret remedies has been, and still is, an important one. We are a bitters and pil-taking people; in the fried pork and saleras-biscuit regions the demand for such medicines is unfailing, but everywhere they are found. I suppose the chief consumption of them is by women and children,—with a fair allowance of clergymen, if we may judge from the printed testimonials. I sampled a good many of them from the catalogues of the largest and most reputable firms, and some of them do not apply to bitters. One of the latest patents is for a device to wash pills rapidly down the throat.

I am sorry to say that I have been unable to obtain definite information as to the direct benefits which inventions of this kind have conferred on the public in the way of cure of disease or prevention of disease; but these are best shown by the records which were not put in the schedules of the last censuses of the following, namely: Did you ever take any patent or proprietary medicine? If so, what and how much, and what was the result? Some very remarkable statistics would no doubt have been obtained had this inquiry been made. I can only say that I know of but four secret remedies which have been really valuable additions to the remedies in the common system of medicine, and that the invention of all these is now known. These four are all powerful and dangerous, and should only be used on the advice of a skilled physician.

I said in the beginning that I cannot, on this occasion, give any sufficient account of the progress of invention and discovery in medicine and sanitation during the century just gone. The great step forward which has been made, has been the establishment of a true scientific foundation for the art upon the discoveries made in physics, chemistry, and biology. One hundred years ago the practice of medicine, and measures to preserve health, so far as these were really efficacious, were in the main empirical—that is, certain effects were known to usually follow the use of a medicine. The science of certain medicines, but why or how these effects were produced was unknown. They sailed then by dead-reckoning, in several senses of this phrase.

Since then, not only have great advances been made by a continuance of these empirical measures in treatment, but we have learned much as to the mechanism and functions of different parts of the body, and as to the nature of the cause of some of the most prevalent and fatal forms of disease; and, as a consequence, can apply means of prevention or treatment in a much more direct and definite way than was formerly the case. For example, a hundred years ago nothing was known of the difference between typhus and typhoid fevers. We have now discovered that the disease is propagated largely by contact and induced or aggravated by over-crowding, the preventive means being isolation, light, and fresh air; while the second is due to a minute vegetable organism, a bacillus, and is propagated mainly by contaminated water, milk, food, and clothing; and that the treatment of the two diseases should be very different.

The most important improvements in medical practice made in the United States have been chiefly in surgery in its various branches. We have led the way in the ligation of some of the larger arteries, in the removal of abdominal tumors, in the treatment of diseases and injuries peculiar to women, in the treatment of spinal affections and of deformities of various kinds. Above all, we were the first to show the use of anesthetics—the most important advance in medicine made during the century. In our late war we taught Europe how to build, organize, and manage vast military hospitals; and we formed the best system in existence illustrating modern military medicine and surgery.

As regards preventive public medicine and sanitation, we have not made so many valuable contributions to the world’s stock of knowledge, chiefly because, until quite recently, we have not had the stimulus to persistent effort which comes with money. We have adopted the best systems of public health and its complicated relations to sewage disposal and water supplies; nor have we had information relative to localized causes of disease and death which is the essential foundation of public hygiene, and which can only be obtained by a proper system of vital statistics. We can, however, show enough and to spare of inventions in the way of sanitary appliances, fixtures, and systems for house-drainage, sewerage, etc.; founding ingenious devices to keep pace with the increasing demands for protection from the effects of the decomposition of waste matters, as increase of knowledge has made these known to us. The total number of patents granted for sanitary appliances during the last decade (1880-1890) is about 1,175.

No doubt the greatest progress in medical science during the next few years will be in the direction of prevention, and to this end mechanical and chemical invention and discovery must go hand in hand with increase in biological and medical knowledge. Neither can afford to neglect or despise the other, and both are working for the common good. If the American patent system has not given rise to any specially valuable inventions in practical medicine or in theology, it must be due to the nature of the subjects, and not to fault of the system.
and as the bowels had not moved, a large injection of very hot water was then thrown into the bowels. In a short time this was passed by stool, after which the injection was repeated. Relief from the cramps was speedy and permanent, and although I had charged my hypodermic syringe with one-fourth grain of morphine, I withheld the use of it with complete confidence. In those affecting the nervous system, soon after the pain and cramps returned, to control them in the usual manner. The patient, however, soon sank into a sound sleep from which he awakened free of all trouble, except the debility and soreness that follow such attacks.

Since then I have pursued the same course of treatment in many cases, and although I have been compelled to use the hypodermic syringe in some of them, yet the hot water has always proved a reliable adjunct in the treatment.

In cholera and cholera morbus, the cramps are supposed to be caused by the blood parting with its watery portion, thus sadly interfering with the general circulation. This being the case, it is plainly our duty to restore water to the blood as speedily as possible. Water is much more readily absorbed by blood-vessels when it is warm than when cold. By introducing hot water into the bowels as well as the stomach a large absorbing surface is reached by the fluid. In addition to this the effect of the heat on the terminal branches of nerves acts beneficially upon the circulation by stimulating the heart to increased action.

I have no doubt but that in Asiatic cholera hot water properly prepared and found of more service than any other treatment. Given by the mouth and by injection through a rectal tube, it would, in my opinion, have a marked effect in bringing about reaction in severe cases; at least it is certainly worthy of a trial.

In cases of cholera that have passed into the stage of collapse, and when, under ordinary treatment, no hope can be entertained of the patient’s recovery, I would not hesitate to make a small incision through the linea alba and flood the peritoneal cavity with hot water. The peritoneum absorbs water with great rapidity, and in cases of profound shock following operations upon the abdominal and pelvic organs, no other means acts so speedily and efficiently in restoring the circulation as does flooding the peritoneal cavity with water.

In the collapsed stage of cholera, where the pathology of the disease may be attributed to dehydration of the blood, it seems plain that to restore water to the blood as speedily as possible should be the main object of treatment. In such cases no organic lesions have occurred in any of the viscera of the body, but they are in condition to resume their functions when their normal stimulus is applied to them. Hence if the fluidity of the blood be restored, and if the heart be artificially stimulated for a while by electricity, it would seem that death might be averted. These indications most likely be met by taking hot water into the stomach, by injecting it in large quantities into the bowels, and, in extreme cases, by flooding the peritoneal cavity with it.

**[Manufacturer and Bolder.]

**ELECTRICITY.**

**ELECTRICITY** is a word to conjure with. There is a something mysterious and awesome about its manifestations that excites the imagination of the untutored multitude, and prepares it to accept anything as possible when this protein agent is called upon to stand sponsor for it. It is, therefore, the most natural thing in the world that the electric field should be the very stronghold of quackery.

It is most unfortunate that this should be the case, for, legitimately employed, electricity is at once one of the most powerful as well as beneficial curative agents known to the physician and surgeon. In several classes of physical ailments, notably in those affecting the nervous system, and in rheumatic affections, at once the most obscure in their origin and the most difficult to cure, it is almost unanimously agreed that the application of mild electric currents of an interrupted character affords relief, and frequently brings about a permanent cure where medication has signally failed. The forms of apparatus devised for the application of the electricity in these instances have been improved and brought to a condition of high efficiency, and only the prevailing ignorance of the first principles of electric science, and the pernicious habit among a large class of the people of self-dosing and self-doctoring, are responsible for the electrical quackery that abounds in our midst in the full tide of prosperity.

In this classification belongs the innumerable (so-called) electrical appliances for wearing upon the body—electrical pads for various organs, magnetic belts and chains, electro-magnetic shoes, and the like, to say nothing of electric combs and brushes, all and singular, claimed to possess the power of reviving the vital forces and rejuvenating the weaker. To those who may be disposed to lend a willing ear to the marvelous claims made for these great panaceas of quackery, or to be deluded by the pieties of male and female persons bedecked with appliances from which electric sparks are being emitted with dazzling effect, we would give the advice of Punch—Don’t! They are the veriest humbugs, and absolutely worthless for their pretended purposes.

We are fully prepared to admit that instances of beneficial treatment may be cited where some apparent benefit has been derived from these things, but such cases can be explained most rationally to be due to the influence of the imagination, and the same result would have been reached by other and equally worthless agencies, such as the wearing of amulets, talismans, and the like, which is exclusively practiced among the ignorant and credulous. The safe course for him who knows nothing about electricity and its laws and manifestations, and who may be tempted by the glowing accounts issued in behalf of such trumpery humbugs as those above enumerated, is to ask medical advice before yielding to temptation.

**EPISTAXIS.—The Satellite calls the attention of its readers to the fact that the eminent Mr. John Hutchinson, of the London Hospital, recommends for the treatment of epistaxis the plunging of the feet and hands of the patients in water as hot as it can be borne. The most rebellious cases are said to yield to this method of treatment.

A BROADWAY DRUGGIST has a large, inviting silver-plated machine for registering weight. People come in to make purchases, and while the clerks are filling their orders, they step on the scales. To the right of the scales is a small table covered with pamphlets entitled "How to Get Thin." On the other side is a similar table on which there are a lot of books labeled "How to Increase One’s Weight." No man ever gets off the scales without deciding that he is either too fat or too lean, and naturally selects a book, which recommends a pill, and the pills cost $2.00 a box. If the visitor be too fat he buys a box having a blue label, and if he is too thin he takes a box of a reddish tint.

Dr. L. B. Edwards, editor Medical Monthly, Richmond, Va., writes: "COLDEN'S LIQUID BISE TONIC is endorsed by a great many leading practitioners of America who have used it with remarkable beneficial results. It should be encouraged by the profession.

The firm of James Queen & Co., of Philadelphia, are the leading manufacturers, importers, and dealers of scientific instruments and apparatus in the country. All departments of science are represented in their stock, and one is always sure of obtaining from them anything that may be needed.

The fascinating works descriptive of birds, trees, and flowers published by the Educational Publishing Company, of Boston, are meeting with a large sale, and furnish the most delightful summer reading. They are by no means dry scientific works, but will be found interesting and entertaining to every lover of Nature.

Physicians in search of a therapeutic agent designed to assist the function of digestion, are recommended to make a trial of the Tri-Ferment Comp., manufactured by Henry Thayer & Co., of Cambridgeport, Mass. The management of the present firm has in addition to its quality and excellence, at a price that will be found attractive.

Everything that can be made out of rubber is made by the Tyer Rubber Company, of Andover, Mass. The physician, the druggist, and the housekeeper will all find among its specialties some article that is indispensable, and the quality of its goods is of the very highest. Ask your druggist or dealer in rubber goods for the Tyer Company’s goods.

Those who have read Prof. T. G. Slocum’s "Home Experiments in Science" do not need to be recommended to procure his "Arithmetic of Electricity" advertised in another column. We have never before met with a thoroughly satisfactory popular explanation of electrical units and measurements, and, as this book accomplishes this most difficult task very successfully, we predict a large sale for it.

D. C. Heath & Co., Boston, are just issuing "A Comparative View of the Executive and Legislative Departments of the Governments of the United States, France, England, and Germany," by John Wasel, Assistant Librarian of the Library Aria, Boston University. This consists of outlines of the four great branches of government, arranged in parallel columns in such a way that similar topics are grouped together.
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Familiar Science.

[Original in Popular Science News.]

FORMS OF BEAUTY—COHESION FIGURES.

BY E. RATTENBURY HODGES.

Various remarkable phenomena are found more or less directly associated with, and sometimes owe their origin to, the surface tension of liquids. In our last article, entitled "Forms of Beauty," we attempted to describe the very striking changes which a drop of a solution of some coloring matter or other substance exhibits as it descends and diffuses through another medium, such as water, oil, alcohol, etc.

It is a matter of almost common observation that the film of a soap-bubble is in a state of tension. This is equally true of the surface of water or any other liquid contained within a vessel. If, now, we take up on a clean glass rod a drop of some oil or other hydro-carbon, and gently deposit it to the surface of pure water in a properly cleansed dish or other suitable vessel, we shall probably witness a most interesting contest. The water surface in clinging to the oil will tend to spread it out, since the adhesive force of the water here comes into play. On the other hand, the tendency of the oil-drop particles is to keep together, or cohere. Hence we shall see the beautiful phenomenon which mark the struggle between cohesion and adhesion.

But we must observe the conditions necessary to success with these experiments. Distilled water may be used, but rain or ordinary drinking water will suffice. The containing vessel must be chemically clean, (catharised), for the slightest trace of grease or other impurities would be fatal. The glass or dish used for these experiments should be well rinsed with a solution of potash or common washing soda; then a sufficient quantity—say six or eight ounces—of water taken, otherwise it would be too soon saturated with the substance under examination. The fingers must not touch the inside of the clean glass nor the surface of the water which it contains, because they would impart an organic film. The necessity for this precaution is strikingly proved by the fact that when small pieces of camphor are dropped on fresh water, they immediately spin about like water beetles; but when we touch the water surface with the finger they stop as if struck dead,—nor will they recommence their gyrations until the surface is again clean. Then, too, in order to see the effects about to be described, one must not look down vertically at the drop, but obliquely, so that the entire water surface is reflected to the eye.

The above conditions having been complied with, if a drop of cresote is now delivered from a glass rod to the water surface, the drop will be seen to act in a remarkable way. It flattens out as a disk, having a silvery reflection, and sails about with some speed, being also rapidly agitated with a motion that gives it the appearance of a living creature. (Fig. 1.) “Its edge vibrates with rapid criptions; it darts out small globules, which immediately begin a series of motions of rotation and translation on their own account. In the mean time, a silvery film spreads over the surface of the water; the parent globule and the smaller globules become less energetic; they perform a number of motions among themselves, moving about in circular or curved paths, carefully avoiding each other.” Sometimes the larger globules remain still and the smaller rotate in little lakes which they clear for themselves in the film, as if to disport in. When these globules have all dissolved, a second drop of cresote delivered to the same surface shows far less activity; moreover, a longer time elapses before it disappears.

These surface forms have been named cohesion forms by Prof. Charles Tomlinson, F. R. S., of London, England, their discoverer and investigator. In one of his monographs he says of the cohesion form: “It may be regarded as the resultant of the cohesive force of the substance, its density, and the adhesion of the surface on which it is placed. I believe that every independent liquid has its own cohesion form. By an independent liquid I mean not a solution; for in the solution of solids and liquids cohesion has already overcome. * * * The cohesion forms of liquids will be more or less permanent in the inverse ratio of the solubility of the substance.” He further remarks that an increase of temperature quickens and exalts the phenomena shown by many of these films. And here it is necessary to say that in preparing this paper the writer is largely indebted to Mr. Tomlinson’s memoirs, published in the Philosophical Magazine in the years 1891, 1894, and 1897.

These surface forms are numerous and distinctly characteristic of the substances employed, and may be used as tests for all such organic bodies. “The cohesion figure of carbolic acid appears to be a sort of exaggerated form of the cresote figure. The water seems to bear to it less pieces; the criptions are amazingly active, and the disk quickly breaks up and disappears.” (Fig. 2). While a drop of cresote lasts five minutes on a water surface, a drop of the acid endures but a few seconds. A drop of absolute alcohol (ethyllic) flashes out as a circular disk; its central parts seem to resemble the petals of a flower, (Fig. 3), although the figure does not last longer than one or two seconds. Naphtha treated in this way yields a circular film, its inner circumference being lined by a double row of little bosses, the inner row being smaller and fainter than the other. (Fig. 4).

Some of the essential oils furnish cohesion figures of extraordinary beauty and elaborateness.
Pure olive oil gives a finely iridescent film with an indented edge, which shortly changes to something very like a lace pattern. A portion of the film at this stage is represented by Fig. 5. In a few minutes this pattern vanishes, and the oil collects in irregular lines with ragged edges, surrounded by many small globules. A drop of oil of almonds yields a large film, also with a beautiful lace-like edge, (Fig. 6), which soon disappears by the holes opening into each other. Soon the edge breaks away from the parent film and forms small lenticules outside it. The edge of the film appears raised; its holes continue to open and widen, and the detached portions shrivel to lenticules. In a few minutes the parent film has diminished to about the size of a quarter-piece, and is seen surrounded by numbers of lenticules of various degrees of minuteness. In the case of oil of peppermint, the drop, when placed on water, spreads and develops a "honey-combed film," displaying color. The oils of turpentine, cinnamom, anise-seed, etc., each yield finely characteristic cohesion figures.

Newly distilled oil of coriander gives a beautiful figure. The edge of the film becomes deeply serrated, and a double row of lenticules surround it. Presently some of the indentations run in and then branch out as rounded hollows of almost tree-like outline, within the disk. The sketch (Fig. 7) represents this second phase. Colza oil forms a large, smooth film, with iridescent rings, which immediately disappear. Minute holes open at the edge at intervals, three or four together,—sharp and clean, as if punched out. Similar perforations form in other parts of the film, and these widen and thicken at the edges until the surface acquires a honey-combed pattern, the holes pressing together in twos and threes. These large holes with thickened edges, grouped together, are characteristic of the colza film. Mr. Tomlinson thus graphically describes the behavior of a drop of oil of lavender on water: "The adhesion of the water will cause it to spread out into a film; but the cohesion of the oil immediately begins to reassert itself; the film opens in a number of places, forming long irregular areas, or processes, resembling the pattern assumed by worm-eaten wood. These processes tend to gather up into separate disks or lenticules; the adhesion of the water spreads them out, and the cohesion of the oil struggles to prevent this, and soon prevails; the almost immediate issue being the formation of the original drop into a number of disks, with sharp, well-defined outlines and convex bottoms. By varying the surface, the phenomena exhibited by the drop under examination were found to likewise vary in many ways. Tomlinson's experiments in this direction were published by him in 1864. We can here only mention some of the substances used. Instead of water surfaces he employed those of cocoa-nut oil at 80° F., of castor oil at about the same temperature, paraffin, wax, and hard made fat at various temperatures, sulphur made liquid by heat, and also olive oil. He states that "some of the figures formed on these surfaces are very remarkable and of great beauty."

In one case it was found that if a drop of strong sulphuric acid be delivered to the surface of clean mercury, characteristic phenomena result. The drop of acid instantly spreads and covers the mercury; but cohesion immediately begins to reassert its claims, and forms the acid near the edge into large, flat bosses, each of which becomes the center of action; minute globules pass in and out of it; similar ones move to and fro over the rounded edge of the mercury. After a few minutes all action ceases; the film contracts with a smooth surface and well defined edge. Then, too, it was observed that a drop of alcohol or ether held over the acid film when it was at its widest, instantly gathers it up into a small disk—there being a much stronger adhesion between the acid and the alcohol or ether vapor than between the acid and the metal.

In June, 1897, this able scientist published an account of results he had obtained in the course of investigations on "the cohesion of liquids to large, flat bosses, each of which becomes the center of action over another." I cannot do better than give one extract from that most interesting monograph. It is also a good example of the author's descriptive power, which, by the way, is always governed by love of scientific accuracy. "Many of the oils of the turpentine series spread with energy on the surface of water. Thus a drop of the essential oil of turpentine no sooner touches the surface than it flutters out into a film. If, now, a drop of creosote be placed on this film, it simply slips through and falls to the bottom of the vessel; but if the drop be carefully delivered to the water near the edge, it will form a convex lens, and, slightly repelling the turpentine film, make its way into it, so as to be surrounded by it, with a clear intervening space. In the mean time the turpentine becomes thinner by evaporation and displays its iridescent colors. The cresote lens flattens, widens the clear space around it; soon the edge begins to quiver; and all at once, as if at a signal, the vibrations suddenly set in, the figure falls about, everywhere repelling the film, and causing it, or what is left of it, to gather up into these lenticules again. When the cresote film is dissipated, the turpentine disks begin slowly and cautiously to flatten out into films. A second drop of creosote will cause them instantly to collapse. A second drop of turpentine will, in like manner, shut up in a lens the second cresote figure. The film goes through its changes as before; the second cresote figure in due time becomes active, and when it has disappeared the disks of turpentine flatten out as before." The action of a cresote drop near to an oil of coaljet film on water is equally striking: a drop of turpentine on the film of cresote, a drop of benzol is so exceedingly active that it pursues the cresote and attacks it with life-like motions, while the latter darts about as if trying to escape from its adversary.

These cohesion figures furnish good physical tests for any given substance. As the pure oil, spirit, etc., yields its own proper cohesion figure, any departure from the standard figure is suggestive of impurities or adulteration, although sometimes chemical changes (due to long keeping, exposure to light, air, or extremes of temperature) are the cause of variation. It is greatly to be regretted that, so far, no illustrated catalogue of such figures has been produced. Instantaneous photography, aided by polarised light, may yet secure this very desirable object. About twenty years ago, Professor Ostrom, but her results were hardly more successful than those of Dr. Modfot. Doubtless many new cohesion figures will be discovered when a yet more extensive series of investigations are made with drops and surfaces of all kinds and under various temperatures and pressures.

[Original in Popular Science News.]

COMPRESSED AIR.

BY HERBERT S. ROBINSON.

There are but few people who know that the air we breathe, when compressed, is used in many large factories, foundries, and machine-shops all over the world, to do work of different kinds formerly done by hand. Yet in the case and, when you have once thought such a thing possible, it seems no more wonderful than the telephone, phonograph, and other recent developments of electricity.

Take, for example, the putty-blower which the mischievous schoolboy uses. The air is, to a certain extent, compressed before it forces out the wad of putty or paper; and, during the process, air is capable of being compressed and confined to the uses to which it is to be put. A somewhat modern device, which is much used in large public buildings, theatres, etc., is a fan. In winter warm air can be fanned through the fans to registers all over the house, thus doing away with the unsightly radiator. In summer the same fan can be used to force fresh air to every room. It has recently been given a large plant of this kind, which was a very complete one. On one side of a small room was the fan—a huge affair, eleven feet in diameter and about three feet in width. It was run by a small engine at the rate of about one
POPULAR SCIENCE NEWS.

AN ANCIENT IRRIGATING MACHINE.

In a recent number of the Scientific American is described a primitive but ingenious machine for elevating water for purposes of irrigation, which has been in use in India for many centuries. As shown in the engraving, it consists of a double system of troughs, which are mounted in a zigzag manner and mounted on a horizontal axis so that the whole forms a great pendulum, which is set in motion by ropes held in the hands of two men standing on opposite banks of the stream. At each angle or point where two troughs come together, is placed a movable piece of board which acts as a valve and prevents the water from flowing back again. It will be seen that, as the machine is swung to and fro, the end of each conductor dips under the water alternately, scooping up a certain quantity, which at each subsequent movement passes by its own weight into the trough above, until it is finally discharged at the top into a gutter which conveys it over the land to be irrigated.

This device, although clumsy and uneconomical, serves its purpose fairly well, especially in a land where human labor is of but little value, and it is of interest as showing considerable originality and knowledge of the elementary principles of hydraulics on the part of its ancient and unknown inventor.

By George L. Hurd, Jr.

CHLORINE.

Chlorine, one of the most abundant of the elements, is the most important member of the halogen group. The other members of the group are bromine, iodine, and fluorine. Their characteristic features are their indifference to one another, and their affinity for the metals with which they unite to form a class of salts.

Chlorine (Cl2, 35.5) was discovered by Scheele in 1774, but it was first recognized as an element by Davy in 1810. It never occurs free in Nature, but exists in large quantities in combination with sodium, potassium, calcium, magnesium, and other elements. Sodium chloride (NaCl) is the principal source. It is also made by the following reaction:

\[ 4\text{Cl}_2 + \text{Na}_2\text{O}_2 = \text{NaCl}_2 + \text{Cl}_2 + 2\text{H}_2\text{O} \]

The chlorine thus produced is a green or greenish-yellow gas, with a suffocating odor. If breathed in small quantities it produces irritation of the air passages and coughing. Chlorine is soluble in about one-half of its bulk of cold water, and the solution which is readily formed by shaking the water and the gas together has the odor, color, and taste of the gas. In consequence of this solubility it cannot be conveniently collected over water. The common method of collecting it is to collect it in dry bottles by downward displacement. Chlorine is not combustible, although it sometimes supports combustion. Many bodies burn readily in it, as is shown in the case of copper leaf, finely divided antimony, and arsenic. Chlorine is valuable as a disinfectant, a bleaching agent, and an oxidizing agent. Its strong attraction for hydrogen causes it to decompose water and set free oxygen which may unite with something else.

Chlorine combines with all non-metallic elements, forming an important class of compounds, called chlorides, all of which—with the exception of argentic chloride, cuprous and mereaurozous chlorides—are more or less insoluble in water. To test a solution for a chloride, add argentite nitrate. If a precipitate is formed, it is chlorine. This is argentite chloride, which is insoluble. The commonest chloride we meet with is chloride of sodium (NaCl), or common salt, the properties of which are well known. The blowpipe test for a chloride is as follows: Make a borax bead and add oxalate of copper; then add the substance to be tested. If it is a chloride, a bluish green flame will be given.

The most important combination of chlorine with the non-metallic elements is its combination with hydrogen to form hydrochloric acid (HCl). Equal volumes of hydrogen and chlorine may be mixed together in a vessel, and no action will take place while the vessel is kept in the dark. But as soon as it is exposed to direct sunlight, a loud explosion takes place. The gases unite, forming a colorless but strongly acid gas—hydrochloric acid gas. It fumes strongly when exposed to the air. A solution of this gas in water makes hydrochloric acid. The gas is very soluble, water dissolving about 450 times its own volume of it. It is usually made from common salt: 2NaCl + H2SO4 = Na2SO4 + HCl + NaCl = Na2SO4 + 2HCl.

The acid is powerful and gives a strong acid reaction. It dissolves many metals, setting free hydrogen, and forms chlorides. The commercial hydrochloric acid, commonly called muriatic acid or spirit of salt, is generally yellow, owing to impurities; the pure acid is colorless. A little concentrated HCl added to about three grammes of sand in a test-tube will generate enough of the gas to show its solubility and acid reaction.

Chlorine gas is a great bleaching agent. This power depends upon the fact that chlorine has a greater affinity for hydrogen than for oxygen. If a dry piece of calico is suspended in a jar of chlorine gas, nothing will happen; but if the calico is taken out, moistened, and put back, it will be quickly bleached. The chlorine in the jar combines with the hydrogen of the water on the cloth, and decomposes the water. The oxygen, freed from its former combination, unites with the coloring matter on the calico and removes it, leaving a white cloth. Bleaching-powder, CaO Cl2, is commonly used. It is frequently, but improperly, called chloride of lime. When acted upon by an acid it gives chlorine. The cloth to be bleached is first immersed in a solution of bleaching-powder, and then dipped into dilute sulphuric.
THE NATURE OF SOLUTION.

An answer has long been sought to the question “What goes on when a solid substance is dissolved by a liquid?” Those who received their course of didactic instruction a good many years ago were taught that the solid substance was liquefied. It was said that the particles of a fusible salt, such as nitre, for instance, could be brought into the liquid condition by one of two methods: the first of applying heat, heat-energy being used up in the process of liquefaction; the second process being that of submitting the body to the action of water, when the absorption of heat due to liquefaction was shown by the lowering of temperature. This explanation of the process of solution has never been fully satisfactory, and more recent teachers have preferred to say as little as possible about a process in appearance so simple but of which the explanation was found to be encompassed with difficulties. Of late, however, the question has assumed another aspect. We have not attained, it is true, to unanimity of opinion as to what goes on in the process of solution, but scientific work has been sufficient to constitute a definite theory of the process now current, which has the strenuous support of a prominent school of continental chemists. A complete account of the new theory has recently appeared in an accessible form in Oswald’s ‘General Chemistry.’ In this work the pros rather than the cons of the question are dealt with. Exceptions remain to be explained, and fundamental errors remain which will have to be repeated and confirmed by independent workers, before the new theory can be looked upon as firmly established. Whatever may be the final judgment of the chemical world, the adequacy of the new theory to explain the phenomena of solution is undoubtedly one of the great scientific questions of the day.

The following is a short resume of the theory and the data on which it is based. The particles of a body in solution are not in the liquid but the gaseous condition; that is to say, they obey laws having exactly the same form as the laws of gases. In diluted solutions the conditions are similar to those in a perfect gas; concentrated solutions show deviations from the simple laws which are similar and in the same direction as the deviations from the laws of Boyle and Charles shown by gases near the point of liquefaction. If pure water be poured on the surface of a solution the particles of sugar rise against the action of gravity and mix with the pure water. There are certain substances with which we can build up a semi-permeable wall which will allow the water to pass but not the dissolved substance. Various earthy water cell in and on which is deposited copper ferrocyanide forms such a wall. Its properties are not the same as those of an animal membrane, such as parchment, which will allow a crystalline substance in solution to pass through it. If a cell containing a sugar solution be provided with such a semi-permeable wall and a cell containing a solution of sugar connected with a pressure gauge, then on immersing the cell in a vessel of pure water, water passes slowly into the cell, the sugar does not pass out, and the particles of the dissolved substance exercise a pressure on the solvent which is registered by the manometer. The maximum pressure is only obtained slowly, but is of considerable magnitude, a one per cent. solution of sugar showing a maximum pressure of about 50 c. m. of mercury. The arrangement described affords us then a means of measuring the pressure exerted on the solvent by the particles of a substance in solution. It is found that this pressure is directly proportional to the concentration of the sugar solution. All the other substances which have been investigated follow the law—pressure varies as concentration. It will be noticed that this law is of exactly the same form as that of Boyle, which states that the pressure of a gas varies inversely as the volume, i.e., directly as the concentration. Again the pressure of the dissolved substance increases as the temperature rises, and for all substances so far investigated the rate of increase is the same as in the case of gases. With gases, if the volume be maintained constant, the pressure varies directly as the temperature reckoned from the absolute zero of the air thermometer. This is Charles’ law, followed, as has been said, by dissolved substances as by gases. We see then that the general relation of volume, i.e.,

\[ \frac{1}{V} \text{ concentration,} \]

to pressure and temperature is the same for dissolved substances as for gases. For either case may write:

- Volume varies as pressure × temperature, or
- \( \frac{\text{Volume}}{\text{pressure × temperature}} = \text{a constant quantity.} \)

The most striking evidence in favor of the view that substances in solution are in a gaseous state is afforded by the fact that this constant has the same value for dissolved substances as for gases; in other words, a dissolved substance at a certain temperature and which exercises on the solvent a certain pressure, occupies the same volume as it would if under these conditions of temperature and pressure it were in the form of a gas. An example will make this striking relation clear. At 0° C. and 760 m. m. of mercury pressure, the molecular weight of any gas expressed in grams occupies 22830 c.c. The pressure of 760 m. m. of mercury is 1033 grams per square centimeter, which number expresses the pressure in absolute units. 0° C. = 273 on the scale of absolute temperature; therefore the value of the constant for gas is—

\[ \frac{1033 \times 22830}{273} = 87400 \text{ approximately.} \]

Now take the case of sugar in solution. The molecular weight expressed by the formula \( \text{C}_{12}\text{H}_{22}\text{O}_{11} \) is 342. Therefore the molecular weight expressed in grams occupies 34200 c.c. At 0° C. the pressure on the solvent is found to be equal to 493 m. m. of mercury, that is to say 671 grams per square centimeter. The constant for sugar is therefore—

\[ \frac{671 \times 342000}{273} = 84200 \]

which agrees to within 6 parts in 1000 with that for gases. As this relation is not special to the case of sugar but is a general relation, it follows that Avogadro’s law is obeyed by substances in solution, equal volumes of which, at the same temperature and pressure, and under the same condition on the solvent, contain equal numbers of molecules.

It is well known that the abnormal vapour densities of certain bodies which we now know to be dissociated in the gaseous state long opposed an obstacle to the acceptance of Avogadro’s generalization. The exceptions met with in the case of substances in solution are of exactly parallel character. The deviations from the law are always in one direction, giving too great a volume when the calculation is based on the received molecular weight. These deviations are met by the hypothesis that such exceptional substances are to some extent dissociated in solution. As in the case of gases so also in the case of substances in solution, many bodies occupy a volume twice as great as that calculated from their molecular weight. These are regarded as being completely dissociated into two constituents. The most important classes of substances thus far met by the hypothesis are the strong acids and bases and their salts. A large number of phenomena afford evidence in support of this hypothesis of dissociation in solution, the study of which now constitutes an important field of work connected with the development of the new theory of solution.

THE ALLEGED WORTH OF ALUMINUM.

In the Tribune of May 6 we find what purports to be a communication from a Springfield, Mass., correspondent, signing himself "C. M.," over the date of April 6, which traverses in no ambiguous phrases the generally accepted value to the arts and sciences of aluminum. He says:

"It is interesting to watch century after century, in which at certain times in history have taken hold of and still affect the minds of men. Thus the tulip craze, the South Sea craze, and the balloon craze in the beginning of this century and end of the last. In the present age we may notice the aluminum craze. How people will invest thousands of dollars on hearsay evidence, when they could ascertain the truth by buying twenty-five cents worth of pure aluminum wire or sheet, belongs to the oddities of capital gone crazy. The yarns about aluminum are so numerous, and are repeated in so many bold and frank lies, that it seems almost a vain task to try to set people right. Now, Jules Verne, the champion writer of scientific fancy, never uses aluminum much in his fiction. He knows too well that it is a 'loan' substance which, when the process of casting, or casting and forging, leaves a large aluminum bullet—not because of its strength, but because it is so light. Not long ago a card from persons interested in the making of aluminum came to me, stating that aluminum is as hard as steel. All wrong! The purer, the softer. Pure aluminum is just a trifle harder than ordinary cheap zinc or spelter, which can be soldered, but not the pure aluminum cannot be soldered reliably, and for working is one of the 'nastiest metals' in existence. One great point in its favor, but only a point of skin-deep beauty, is that the aluminum rust forming in the air is white, while it is brownish red on iron, green on copper, and gray on zinc,—but aluminum tarnishes readily, especially in salt air. Salt air without it go far more than it does upon iron, and a ship built of aluminum would be full of holes after one trip around the globe. Therefore, for ship-building and all parts exposed to the water it is even intrinsically inferior to iron—therefore not worth six cents a pound. For roofing it is vastly inferior to galvanized iron, because it is not a metal and for roofing it must be hard and it is therefore not worth five cents a pound. For vessels to be used in the kitchen it could only be employed if salt was kept away, but with salt present it would not have the slightest advantage over ordinary tin.
pains—therefore would not be worth eight cents a pound. For parts of machinery where strength is required, weight for weight, it is not as strong as iron. As such iron can be bought for fourteen cents a pound, aluminum would be worth less than that; for the same strength, aluminum would be four times more bulky. For spoons and knife-handled, where no particular quality except looks is called for, it might be worth as much as twenty-five cents a pound. The drawback in that use would be its great softness, as it soils the fingers when handled, like lead. The only use for which, at present, pure aluminum may take, with advantage, the place of longer known metals, is for electric appliances and wires. For the same diameter, aluminum is twice as good a conductor as iron; its weight is essentially one-third, but its strength about two cents by pound. The only use for which, at present, pure aluminum may take, with advantage, the place of longer known metals, is for electric appliances and wires. For the same diameter, aluminum is twice as good a conductor as iron; its weight is essentially one-third, but its strength about two cents by pound.

**Preparation of the Oxides of the Rarer Elements.**

The use of the oxides of the rarer elements in the various systems of incandescent gas lighting which are now coming into prominence, makes it of interest to note the manner in which these are prepared. Thorium, lanthanum, cerium, and dysprosium are obtained from the mineral monazite. This is, however, a complicated ore, and difficult to deal with. Orthite is another source from which cerium and dysprosium are obtained, the mineral costing in England about twenty-five cents per kilogramme. Zircon, from which zirconia is obtained, was quoted some time ago at $1.87 per ounce, but can now be bought in quantity at about fifty cents per pound. A similar reduction in price has taken place in the case of thorite, from which thorium oxide is extracted. This mineral, as commonly obtained, carries about fifty per cent. thorium, ten per cent. uranium oxide, and fifteen per cent. silica. Yttrium is obtained as much as the niobium which is obtained from these minerals is said to come from Norway.

In the extraction of the oxides from thorite, the mineral is finely powdered and dissolved in hydrochloric acid, with which it forms a stiff gelatinous mass, part of the silica passing into solution, which is evaporated to dryness to render the silica insoluble. Hydrochloric acid is then added, and the acidified precipitate is filtered, as has been the case with all other precipitates. The oxides of aluminium are then added to the filtrate, and the resulting precipitated solution is evaporated to dryness, the silica being filtered off, and the hydroxide of aluminium is precipitated as a hydroxide for the second or third time. Finally, the thorium is brought down from the solution of the pure chlorides with ammonia, thus getting a hydrate from which any of the other salts can be obtained. Zircon can be treated in the same way if first fused with bisulphite of soda or caustic soda, and afterward evaporated to dryness, the chemical reactions being much the same as in the case of thorium. Cerium may be prepared from cerite or the other minerals mentioned of which it is a constituent. With the exception of zircon, most of the minerals, being hydrated silicates, are very soluble in hydrochloric acid unless they are first heated, in which case they become quite insoluble, excepting in boiling sulphuric acid.

These oxides are recovered from the old and broken mantles, used in the incandescent gas lighting systems, in the following manner: They are first treated with sulphuric acid, evaporated to dryness, and dissolved in water. The solution of the sulphates is treated with caustic soda and the precipitated hydrates washed to get rid of the soluble salts. The sulphate of the sliver is precipitated as the hydrate of aluminium, and the precipitate is dissolved in hydrochloric acid and treated with hydrochlorides of soda to precipitate the thorium and zirconium. Lanthanum, yttrium, and cerium are thrown down from the filtrate as oxalates by ammonia oxalate. These oxalates are then ignited and dissolved in dilute nitric acid, by which means the cerium oxide is left unsoluble, the lanthanum, yttrium, and cerium being dissolved. Another method, and one more useful in analysis, is to treat the oxides of lanthanum, yttrium, and cerium with ammonium chloride, thus converting the lanthanum and yttrium into the soluble chlorides and leaving the cerium insoluble.

**Scientific Experiments.**

**Crystals of Platinum.**—Professor Joly, of Trinity College, Dublin, announces in Nature that he has succeeded in producing small crystals of platinum by stretching ribbons of pure metal, sprinkling them with powdered topaz, and passing an electric current through the metal until it is red-hot. In half an hour, if the metal is examined under the microscope after removal of the topaz, it is found to have small and brilliant octahedral crystals adhering to the edges. Other forms also occur. Professor Joly says that the cause of the formation of the crystals is that the platinum is liberated at a high temperature from the topaz, which attacks the platinum, forming a fluor-oxide, which again breaks up, depositing the crystals. This reaction is similar to what M. Mossialos has already described. The same thing takes place with palladium.

**Sanguinité, a New Mineral.**—A. Miers, in the Mineralogical Magazine, describes a new mineral which he has found in the granite at Dioque, near Conacry. It is almost hexagonal in shape, and is found in places where other minerals have been broken up. It is a mixture of iron and nickel, and is about the size of a pea. It has a metallic sheen, and is黑色, like iron. It is very hard, and is not decomposed by ordinary acids. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic. It is found in the same place as the sanguinité, and is also a mixture of iron and nickel. Miers observes that it has a peculiar smell, and that it is very magnetic.
The Out-Door World.

EDITED BY HARLAN H. BALLARD, PRESIDENT OF THE AGASSIZ ASSOCIATION. [P. O. ADDRESS, PITTSFIELD, MASS.]

AN INTERESTING CONVENTION.
The fourth annual convention of the Massachusetts Assembly of the Agassiz Association was held at Middlesex Fells, Wyoming, Mass., May 30. Many anxious glances were turned toward the sky on Friday, for it looked as if a storm was gathering; but Saturday morning was more promising, although "Old Prob" said "showers." A special car was chartered to the 10:25 train from Boston. A charming walk of three-quarters of a mile from Wyoming station brought the delegates to Spot Pond, where they found a beautiful and—what was even more to the purpose—dry grove. Everything went off splendidly. The addresses were good, the luncheon was good,—as it ought to be, being served by Dill of Melrose,—everyone was enthusiastic. Only the drones staid at home, afraid of the weather.

At 3 o'clock Mr. Warren Upham delivered a "Memorial Tribute to Agassiz." He spoke of four perpetual memorials of the great scientist: 1st, the boulder that marks his grave at Mt. Auburn; 2d, Agassiz Museum at Cambridge; 3d, the Agassiz Association; 4th, Lake Agassiz, that great glacial lake in the wheat-fields of Minnesota.

The afternoon address was by Dr. Fred Gage, of the Harvard Veterinary School, on "The Evolution of the Horse.

The reports from the Chapters of the State were encouraging; all had done good work.

The evening camp-fire was a great success. About sixty delegates were present.

The officers elected for the ensuing year are as follows:

President—R. P. Williams, Boston.
Vice-President—Prof. E. A. Hartwell, Fitchburg; Prof. G. E. Bennett, Pittsfield; W. F. P. MacCarthy, Taunton.
Secretary—Helen M. Horsey, Hyde Park.
Treasurer—George F. Perry, Melrose.
Executive Board—Howard M. Baldwin, Boston; Thomas H. Pay, Boston; Belle P. Gowing, Reading; Sophie Washburn, West Bridgewater; Edmund Woodward, Andover; Mrs. Elin F. Boyd, Hyde Park.

CONVENTION NOTES.
The diplomas for best work during the year were gracefully awarded by President Hall, the first to Chapter 501, Hyde Park, (A); the second to Chapter 501, Hyde Park, (A); the third to Chapter 575, Taunton, (C).

Pleasant letters were received from sister Assemblies in New York, New Jersey, Philadelphia, and California.

Fourteen Chapters responded to the call for a report of the year's work.

The "Field-Day Convention" was a success.

The address of welcome by R. P. Williams, and the response by Prof. E. Adams Hartwell, were particularly appropriate and graceful.

Universal regret was felt that the President of the A. A. was detained from the Convention by illness.

The evening reception by the new officers was a pleasing incident.

It is suggested that the Assembly may ere long profitably undertake to map the State of Massachusetts, geologically, botanically, and zoologically, each Chapter doing its part. Different sections could meet quarterly to compare notes and render mutual assistance, and each Chapter should return monthly reports to the General Secretary to be circulated throughout the State.

The delegates separated with a firm determination to "wake up the whole State" before another year ends.

Much of the credit for the success of this Convention is due to the enthusiastic and untrivial efforts of the Secretary, Mrs. Ella F. Boyd, of Hyde Park.

It has been proposed that the next Convention meets at Harvard College, where, if anywhere, the spirit of Louis Agassiz still lingers upon earth.

A. A. CORRESPONDING GEOLOGICAL CHAPTER.
The first annual report of our Corresponding Geological Chapter is very gratifying. The Chapter has also issued a very neat printed report of its work, for circulation among its members.

Here is the report:

Chapter 551, Buffalo, N. Y.—This Chapter was organized February 20, 1890, with sixteen charter members, and on the first of May this year we had thirty-one active members. By the word "active" we mean workers, as there are no drones in our Chapter, for each and every member must report every three months the result of his observation. To cover a large territory and get the help of the labor and investigation of workers in geology and kindred sciences in various parts of the country, this Corresponding Chapter was formed, and with grand results. We have members who are investigating that vast and rich field of fossils, New York; and reports from that region are a feast to those whose work has been confined to the erupitive and metamorphic rocks of the Eastern Massachusetts, where a fossil is a rarity.

From other members we get valuable information in regard to the gas and oil fields of Pennsylvania, Ohio, and Indiana. Again our interest is centered on the description of some peculiar phenomena of South Dakota or California; and not less interesting are the reports from Connecticut, New Jersey, Maryland, or Georgia.

We have members at all points of the compass, from the Pacific Ocean to the Gulf, and from the Atlantic to the Pacific. We already have members in thirteen States of the Union, and are represented in Nova Scotia. We have communications of great commercial interest, showing the economic uses of building and manufacturing products, ore-bearing rocks, granite, sandstone, slate, lime, cement, oil, gas, coal, etc.

During the past year we have circulated eighty-three valuable reports; valuable because they are the results of personal observation; valuable because of the minute detail into which they enter, as our members in many cases have spent years in studying a limited territory. The reports cover all phases of geological phenomena, eruptive and sedimentary formations, fossils, minerals, metamorphism, disintegration, erosion, discussion, drift, flag, fact, and, in fact, all questions relating to geological history. Geology teaches the earth's history; it teaches all of the organisms which have existed in the past. To be a thorough geologist, one should be acquainted with chemistry and mineralogy, and it is well to know something of physics and geology; it is also of great advantage to be a paleontologist as well as a botanist, zoologist, and cactologist. What a field we have for study!

We have members in all walks of life, from the professor of natural history to the mechanic. We have both teachers and scholars; and when teachers are interested in the study of nature, what may not their influence be on the pupils in their charge? We shall never know how far-reaching the influence of our labor may be. Some of our members have contributed to scientific literature, and some have given the results of their researches on the lecture platform. Professor Barrows who last year was President, and Mr. A. W. Grabau who was General Secretary have both on account of pressing duties been obliged to decline, a re-election, but they are both members of the executive council and are as interested as ever in the work. We have every reason to feel proud of our Chapter as a whole. All who are interested in geology, mineralogy or paleontology are cordially invited to join us.

The officers for 1891 are:

President—Frederick A. Vogt, 841 Genesee street, Buffalo, N. Y.
General Secretary—George F. Perry, Melrose, Mass.
Treasurer—Miss Isabella S. Dean, 45 Park street, Buffalo, N. Y.

Executive Council—Amadene W. Grahan, Society of Nat.
History, Boston, Mass.; Franklin W. Barrows, High School, Buffalo, N. Y.

Division Secretaries—

E. T. Tiefel, 32 Cottage street, New Haven, Ct.
C. D. E. Dinsley, M. D., Geneva, N. Y.
D. Franklin W. Barrow, High School, Buffalo, N. Y.
E. Harrison Weirich, Box 356, J. H. U., Baltimore, Md.
F. Mrs. C. M. Winston, Forrest, Id.

GEORGE F. PERRY, Secretary, Melrose, Mass.

WILSON ENTOMOLOGICAL CHAPTER.
The President of the Ornithological Corresponding Chapter has been unable for some time, for want of an executive secretary, to answer communications regarding the Chapter. He has now happily recovered his health, and is anxious to see the Chapter once more take its position by the side of the Gray Memorial Chapter, the Isaac Lee Memorial Chapter, and the Corresponding Geological Chapter. All who are interested in this branch are invited to address Mr. J. B. Richards, Box 392, Fall River, Mass.

By the way is there not room for a wide-awake Corresponding Entomological Chapter?

OUR FRIENDS IN RUSSIA.
Our Russian members are enthusiastic and active. Madame Fedchenko's list of plants is attracting favorable attention to her faithful work, and other members are making full local collections of Russian insects and birds.

In a recent number of one of the leading Russian magazines, Mr. B. Lessievitch has an article on the Agassiz Association. It looks very interesting in its literary style, and the following words of it we can read are "Agassiz Agassiz," "Popular Science News," and our address.

Speaking of Popular Science News, the middle of the year is a busy time and we have not yet secured the requisite number of subscribers for our paper. Try once more, please. The journal is really worth much more than one dollar to anyone who reads it.

NOTES FROM HALIFAX.
I thought it might interest you to know of some of our local names for well-known plants. Checkberry is here called "ten-berry"; partridgeberry is called "sneke-berry"; and as for...
FOSSILS WANTED.
I wish to get by purchase or exchange a few specimens of trilobites and other fossils of the same age.—H. B. Wiley, First National Bank, Miles City, Montana.

THF A. A. LESSONS IN MINERALOGY.
Professor Gutenberg's third grade, which has been issued for a few months by the National Publishing Company, is the one that attends the first and second grades. The success is thoroughly deserved. The specimens are carefully selected, and neatly packed in a convenient case, and the book that contains the lessons—in this grade on blowpipe analysis—is handsome printed and illustrated. The charge for book, specimens, and case, is only one dollar, and the Professor makes no charge beyond this for the work of Columbia College, has written of the third grade lessons: "The little book is simply admirable; at least I do not remember having ever seen anything half so good, even in England, where elementary science primers have been in vogue for more than twenty years."

To show how practical and simple the lessons are, I quote from a letter written by a most intelligent and wise mother:

"Is the third grade ready? I am arranging my little girl's lessons for the winter, and it would aid me to know when you may expect them. She and her little friend Sally are very eager to go on with the course. It has been a most excellent thing for them both; and I was delighted to see with what interest and appreciation she examined the minerals in the South Kensington Museum this summer. She spent many hours there recognizing old friends and studying new,—always with pleasure,—and it is due to your course."

The following extract shows how the A. A. course in mineral study appeals to the average boy:

"I must tell you how the course in mineralogy,—of which I should have known nothing had I not joined the Agassiz Association,—has benefited me more than I hoped to gain. After mastering the first grade I found that I could identify many of the specimens about my own home at a glance. Believing so well pleased I took the second grade, and am now at work upon the third. During one of my walks I found a huge quartz crystal, and from the combined specimens of the purest milk-white quartz I had ever seen. I find in pursuing a course in mineralogy some knowledge of chemistry is indispensable. Is there such a course connected with the A. A.?—O. W. C., Orleans, Mass."

We clip the following well-deserved notice of one of our western Chapters from a Minneapolis paper:

FOLLOWERS OF AGASSIZ.

WHAT THE LOCAL AGASSIZ ASSOCIATION IS AND IS DOING.

Tomorrow afternoon the Minneapolis Chapter of the Agassiz Association will hold the last meeting of the second year of its existence. It was founded in the autumn of 1889, by Frank Corbett and Fred White, both then students at the High School, and has grown until it now has a membership of fifty members, who attend a weekly meeting at the High School. The specimens were donated by the Academy of Science and by friends of the Association. This collection is at present kept in a room at the High School building, but it is soon to be moved to the Public Library. The Association is recognized by the Smithsonian Institute, and receives all its publications.
The Association is divided into five departments, or classes, each for the study of a particular branch of science. A certain number of the classes meet bi-weekly, but the classes in electricity meet every week. A specialty is being made of the mathematical part of the science, and the mechanism of new inventions is studied. The duplex telegraph has recently been supplying the attention of this class. The astronomical department observed the transit of Mercury through the South High School telescope.

The work of the Association is entirely voluntary and independent of the High School course, but the young scientists receive valuable assistance and a certain amount of direction from the teachers, and have the use of the laboratories for their experiments. Among the honorary members, besides a number of High School instructors, are Professor Pratt, of Davenport, who has interested himself in the astronomical work of the Association; Dr. A. P. Elbert, formerly president of the Academy of Sciences; Prof. C. W. Hall, of the university, and Librarian Herbert Putnam.

The officers of the Association are as follows: President, Frank Corbett; Vice-President, Charles Wilkinson; Secretary, Miss Ella Holts; Treasurer, Miss Mary Wilson; Corresponding Secretary, E. F. Bacon; Librarian, C. G. M. This is a statement of the presidents of departments: Botany, Miss Edna Day; mineralogy and chemistry, William J. Taylor; entomology, W. H. Bird; astronomy, Joseph Morton; electricity, Robert Ford.

A branch has been organized at the North Side High School with about fifty members.

**THE MICROSCOPE PRIZE.**

Each competitor for this beautiful prize is left free to choose for himself what to observe, how to observe, and to record his observations. There is as much room for originality and success in deciding what to study as in selecting methods and securing results.

**A SQUIRREL'S UNUSUAL MEAL.**

On the third of last May as I was taking a walk near the village of Dublin, N. H., I saw a striped squirrel (chimunk), the first of the season I had observed, leap upon a wall about a rod away, and, considering the customary eating position crouch upon the haunches, prepare to busy himself with something stowed away in his crotch. Instead of a kernel of corn or a nut, he took from his mouth an earthworm not less than seven inches in length and about one and a half inches in diameter. I should add, that ordinary food for squirrels was scarce; there had been very few acorns or beechnuts the previous fall, comparatively little grain in the neighborhood, and less than the usual supply of fruit seeds. After holding the worm for a few seconds while he "sized up" my intentions, he began nibbling away upon it with earnest relish. When an inch or more had disappeared, he advanced toward me, thinking he would get the prize as he ran away, but instead of that he carefully tucked it into his cheeks again. To make sure that I had not been deceived, I turned to my little daughter of nine years, who had stood near me all the time, and asked, "What was the squirrel eating?" and she immediately answered, "Why, a fish-bone chawing."

I have observed a striped squirrel a thousand times, and never saw one chew a worm, or flesh of any kind. I consulted the best observers of the habits of animals in that region, as also books of reference in natural history, but none of these could throw light upon what I had observed. The simple explanation probably is, that the squirrel was starved into eating something it liked, and seldom or never tasted before.—H. B. Pratt.

**STRONG NEW CHAPTER.**

A very promising Chapter, just organized, is No. 511, Nanticoke, Ct. It has twelve enthusiastic members. The Secretary is Mrs. J. E. Buxton.
The POPULAR SCIENCE NEWS.

BOSTON, JULY 1, 1891.

AUSTIN P. NICHOLS, S.B. . . . . . . . . EDITOR
WILLIAM J. ROLFE, Litt. D. . . . . . ASSOCIATE EDITOR

With the present number the POPULAR SCIENCE NEWS commences its second quarter of a century. Twenty-five years ago, on the first day of July, 1866, the first number of the Journal of Chemistry and Pharmacy, a small trade journal of eight pages, made its appearance, the principal object of its existence being to further the business interests of the wholesale druggists of J. R. Nichols & Co. Owing to the eminent scientific and literary abilities of its editor, Dr. Nichols, it met with such an immediate and unexpected success that its scope and character was soon changed, and it took a leading place among the standard scientific journals of the world—a place which the present editors will use every endeavor to retain in the future as they have in the past. The period of time just completed has been unusually rich in scientific discovery in every branch. To simply name the more important discoveries would take more space than is at our disposal, but we may mention the fields of spectroscopy, photography, telephony, and electric lighting and power, as those in which the greatest progress has been made, as well as the new systems of chemical philosophy and molecular physics which have been formulated, and the general acceptance of the theory of the gradual development of living organisms from previously existing forms—one of the most important and revolutionary scientific generalizations ever brought forward. The promise for years to come is equally hopeful; we see the standing on the verge of discoveries even more wonderful than those which have already been made, and at any moment we may expect the announcement of new phenomena and laws which will give us a far deeper insight into the mysteries of Nature than we have ever considered possible. The field of psychology is one which has heretofore been almost entirely neglected, but which only needs to be cultivated by systematic scientific investigations to yield a rich return. Many other changes may be noted during the period just concluded. The name of the paper has been changed to one denote more accurately its character and scope. Its connection with the original business house has been entirely dissolved, the size of the paper has been increased, and the variety and quality of its contents improved in every possible way. The death of Dr. Nichols, in 1888, was an irreparable loss, both to the paper itself, and to the present occupant of the editorial chair and those associated with him in the management of the paper; but, notwithstanding this loss, it is with peculiar pleasure that we note the continued prosperity of the Science News, and its increasing influence in the field which it has made especially its own. It begins its second quarter century under the most favorable auspices for a success which every one connected with it will use his best efforts to deserve and attain.

One of the most ingenious scientific hoaxes ever perpetrated was the description of an alleged automatic "comet finder" attributed to the inventive genius of Professor Barnard of the Lick Observatory, the action of which was said to be dependent upon the varying electric resistance of the element selenium under the action of light. [SCIENCE NEWS, May, 1891, page 71]. Originally appearing in a San Francisco daily newspaper, it was written with such skill, and with all the details of the apparatus described in such a plausible manner by one evidently thoroughly familiar with the principles of physics and astronomy, that it was particularly well calculated to deceive—as, in fact, it did—nearly every scientific periodical in the country, although a close examination of the article would have shown at once the absurdity of the story. A letter from Professor Barnard, exposing the hoax, states that he considers it one of the most remarkable ever gotten up on an astronomical subject, and that it was originated by a young man of remarkable ability—as, indeed, he must have been to have succeeded in deceiving so many scientific journals. Professor Barnard's "comet finder" will have to be classified hereafter with the "moon hoax" of some half century ago, and other products of a too lively and indiscriminating scientific imagination.

A slight modification of the present system of weights and measures is proposed by Mr. HANSSON, a Danish engineer, by which it can be converted into a true decimal system equally convenient for calculations with the French metric system now so extensively used. Briefly stated, the foot is increased by about 1-2,500 of its present length, or the thickness of ordinary note-paper, exactly from 1,000 to 1,000.003,—while the pound avoirdupois, the ounce, and the imperial gallon remain unaltered. By this very slight alteration of the length of the foot, which will hardly be noticed in trade, manufacture, and commerce, the present system of standards is at once converted into a decimal system. While the present cubic foot only contains 436,871.75 gallons of distilled water, the new standard cubic foot will contain exactly 1,000 gallons (437,500 gallons) of distilled water of 4° C. temperature; 16 cubic feet consequently will be equal to 100 gallons, (called 1 hectogallon), and 1 hectogallon of distilled water of 4° C. weighs 1,000 pounds. The new standard will be divided into deci-, centi-, and milli-foot; and all the other units of weight and measure are correspondingly simplified. The new system is described very fully in a recent number of the Chemical News, and Mr. Hannson has certainly hit upon some very curious and remarkable relations between our present standards of weight and measure. The difficulty experienced in introducing the metric system into general use goes on showing how hard it is to make any change in this direction; but the slight actual alteration from existing standards required by this system, and the great ease and simplicity introduced by it into all calculations, may serve to render it more popular and generally acceptable if further discussions of the subject show no other objection to its general adoption.

In April last a telephone line between London and Paris, a distance of 267 miles, was opened for public use, and was immediately crowded with descriptions and illustrations of what they apparently seem to think is an entirely new application of electricity. As a matter of fact, telephoning over much greater distances has been a matter of daily occurrence in this country, since 1883, when a conversation was carried on between New York and Cleveland, a distance 650 miles, and since then communication has been obtained between Boston and Chicago (1,000 miles). At the time of the great blizzard of 1888, the only direct means of communication between Boston and New York for several days was over a long distance telephone wire, which withstood the storm that prostrated all the other lines. Like most other luxuries in Europe, the price for the use of the long distance telephone is much higher than in this country, a charge of two dollars being made for three minutes use of the wire between the English and French capitals.

An undertaking which will undoubtedly be of great value to science is the deep boring into the frozen earth, soon to be attempted by the government. An eight-inch well near Wheeling, West Virginia, has been sunk by a private company to a depth of 4,100 feet. Both oil and gas have been struck throughout in paying quantities. It has gone through several thick veils of coal, and has traversed layers of gold quartz, iron and numerous other minerals. The owners are to drill about one thousand feet farther and then the government will take up the work, and, under the direction of the Geological Survey, drill into the earth as far as human skill can penetrate. A complete record of all the strata passed through and the discoveries that may be made will be kept, and will form one of the exhibits at the coming World's Fair. Although the propriety of expending the public funds for such a purpose, there can be no question but that the results of the boring will be of the greatest scientific interest and importance; and, with the aid of modern machinery and appliances, the engineers in charge will, without doubt, succeed in penetrating into the earth to a much greater depth than has ever before been attained.

An interesting, though not entirely novel, experiment recently attempted by the writer was the taking of a photograph by the light of the full moon. The clockwork of a motion was chosen, and the plate (a Seel 29) was exposed for an hour and a half with the full opening of the lens. It was developed in the usual way, giving a very good picture of the buildings of a city surrounded by hills in the background. The electric street lights and the illuminated windows were reproduced with great intensity, while in the shadows there was a few streaks of light, but for the most part the whole was concealed under the circumstances. The most surprising feature of the picture, however, was the clearness and the minuteuseness with which distant details were reproduced, trees and other small objects on the distant hills appearing with perfect distinctness, which were entirely invisible to the eye by moonlight, and hardly to be distinguished even before the picture was made. It is evident that the world of photography, where the cumulative effect of a long exposure gives a minuteness of detail which is not shown to the eye by the most powerful telescopes. The difference in intensity between the light of the sun and moon is shown by the long exposure required for the latter, as an exposure of a fifth of a second would have been sufficient to have given a photograph of the same landscape when illuminated by direct sunlight.

At the meeting of the American Medical Association, held at Washington, May 5, 1891, Dr. Charles A. L. Reed, of Cincinnati, introduced the following:

Resolved: That the Committee on Nominations be and is hereby instructed to nominate one member for each State...
and Territory, and one each from the army, navy, and marine hospital service, who shall constitute a committee, which is hereby instructed to effect a permanent organization of the proposed Inter-Continental American Medical Congress, and to determine the time and place at which the same shall be held.

The resolutions were seconded by Dr. William H. Pancoast and others, and unanimously adopted. The committee will meet next October, when the time and place of meeting of the Congress will be decided, and permanent officers elected.

THE MANCHOTS OF THE CAPE OF GOOD HOPE.

Among the most curious and remarkable of the sea fowl tribe are the manchots, or jackass penguins, found at the Cape of Good Hope and the neighboring islands. The animals are of a most strange and aberrant type, and are hardly worthy the name of birds. Their wings are entirely useless for purposes of flight, and have, apparently, been modified into an organ more nearly resembling the flipper of a seal. The feet are large and clumsy, and, like the bear, the manchot is a plantigrade, standing upon the full length of the foot; but, even with this advantage, his movements on land are so clumsy that he is obliged to use the cluster of strong feathers forming the tip of the tail as an additional means of support when standing upright. In the water, however, the manchot is perfectly at home, and the limbs which are of so little use to it on land enable it to move with the greatest swiftness and ease.

The color of these birds is a pure white on the under part of the body, and a black or grayish blue above. Bands of a yellowish color have sometimes been observed on the breast and the sides of the neck, and tufts of bright yellow feathers about the eye. A peculiarity of the plumage of the adult male birds is the dark band surrounding the lower part of the body, as shown in the illustration. The average length of the birds is about two feet.

The eggs are laid on rocky islands and on cliffs bordering the sea. The nest is roughly constructed of stones and shells, the principal object being, apparently, to raise the eggs from the ground and keep them dry during the process of incubation. Usually a single egg only is found in the nest, of a pure white color, and globular in form, like that of a duck. After five weeks' incubation the young manchots make their appearance, and are fed from the beaks of their parents with partially digested food regurgitated from the stomach. After the responsibility for their young ceases, the old birds commence to moult, and during this process they remain in a sort of agreement which is called the winter rest, and it is safe for them to take to the water once more.

Several of these birds are kept in the Jardin d'Acclimatation at Paris, and have successfully raised their young and withstood the rigors of the past exceptionally cold winter. It is worthy of notice that when removed to the northern hemisphere the manchot tends instinctively to delay moult, and it appears that this is statistically true for the two hemispheres. A similar tendency has been observed in other exotic species.

Intermediate types of animals like the bird above described are the strongest witnesses to the truth of the theory of development. Like the whale, which is a true mammal and not a fish at all, and which was probably derived from some terrestrial form of life, so in the manchot we can almost say we have a true "missing link," and an actual example of a bird in process of transformation into a marine animal. Numerous similar intermediate forms, both existing and fossil, are known to naturalists; and the more the innumerable forms of life are studied, the more strongly the conviction is forced upon us that the structure and functions of living forms are not fixed, but constantly, although slowly, changing; or, in other words, the picture which Nature presents to our view in the world of life is not a mosaic, but an ever varying kaleidoscopic design.

The accompanying illustration is reproduced from *La Nature*.

THE END OF THE WORLD.

We are taught by astronomy and geology, that this earth upon which we live has not always been in the same condition in which it now appears to us. It has had a beginning, and has gone through a series of changes from a mass of incandescent gas, through liquid and solid forms, subjected to varying climates and occupied by ever-varying forms of life, until in our own day we find it so well adapted to our existence, that, forgetting the comparatively minute space of time in which we, or even the human race, have lived upon it, we are likely to think that the present conditions are fixed and that the earth will continue to go through its daily and yearly rotations, with alternations of summer and winter, day and night, while generations of man and the present races of animals continue to succeed each other for an indefinite or infinite number of years.

Nothing could be further from the fact than this belief. The earth is passing through a regular cyclic of changes, the forms of vegetable and animal life existing upon it are constantly varying, and there can be no doubt but that in the course of time, ages hence though it may be, this earth will become unfit for human habitation, if, indeed, before that time the form of life known as man, has not been developed into an entirely different organism, or "improved off of the face of the earth."

We cannot say positively what will be the final fate of the earth. The present condition of this planet is so well adapted for the maintenance of life that we can only conjecture what may be the condition of existence in which we can view the mysteries of nature with a clearer vision, and look back upon the problems which now appear so perplexing and unsolvable, as in our waking hours we look back upon the troubled visions and fancies of a restless sleep.

An electric welding machine for making chain cables is among the latest applications of electric welding. It has been found possible to weld two links at the same time.
STUDIES IN PLANT BIOLOGY.

IV.

THE MAIDENHAIR FERN.

No plants that grow in the woods or waste fields are more noticeable than the ferns. The tall feather-shaped fronds of the common species, met with everywhere in damp, shady places, are among the most familiar forms of vegetation. In almost any locality at least a dozen species of ferns may be found, and among them the maidenhair fern (Adiantum pedatum), well known for its graceful form and delicacy of structure. It may be distinguished from all others by the fact that the leaf-stalk is slender, highly polished, purplish in color, and forks into two equal curved branches, upon the divisions of which the small oblong leaflets are borne.

It should be observed that the portion of the plant appearing above ground consists of the leaf only. The stem is under ground, being a rhizome; it is dark colored, woody, branching. It remains alive from year to year, growing with each season at one end of the main axis, and at the ends of the branches, dying away at the other end of the axis. (II. follows from the manner of growth that one plant eventually breaks up into many.) From the growing ends each spring new leaves arise, those of the preceding year having died away at the approach of winter. Roots are given off from the lower side of the rhizome.

Everyone who is observant of plant life has noticed that ferns, unlike other common plants of their size and kind, have an indistinct form. It is generally known that the brown patches that appear on the under sides of the leaves in late summer take the place— are the physiological equivalents—of flowers. Each of these patches, called a sori, is made up of a number of box-like parts, termed sorangia, in which are contained spores. A spore is a single plant-cell, just large enough to be discerned with the naked eye, consisting of a firm outer coat, or cell-wall, and soft contents of protoplasm.

Let us trace the history of the spore produced by the maiden-hair fern. When, by the rupture of the sorangia, the spores have fallen to the ground, having been transported, perhaps, to some distance by the wind, they remain for some time—ordinarily until the next spring—in an inactive condition. But the life of the tiny cell is conserved, and at last germination takes place, the spore giving off a slender thread-like projection. This thread, by the formation of cross-partitions, comes to consist of a row of cells. Presently it sends off a downward-growing branch, which penetrates a little way into the soil. Thus a tiny plant consisting of two- or three-ground portion, or thallus, and an underground portion, or root, is formed. Growth continues, and the aerial part, having increased both in length and breadth, comes to consist of a small, flat, heart-shaped green leaf. Meanwhile many additional hair-like roots have grown out from the lower side of the leaf, holding it to the ground and absorbing nourishment from the soil.

This little plant, which is no more than about one inch in diameter, is called a prothallus.

Thus the result of the development of the spore is the production of a tiny plant bearing no resemblance whatever to the fern plant from which the spore was derived. We must look to see what becomes of the prothallus, to find out, perchance, how a new maiden-hair fern comes into being.

When the little green leaf is closely examined there will be seen upon its lower side small elevations of two kinds. Those of the one sort are rounded in form, numerous, and placed among the root-hairs, at their bases; those of the other kind are larger, flask-shaped, and situated near the notch in the middle of the wide end of the leaf. Examination of the rounded elevations shows that within them a number of cells are developed, and by continued observation it may be ascertained that these cells become changed to spirally-rolled, cil- lated, and finally think, ciliated, threads, which swim and swim about in the drop of rain or dew that may be adherent to the leaf. These bodies are antherozoids, or male reproductive cells. In the flask-shaped elevations a single, relatively large cell develops, the oosphere, or female reproductive cell. The motile antherozoids make their way through the neck of the flask, and, uniting with the oosphere, effect its fertilization.

This cell is now the germ of a new plant. It soon begins to divide, and, by the usual process of cell-multiplication and differentiation, ultimately develops into the familiar fern plant. The prothallus exists only for a short time—passing away as soon as it has afforded nourishment for the primary stage of growth of the fern. Thus the office of the prothallus is the development of the sexual reproductive parts of the fern plant. The spores produced on the leaves of the fern in summer, while truly reproductive cells, are lacking in any character of sex. They serve only to produce a thallus upon which are formed the true sexual cells.

Plants going through a round of life like that of the ferns are said to exhibit alternation of generations. By this is meant the alternation of a sexual and an asexual generation. This principle of alternation is true of most of the cryptogamic, or non-flowering plants; and it is perpetuated, in indistinct form, in the higher flowering plants.

If a thin cross-section of the stem of a fern leaf be examined with the microscope, it presents a very pretty appearance, and also affords a means for gaining a knowledge of tissue-structure, as well as in plants. One sees that the stem is made up of cells, the appearance as a whole being like a piece of delicate lacework. A little observation shows that the cells are of several different kinds, in regard to shape, size, and thickness of walls, and that those of the same kind are arranged in groups. Thus at the outside of the stem are small, thick-walled cells, and it may be readily inferred that these are protective for the cells within, and that they give to the stalk its hardness and strength. These cells thus form an epidermis, or protective and supporting tissue. Within the epidermis, and making up the greater part of the section, are rather large cells, polygonal in shape, with thin walls, and having granular contents, which, upon being tested, proves to be starch. These cells form the parenchyma, or nourishing tissue. In the stem of a young fern the parenchyma cells are green in color, due to the presence of chlorophyll, and at this time they perform the function of starch-makers. But as soon as the leaves are fully formed, this work is mainly transferred to them. The starch present in the parenchyma cells of the stem of the fully grown plant, is derived from the leaves, and is stored up in the cells as food-material, available for the living cells of every part of the plant.

In the middle portion of the stem one sees a large group of cells forming a third kind of tissue, or rather a system of tissues, namely, floro-vascular bundles. Some of these cells of this bundle are much elongated and placed end to end, forming vessels, for the transfer of gases and liquids through the plant-body. Other cells are smaller, thick-walled, and are packed around the vessels; these are called fibers. Of these vessels and fibers there are to be distinguished those which are associated to form the xylem, or wood part of the bundle, and those which form the phloem, or bast portion of the bundle.

In the possession of these several tissues the ferns approximate in organization, the higher flower-bearing plants. In the scale of plant life the ferns stand somewhat above the middle place. That this is their relative rank is also indicated in the fact that the ferns and their allies were characteristic of the middle periods of geologic time.

UNION COLLEGE, SCHENECTADY, N. Y.

[Originally Published for Popular Science News.]

METEOROLOGY FOR MAY, 1891, WITH REVIEW OF THE SPRING.

TEMPERATURE.

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<td>A. L. M.</td>
<td>51.5°F</td>
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<td>19th M.</td>
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| Last 21 Mays       | 72.6°F | 84°F            |
| Second average     | 68.8°F | 84°F            |
| Last 21 Springs    | 80.2°F | 98°F            |
| Second average     | 78.2°F | 107°F           |
| Spring of 1891     | 46.7°F | 84°F            |
| Last 21 Springs    | 45.2°F | 63.5°F          |

The most remarkable feature of the last month was its dryness, as shown below. The temperature was near average. The lowest point of the thermometer, at the hours of observation, was 38°F, on the morning of the 4th and 6th, when frosts appeared, doing considerable damage in some localities, as also on a few other mornings. The 6th was the coldest day, with an average of 42.6°F. There were several cool spells, which seemed to check vegetation. The 11th and 13th were the warmest days, each averaging 68.3°F, the highest point (84°F) being on the 19th. They were several warm as well as cool spells. The daily extremes in the last twenty-one Mays have been 33°F and 91°F in 1889,—a range of 58°F. The monthly extremes and range are shown in the table.

The mean temperature of the present spring (46.6°F) was nearly 1.5° above the average. The daily extremes in twenty-one springs have been —4.5°F in 1872, and 91°F in 1889,—a range of 95°F.

SKY.

The face of the sky, in 83 observations, gave 50 fair, 29 cloudy, 16 overcast, and 7 rain, which is a percentage of 53.8 fair. The average fair for the last twenty-one Mays has been 54.4, with extremes of only 29.9 in 1888, and 78.5 in 1871,—a wide range. The average fair the last spring was 54 per cent., while that of the last twenty-one springs has been 52.3, with extremes of 41.7 in 1884, and 63.0 in 1872.

PRECIPITATION.

The amount of rainfall the last month was only 1.37 inches, of which 0.55 inch fell on the 16th, and .35 on the 29th, leaving but .07 inch for the rest of the month. This scanty amount was preceded by only .17 inch in the last half of April, making a period of fully six weeks, when vegetation most needs rain, of unusually dry weather. The severity of the drought must have been lessened by the abundant precipitation during the months immediately preceding. The average rainfall the last
twenty-three Mays has been 2.92 inches, with extremes of .55 inch in 1878, and 4.83 inches in 1890. In 1870 and 1887, also, there was less than one inch in May, but in those years, like the present, large amounts had fallen in April and preceding months. The amount this year since January 1 was 20.35 inches, while the average for these five months in twenty-three years has been only 22.33. The snow book of the last winter season shows it to have been 14.21 inches, while for the last twenty-three springs has been 12.50 inches, with extremes of 8.44 in 1880, and 17.39 in 1890.

PRESSURE.

The average pressure past the month was 29.996 inches, with extremes of 27.07 on the 1st, and 30.49 on the 30th and 21st, a range of .70 inch. The mean for the last eighteen Mays has been 29.942 inches, with extremes of 29.898 in 1874, and 30.036 in 1887—a range of 170 inch. The sum of the daily variations was 3.34 inches, giving a mean daily movement of .172 inch. This average the last eighteen Mays has been .123, with extremes of .073 and .170. The largest daily movements were .38 and .37, while 14 observations were stationary—indicating much steady weather.

The average pressure last spring was 29.970 inches, with extremes of 29.70 and 30.45, both in April. The daily variations were .174 inch.

WINDS.

The average direction of the wind past month was W. 1° 33° S., or one full point south of west. The mean for the last twenty-two Mays has been W. 3° 33° N., with extremes of E. 63° 45° W. in 1881, and W. 57° 32° S. in 1887—a range of 173° 47', nearly half the entire circle. The relative progressive distance travelled the last month was 38.33 units, and during the last twenty-two Mays 552.3, an average of 25.24,—showing much less easterly winds than usual the last month.

The mean direction of the wind this present spring was W. 26° 2' N., while the average of the last twenty-two springs has been W. 26° 10' N. The distance travelled the last spring was 97.03 units, and the last twenty-two springs 2,388 such units, an average of 97.18,—showing the winds this spring to have been a very near average.

D. W.

NATICK, June 5, 1891.

[Specially Computed for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR JULY, 1891.

The earth is in aphelion—that is, it reaches its greatest distance from the sun—on July 3, at 10 P. M. Mercury, at the beginning of the month, is a morning star; it passes superior conjunction with the sun and is an evening star on the morning of July 7, and by the end of the month is well out toward eastern elongation, which it reaches about the middle of August. It is rather too far south of the sun to be easily seen. Venus is still a morning star, but it is getting nearer the sun, and by the end of the month rises only about an hour earlier. It is much fainter than it was in the spring, and it moves an earthward from the conjunction, but will not reach it until the middle of September. Mars is quite close to the sun throughout the month, too close to be seen, and passes conjunction, changing from an evening to a morning star, on the morning of July 30. Jupiter is in the constellation Pisces, and moves slowly eastward among the stars until July 8, when it stops and begins to move westward, but the whole motion is only about equal to the moon’s diameter. It rises at the beginning of the month at 11 P. M., and about two hours earlier at the end. The folowing eclipses of Jupiter’s satellites may be seen from some point or other in the United States. All the phenomena take place on the left of the planet, as seen in an inverting telescope. D. denotes disappearance; R., reappearance. Times are Eastern Standard.

I. July 4, 3h., 49m. A. M.
II. July 5, 10h., 17m. P. M.
III. July 7, 12h., 4m. A. M.
IV. July 10, 1h., 17m. P. M.
V. July 11, 11h., 39m. P. M.
VI. July 13, 12h., 12m. A. M.
VII. July 15, 12h., 14m. A. M.
VIII. July 10, 2h., 14m. A. M.
IX. July 12, 12h., 5m. A. M.
X. July 20, 2h., 4m. A. M.
XI. July 26, 12h., 15m. A. M.
XII. July 26, 4h., 5m. A. M.
XIII. July 26, 2h., 5m. A. M.
XIV. July 27, 4h., 4m. A. M.
XV. July 28, 10h., 39m. P. M.

Saturn is in the constellation Leo, and during the month moves eastward among the stars about 25°. It sets at about 11 P. M. on July 1, and at about 9 P. M. on July 31. During the month it is quite a conspicuous object in the southwestern sky in the evening. Uranius is in the constellation Virgo, and is in the southwestern sky, following Saturn a little less than three hours. Neptune is a morning star in the constellation Taurus.

The Constellations.—The positions given hold good for latitudes differing not many degrees from 40° north, and for 10° P. M. on July 1, 9 P. M. on July 16, and 8 P. M. on July 31. On the southern horizon, Capricornus is to the right of the pole star; Cappiola near the horizon, a little east of the meridian. The principal stars of Ursa Minor lie near the meridian, above the pole. Ursa Major is to the left, with the pointers at about the same altitude as the pole star. Booetes is just west of the zenith, and Leo is near the western horizon.

Venus follows Leo, low down in the southwest, and Libra lies between Virgo and Scorpius.

LAKE FOREST, Ill., June 3, 1891.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

T. D. N., Milwaukee.—What is the greatest distance to which the most powerful modern cannon can throw a shot?

Answer.—From nine to twelve miles, according to various conditions of powder, wind, etc.

SCHISHER, Vermont.—The laws governing the action of lightning are not well understood, owing to the imperfect experimental work in the laboratory, and the uncertain and uncontrollable nature of the natural discharges. Although currents of electricity are of the same type as those produced by batteries or dynamo machines, yet the same general principles do not apply to all manifestations of electrical energy. It is now well established fact that lightning-rods, properly applied, and with a good ground connection, do furnish a large measure of protection; and, although we have obtained little additional knowledge regarding them since Franklin’s day, there is no reason why we may not in the future arrive at a much better understanding of the nature and laws of lightning, and be able to protect buildings from its destructive effects with absolute certainty.

LITERARY NOTES.

An Elementary Handbook of Potable Water, by Floyd Davis, Ph. D., Silver Burdett & Co., 6 Hancock Avenue, Boston.

This book is the result of an able chemist and sanitarian, who writes from the standpoint of an experienced gain from the examination and study of nearly one thousand water supplies. The results are are extremely interesting, and extremely satisfying. They cover well the field of inquiry, and display a thorough knowledge of the subject in great breadth. In drinking-water that are oftentimes the cause of disease and death are discussed and the natural and artificial processes of removing them are considered. But all methods of analysis are avoided, except some of the elementary qualitative tests given in the appendix.


These tables are very full and complete, and are found to be of a systematic and logical development. It is determined in a very short time and with a few simple instruments which may be carried into the field of industrial or to the study of the habits of the mineral. It will be found extremely valuable to students, both as an aid for study at home and as an aid for dragoon collecting tours. The present third edition has been entirely rewritten and brought down to date.


These two elementary works are intended for beginners in scientific study without previous knowledge of the subjects treated of. They are most excellent in their way, and we can recommend their perusal to all desiring to obtain a knowledge of the principles and applications of natural philosophy. The endeavor has been made to give correct scientific information in plain language, so as to form a basis for successful work in the interesting and important branches of study here dealt with.

We have before made mention of The Fairfield of Flowers, (Educational Publishing Company, Boston), a more careful periodical examination of this elementary text-book of botany for children and others commencing the study of this fascinating branch of science, compels us to give it an additional word of commendation.

The Friel of Death is the fantastic title of the latest number of the Unknown Library, published by the Cassell Publishing Co., of New York, (50 cents), but it is a powerfully written story, showing considerable literary ability, and will be enjoyed by novel readers.

The Pantophobia is a new monthly periodical, published at St. Petersburg, Russia, by A. Kersha, which is intended to be a complete summary of contemporary periodical literature and periodicals. It will also contain critical articles on scientific publications and a review of the current periodical literature of the world, showing the contents of all the chief scientific magazines of the day devoted to the applied sciences and published in all the principal languages. The subscription price is 34 shillings, (about $6.00) per year, and Messrs. D. Appleton & Co., of New York, are the American agents and will receive subscriptions.

**The MYSTERIES of CONTAGION.**

A well-known lecturer has suggested as an improvement upon the present order of things, that he would erect a statue to "the disease," and while such an arrangement would undoubtedly be a very desirable one, the irrefutable logic of facts against its possibility. The whole matter of contagion and infection, however, is so mysterious and little understood that on theoretical considerations alone the communicability of health would seem to be as likely to be infected with a disease, as to be lost by a plague; in dry seasons their houses will stand in the very center of great plains of reeking ooze, in times of flood the muddy river will rise to their very verandas, and yet these people are robust and healthy. I have gone from there, and a few weeks later visited islands in the Solomon group, or New Hebrides, where I have found a dry coral soil and a health which is such that there is life and frequently a freshly mouth after month, steep land, too, from which the rain water is quickly borne downward to the sea, and all this but a few hundred miles from the Fiji group, and in the same latitude, and blown upon by the same trade wind, and yet in these places it is almost death for a white man to spend more than a few months in the year on such a place, practically no one who lives ashore at all can hope to escape frequent and severe attacks of fever. In fact, it is only by being thoroughly acclimated, through a long period of time, that he can hope to live there at all.

Individual resistance to contagion is none the less remarkable. A physician or nurse will be brought into the most intimate contact with a case of contagious disease without contracting it, but in spite of which, practically no one who lives ashore at all can hope to escape frequent and severe attacks of fever. In fact, it is only by being thoroughly acclimated, through a long period of time, that he can hope to live there at all.

Although there is much in regard to contagion that is mysterious and not well understood, the fact remains that a certain class of diseases are directly contagious; that is to say, that those who have an external source. We have known of two children residing on a lonely farm to be taken with scarlet fever, although they had not left the neighborhood for weeks. In a family which had spent several weeks at a summer resort, one only was attacked with typhoid fever on returning home, and yet all the members must have been equally exposed to the defective drainage or contaminated water supply, if any such existed.

Thousand of persons are today drinking impure water, living in an atmosphere saturated with sewer gas, and exposed to every unhygienic influence, and yet what a small proportion will ever contract one of the so-called "five diseases."

No view is more generally accepted than that low, wet, swampy districts are unhealthy; yet Stanley, in his work on "The Congo," tells us that the station of Vivi, built on a high, well-trained bluff, overlooking the river, and especially selected for its salubrious position, was one of the most unhealthy places in the whole valley, while at Equator station, only a few feet above the river, and surrounded by swamps filled with water, was an undisturbed spot lying under the rays of the tropical sun, the men there being strong and hearty and in much better condition, than at stations presumably much better adapted for a white man’s residence.

Mr. Walter Coote, who travelled extensively in the South Sea Islands, gives the following similar evidence:

"I have seen Englishmen living in Fiji, on the borders of almost stagnant estuaries, with the densest and most rank vegetation around them on all sides, with mosquitoes and a hundred such; they have had no experience of a plague; in dry seasons their houses will stand in the very center of great plains of reeking ooze, in times of flood the muddy river will rise to their very verandas, and yet these people are robust and healthy. I have gone from there, and a few weeks later visited islands in the Solomon group, or New Hebrides, where I have found a dry coral soil and a health which is such that there is life and frequently a freshly mouth after month, steep land, too, from which the rain water is quickly borne downward to the sea, and all this but a few hundred miles from the Fiji group, and in the same latitude, and blown upon by the same trade wind, and yet in these places it is almost death for a white man to spend more than a few months in the year on such a place, practically no one who lives ashore at all can hope to escape frequent and severe attacks of fever. In fact, it is only by being thoroughly acclimated, through a long period of time, that he can hope to live there at all."

The TEETH in RELATION to HEALTH.*

By W. Rushton, L. D. S.

First of all, let us inquire what the teeth are. They consist in the human adult of thirty-two masses of ivory-like substance, differing in size, shape, and, inserted in the bone of the upper and lower jaws (sixteen teeth in each jaw) in the form of elliptical arches. The upper arch is normally larger than the lower, the latter being inside the former when the mouth is closed, especially the incisors. The lower grinding teeth do not close against the corresponding teeth in the upper jaw, but the tooth that is left behind in the depression between two upper teeth, and an upper tooth fits in between the cusps of the two lower teeth, so that when the teeth are closed the cusps are interlocked, and every tooth antagonizes more or less two teeth of the opposite jaw. The importance of bearing this fact in view will be seen later on. The bulk of the individual tooth is composed of a dense ivory-like substance, while the pinnule, the softer part of the tooth, is composed of a tooth lay by a substance almost identical with hard bone, cemented, and covered on the crown by a coating of enamel. Enamel is the hardest tissue in the body, only containing from three to one per cent. of animal matter, being chiefly composed of carbonate and phosphate of calcium and magnesium, and fluoride of calcium. It is hard enough to strike a spark from steel like a flint.

It would take too long to describe the formation of the teeth, but it may interest you to know that the enamel is derived in the first place from the epithelium, or scarfskin, and is, in fact, modified skin, while the dentine, of which the bulk of the tooth is composed, is derived from the mucous layer below the epithelium. Lime salts are slowly deposited, and the tooth pulp, or "nerve," is the last remains of what was once a pulpy mass of the shape of the future tooth, and even the tooth pulp in old people sometimes gets quite obliterated by calcareous deposits. Of course, as you all know, the thirty-two permanent teeth are preceded by twenty temporary, deciduous, or milk teeth. These are all fully erupted at about two to two and a half years old, and at about six years of age a wonderful process of absorption sets in by which the roots of the temporary teeth are removed to make room for the advancing permanent ones. The crowns of the former, having no support, become loose and fall away. One would naturally suppose that the advancing permanent tooth was a powerful factor in the absorption of its temporary predecessor, but we have many cases on record where the dental arch has been closed, and indeed, the interesting phenomena of the eruption and succession of teeth are very little understood. I may remark in passing that a child of six who has not yet lost any temporary teeth, has in its jaws, either erupted or non-erupted, no less than fifty-two teeth more or less formed; and the compact and convenient way in which they remain in the jaw ready to come down and take their place in their turn, is very beautiful.

The two great uses of teeth are, briefly, mastication and articulation. For the former, the grinding back teeth (molars and bicusps) are used; for the latter, the incisivte teeth (incisors and canines) are called into requisition; and these, of course, are also used for biting or tearing. In carnivorous animals all the teeth are of an incisive or cutting form, while those of herbivorous or granivorous animals are broad and flat; in carnivora the lower teeth close inside the upper ones, and so divide the flesh on which the animal feeds like a pair of scissors. In herbivora, on the other hand, the teeth all the way round close on those of the opposite jaw like a sharp-edged mill, or, as is the case of horses, the grinding surface, cutting teeth not being required. In man, we have a combination of both kinds of teeth, which leads us to believe (whatever the vegetarians may say) that man is intended to be an omnivorous animal.

*Head before the Chemists’ Assistance Association of London.
I need not tell you how fearfully prevalent decay of the teeth or dental caries is. I have no doubt that most of you have experienced its unpleasant effects in some form or other, and the question naturally arises, "What is it?" We have seen what an extremely hard and seemingly indestructible substance enamel is, but at the present day there is no tissue of the body which so soon fails a prey to disease. Why is this? I will give you the answer in the words of the eminent medical writer, Sir Charles Bell: "Our teeth consist of three parts: (1) the enamel, the hardest substance which we have; (2) the dentine, which is softer than the bone, but has great firmness and firm development of the jaws. Bret Harte in one of his poems asks, 'Is civilization a failure?' and I think we must admit that as regards teeth it is; the jaws now-a-days being smaller than those of our ancestors, and the teeth not worn away with use, but by disease, and more or less overcrowded and irregular in shape. This is a further proof of this, (3) the gum, or ginglymus. These are, briefly, as follows: viz.: The food we eat. The food now-a-days, by the time it comes to the table, is so well cooked that it is half eaten for us, and it is a well-known law of nature that when any member is not required to exert itself, it dwindles in proportion to its inactivity; that is one reason why our jaws are smaller. Another reason is this: In the case of many of our wives, most of us would, I think, prefer a hard diet, which is a refined cast of features rather than one who was heavy-jawed and thus coarse looking; her peculiarities in this respect would be more or less transmitted to her offspring, and this again is no doubt another factor in producing smaller jaws. But the jaws being composed of softer tissue than that of the teeth, we can contain more of this tissue in the same space and therefore we have jaws getting smaller and teeth remaining more the same size, the consequence being overcrowding, which is a very active agent in producing caries. Add to these our artificial mode of life, improper food containing far too little bone and teeth-forming elements, excitement and worry of our modern life, and last, but not least, dyspepsia, and you have, I think, sufficient explanation of the cause of tooth deterioration.

But the results of caries are, toothache in its many forms, whether from irritation of the dentine, irritation or inflammation of the tooth pulp and of the membrane surrounding the tooth in its socket (which if unchecked lead to abscess at the root of the tooth, with temporary or permanent disfiguration), neuralgia (often at parts of the face and head remote from the offending tooth), neuralgia in the tongue (either from decay or extraction), feild bath, restless nights.

I think I am right in saying that two of the most common diseases of the present day are neuralgia and indigestion, and although specialists are inclined to think that every malady is closely connected with the disease of which they make a specialty, yet I think you will agree with me that there is a very large proportion of the two diseases named above from tooth trouble. To put it roughly I might say, neuralgia when the teeth are in, indigestion when they are out. It is pointed out in a very interesting and able paper, by Dr. MacNaughton Jones, upon "Dental Reflexes," how neuralgia and lesions of the eye, ear, and other parts of the head and face are directly attributable to carious teeth, and how in many cases relief and cure have been obtained in this way. Although, of course, sometimes the mischief is too firmly rooted to be permanently dislodged.

There is far too much apathy shown by the British public about the loss of their teeth, in fact, about the care of their teeth altogether. We must not look upon a tooth as an isolated member; it must be looked upon as part of a beautiful and symmetrical organization, from which one member cannot be taken without affecting the others; so that when we sit down and have a tooth out and put ourselves on the back for being very plucky, not one out of a thousand reflect that in having that troublesome grinder out he has deprived himself also of the use of its antagonists; and very often, as time goes on, the contiguous teeth to the one extracted till over, and instead of having a good grinding surface, we have a bad one or none at all; and again, when a tooth has lost its antagonist, the tendency is for it slowly to elongate, loosen, and come out. Then when the back teeth are lost, food is improperly masticated by nibbling it, like a rabbit, with the front teeth, which were never made to bear the brunt, and which consequently are pushed outwards, or the food is bolted, and indigestion is the natural result. The sufferer often endeavors to cure the disease without remedying the cause, and, of course, fails. All the pepin and bismuth in the world will not make up the loss of masticating teeth.

The remedies for the state of things which I have briefly touched upon are: (1) strict personal and family hygiene; (2) a wise and important time; (2) conservative treatment of the teeth, that is to say, having them preserved by the process of stopping, or filling, which consists in removing all the decayed portions of a tooth and filling the cavity so made with some suitable filling. This process of filling teeth is, when efficiently performed, the most successful operation the dental surgeon has to his credit. If the tooth be sound, the decayed portion is carefully scraped and the sound part, if possible, is left in situ, and the cavity is lined with a material which will attract the vitality and grow as firmly as the original bone; such materials are, however, not always conveniently obtained, as the teeth are sometimes situated in inaccessible places. There is no doubt that the best results are obtained when the tooth is divided into two or more parts, and each division is filled separately. If the tooth be decayed to the extent of having the root broken, a silver or gold plate is made, which is fastened to the tooth by a shank of wire. The tooth is thus strengthened, and the plate is also masticatory material, and therefore helps to keep the mouth free from decay. The only danger attending these operations is an accident to the nerves of the tooth, and this may occur in any part of the tooth. The tooth may be permanently disabled in consequence of this operation, but the other teeth may be saved. The loss of teeth among the children of the poorer classes and also among the men in the army, navy, and civil service is very great. It is a common sight in the wards of the Evelina Hospital for children in Southwark, where in a very thorough insight into the condition of the mouths of the children of the poor; that condition I can only describe as shocking. Their troubles, of course, commence with teething; their temporary teeth soon decay and are extracted, and the permanent ones very soon follow suit; no attention is paid to them by parents, and, of course, the teeth quickly take revenge. For private individuals and institutions to cope with this sort of thing we should want dozens of dental charities where we at present have one. In London there are two purely dental hospitals, and each of the general hospitals and dispensaries have their dental departments, which are more or less complete, but they can do at a very small proportion of the stopping which is actually required. It should take too long. So the condition of things is, firstly, that the patients, as a rule, are those who visit the hospitals not being able to stand their toothache any longer, and have their teeth extracted; and, secondly, that teeth which could be saved with care, time, and attention are often sacrificed from sheer want of time on the part of the dentist; and, thirdly, that the patient, in the army and navy, again, and the post-office, though the possession of sound teeth is one of the requirements for admission into these services, the State takes no pains to see that the youths who seek to enter upon these careers have had their teeth previously attended to, and consequently many otherwise likely lads are debarred. Again, after they have been admitted into these services there are no dentists attached to the services, and the doctors are otherwise engaged, or if their services are requisitioned it is for the old purpose, extraction. I maintain that the State should provide highly trained dentists to look after the children of our board schools, and also dentists attached to our naval and military forces. We admit that the soundness of the teeth is necessary for admission, and after spending large sums on our soldiers and sailors to make them good fighting machines we grudge them the attention to a disease which at present day causes more direct and indirect suffering than any other in our country, and a man who cannot feed well cannot march well or fight well.

Gentlemen, I thank you for listening so attentively to a paper which, owing to many circumstances, is crude and somewhat disjointed, but I have briefly endeavored to show you the relation between the individual and his teeth, how bad health and neglect produce bad teeth, and how bad teeth produce or aggravate bad health. I have also tried to point out the remedy, and trust you will do all in your power to educate and influence others in the care of these important organs which seem to be disappearing so rapidly.

[Spedally Compiled for Popular Science News.]

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARKE, M.D.

EPIDEMIC INFLUENZA AND INSANITY.—Taking the cases of the Danvers Hospital and those reported from other hospitals, Dr. Harrington finds forty-eight cases in which an attack of the influenza was followed immediately or in a short time by the development of a psychosis. In thirty-one cases the influenza acted as an exciting cause to insanity, predisposing and other exciting causes being clearly made out. In seventeen cases the
influenza was the only assignable cause of insan-ity. He inclines to the belief that if the anteced-ents of these seventeen cases could be thoroughly analyzed, this number seventeen, in whom no pre-disposing cause was found, would be dismis-sed, and that we might approach nearer to a conclusion made by Krappe, namely, that the influenza alone is not sufficient to occasion the de-velopment of a psychosis.

Of the total forty-eight cases, sixteen recovered. Considering that in hospitals the average number of recoveries in new cases is only from fifteen per cent. to twenty per cent., the recovery of thirty-three per cent. of these cases is worthy of remark.

Cases of insanity excited by the influenza have shown a tendency to prompt recovery or improvement than is usual in recent cases. In most instances the improvement has been coincid-ent with the abatement of the acute bodily symptoms and the return to physical strength and health.

Finally, out of these forty-eight cases, it is quite easy to recognize three main groups, namely:
1. Cases of simple depression and hypochondria. Many such instances were not observed by those in general practice during the epidemic, but in which the mental disturbance did not proceed far enough to demand hospital treatment.
2. Cases in which the emotional disturbance was carried further than in the first group, result-ing in acute forms of mania and melancholia.
3. A considerable proportion of cases which developed on the basis of bodily exhaustion and depression of the nervous forces, namely: the cases of delirious mania, febrile delirium, and especially those of acute confusional insanity, which appears to be the type towards which the symptoms in many cases have inclined.

—Boston Medical and Surgical Journal.

BLINDNESS OF MANY YEARS CURED BY TRE-WHING THE OCCIPIT.—At a late meeting of the St. Louis Medical Society, Dr. T. F. Prewitt re-port ed a case of prompt recovery of sight in one eye after nine years of complete blindness as the result of a simple retrograde thrombosis of the internal carotid artery. When seven to eight years old the patient re-ceived a severe blow on the back of the head. When fourteen years old the left eye became totally blind, which was nine years before the operation. Severe brain symptoms slowly developed and grew constantly worse till a few weeks ago, when the young lady was forced to seek relief from the intense and constant suffering. The examination revealed a large, tender cicatrix in the median line over the upper margin of the occipital bone. Pressure upon the spot caused intense headache to follow. Depression of the bone could not be positively diagnosed. As stated, the left eye had been blind for nine years; more recently the vision of the other eye was seriously impaired by a rash. The appearance of the ocular adnexae in each eye was stated to be nor-mal—an important fact in making a prognosis. Dr. Prewitt concluded that the only thing to do was to trephine the skull at the point of injury. He removed a large section of bone, which was found to be much thinned but not perceptibly depressed. The dura mater was also somewhat thinned. When a flap of the membrane was raised, the substance of the brain seemed to be healthy. The wound was closed and dressed in the usual way. A few hours after the operation the patient discovered that she could see perfectly with her left (blind) eye, and the vision continued good up to the time the report was made.—St. Louis Medical Journal.
Transmissibility of Influenza.—In opposition to the theory that Influenza is a disease not dependent upon personal contact of individuals for its propagation, it is not evolved by the intranasal operations of a specific poison and propagated through and by means of the ordinary channels of human intercourse, may be mentioned that during the late epidemic observers have found that the course of Influenza was independent of, and quite opposed to, the prevailing winds. It travelled slowly in Siberia and Russia, but rapidly as soon as it reached the network of railways in Central and Western Europe. Its course was changed by the mountain ranges of Scandinavia, and it invaded Norway, not from Sweden, but from Holland and England. Again, it was deflected by the Carpathians, turning its course in the channels of travel down the valley of the Danube, and ultimately following, in direction and time, the ocean routes to Africa, India, Australia, and this country. In India it has shown the same peculiarities in following the railway lines as has been observed with.—


[Medical Record.]

Cure by Miracle.

The age of miracles was popularly supposed to have terminated some few centuries ago, but such is not the case, at least so far as St. Louis is concerned. The following is a brief report of one of the latest and best from that city: "For five years Sister Mary Philomena had suffered from an abscess that threatened permanent injury to the brain. Through the medium of the Rosary, Sister Baptista visited the sick man, and offered up a Novena in private prayer. She also gave him a rolice. In a paroxysm of pain, Wednesday night, Sister Philomena swallowed the rolice. When she awoke she felt a strange prickling above her eye. Lifting her hand to the spot, she felt a needle, which she grasped and pulled out, and, transfixed on its point, was the rolice that the sister swallowed. The truth of the marvellous miracle," the account goes on to say, "is vouched for by Dr. Alt and the Mother Superior." We confess ourselves glad that the transfixted rolice part of the story has been vouched for, else 'twere hard to credit. Should this fall under the eye of Dr. Alt, we sincerely hope he will send further details of the rolice's progress from the stomach to the eye. This might have effects upon the orbit and its progress through the orbit is not so wonderful, since we are told that it is easier for a needle to pass through the eye than it is for a rich man; the probable interpretation of this being, that if a lady gets a rich man in her eye it is harder for him to escape than it would be for a needle similarly situated. Dr. Oliver W. Holmes's hypothesis of the total depravity of inanimate objects can alone account for the perversity of the needle in remaining in the lady's eye until it was furnished with a rolice to transfix it. Many instances have been placed on record of particles of glass passing through the eye, but investigation has almost always brought out the history of a man with an eye-glass, or a man with a glass eye, as party of the first part, and a man with a flat, and possessing a knowledge of its use, as party of the second. Miracles are always interesting, and if Dr. Alt knows of other instances equal to the one related, it is to be hoped he will not withhold them.

Medical Miscellany.

Smell of Iodoform.—It is stated that the smell of iodoform may be quickly removed from the hands by washing once or twice with flaxseed meal in water.

Medical Hints.—It is proposed by certain German physicians that medical coaches, or rather the coachmen of medical men, be distinguished by wearing white hats.

A Chemist's Rez.—A man named Harry Jarvis was charged at Birmingham with attempting suicide. He appears to have gone home in a very excited state, said some prayers, and then, having swallowed the contents of a packet labelled poison, sealed himself to wait results. His wife sent for the police, who took the would-be suicide to a neighboring chemist's for an eclectic, and then it turned out that the man had obtained the supposed poison from this chemist, who, noting that the fellow looked peculiar, gave him a harmless packet of chalk.

Milton's Homeopathy.—A correspondent of the Scientific American points out the curious fact that the poetical mind of John Milton anticipated the theory of Hahnemann, as is evinced by the following extract from his preface to "Sawson Agonistes." He remarks that tragedy has power, by raising pity or fear or terror, to purge the mind of these and such like passions; that is, to temper and reduce them to just measure with a kind of delight, stirred up by seeing those passions well imitated. Norse nature wanting in her own effects to make good this assertion; for so in physicks, melancolichus and quality are used against melancholy, sour against sour, salt to remove salt humors.

Unique Treatment.—Dr. Tyrus, says the Boston Medical and Surgical Journal, a unique and successful treatment for hysterical vomiting. A young girl, fourteen years of age, insisted that she vomited everything she swallowed, even water. Her statements were found to be true. She had every manner of treatment employed, but to no purpose. She was blistered, and received strong currents of electricity to no effect, and was finally discharged. She returned a few days afterwards, claiming to be as bad as ever. The resident physician, knowing that all else had been tried, told her emphatically that whatever she vomited she must immediately swallow. To the surprise of all, her vomiting ceased, and since the order was given has had no further trouble.

Dispensing on Board Ship.—It is related that a lieutenant in command of one of Her Majesty's ships was ever mindful of the responsibility of the charge of a medicinal chest too much for him. Immediately she was off sounding the gallant officer mustered all hands, and divided the contents of the chest equally, so that each had "his whack and ma nair." There is another naval yarn in this connection well worth mentioning. A man-of-war doctor, whose name is unfortunately lost to history, had a simple method of locating a man's ailments, and it saved the puck by drastic and inofflable remedies. He would tie a piece of tape around the waist of the complaining mariner, and command him to declare whether his paill existed above or below the tape. If above, an emetic, and if below, a dose of salts, followed as a matter of course.

The Popular Science News

AND

Boston Journal of Chemistry.

A MONTHLY JOURNAL DEVOTED TO THE POPULAR PRESENTATION OF ALL THE BRANCHES OF PHYSICAL AND NATURAL SCIENCE, AND THE RESULTS OF THE LATEST DISCOVERIES AND INVESTIGATIONS.

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Familiar Science.

[Original in Popular Science News.]

THE OFFICE OF THE GREEN PLANT.

BY J. HOBERT EGERT, M.D., PH. D.

Plants may be divided into two general classes, to wit: those possessing chlorophyll (green plants) and those devoid of chlorophyll (fungi, bacteria, etc.); and these two classes are separate and distinct, being characterized by certain interesting and important phenomena of life and life-work. To the latter class we shall make but a passing reference; still they doubtless deserve an important place in natural life.

Animals, including man, are either directly or indirectly dependent upon the vegetable kingdom for sustenance; and, in turn, plants are primarily dependent upon the inorganic world. Many plants, however, need organic material for food; it being only those plants which possess the green coloring matter known as chlorophyll that are able to thrive upon inorganic compounds. The essential features of life are the same in all living things, i.e., in the members of both the animal and vegetable kingdoms. Thus plants have organs for sustaining life in common with animals. They take in food and digest and absorb nutrient matter; they respire air, breathing in oxygen and exhaling carbonic acid gas; and as a result of this life a capacity for doing work is developed, a large portion of which is stored up in the plant as latent or potential energy. Manifest energy is, however, also produced. Heat is a manifestation of energy in plants as well as in animals, and is easily demonstrated by adjusting a thermometer in some spraying peas, which, when properly arranged, will indicate the amount of heat given off. Motion as a manifestation of energy in plants is exhibited by the zonites and many of the Cryptogams exhibit ciliary or amoeboid movements resembling those seen in animalcules; and even among the higher orders of plants quite a few exhibit such inherent power of movement, either at regular times or on the application of external irritation, as might lead one to regard them as sentient beings. Dionaea muscipula (Vegetable fly-trap) and Monox caesalica (sensitive plant) may be mentioned as examples of this class.

Animals require organic compounds for food, and so do all those plants which do not show a green color; but here we find a well-marked line of distinction between plants and animals. Animals require food containing compounds which are as complex as the organic proximate principle of their own bodies, while this is not essentially so with plants. Thus animals must be supplied with proteids, while plants can make their own—since even those plants which have no chlorophyll can extract the nitrogen and sulphur from simpler organic material and build up protides for themselves. The green plant, however, has a greater work to perform, transforming inert, stable compounds into complex food stuffs exceedingly rich in potential energy. How is this accomplished? If a cell of a green plant be examined under the microscope it will be seen to have somewhat the following arrangement: In the first place there is the cell-wall, composed of cellulose, which surrounds the cell and connects it with neighboring cells; within the cell is an apparently homogeneous mass, known as protoplasm,—the vital principle of the cell, and somewhere in the protoplasm may be detected a nucleus, while scattered here and there throughout the cell contents the chlorophyll bodies appear as green spots. Upon close inspection small whitish specks are to be observed imbedded within the chlorophyll; these are starch granules, for it is into starch that the inorganic compounds are first changed. The reaction may be simply expressed thus:

\[ 6 CO_2 + 6 H_2O = C_6H_{12}O_6 + 6 O_2 \]

By this equation it is shown that two stable compounds, having their molecules completely satisfied with oxygen, are broken up and combined to form an energetic organic compound, while combined oxygen is liberated. Thus oxygen is given off in a free state by plants, and may be collected and shown to be such by the regular tests. Thus energy is developed. But whence does it come? Energy, like matter, is neither created nor destroyed, although it may be transformed and transferred; hence the plant must take it in from without, obtaining it from some other form of energy. This potential energy is supplied to the plants by the light of the sun, whose actinic rays they absorb. The chlorophyll and the protoplasm are the machines by which this mighty work is wrought, and the media through which plants absorb the kinetic energy of sunlight and transform it into potential energy, which is accumulated during the growth of the plant in its tissues and in the food stuffs produced by it during its growth.

Green plants, by virtue of their chlorophyll and the light of the sun, absorb from the air, and soil, carbonic acid gas, water, ammonia, and free nitrogen, and convert them into organic compounds rich in potential energy and suitable for the nourishment of all animals. At the same time the matter and the capacity of energy in the atmosphere, it restores to it free oxygen, and the necessary constituents of the air are balanced. If this were not the case, all available free oxygen would soon be consumed, and all life would become extinct. While oxygen is liberated by plants, it should be remembered that they all inhale oxygen and exhale carbonic acid gas in common with all living things; but the amount of oxygen inspired in the respiration of the plant is exceedingly small compared to the amount of carbonic acid gas taken in as food by the plant, and the amount of carbonic acid gas given off in expiration is insignificant compared with the amount of free oxygen liberated.

Sunlight, as before stated, is essential to the reproduction and action of chlorophyll, and consequently to the vitality of the green plant. Chlorophyll is only formed under the influence of light. If a seed be planted in a dark cellar it will sprout in virtue of a certain amount of food matter stored up within it by the parent plant; but as soon as this food is consumed it has no power to create more food, and consequently loses its green color, becomes stationary in growth, and finally dies. A similar degeneration occurs in a developed green plant if placed under similar circumstances.

Green plants, then, by the action of the sunlight upon the chlorophyll, transform simple stable combinations into complex compounds, whereby solar energy is transformed into chemically potential energy and stored up in vegetable tissues. Animals by oxidation decompose, or break up, the complex compounds manufactured by plants, transforming potential into kinetic or manifest energy. Thus there is a constant circulation of energy between plants and animals. The energy of animals is derived from plants, and all the energy of phantasms arises from the sun. Hence the sun is the cause and original source of all energy in natural
life. We are dependent upon the sun for actual existence, and, with the plant, receive our food, our light, our warmth, and even our fuel from its benign rays; and the green plant is the oft-forgotten medium through which we receive both food and fuel.

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**ANIMAL PIRATES.**

**BY MRS. M. J. GORTON.**

In the animal creation are exhibited so many traits that are characteristic of the human species that we might regard this or that phenomenon as an example of human nature; and in no one trait is the parallelism more drawn with greater fidelity in the faithfulness of the likeness between certain animals and man than in the art of swindling. There are on record plans of the greatest ingenuity, invented by him whose energies are conserved against the rightful belongings of another; and, according to Sir John Lubbock, animals recognize the basic right to property—each member of a community to the produce of his own labor; and therefore robbers are robbers, whether animal or human beings. Of the vast and often successful frauds perpetrated, there is a constant surprise at the accurate psychological insight and ability developed by the operator in the transaction, as also never-ending wonder at the simple credulity or helplessness of the victim. This is seen among the sand wasps, which often play upon the unwary, and which often becomes swallowed up in delusive contempt for the injured party; and the cheeky marauder wins the prize from the luckless victim of his arts, and also wins applause for his sagacity in securing booty.

The pullet in the yard-pan secures a prize unskilled, a nice fat worm or a bean-headed grasshopper—and the whole flock will take after her with outstretched wings, covetously and jealously prompting to the most arduous efforts, when, with a premonitory "whirr! whirr!" sharply intoned and long drawn out, the Turk of this surfer of fluttering females announces grave danger from some lurking foe. The hens one and all hesitate, pause, and hurry to the side of the flock, and will be taken a few slow steps, drops his military role, becomes the robber and glutton he really is, and helps innocence devour her tidbit, taking care to secure the choicest morsels for himself.

On the plains and along the broad bottoms of the Missouri River are the colonies—often a community of many members, with villages of wide extent—of the American marmots, or prairie dogs. Merry, cheery, chitter little fellows, these gregarious villagers sit on the mound above or beside the open door that leads to their comfortable subterranean dwellings, and hold converse in short, not unmusical barks, each greeting his neighbor and rejoicing in the sunshine. But into the sanctity of the home which he and his have constructed with much labor, the burrowing owl comes, uninvited, and becomes a tenant with a life lease, without so much as by your leave; and one of the most atrocious results of this swindling arrangement is that the dog (a strict vegetarian) finds that the owl, whose young shares the nest with the infant marmots, feeds upon them, and tears its young upon the bodies of the children of its victimized landlord. Another and much more vicious tenant is the prairie rattlesnake; but his visits are few and far between, and when he does come it is in the character, quite often, of a vengeur, as it has been demonstrated beyond a doubt that owl pie is one of his favorite dishes, which seems just, for his more ravenous appetite requires several to satisfy, especially if young and juicy. The dogs are also at the mercy of this rapacious pirate.

One of the most notable instances of "beggar-my-neighbor" is the cuckoo, which lives, is bred and nurtured by the labor of other birds; and this Socrates of the skies, the cuckoos and eggs are systematically robbed of the fruits of their labors by the long-beaked pirates ever on the alert to rob. There seems very little excuse for these shameless swindlers, as the bald eagle and the white-headed eagle—each the worst in this particular of its kind—are well fitted by nature to provide themselves with their own fish, and who are able to hunt with the skill of the one whom wrote in his note-book: "Some men have plenty of brains and no brass; and some men have plenty of brass and no brains. It follows that the men with plenty of brass and no brains were made for men with plenty of brains and no brass." However, the altruistic instincts of the race in the shape of law did not accord with this philosophy of natural law, and the swindler has been made to suffer prolonged imprisonment in consequence.

That animals have no method of redress does not fill our ideas of abstract justice, and "survival of the fittest" seems a cruel code. One day a long furry caterpillar was lying on the window-sill, and, as he seemed out of place, he was an extra specimen. The next day, he had disappeared, and the window-sill was covered with a layer of dead leaves. On the third day, this insect was discovered in nearly the same position. To secure his banishment he was carried to the door and tossed out—all in vain, for soon there were two where before had been only one. Curious to see whence they came, a few minutes spent in watching discovered the ground-wasp, or mud-dauber, who came and deposited a pap towards the end of the window. Having placed four in position, his mate came and arranged the bodies to suit her fancy in one corner of the window-seat. She deposited in each one an egg, and then the pair brought the mud and did a beautiful piece of masonry, sealing up the living bodies hermetically—for the wasps do not kill their prey, but paralyze it, so that their young will have fresh food. Ruthless robbers! Haunted only with the thought of their next meal.

A curious experiment may be made with a garden spider by going to one of their beautiful geometrically shaped webs and twanging a fork,—a silver dining-fork will vibrate sufficiently if held lightly and struck against some metallic substance,—and touching the web at one of the radiating lines at the outer edge of the circle. The spider, if in the center of the web, turns rapidly to the right, then to the left, that he may be able to determine where the agitation is. The vibrating thread shows where the prey is, and, feeling carefully, that there may be no mistake, he darts down the tremulous cable, seizes upon the fork, runs upon the lines, and tries to entrap the buzzing thing to entrap it for his own uses. Dip the fork in the center of the web, turns rapidly to the right, and when is setted and intent upon the sweets, strike the fork gently and touch the leaf or the vibrating cable of the web. The spider, as soon as he can locate the prey, darts down, and specifically becomes aware of theummy substance between him and his prey. Ascending the outer circle of the web, he hastily spins a procelain net, or a tiny shuttle, into which he darts down on the hitherwise side of his unsuspecting victim and quickly pounces upon him; and the old drama of the spider, the fly re-enacted for his sole benefit and enjoyment.

There is another view of this interesting topic: there are many insects, birds, and beasts that preserve their being by simulating what they are not, that they may remain undistinguishable and escape the pit-falls that may lie in wait for them; also to catch the unobservant and destroy them. Among these are the spectre insect, the "walking-stick insect," the "praying insect" (Men- "tis religiosa), which is so constructed, with its fore legs stiff and thrust into the air to resemble a withered twig, that it may escape foes from this very resemblance, also it may catch any unwary insect that ventures near for its own sustenance, thus simulating an attitude of patient endurance quite like those scavengers of the vegetable kingdom; and that is probably done with the same faith and patient endurance, but are really burglars and robbers. The sphinx caterpillar also simulates what it is not, and escapes its enemies by putting on a false appearance, and also attracts its food in a like manner.

Sir John Lubbock, in calling attention to the varied markings of the many varieties of caterpillars of India, says: "The tiger, the cobra, the elephant, the marmot, the mason, the antiope, the argus, the marmoset, the argyris, the anguis, the argyris gangis, the argyris beta, the argyris lathonia, the argyris eristalis, the argyris factor, the argyris leucophaea, the argyris l. trifolii, the argyris coeloma, the argyris l. norilis, the argyris guttata, the argyris cerambyx, and many others,—says that there is 'not a hair or a line, not a spot or a color, for which there is not reason, and which has not a purpose and a meaning in the economy of nature.' And in much of the explanation of these colors, spots, hairs, and lines there is ever the fact that the animal is playing a ruse, either to attract prey or to escape enemies; and often every act of its life seems to be to take in some luckless one, who is thus lured to destruction, or at least robbed of its rightfully acquired propertys.

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**WOORALI POISON.**

**BY S. L. CLAYES.**

Woorali is a vegetable poison which causes death very quickly it is injected into the blood or applied to an open cut or wound; but, though speedily, it is gentle in its action, and its victim dies painlessly. It is this plant which is used by a number of the tribes of South American Indians as the principal ingredient in the preparation of their famous envenomed arrows. For a long while it had proved impossible to wrest the secret of their poison from the tribes, but early in the present century it was confided by them, first to Sir Robert Schomburgk, and soon after to the celebrated English traveller, Waterton.

The woorali is a plant with a climbing stem covered with prettily shaped ovate leaves, and has a round fruit, which would not be unattractive to the eye were it not that the whole plant—stem, leaves, and fruit—is covered with a thick coating of long, stiff, reddish hairs, which stand out in a defiant way from its every part, and look like poison. It is this plant which is said to be comparatively harmless when taken into the stomach, and has even been made use of by medical men in the treatment of certain diseases, such as lock-jaw and hydrophobia.

Some days before the Indian wishes to prepare his arrows, he goes into the forest in quest of the materials for his decoction. First he seeks for the "poison plant," or "Matona cainea, M. artemis, M. mithaca, M. selene. M. dio, M. enophora, Argyris aglaia, Va- nena polychloros, V. fo, V. antiope, Cynthia corni, Argyris lathonia, Erigeron harrariensis, Odontonotus foliaria, Lasicoccus rubi, L. trifoli, L. roeboris, Gastropacha, Cheirocarpus, and many others,—says that there is 'not a hair or a line, not a spot or a color, for which there is not reason, and which has not a purpose and a meaning in the economy of nature.' And in much of the explanation of these colors, spots, hairs, and lines there is ever the fact that the animal is playing a ruse, either to attract prey or to escape enemies; and often every act of its life seems to be to take in some luckless one, who is thus lured to destruction, or at least robbed of its rightfully acquired property.
until he finds two sorts of bulbous plants. They yield glutinous juice of a greenish hue. He cuts a number of small holes, deep enough to keep the roots serenely separated from the bundle he has already made, he deposits in a vessel that he carries for this purpose slung between his shoulders. Now, having collected all the vegetable matter that he judges necessary for the poison bath, he proceeds to glean the rest of its ingredients from the animal kingdom. To this end he first sets out upon a hunt for the peculiar kind of grass that will take two kinds to serve his needs. One is large, bick, ferocious, and so venomous, withal, that its bite will cause a fever. He usually finds these grass in the ground, from which he digs them out, for luckily the creatures have a habit of modestly hiding themselves the greater part of the time. The other ant that he selects is a thin red variety, which makes its nest under some leaf, and tangles like a nettle. When he has secured as many of these as he wants, his work in the forest is done, and he can turn homeward again,—for the strong Indian pepper, of which a quantity is used, grows about his hut, and the snake fangs that are to be pounded and added to the mixture he usually has on hand.

Those of both the hiarrri and cunoucouchi snakes are always considered indispensable, and so he is provided in supply with them to keep in store whenever opportunity offers.

The ingredients being all at hand, he now enters upon the work of preparing and mixing. He again gives his first attention to the woollu vine and bitter root, scraping them into the finest and thinnest of ribbons and threads. When that is done he puts them into a sort of draughting dish which he has wound with several thicknesses of leaves spread over an earthen jar, and pours water upon the mass. The liquor, as it slowly trickles through into the jar, looks like coffee. The bulbous stems he first bruises and crushes, then with his hands squeezes out their juice and adds it in due proportion to the coffee-colored liquid in the jar. He grinds the pepper to a powder; he pulverizes the snake fangs; he bruises the bodies of the ants until the resulting mass is as smooth as he can make it, and then stirs the whole into the jar, which he now puts over a slow fire, where it steeps for a while and finally comes to a boil. As the boiling begins, a scum rises, which he deftly takes off, using a leaf for a skimmer; and from time to time he adds a little more liquid from the unacarated woollu mixture, as it seems to him to be needed. After boiling for a while, another thick scum of a dark brown color gradually begins to gather. This is by no means to be removed, for it is a sign that the cooking is nearly done. When nothing but this scum remains in the jar the poison is supposed to be completed. Some arrows are dipped in to try its strength, which proving satisfactory, the Indian pours the poison, noted from a small jar or calabash. First he gives his jar a cover of leaves, and then adds a bit of deer skin, which he ties tightly over the opening. He finally hangs it up in what he considers to be the very driest place to be found in the hut, and even from thence he takes it down often to suspend it for a while over the fire, that it may be insured from contracting a degree of humidity.

As I said at the beginning of my sketch, the death produced by the action of woollu is both a quick and easy one. Mr. Waterton states that there is absolutely no pain felt, “saving the smart at the time the arrow enters.” Nor does the poison render unfit for eating the flesh of the animal which dies from its effects. In confirmation of his statement Mr. Waterton tells that he saw a large ox, which was tied to a stake that he could move freely. Three poisoned arrows were shot into him, the intent being to avoid wounding him in any vital part. One arrow entered each thigh and the third grazed the tips of his nostrils. It was about four minutes before the poison began to act; then the ox set his feet a trifle farther apart, planting them a little more firmly. At the end of an hour of that he bent his head, smelled the ground, and started to walk about; and fell, rolling over upon his side, where he lay quietly for a few minutes. Then his breathing became labored, his limbs were somewhat con- vulsed, and he frothed at the mouth. Soon only a faint fluttering of the heart showed life, and in twenty-five minutes from the time the first arrow entered his body he was quite dead. Mr. Water- ton says a portion of his flesh and pronounced it to be “very sweet and savory.”

[Original in Popular Science News.]

COMPARATIVE PLANT MORPHOLOGY.

BY C. SIMON REAG.

The great order Leguminosae would at first seem to be very distantly related to the vast and extensive Compositae, the former difference being that they belong to entirely different classes—the Leguminosae to those flowers having their petals separate and distinct, (polypetalous), and the Compositae to those in which the petals are slightly or entirely united into one piece (gymnopolitan). This character, however, is not a permanent distinction, as a number of flowers from the former order may safely be called gymno-petalous, the corolla being united at the base.

To compare the two orders we will therefore choose such a representative of the Leguminosae as is gymno-petalous, Trifolium (clover) being an excellent genus to illustrate this point. As a number of orders beside the Leguminosae contain flowers of both divisions, i.e., both polypetalous and gymno-petalous,—for instance, Primulaceae, Boydaceae, and Eriaceae,—this feature has less value than might be expected. The characteristic arrangement of the stamens in Leguminosae is very different—almost exactly the reverse—from that in Compositae. In the former the filaments of the stamens are united below, either into one set of ten, (monadelphous), or into two sets, consisting of five in one, and one stamen in the other set (diaspilous). The latter is more common, and the tube thus formed is normally free from the corolla; but in Trifolium the corolla is more or less adnate to it, below. In Compositae, on the other hand, the filaments are distinct, and are inserted on the tube of the corolla, while the anthers of the stamens are united by their edges into a tube (symphyseous). The common arrangement in a Leguminosae as described above, is not constant, a good example of distinct stamens being Astragalus tinctoria.

Let us examine the inferences. The dense head of Trifolium pratense, surrounded below by the broad, lanceolate leaf stipules, has some resemblance, at least, to the involucre heads of Leguminosae in Compositae. This is merely a resemblance, however, as the heads of Compositae are morphologically different from that inferences termed a head in other orders.

The calyx of the Buffalo clover (T. reflexum) has a remarkable resemblance to the pappus of some Compositae. The calyx teeth are slender, plumose, and pappus-like, persistent in their fruit. This is similar to what we have in those Compositae with a plumose pappus,—Tragopogon, for example,—the

essential difference being, that in the latter (Tragopogon) we have an inferior, and in the former (T. reflexum) a superior ovary. The ovary of both orders is one-celled, consisting of but one carpilary leaf in Leguminosae, i.e., simple. In the Compositae it is compound, as is shown by the cleft style, and it contains but one seed. The Leguminosae bear legumes, as the name implies, and in Trifolium there are from one to six seeds.

In thus comparing the two orders, we have seen merely resemblances, not true relations; but those resemblances still point out that there is some relation between orders so far different and separated.

THE SPIROGRAPH.

The ingenious little instrument illustrated in Fig. 1 is the invention of a French engineer, and is designed for drawing curves and spirals with the same accuracy with which circles are drawn with the ordinary compasses, of which the spirograph is only a simple modification.

As shown in the engraving, it consists of a pair of compasses with one vertical and one inclined leg. The inclined leg is attached to a sleeve (b) which revolves around the shaft of the vertical leg (c). A screw (d) binds it firmly to the shaft when necessary, and a spring (e) and nut (f) enable one to vary the distance between the two legs as may be desired. In the end of the vertical leg is inserted a dry point (f), and the inclined leg is provided with any suitable marking apparatus, such as a pencil point, a drawing pen, or a pen for making dotted or irregular lines. The two legs are connected together by a thread (F),
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by using different sizes of dry points and varying the character of the marking point.

In Fig. 2 some illustrations are given of the possibilities of this simple but useful instrument, which can easily be improvised from the contents of an ordinary box of drawing instruments.

[Original in Popular Science News.]

EPIDOHNUM.

BY S. E. KENNEDY.

From July to September we find two species of Epidohnum in bloom, one of which (E. salsol) Wood puts down as rare. It is a small downy plant with straight round stem, crowded sessil leaves, linear oblong and mostly entire, opposite below and alternate above. The stem sometimes branches at the top, but often stands quite erect, its closely appressed leaves giving it a rather unusual appearance, and the short hairs by which the whole plant is covered making it soft and velvety to the touch. The pretty rose-colored flowers are arranged in a loose panicle. The four petals are deeply notched, and are much larger than the sepals. There are eight stamens with anthers attached near the middle, and the pollen connected by cobwebby threads. The style is erect, bearing a large club-shaped stigma, nearly out of reach of the leaves. A plant of great artistic beauty. The elongated capsule is a conspicuous characteristic, each of its many seeds bearing a tuft of long silky hairs. We find this plant among the bogs and swamp moss in a rocky pasture overrun with huckleberry brush and swamp azaleas.

The other species (E. angustifolium) grows in dry soil, often upon newly cleared land,—sometimes where it has lately burned over, and for this reason has received the local name of "fire-weed." This is a much larger plant, sometimes growing as high as seven feet, but usually from three to five. It branches toward the summit, has long lanceolate leaves, somewhat scattered, each with a curious marginal vein. The flowers are in long terminal racemes, large and showy, of a pinkish purple hue. The pedicles are angular; stamens and style declined; stigma with four long linear lobes turned backward. This also has a linear four-corrugated capsule, with many comos seeds.

MOOSUP VALLEY, R. I. [August, 1891.]

STATE INTERFERENCE WITH THE INDIVIDUAL.

The state is the enemy of all volition in the individual: hence it is the enemy of all manliness, of all force, of all independence, and of all originality. The exigences of the state, from its monstrous taxation to its irritating by-laws, are in continual antagonism with all those who have character uncowed and vision unobscured. Under the terrorizing generic term of law, the state cunningly, and for its own purposes, confines its own petty regulations and fiscal exactions with the insignificance of more grand criminal laws. The latter any man who is not a criminal will feel bound to respect; the former no man who has an opinion and courage of his own will care to observe. Trampetry police and municipal regulations are merged by the ingenuity of the state into a nominal identity with genuine law; and for all its purposes, whether of social tyranny or of fiscal extortion, the Union is to the state as useful as it is fictitious. The state has everywhere discovered that it is lucrative and imposing to worry and fleece the honest citizen; and everywhere it shapes its civil code, therefore, mercilessly and cunningly towards this end. Under the incessant meddling of government and its off-spring, bureaucracy, the man becomes poor of spirit and helpless. He is like a child who, never being permitted to have its own way, has no knowledge of taking care of itself, or of avoiding accidents. As, here and there, a child is of rare and strong enough stuff to break his leading strings, and grows, when recaptured, dogged and small, the dog are the young family destroyed man and distribution of the state, and when coerced and chastised become rebels to its rules. The petty tyrannies of the state gall and fret them at every step; and the citizen who is law-abiding, so far as the greater moral code is concerned, is stung and whipped into continual continuance by the incessant interference of the civil code with his daily life. Why should a man still up a causes return, declare his income to a tax gatherer, send his children to schools he disapproves, ask permission of the state to marry, or do perpetually what he dislikes or condemns, because the state wishes him to do these things? When a man is a criminal, the state has a right to lay hands on him; but whilst he is innocent of all crime his unoblivious and his objections should be respected. There may be many reasons—harassing or excellent reasons—why publicly about his life is offensive or injurious to him: what right has the state to pry into his private and force him to write its details in staring letters for all who run to read? The state only teaches him to lie. "You ask me things that I have no right to tell you," replied Jeanne d'Arc to her judges. So may the innocent man, tormented by the state, reply to the state which has no business with his private life until he has made it forfeit by a crime. The moment that the state leaves the broad lines of public affairs to meddle with the private interests and actions of its people, it is compelled to enlist in its service spies and informers. Without these it cannot make its long list of transgressions; it cannot know whom to summon and what to prosecute. —Ouida, in North American Review for August.

IDENTIFICATION OF MORE ANCIENT CITIES OF THE PHARAOHS.

Dr. Naville, the discoverer of Bubastis and of the Treasure City of Pithom, has just given to the world the results of his work in identifying other cities and districts in Egypt, more especially some connected with the Exodus of the Israelites, and at the end of the month of June he presented these results before one of the largest meetings ever held by the Victoria (Philosophical) Institute, of Adelphi Terrace, London, the great hall in which the meeting was held being so crowded that many had to be accommodated in the vestibule.

Dr. Naville illustrated his remarks by referring to an elaborate map of his surveys. He said he had found that Succoth was not a city as some had supposed, but a district; from a remarkably extensive inscription discovered at Pithom, there was no longer any doubt that it was that Great Hesperopolis, from whence, as Strabo, Pliny, Agathemerus, and Arimadcius described, merchant ships sailed to the Arabian Gulf. This fact coincided with the results of modern scientific surveys, which showed that there had been a gradual rising of the land, and that the Red Sea once extended up to the walls of Pithom; this must have been the case about 3,000 years ago, and Sir William Dawson and the French engineer Linant held that it went even further north. The next place noted by M. Naville, was Baal Zephon, and in identifying this, he had been aided through some recently discovered papyri, which proved that it was not a village or city, but an ancient shrine of Baal and a noted place of pilgrimage. Other places were Migdal and 15 Hahiroth, and here again a papyrus had helped him. It seems probable that the Serapeum was the Egyptian Makil or Migdal, and it was greatly to be regretted that a bilingual tablet discovered there a while ago had been destroyed before being deciphered. The bearing of his identifications was of no small interest to the student of history, both sacred and other.

INDUSTRIAL MEMORANDA.

Iron rusts readily in all locations when alternately cold and hot, but particularly with a porous material which prevents the moisture from evaporating freely.

One dollar a minute is the charge for using the new telephone line between London and Paris. Distance, about 280 miles. Forty cents a minute is charged between New York and Washington, about 240 miles.

In painting ironwork exposed to wind and rain, take red oxide of iron, ground in oil, and mix it with equal parts of boiled linseed oil and turpentine; add one ounce of patent driers to the pound. This is said to be a good paint for the purpose.

Preserving Gilding.—The gilding on frames, etc., can, according to the Colorist, be rendered much more durable without interfering with its beauty by giving it a coating with a warm mixture of one part of boiled linseed oil and two parts of turpentine. To clean the frames of fly specks a mixture of one part of ammonia to three or four of water is recommended.

A Skin for Stone.—Soft oillicite limestone, or limestone with spherical granules, is now hardened into marble by treatment with a certain chemical solution, which gives to the stone a thick, strong skin about half an inch deep, capable of a fine polish, and stone can thus be worked into any form and hardened afterward. The marble becomes impervious to damp and atmospheric influences.

Figures show that the consumption of iron in general construction—other than railroads—in this country has grown from a little more than a million and a half of tons in 1879 to more than six million tons in 1898. Much of this increase has gone into iron buildings. By using large iron frames and thin curtain walls for each story supported thereon, as is done in a building going up on lower Broadway, New York City, a good deal of space can be saved.

Alpine Railways.—The bold scheme of Colonel Lochner with regard to the railway up the Jungfrau is now considered perfectly practical by experts, and his success in that direction was probably his incentive in proposing a railway in a vertical shaft—in other words, a huge lift—up the summit of the Matterhorn. The Matterhorn Railway, as proposed, is to consist of three sections. Another Alpine railway proposed is the Gornergrat Railway, which is also a combination of a wire rope line and a rack railway, and is to lead from Zermatt to Lauterbrunnen and Visp Railway, especially intended for tourists.

Oil-Hardened Steel Plates.—Messrs. Brown and Messrs. Cannell, the two great Sheffield firms, have recently been making some experi-
The Out-Door World.

EDITED BY HARLAN H. BALLARD,
PRESIDENT OF THE AGASSIZ ASSOCIATION.
[PO. ADDRESS, PITTSFIELD, MASS.]

EX UNO DISCE OMNES.
The old Latin proverb that from the study of one typical specimen much may be learned of the entire group to which that specimen belongs, is true. It would be a mistake, however, to suppose that the only one Chapter of the Agassiz Association a correct understanding of all others can be obtained, because the absolute freedom granted by our constitution to each Chapter—in other words, the "local option" given to all our branches—has resulted in an individuality, and a variety both of organization and methods of work, which constitutes one of the greatest charms of our society. In our case, therefore, the old rule fails, and it is only from a knowledge of the history of each Chapter that an understanding of the whole Association can be had. It is with peculiar pleasure, then, that we present the following record of one of our most faithful Chapters—not as a typical specimen of our local societies, but as an illustration of one of the many and excellent, the fruit of a spirit which the spirit of our Association works itself out in our original and practical study and work. The history of this "Cuvier Society" is full of interest and rich in helpful suggestion, and was printed by the Chapter on March 5, 1891—the date of its tenth anniversary. It seems best to publish it without alteration, as the gradual change from the somewhat uncouth and enthusiastic language of boyhood, when the following outline of the history of the Society, stating the plan of work and showing what has been done in this time.

The Society was formed in Salem, Mass., May 5, 1881, under the name of the Nature Club, by three boys about twelve years of age, who were interested in Natural History, to aid another in foraging collections. New members were shortly after admitted, and, although a few withdrew, the number has gradually increased, until at the present time the membership numbers nine.

The charter members of the Society were Maxwell A. Kilvert, Oliver Thayer, 2d, and S. Herriek Cruikshank. George A. Webb was admitted on Mar. 11, 1881, and Louis F. Gavet on Mar. 18. To become a member one had satisfactorily to answer the following questions: 1. What is the object of the Nature Club? 2. Do you agree to keep the rules of the Club? 3. Do you agree to the qualifications for membership which are stated in the rules of the Club? 4. Do you think you can meet those qualifications? 5. Do you think that you will be able to go on such expeditions as the Club may undertake? Also to sign the following declaration: "I promise to enter the Nature Club under the rules now in force; to abide by these and all other rules of the Club; not to tell of the doings of the Club, if so doing would hurt the Club, its members, or its objects, or if the members do not wish the doings told; and to help the Club in the attainments of its aims." When the Club was formed but little attention was given to meetings, those that were held being solely for business, the most of our gatherings taking the shape of "Expeditions," so called, in search of specimens. But to show the object of the Club and also to give an idea of what restrictions we were under, the following list of rules, adopted at the first meeting, is here introduced:

CLUB RULES.

1. The object of this Club is to study Natural History, and to apply it; to study Botany, Conchology, Mineralogy, and Antiquities, and apply all the sciences; also to make collections.

2. The members will be expected to help one another in collecting and hunting after specimens, and also they will be expected to exchange if they have duplicates. They will be expected to help one another in all ways.

3. Members are not always bound to exchange, but they will be expected to favor one another more than outsiders.

4. When persons wish to join this Club they will be required: to fire with some accuracy with a sling-shot; to be able to name the parts of a pistol, load, unload, and fire it; to be able to climb a tree; to have some strength and not be afraid to go on such expeditions as the Club may undertake; to possess a pole-knife, a sling-shot, and a net, and be prepared to keep the insects caught, in a box prepared for the purpose; to answer certain questions which will be submitted to every candidate for membership; and to sign the Charter.

5. All members will be expected to obey the rules of the Club, and if any member does not, such punishment may be inflicted upon him as a majority of the members think best.

6. A member may not be expelled unless he refuses to obey the laws of the Club, and under those circumstances he may be expelled by a unanimous vote of the members (not counting the member who is under consideration).

7. The Club shall have no formal meetings and shall have no officers.

8. When all or any of the members wish to go on any tramp or expedition they may do so, and it is not necessary that all the members should go or be informed of the expedition, if it is not convenient; but it is desirable that the members who do go should make a report of the expedition to be read to the other members in all ways.

9. All reports, records, etc., of the Club, shall be kept at the Club Rooms, and all the members shall have free access to both.

10. It is desirable that all the members should go off together at least once a week, if possible.

11. When on expeditions, all members are to be governed by the "Hunting Rules."

12. All hunting rules may be made by the unanimous consent of the members.

13. All members will be required to sign the rules of the Club, on entering the Club; and on doing so, and on signing the "Chiker," a certificate of membership will be given them.

THE "HUNTING RULES."

1. There shall be no wantonness in the Club.

2. No member shall point his pistol, or sling-shot, or bow and arrow at any other member— even if he knows the weapon not to be loaded, or not in a condition to go off. There shall be no feeding, shotting, or killing with the pole-knife, or anything of the sort.

3. The Club shall not shoot the domestic birds.

4. It is desirable that at least once a fortnight, during the summer season, the Club should take a long tramp and follow out in general some fixed course. The maps of these courses shall be kept...
with the records of the expeditions at the Club Rooms.

3. Each member, on each expedition, carry a sling-shot, pebbles, insect-box, and whatever else he may think is necessary. On long tramps it will be well for him to take some food. It is best to wear thick boots, old clothes, and stout gloves, on long expeditions.

6. Ball cartridges are prohibited in the Club.

It will be noticed that fire arms in the shape of pistols (which cost 22 cents each) were used by some of the members of the Club, those whose parents would allow of the purchase of a small car-tridges were prohibited; but this latter clause was very easily gotten over by loading the pistols with gravel and small pebbles, a much more dangerous practice, as was illustrated when one member accidentally shot himself in the palm of the hand and came near having serious trouble. On September 30, 1881, the name of the Club was changed to the Cuvier Natural History Club, and the style of the meetings was somewhat altered; the office of chairman was created and combined with that of treasurer, and at each meeting all of the members read articles from books on Natural History.

CLUB MEETINGS.

Up to November meetings had been hold in the Club Rooms on afternoons, but when cold weather set in, it was found necessary to repair to the houses of the members, and the meetings were held in the evenings. These evening meetings were held, November 15, 1884, up to April 20, 1882, when they were discontinued until Feb. 6, 1883, when Morse's "First Book of Zoology" was taken up as a course of reading. Soon after this it became the custom for the members to read short, original papers, called "Lectures," on subjects with which they might be familiar.

A further change was made in the style of the meetings November, 1884, when, instead of each member writing or reading an article on any subject which he chose, certain subjects of a like character were given out by the president to the members. In the fall of 1885, this arrangement was further changed, and a paper of greater length, the subject generally being some genus in the animal kingdom, was prepared and read by one member, the others being allowed to note the points on it, and a short discussion was held at the next meeting. In addition to this, the members wrote short descriptions of specimens in the collection; these were called "Observations."

In May, 1886, a new enterprise was started in the shape of a small four-page monthly paper, called the "Amateur Collector." This was managed by a committee, and the Club, for nearly three years was successfully published, but resulted in no financial gain, although we are thankful to say that there was no loss. The articles that appeared in it were for the most part written by the members, and the practice thus gained has no doubt been of considerable help to each, since that time.

Expeditions were the main object of the Society for the first year or two, and many walks were taken for the purpose of collecting in the vicinity of Salem. As the members grew older, expeditions were held to more distant parts, and in this way many of the towns of Essex County have been visited. Hereafter, by using smaller collections of mammals, fishes, reptiles, echinoderms, sponges, corals, marbles, gums, fibers, etc. The collections, though by no means complete, may be said to be fairly representative in several branches, more especially in the Essex County portion.

FIELD MEETINGS.

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ENTERS THE AGASSIZ ASSOCIATION.

In April, 1887, it was voted that the members should take such subjects for their essays as they saw fit, and as a result many interesting papers have been read on several branches of scientific work. In the following year a series of discussions on scientific subjects, alternating with the essays, was started, and found to be very interesting and profitable. It was being thought desirable. In was unanimously agreed that the word "Society" be substituted in place of the word "Club," so our organization is now known as "the Cuvier Natural History Society." At several of our meetings there have been present, persons of more or less prominence, who have kindly given us informal talks on scientific subjects and to whom we are much indebted.

A considerable portion of the winter of 1883-84 was taken up by a discussion on Evolution, which proved very interesting, and this was followed by a brief course in geology. Some of our meetings have comprised practical work, such as the dissection of an animal, and many of our papers are illustrated by specimens from the collection.

THE CLUB MUSEUM.

One of the first objects of the Society was to form collections of Natural History. These were not owned in common, but individually, and kept in the members' houses.
POPULAR SCIENCE NEWS.

A BIRD DRUMMER.

While passing a lamp-post the other day my attention was called to a loud noise, as if someone was pounding on a tin pan. Not being able to discover whence the sound came, I passed on. On my way back I heard the same noise again, and, after looking around for some time, saw a downy woodpecker (Picus pubescens) perched on the tin cap of the lamp-post and thumping as if his life depended on it. As there could have been nothing to eat there, I arrived at the conclusion that he did simply to hear himself thump. He repeated this performance for several days. Can anyone account for his drumming in any other way—MAURICE S. SHERMAN, Hanover, N. H.

AN ANCIENT QUARRY.

Very few people in Washington, D. C., know that all around that city can be discovered remains of an extinct people. The most important discovery was made in the fall of 1888, by Mr. W. C. Holmes, Curator of the Department of Ethnology, who found an ancient quarry on Piney Branch, near Fourteenth street. The first known discovery of implements upon this particular site was made by Mr. De Lancy Gill, in 1887. In September, 1892, Mr. Holmes visited Mr. Bladen, owner of the place where the quarry is situated, and obtained permission from him to work upon it. He learned from Mr. Bladen that in the year 1878 a second contrivance had been permitted to collect paving material from these grounds, and that the piles of stone had then been collected but never removed. Mr. Holmes determined from the contour of the ground the site of the old quarry, and excavated a trench directly across the ground occupied by the ancient workmen. This trench crossed a belt of anciently worked material, fifty feet wide and about six feet deep, and this belt extends along the bluff for perhaps half a mile. The specimens collected were principally what Mr. Holmes termed “turtle-backs,” although out of about fifteen hundred only twelve were perfect. I think three perfect arrow-heads were found. I visited the quarry and obtained about thirty-five specimens, and was very much pleased with it. It is this “turtle-back,” knife and part of an arrow-head. Before the quarry was worked by Mr. Holmes, my brother and I were riding along the road near it, when he spied a stone which he thought had an unusual appearance. We brought it home, and I showed it to a curator at the Smithsonian Institution. He pronounced it to be a hammer which had once been an axe, but had been broken off. I think I may claim that it is the finest specimen which has been obtained at or near this quarry. It is double grooved and measures five inches in width by three and a half in length.—CHAS. L. WILHELM, President Chapter 347, A. A.

WILL ANSWER ALL LETTERS.

Please count us willing to answer all communications, and very glad to help any of the A. A. H. within our power. We are interested in birds, butterflies, insects, and other birds. We answer questions of all kinds. The writer is free to choose his own field of interest. We are glad to help any of the A. A. H. within our power. We answer questions of all kinds. The writer is free to choose his own field of interest. We are glad to help any of the A. A. H. within our power. We answer questions of all kinds. The writer is free to choose his own field of interest.

A RARE FOSSIL.

One evening last summer I was looking over a ledge of rock in search of fossils when I noticed a stone covered with little indentations. In the imperfect light I thought it might be some species of coral, but upon taking it up found that it was a most impression of a very curious fossil imbedded below. As I afterward found, it was a part of the shield of a placoderm fish of the Devonian Age, and but one piece had ever been found before. The fragment was about seven by three inches. One-third of this I sent to the Smithsonian Institute through Mr. Deering, a local geologist who has helped us a great deal in our work. He thinks it is “half inch through.” The main portion has the structure of bone, but the pores are quite small, and there seems to be no solid casing. The top is covered by a thin brown enamel, bearing the little knobs which caused the curious impression; these average one-sixteenth of an inch in diameter, and there are between fifty and sixty in one square inch of surface. They are arranged in no very certain order, but in some parts parallel lines may be distinguished quite plainly.—MORRIS SANFORD, Chapter 212, Independence, Ind.

FROG EATS FROG.

I am not a member of the A. A., but am an interested reader of your department in the Portu- lar SCIENCE NEWS. Let me relate what I have seen, and I should like to know if others have had a similar experience. I once had seven or eight large and medium-sized frogs in a tub. I missed one, and, thinking it might have hopped out, I looked for it outside. On looking in the tub again I saw that one large croaker that had been looking rather hollow was swelled up to an uncommon degree of distension. A pair of frog’s feet were protruding from his mouth. By pulling gently upon the protruding feet I succeeded in getting back my lost frog, which was soon as lively and apparently as well as ever. The large
List of the Plants of the District of Moschaisk, Government of Moscow, Russia.

By Mrs. Olga Fedchenko.

This valuable and complete list of Russian plants was commenced in the May number, and is completed in this issue. The sign (*) stands in the list before the names of such plants as cannot strongly be considered as wild, but either are or have been cultivated and now grow wild in gardens.

Gentianæ, Juss. (Concluded.)

Papilionidae.

Pappilio machaon, L.*

Lepidoptera, Juss. (Concluded.)

Theophila cathartica, Roth.*

The entire list of the Lepidoptera of the District of Moschaisk, Government of Moscow, Russia.

By Boris Fedchenko.
A recent number of the Chemical News contains an interesting article by Dr. Crookes upon electrical evaporation, or the effect of a charge of electricity upon the rate of evaporation of liquids and solids. Two dishes containing equal weights of water were placed upon a delicate balance, one being insulated and the other charged with positive electricity from an induction coil. After an hour and three-quarters there was scarcely any difference between the weight of the insulated water and that which had been exposed to the positive current. Equilibrium being restored, the current was reversed, the negative current being kept on the dish for two hours. At the end of this time the electrified water was decidedly lighter. After having again restored equilibrium, the electrification of the dishes was reversed, i.e., the one that had before been insulated was made negative and the other one was insulated. In an hour the electrified water had become decidedly lighter than the insulated water. In a subsequent experiment in which the quantities were weighed, it was found that negatively electrified water lost in one and a half hours 1-1000 part of its weight more than did insulated water. Similar experiments were made upon metals, and the rate at which they were dissipated from an electrode, sealed into a high vacuum tube, was determined. Cadmium and silver were quickly dissipated from the negative electrode, while the metal on the positive electrode remained practically unchanged. An alloy of copper and zinc, or brass, appeared to evaporate without separation of its constituents; while one of aluminum and gold was partly separated, the gold evaporating, or volatilizing, under the influence of the electric current, while the aluminum was left behind. Dr. Crookes considers that this dissipation of metal electrodes in a high vacuum tube is strictly analogous to the evaporation of water, or volatilization of metals in the air, the only difference being that in one case the electrical action is an actual part of the process, and in the other instance the electrical action is thrown off as a consequence of the surface of the substance experimented upon, while in evaporation or volatilization by heat the whole mass must be raised to the requisite temperature.

Much has been published lately in the newspapers about a wonderful invention of Mr. Edison, by which views of distant objects were to be electrically transmitted to a distance, so that in combination with a telephone and phonograph, a theatrical performance might be both seen and heard in a distant city. This remarkable instrument, which has been baptized the "Kinetograph," proves to be merely a modification of the well-known zoetrope, or wheel of life. Mr. Edison's invention simply consists of a camera by which photographs of a moving person may be taken while successively viewed on a screen from a lantern in such a manner as to reproduce the movements by a well-known principle of optics. The kinetograph is undoubtedly an ingenious and wonderful invention, but it has not even the merit of novelty, as a similar instrument, invented by a Frenchman, was described in the Science News in May, 1880. Mr. Edison has suffered more than most men at the hands of unscientific newspaper reporters, and it is not probable that he ever made the absurd claims for his invention with which he was credited; but the contrast between the promises and performances of the alleged scientific wonder fully reenacts that classical occurrence when "the mountain labored and brought forth a ridiculous mouse."

The magnificent glaciated scratches and grooving in the limestone at Kelley's Island, near Sandusky, Ohio, have been preserved from destruction and perpetually dedicated to the public as a "park" by Mr. Thos. Andrews, of Exeter, N. H., instead of James Andrews, as printed. The ancient name of Cornwall should also have been printed Cornubienius instead of Cornubienis.

The scientific knowledge of Congress is well illustrated by its action in appropriating a large sum of money to carry on experiments for producing rain by explosions in the air at high altitudes. These experiments are now in progress, and balloons are filled with a mixture of hydrogen and oxygen gases, and exploded in the air by an electric spark. As might have been expected, no results have as yet been obtained, except the wasting of the public funds to gratify the whims of a few scientific cranks. The idea that rain or any other meteorological change can be induced by explosions in the atmosphere is a scientific superstition unworthy of a moment's consideration, and with no more basis of fact than the influence of the moon or the sun-spots. It was, we believe, the same Congress which came so near appropriating several million dollars to build somebody's patent 'flying-machine.'

The small rubber balloons sold as toys for children can be used to illustrate the principle of the diffusion of gases in a very beautiful manner. When sold they are filled with hydrogen gas, and this, by its low specific gravity, tends to diffuse out into the air through the thin rubber covering at a faster rate than the air passes in. As a consequence, in a few hours the balloon is in a semi-collapsed condition, and has lost its power of floating in the air—as many children have learned to their sorrow. If, now, the balloon is refilled with air, no diffusion will take place, and it will remain inflated for several days, the only loss being due to leakage. This leakage is a very different matter from the mutual diffusion of hydrogen and air, which is a true molecular movement through the pores of the rubber.

An interesting experiment with Leyden jars was recently shown at a scientific meeting in London by Dr. Lodge, in which the discharge of one jar precipitated the overflow of another when the lengths of the jar circuits were properly adjusted or tuned. The latter jar was entirely disconnected from the former, and was influenced by the precipitated discharge coming from the discharging circuit. Lengthening or shortening either circuit prevented the overflow. The effect could be shown over considerable distances. A similar observation was made by Priestley almost a hundred years ago, who noticed that when several jars were being charged from the same prime conductor, if one of them discharged, the others would sometimes also discharge, although they were not fully charged. This phenomenon seems to be strictly analogous to the sound vibrations induced in a string or other body of a certain rate of vibration, by sounding a note of identical pitch in its vicinity, and tends to confirm the theory that electric energy is, like sound, light, and heat, only a mode of motion of a wave-like or vibratory nature.

ERRATA.—The letter in the May issue regarding the presence of the ancient Phoenicians in Britain written by Mr. Thos. Andrews, of Exeter, N. H., instead of James Andrews, as printed. The ancient name of Cornwall should also have been printed Cornubienius instead of Cornubienis.

[Original in Popular Science News.]

THE GIANT SLOTHS OF THE PAST.

By KATHARINE B. CLAYPOLE.

PART I.

Passing one summer day through the Jardin des Plantes, in Paris, the writer was struck with the spectacle of a little ragged boy staring in at the glass door of the Museum of Palentology. Now it is not necessary to enter this museum in order to see a few little pictures of the great echinat which was enjoying, in an interval of play, an opportunity for which many a student in this country would gladly cross the seas. There, before him, were skeletons of the extinct animals studied and described by Cuvier, the founder of the science of comparative anatomy; some in a fossil condition, others little altered by the addition of mineral matter. Many of these, though unique specimens, would have a familiar look to the student. He has already made their acquaintance in textbooks of geology, for they are the originals from which all illustrations of their species have been made. Though this is not the case with the gigantic creature that stands immediately opposite to this glass door, its bones have, nevertheless, been put together on the model of the great original. In the massive pelvis, in the thighs twice to three times as thick as those of any existing elephant, with the leg bones still thicker in proportion; in the small head that seems all under jaw, and the long fore limbs with their formidable claws, who does not recognize the mighty megatherium figured in almost every illustration of Pleistocene life? In the long past a denizen of South America with a position well assigned in the economy of nature, the monster looked strangely out of place when, about a century ago, the first skeleton was brought to the light of these later days. It was discovered about one hundred feet below the surface in the neighborhood of Buenos Ayres, and at once sent to Madrid, where it shortly fell into the hands of Cuvier, who regarded it with the most astonishing and interesting discovery that had come under his notice. The bones clearly belonged to a living species of animal, yet certain among them indicated their place in the system of quadrupeds. The sole inspection of the claws marked the bearer of them as an ungnathian. The teeth, five on each side of the upper jaw and four in the lower jaw, every tooth a molar with growing from birth to death and never shed as are the incisors and canines of other animals,—gave it a right to be included among the edentates. There Cuvier placed it, though its huge and formidable frame was an anomaly among the little ant-eaters, pangolins, armadillos, ant-eaters, and sloths that now form the family. To which of these it most nearly approached, Cuvier, with only the skeleton before him, could not determine. He therefore made a
new genus for it, intermediate between the sloths and the armadillos, since to the shape of the head of the former it added the teeth of the latter. To this genus he gave the name of Megatherium—the large animal.

Nothing could have been a greater surprise to the naturalists of his day than this classification of Cuvier’s. That there could be any relation between this gigantic, powerful creature and the small, insignificant sloths—animals considered at that time as the rudest of the lower animals, and the most imperfect and grotesque that simple existence alone must be a burden to them—was a revelation for which the world was hardly prepared. It was, however, a reference worthy of Cuvier, and

modern science has confirmed its sagacity. The megatherium is substantially a gigantic antique sloth, notwithstanding that its relation to the sloths from the South American forests of today has to be taken on faith by most of the visitors to the Jardin des Plantes. In the menageries are the little living animals dragging their limbs laboriously and awkwardly along the ground, hanging asleep from the limbs of trees, or clinging with activity and ease among the branches. In the museum is this colossal skeleton of their ancestor, standing as a perpetual witness to the fact that the mighty must yield when conditions become fit only for the humble and weak.

The megatherium is now desired for every museum, but happy is that institution that can secure even a few bones of the mighty beast. Madrid is the happy owner of the classical specimen studied by Cuvier; Paris, as has been seen, boasts an almost complete skeleton; Berlin is equally fortunate. But, with these exceptions, and that of the skeleton discovered at Lima in 1785,—which may be the one now at Berlin,—the animal is characterised by the masterful models made from a study of detached bones. Such a model adorns the new Natural History Building at Kensington. The pelvis, thighs, and upper bones of the tail are cast, with some other parts, from remains found by Sir Woodbine Parish in the bed of a stream near Buenos Ayres, after a succession of three unusually dry seasons. They indicate a slightly known species, closely related to the megalitherium, as described by Cuvier. The model, eighteen feet in length, is the original of the second current figure of the megalitherium, and represents the animal with the right hand clasping the trunk of a tree—a position that is considered somewhat hypothetic by critics. Open to still more criticism, though remarkably striking, is the attitude ascribed to the monster in some lengthier illustrations of it by Cuvier. Resting on its huge branches it well displays the size and massiveeness of the thigh bones and pelvis, while the powerful arms with their formidable claws leave little room to doubt that the tree they clasp and bend readily have succumbed to their attack.

The megalitherium, the first of the extinct ground sloths to be brought back into the life of the present, is still regarded as the most interesting and wonderful of the family, although remains of at least seven other gigantic forms have been discovered and described. The first of these to attract wide attention was the complete skeleton of an animal somewhat smaller than the megalitherium, being only eleven feet from the point of the muzzle to the end of the tail. This was found by Sir Woodbine Parish near Buenos Ayres in 1841, and presented to the Royal College of Surgeons, in London, where it may still be seen as it was first set up. The arms resting one above the other on the trunk of a tree indicated megalitherium more power than those of the megalitherium, though the thigh bones are far less massive, the skull is shorter and lighter, and the under jaw neither so thick nor so heavy. To this creature Professor (now Sir Richard) Owen, then the curator of the Hunterian Museum,—the museum attached to the Royal College of Surgeons,—gave the name Megatherium or the well-deserved name, adding robustus to indicate the formidable strength of its framework. At the instigation of the council of the college this mylodon was especially described and figured by Professor Owen in a magnificent quarto work. In this, besides giving an analysis of its osteological structure, he, by a masterly piece of deductive reasoning, threw light on a problem that had puzzled naturalists ever since Cuvier first pronounced the megalitherium a leaf-eating animal. The teeth and peculiar conformation of the jaws of the mylodon bore like testimony as to the food of this megalitherium family. These colossal creatures lived on leaves and small twigs of trees, as the giraffes, elephants, and sloths do today. How did they obtain this food? The giraffe raises its head to graze among the foliage of the trees; the elephant, its trunk. The neck of the ground sloths was short and massive, and there is little reason to believe that they carried even a short nasal appendage. The little modern sloths run along the under side of the branches until they find a convenient feeding place. It is preposterous to imagine an animal

as bulky as a rhinoceros hanging back down from the under side of the limbs of a tree. Nevertheless, the ponderous forms of the extinct sloths and great, strong, curved claws seemed so little adapted for locomotion that some eminent naturalists ventured the opinion that it was too long, too heavy, and too weak to approach the ground. Professor Owen showed that they could obtain the leaves without in any way raising their heads, for, with their massive strength, they could bring down the branches of the trees to the level of their jaws. On this view, the breadth and weight of their hind quarters are no burden, an impression maintained by their great and huge heels fixed firmly against the ground, their powerful arms, and either broke it short off above the ground or gathered it up by the roots, having previously employed the enormous claws to scratch away the earth and render the overthrow more certain. "Extraordinary," says Professor Owen, "must have been the strength and proportions of that tree which, partly undermined, and firmly grasped as with prehensile hooks, could, rocked to and fro, to right and left, long withstanding the effects of the trunk of a tree natural inadmissibility, and the general result would have been ruin to the roots. That this assailant, sluggish as well as ponderous, could not always avoid the shock of the falling tree is suggested in the skull described by Professor Owen, which had been twice fractured and healed during life.

As with the remains of megalitherium so is it with those of mylodon; detached bones of more than one species are found in North and South America, but a complete skeleton seldom comes to light. Indeed, besides that of the Royal College of Surgeons, there is, as yet, but one other, and that has been set up recently in the new Natural History Building at South Kensington.

[Original in Popular Science News]

HEROGLYPHIC INSRIPTIONS OF EGYPT AND PALESTINE—HOW READ, AND BY WHOM DISCOVERED AND Deciphered.

By Joseph Wallace.

In the April issue of Popular Science News we stated that the rings on the Rosetta stone puzzled the learned men of Europe who were interested in hieroglyphic writing, but it was conjectured by some that each ring was the sign of the proper name; and, further, it was discovered that the charactor of the writing was a mixed one, containing partly pictures of objects and partly signs of sounds. This discovery was announced by Champollion in a paper at Grenoble in 1810, and soon after confirmed by Thomas Young, an eminent Oriental scholar. Champollon acknowledged that he was led to this discovery by the labors of De Saec and Ackerbach, who had shown that the Greek proper names on the Rosetta stone were transcribed phonetically in the demotic version. These results were obtained by guessing that a group occurring in almost every line was the conjunction; that a group repeated twenty times in the demotic version corresponded to King in Greek, where the word occurred about the same number of times. For the words Alexander and Alexandria in the fourth and seventeenth lines of the Greek, were discovered two groups of equally close resemblance in the second and tenth lines of the demotic. Young, more important contributor to deciphering the character of the writing was to assert the ideographic nature of many demotic signs, in opposition to the current belief that the hieratic and demotic writings were entirely phonetic. It was therefore observed that the hieratic and demotic characters were abbreviations of the fuller pictures, and Brugsch, now the highest authority on the language, showed that certain demotic characters resembled at least as many ideographic signs as hieratic writing.

All these conjectures were first only applied to the characters inside the rings, but the difficulty remained of determining the order in which they were written. It was suggested that the characters might be in the order of the Hebrew, Arable, etc.—from right to left,—or as in the modern systems—from left to right. This was settled by Champollon, for Mr. Banks, of England, had
brought home a small obelisk that was found in the island of Philae, which was inscribed with a dedication in Hebrew and Greek to one of the Ptolemies and his sister, Cleopatra. This inscription was copied by Calilhill in 1816, and commented on by Letronne and Champollion in the French scientific journals of 1822. On this obelisk there was a ring in the inscription identical with the one on the Rosetta stone which served for Ptolemy II and Cleopatra III. By fortunate coincidence these inscriptions showed much in the relation of characters, and, assuming from the analogy of other systems that objects depicted signified the initial letter of their Coptic names, both groups were spelled out, and Champollion in possession of eleven phonetic signs of the old Egyptian language. It was now made plain in this case that was, "to understand but to make up"

To discover the sounds so absolutely essential to a correct deciphering of hieroglyphic characters, several learned men turned to the modern Egyptian, or Coptic, language, which was expressly stated by the early fathers of the Christian church to be almost the same as demotic, though written in a different alphabet. Although Coptic is now almost obsolete, there was a school of Coptic priests in Rome during the last century and the first half of the present century, who could speak and write the Coptic language of their sacred books; and from the information they possessed, together with the Coptic version of the scriptures, a word by word knowledge of grammar was obtained.

Champollion now set about making himself master of the Coptic language at Rome. He saw as he progressed that it retained more or less accurately the old Egyptian names of a large number of objects. He further analyzed grammatical forms, terminations, and inflections, and found the sound closely corresponding. When he was well versed in the language, he applied what letters he knew to groups of hieroglyphs apparently giving the names of numerous pictures of well-known objects engraved on the tombs of Beni Hassan, and found that the Copts furnished a direct clue, in almost every case, to the sounds of the hieroglyphics. By this aid he easily completed his alphabet from partially established signs agreeing in sound with known names; and the great discovery gradually progressed toward completion through sounds suggesting signs and signs sounds, each step verifying and correcting previous inferences, as well as suggesting new ones.

Two difficulties impeded the progress of the Egyptian investigation. One was the proper application of the symbolic hieroglyphics, and the other, when the same was to be used in the hieroglyphic and phonetic sense. Champollion concluded that the written system of one thousand signs used at random hieroglyphically or phonetically must have been a source of confusion to the Egyptians themselves, and that they must have used some means to avoid it. He therefore looked for and found indications added to the pictures which informed the reader how to interpret their meaning. Sometimes, Champollion left unexplained he considered symbols used by priests, and of a really secret character. Champollion's view of the secret character of some of the symbolic inscriptions was supported by De Rouge and Lauth, but denied by Dümichen, who says he has been unable to find in the monuments any systematic secret writing side by side with the usual hieroglyphics. Mr. Birch, of the British Museum, agrees with this view, and advances the theory that the twenty-second dynasty of Assyrian origin introduced phonetic signs for many ideographs, and so produced these so-called anaglyphs. Brugsch considers them merely a prosaic use of ideographs of individual fancy, which make the interpretation a matter of great labor and ingenuity, but not impossible. The first was then really not overcome as soon as it became evident that the Egyptians used different signs to signify the same sound. At the outset, when the names Benenike and Alexandros were guessed at, it was evident that k and s had different signs. This was noticeable in the rings, and in the several copies of the long and elaborate book of ritual which the old Egyptians placed in collins with the mummies and in some Egyptian museums. It was discovered that, although they are identical in the sense and character, they contain frequent variations as to single signs, and in the hieratic copies the same sign generally represents these variations. It was clear that they were different equivalents for the same sounds, or what are called homophones, and after the discovery of one the others became easily known.

Lepsius has since established that the most ancient alphabet admitted many homophones; and De Rouge says that many of them really indicate slight variations of pronunciation, which, like the various sounds of th, were carefully distinguished by some scribes by separate signs. After discovering the homophones it only remained to apply them to decipher the hieroglyphics, which Champollion had found and analyzed which he had sketched the plan. Hundreds of perfectly distinct documents have since been read by the principles of interpretation, and consistent meaning drawn from them. Though no other corroboration was wanting, it came crowning on the heads of the Egyptologists in the numerous confirmations of historical facts thus readily deciphered; and thus far the results of Champollion's work have enabled him to decipher hieroglyphics in 1866, while making researches at Taus, the demotic. Greek, and Egyptian were read off and explained much easier than a fair Latin scholar could have rendered the same amount of Tauiteus, and the translation produced a sense identical with that of the Greek version.

Another test of the correctness of the principles of Champollion was whether his systems of hieroglyphics was offered not many years ago by Mariette, who copied from the pillars along the line of the Suez Canal inscriptions set in four languages by Darius I, King of Persia, describing how he undertook the cutting of the canal, but stopped when it was almost completed because he was persuaded that the level of the Red Sea and the Mediterranean varied, and Egypt would be inundated by opening the canal. The inscriptions found on several stone pillars were written in hieroglyphic and three kinds of cuneiform characters, and it was found that the Persian and Assyrian versions corresponded in sense with the hieroglyphic as now interpreted, adding, however, many details intended for the special edification of the Egyptian subjects of the great king. Champollion's system of interpreting hieroglyphics is not only the proper step of his progress. Among the enthusiasts who suggested other systems were Klapperk, Jaisell, Palins, Williams, the Jesuit astronomer Secchi, Seyfrath, and Uhlemann. Each one proposed some method of his own, and all differing, with the exception of Uhlemann, who adopted Seyfrath's suggestions. These proposed systems and suggestions had the good effect, however, of stimulating greater exertions to correct and establish the system and rules laid down by Champollion and his disciples. The most renowned of the latter are De Saey, Niebuhr, Humboldt, Lepsius, Bunsen, Rosselli, Leemans, Wilkison, Hinks, Brugsch, Birch, De Rouge, Chepas, La Page, Renouf, Lauth, Dunlent, Goodwin, Czermak, Deveria, Eilenburg, Ebers, Mariette, and Maspero.

The deciphering of Egyptian characters was necessarily very closely linked with the study of hieroglyphics. The deciphering of the demotic writing was especially studied by De Saey, Ackerman, and Young. It was further elucidated by Champollion, Tattam, Salvolini, Lepsius, De Sanbe, Leemans, and Maspero, and finally treated by Brugsch in a separate Grammar, Hieroglyphic and Demotic Dictionary.

[Special Correspondence of Popular Science News.]

PARIS LETTER.

To the naturalist it seems that aquatic animals are more interesting than others, and during the present century more has been done towards the investigation of the conditions and peculiarities of aquatic life than during the whole past civilisation. The numerous marine laboratories which have sprung into existence in the last twenty years have much helped towards this result; and although it may be rightly said that, in France, especially, there are too many of them, and that the money expended might be more profitably spent if the same sum could be distributed among a smaller number of establishments, they have performed good work. It may be presumed that the matter is now one which is likely to become of more interest to us. We are all fully convinced that the physiology of higher animals and of aquatic animals are the same, considerable modifications are to be met in the manner in which they are effected in the latter, on account of the medium in which they live; and the more animals live in different lands, the more the man who inhabits the more they prove interesting to us. We are all fully convinced that the physiology of higher animals is but a special form of innumerable forms of possible physiology, and it is always a matter of great interest to us to witness the possible departure from the type which is best known to us.

The Union of the Scientific Societies which have been written on the conditions of aquatic life, but no really good book has been—until a few weeks ago—published on the matter, giving an abstract of the different investigations and summarizing our present knowledge. M. P. Regnard, professor of physiology in the Institute National Agronomique, and who has conducted a large number of personal investigations on the subject, has just filled this gap in writing his Recherches Experimentales sur
les Conditions Physiques de la vie dans les Eaux, (Paris, Masson, 1891). This book is a very interesting and valuable work, and the principal chapters are on the aquatic life, and is written in a manner which makes it very easy and pleasant to read. The progress in deep-sea soundings and dredgings is very well described, and the author gives an interesting account of the beginning of this sort of investigation. While Sir James Ross, Wallich, Torell, and Pourtales had tried some experiments which were of no importance, it happened in 1865 that the submarine cable between Algeria and Sardinia was ruptured, and to repair it it was necessary to fish it up again. Numerous animals were found clinging to it, although it was lying at a depth of 2,000 meters, and among them were found polyps which were considered as extinct, being only known under the fossil form. This fact was of great importance, as it revealed the circumstance that the depths of the sea are not uninhabited, as was thought, and that fragments of the palaeontological fauna might, perhaps, be discovered there. This gave an impetus to deep-sea investigation, and since that time numerous explorations succeeded each other. The Corwin and the Bible were the first to start; then followed rapidly the Porcupine, Challenger, Hassler, Blake, Varigny, Gazelle, Trainvalleur, Talisman, Hieronide, etc. These names are all familiar to zoologists. The results of their investigations went to show that the depths of the sea are densely inhabited. Wyville Thomson found one day his dredge full of 20,000 sea-urchins; and on the Talisman a single coup de Met brought back 1,000 fishes and 750 shrimps from the depth of 460 meters; the same expedition found fishes at the depth of even 5,000 meters. Ascidians have been found at 7,000 meters depth, mollusks at 9,400, etc., and we know now that life is most abundant even in the most obscure parts of the ocean, although we cannot tell exactly whether life exists also in the deepest parts. M. P. Regnard gives an excellent account, with numerous illustrations, of the large number of instruments which have been devised by himself or others for the deep-sea investigations, and some are very curious—such as his illuminated nets, and his apparatus for taking photographs of the bottom of the sea, which he intends to experiment with shortly.

When we think of the fact that for each ten meters depth the pressure becomes increased by one atmosphere, we can see why the deeper the depths the pressure must be enormous. A large number of instruments have been imagined in order to allow an exact valuation of this pressure and of the depth, and, although very technical, M. P. Regnard has managed to make this chapter a most readable one. It seems that the deepest place at present known is to be found on the coast of New Zealand (about 16,700 meters, or 5,527 atmospheres pressure). As animals certainly do live under such enormous pressures, it is interesting to see how they stand it and how the functions of life are performed. This investigation M. Regnard has accomplished by means of a special apparatus which will enable him to obtain a thousand atmospheres pressure as easily as we can obtain a bar. This is a instrument that imagined by Cailliet in order to study the benefaction and solidification of gases. It is even possible to witness the process of the experiments, M. Regnard having been able to devise special glasses which allow the observer to see all that is going on in the apparatus, so that the effect of pressure on organisms is seen and can be signalled at every moment. One of the curious facts about this influence of pressure is the greater weight and volume of the animals which have been subjected to it. The surrounding water is, in fact, very buoyant, and the animals, which are thus becoming larger and acquire more weight. This effect is very well marked.

After the study of pressure comes that of light, or illumination. It is well known now, through various observers, that the depths of the sea are completely obscure, and, even in the most transparent waters, light completely disappears at some depth, the light becomes at least at human eyes, as has been shown by Tod, the distance to which normal vision extends under water is a very small one; and this explains, perhaps, how it is that animals may pass very near each other without giving the slightest indication of their perceiving the fact, and how it is that very brightly colored fishes or mollusks may lie without getting into trouble on account of their color. P. Regnard studies in a very admirable manner the heat, air, and salt conditions of the aquatic medium, and gives a most interesting account of their influence, while a valuable chapter is devoted to the study of locomotion in water. His book is worth reading, and an English translation would certainly prove acceptable to English readers.

It has often been said and written that camphor is one of the substances which enjoy the privilege of stimulating germination, and horticultural papers often advise horticulturists to use this chemical in order to "awaken" sleepy seeds. Of course, they profess to have witnessed the valuable influence of camphor. M. Henry de Varigny has recently published the results of experiments on camphor in the Société de Botanique, and the result is not at all favorable to the prevalent notion. Seeds of five or six different sorts have been sown in sand saturated with water containing camphor, as advised by horticulturists, and the result has been that they all have germinated much later than similar seeds in water without camphor. It even happens that if there is no camphor in the water, but only vapors of camphor in the air, germination is barely retarded. So it must be concluded that camphor does not operate as it has been said to do, and that persons wishing to "awaken" their seeds had better resort to some other process.

Sportsmen may be interested in M. Lagrange's recent book on Exercise in Adults. It is a very good book, with sound information on what may—also what may not—be done in the matter of exercise and gymnastics, or athletics generally, by those who are no more young and who exhibit pathological tendencies they wish to get rid of, or, at least, to counteract. This is valuable hygine, and will prove useful to many. 

PARIS, June 23, 1891.

TO PHOTOGRAPH LIVING BIRDS.

With some live birds the following plan will be found to work well: suspend a shelf, at the proper height, from the wall of your studio, and in the proper light. This shelf, as usual, is to be entirely covered with white blotting-paper, and upon its horizontal part is to be firmly fixed the bottle of a large bellows, the bottle being made to resemble your specimen to appear. Set up your camera and focus this perch sharply on your ground glass; next put in your smallest diaphragm and attach your "pneumatic shutter" ready for instant use. Gently take your living bird in your hand, smooth its feathers, caress it for a moment or two, then quickly place its head under its wing, and by beginning slowly soon rapidly whirl your specimen in a circle. Thus, at its utmost, "put it to askew," but it will seize the perch with its feet, or rest quietly on rock or turf. Place it as near the end of the tube as possible to the position you desire, and soon ready for a semi-instantaneous picture. Be perfectly quiet. In a few moments your bird gradually comes to, rights himself, preens up a little, looks around, steadies himself into a natural attitude, finally looks himself, and then more or less animated. This is your chance; puff the snap on him!—Dr. R. W. SHUFFELTON, in The Ask.

[Specialy Observed for Popular Science News.]

METEOROLOGY FOR JUNE, 1891.

TEMPERATURE.

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<td>A1 A</td>
<td>63.90°</td>
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<td>A 1 P</td>
<td>62.82°</td>
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<td>A 1 F</td>
<td>60.42°</td>
<td>54°</td>
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<td>Second average</td>
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<td>Last 21 Junes</td>
<td>66.88°</td>
<td>61.07°</td>
<td>70.67°</td>
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<tr>
<td>Second average</td>
<td>62.06°</td>
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"Lovely June" has been less lovely this year than usual, tending to extremes, as may appear below. The 4th was the coolest day, with an average of 49.2°, the 16th, the hottest day, 83°. The lowest point was 47°, on the evening of the 4th; the highest, 92°, on the 16th,—a range of 45°, the widest of any June in twenty-one years. The highest daily range was 23°, on the 17th; the lowest, only 1°, on the following day,—the 18th. During these twenty-one years there has been but one warmer day in June, viz., on the 25th in 1888, when the average was 84.23°. For a few weeks a long hot and dry wave, suddenly followed by a long cool and wet period. The former extended from the 8th to the 16th, without a trace of rain, the mercury rising daily to 80° or above, reaching 92° on the 16th, and then falling suddenly 34° in the next twenty-four hours. The cool and wet spell followed to the 25th, the temperature rising above 88° but once, without a fair observation during the six days, and a rainfall of 2.47 inches—seven observations being noted "rainy." The mercury rose above 73° but twice during the rest of the month. The average of the entire month, however, was but 81° below that for the last twenty-one Junes. The mercury has reached 80° or above in ten of the last twenty-one Junes, the highest being 94° in 1874; but the mean of that day was only 82°. Standard thermometers often disagree from their locations being in different degrees of shadiness. My glass on the 16th at 1' M. stood at 92°; but another, also in the shade, with the same easterly exposure, twenty-five feet distant, stood at 96°. At 1' P. M. they stood at 91° and 94°; at 4' M. at 90° and 92°; at 6:40, with a cloudy sky, at 88° and 89°.

SKY. The face of the sky, in 99 observations, gave 47 fair, 14 cloudy, 21 overcast, and 8 rainy,—a percentage of 52.2 fair. The average fair for the last twenty-one Junes has been 88.2, with extremes of 40.1 in 1874, and 75.5 in 1871. The face of the sky during the hot and cool waves was in almost perfect contrast, the former having 25 observations fair out of 27; the latter, not one fair out of 15. There was no thunder-lightning this month, for five days were noted at the beginning and close of the month, with which the extreme waves did not interfere.

PRECIPITATION. The amount of rainfall the last month was 3.49
POPULAR SCIENCE NEWS.

inches. About 1 inch fell near the first of the month, and the rest during the cool spell, relieving a drought which was becoming severe. The average rainfall in twenty-three June has been 2.72 inches, with extremes of zero in 1875, and 5.30 in 1873. The amount of precipitation since January 1 has been 32.83 inches, while the average rainfall of the month in twenty-three years has been only 25.05 inches.

PRESSURE.

The average pressure the past month was 29.33 inches, with extremes of 29.73 on the 28th, and 30.14 on the 7th, -a range of only .42 inch. The mean for the last eighteen June has been 29.35 inches, with extremes of 29.845 in 1882, and 30.056 in 1884, -a range of .211 inch. The sun of the daily variations was 2.20 inches, giving a mean daily movement of .076 inch. This average the last eighteen June has been .115, with extremes of .058 and .215. The pressure the past month was more uniform than any June in eighteen years, with a single exception. The largest daily movements were .20 and .16 on the 30th and 28th.

WINES.

The direction of the wind was peculiar for June, as follows: 24 observations N., 6 S., 9 E., 25 W., 9 N. E., 10 N. W., 4 S. E., and 9 S. W., an excess of 30 northerly and 22 westerly, which gives a mean of W. 53° 45' N. The mean for the last twenty-two June has been W. 67° 45', with extremes of W. 76° 5' S. in 1876, and W. 53° 45'E. in 1891,-a range of 126° 45', or full eleven and a half points of the compass. The northerly winds in June have prevailed over the southerly six times in the last twenty-two years. The relative progressive distance travelled the last month was 37.21 units, and during the last twenty-two June 72.10 such units, an average of 32.82,-showing less opposing winds than usual.

NATICK, July 6, 1891.

[Separately Computed for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR AUGUST, 1891.

Mercury is an evening star throughout the month, and comes to greatest eastern elongation (32° 25' 25") on August 16. It is, however, nearly 10° south of the sun, and the condition of visibility is not so good as in April, but it can probably be seen low down in the western horizon soon after sunset for a few days about the middle of the month. It will be in conjunction with Saturn on the evening of August 18, the latter being 3° 30' north of Mercury. Venus is still a morning star, but is nearing superior conjunction with the sun, which it will reach on September 18. At the beginning of the month it rises only about an hour before the sun, and less than half of that at the end. There is a very close conjunction with Mars at 3 A. M. on August 22, the distance apart being only about one minute of arc. This will be before sunrise for places in the United States towards the north, but both planets are too near the sun to be easily seen even with a telescope. Mars passed conjunction with the sun on the morning of July 30, and became a morning star, but will remain too near the sun to be easily seen during the month. Jupiter is getting into good position for observation. It passes the meridian at 2h. 59m. A. M. at the beginning of the month, and at 12h. 20m. A. M. at the end of the month, and is above the horizon nearly all night. It is in the constellation Aquarius, and moves westward about 3° during the month. The following eclipses of its satellites will be visible from some part of the United States. The phenomena are all disappearances, and all take place off the left-hand limb of the planet, as seen in an inverting telescope. Times are Eastern Standard.

III. D. August 2, 4h. 55m. A. M.
I. D. August 3, 5h. 55m. A. M.
I. D. August 5, 12h. 24m. A. M.
I. D. August 6, 12h. 28m. A. M.
I. D. August 12, 1h. 15m. P. M.
I. D. August 13, 11h. 47m. P. M.
I. D. August 14, 12h. 13m. A. M.
I. D. August 20, 1h. 50m. A. M.
I. D. August 23, 2h. 15m. A. M.
I. D. August 25, 6h. 14m. A. M.
I. D. August 27, 4h. 25m. A. M.
I. D. August 30, 10h. 58m. P. M.

III. D. August 30, 8h. 50m. P. M.

D. August 2, 1h. 55m. A. M.

Saturn is still an evening star, but is getting near the sun, and after the middle of the month will not be easily seen. At the end of the month it sets a little more than half an hour after the sun. It comes to conjunction with the sun on the morning of September 13. Uranus is in the constellation Virgo, and is in the southwestern sky at the morning of August 16, and in the constellation Taurus, and is a morning star.

The Constellations.-The positions given hold good for latitudes differing not many degrees from 40° north, and for 10 P. M. on August 1, 9 P. M. on August 16, and 8 P. M. on August 31. Lyra is in the zenith, Aquila is coming to the meridian at about 00° altitude, and Sagittarius is low down on the south meridian. East of Sagittarius is Capricornus, at about the same altitude, with Pisces Australis just rising below it. Aquarius is in the northeast, and Pisces is just rising in the east. Above Places are Pegasis and Cygumus, the nearer to the zenith. Going from the eastern horizon toward the pole star, we find first Andromeda, and next Cassiopeia. Perseus is on the horizon below Cassiopeia, and Cepheus is above. The head of Draco is just west of the meridian, and a little north of the zenith. Ursa Minor is mainly to the left and above the pole, while Ursa Major is to the left below. Hercules is to the west of the zenith, high up, and below it are Corona Borealis and Boötes, with Virgo just on the west horizon. Libra and Scorpio follow Virgo, and are both low down in the western sky. Ophiuchus is above Scorpius.

M. LAKE FOREST, ILL., July 3, 1891.

QUESTIONS AND ANSWERS.

QUESTIONS regarding the treatment of diseases cannot be answered in this column.

J. C. R., Alabama.-What is the cause of the St. Elmo's fire sometimes seen about the masts and rigging of vessels at sea?

Answer.-It is caused by a discharge of atmospheric electricity through the rigging of the vessel, the pointed masts and spars exercising excellent conductors for that purpose. Similar glowing lights are caused by lightening, by a frictional electrical machine, or a Rhumhoff coil when worked in the dark.

R. B. C., Penn.-I recently saw a steel drill which had become magnetic without having been in contact or near a magnet. From what was the magnetism derived?

Answer.-The borings and filings formed by steel drills, and, consequently, the drills themselves, are sometimes seen to be magnetic. It is probably due to the inductive action of the magnetism of the earth, aided in some way by the friction. Steel bars which have remained for some time in a position pointing towards the magnetic pole of the earth, often become magnetic from this cause, the earth affecting them like a large magnet— as, in fact, it is.

S. J. F., Losantiville.—If the velocity of a river be doubled, while the amount of water passing a given point in equal times be doubled or quadrupled?

Answer.—The amount of water flowing in a stream, other conditions remaining the same, is directly proportional to the velocity, only twice as much water would pass down if the velocity was doubled. The conditions are exactly analogous to a moving railroad train. Just twice as much car could pass an observer standing by the track in a given time if the speed of the train was doubled.

C. F. T., Boston.—What is the meaning of the term "causative," as used in a cause?

Answer.—A cause is an illuminated curve, produced by the irregular reflection of rays of light from a concave reflecting surface, due to spherical aberration. A good illustration of causative curves is found in the reflection from the interior of a polished silver napkin ring when placed upon a table. It is a light in a strong light. A similar curve is produced by reflection from the sides of a glass tumbler partly filled with milk, and the image is sometimes called by children "the cow's foot in the milk."

J. B. M., Virginia.—What is the scientific explanation of the faintly luminous dusk which appears to be partly surrounded by the more brilliant and brightest of the new moon when two or three days old?

Answer.—The illumination of the moon's disk is due to the sunlight reflected to it from the earth. When this reflection is 18° high, as seen from the moon, would be completely illuminated by the sun, or "full." What we see is really the surface of the moon illuminated by the "earthlight" ahead of the sunrise, just as at the time of the full moon the lunar inhabitants—if any existed—might see the earth by moonlight. The dark, small, slightly larger sized circle on the moon's surface is an optical illusion, due to the principle of irradiation, by which a bright object seen on a dark background appears larger than it really is, while a dark object on a bright background appears smaller.

B. M. C., Conn.—How can a perfectly homogenous light—that is, unaccompanied by any other color—be obtained?

Answer.—Very few sources of light give a pure and unmixed color, or, in other words, emit light waves of a single length. Perhaps the best way to obtain such a light is to volatilize a salt of some substance, and mix it with the gas. The yellow sodium light is composed of rays of two different wave lengths only, and the difference between them is so small that in most cases it may be disregarded.

LITERARY NOTES.

Eberhart's Elements of Entomology. A. Flannagan, publisher, 156 Welsh avenue; Chicago, Price, 35 cents. This work gives full and complete directions for collecting, mounting, and preserving insects; a pictorial key to all our common and interesting forms, and an explanation of technical terms. It contains forty full-page plates, embracing more than three hundred and fifty figures. In direction for collecting and mounting of insects, nothing essential is omitted. Useful instructions are given on time and places to hunt, etc. It has been adopted for use in Eberhart's and in the College of Science. Members of the Agassiz Association will find it particularly useful.

THE ELECTRICAL EXECUTIONS.

The recent executions by electricity at the New York State penitentiary at Sing Sing were successful in that they accomplished the purpose of destroying life instantaneously, painlessly, and without the harrowing accompaniments of a public hanging. It is to be regretted that the former policy of secrecy has prevented a complete knowledge of the particulars of the affair, but enough is known to sustain all the claims made by the advocates of this method of capital punishment.

The outcry in certain quarters against the "barbarity of electrocution" is hard to understand, except on the supposition that it is capital punishment itself, and not any particular thing to which these foolish and ultra-sentimental enthusiasts object. There is not the slightest doubt that a current of 1,000 volts (the number of amperes is not given) passed through the body in the method used in these cases will produce total unconsciousness and death before the slightest sensation of pain is felt. Persons who have been struck by lightning towards evening, agree in stating that no sensation whatever was felt by them at the time of the stroke. The speed of the electric current is so much greater than that with which the sensation of pain travels along the nerves, that the sensory organs are paralyzed and destroyed by the electric energy before the sensation of pain can reach them. An apt illustration of this comparatively slow speed at which sensation is transmitted along the nerves has been given by supposing an infant with an arm long enough to touch the sun. If, in the first year of his life, he burned his fingers in this manner, he would never feel the pain of the burn unless his life far exceeded that of most men, the time required for the sensation of pain to pass through the ninety million or more miles of nerve fiber being much longer than that of an ordinary lifetime.

In a recent number of the Medical Record the editor, Dr. SHIRLEY, states that at the electrical execution of the murderer Kemmler, a year ago, death was not instantaneous, and that he suffered-indescribable torture. This is in direct contradiction of the testimony of other physicians who were also present on the occasion. But whatever mistakes may have been made at the first trial of a new method of execution by those who of necessity were more or less inexperienced in its operation, the more recent executions have shown that in the future no unfortunate accidents are to be anticipated, and that the use of electricity for this purpose is effectual and, perhaps, desirable.

But whether it is really worth while to be at so much trouble and expense in the execution of criminals, is an open question. Death by hanging, as far as all testimony goes, is practically painless and instantaneous. The world is well rid of the miserable wretches who were removed from it at Sing Sing last month, and they are certainly beyond the power to do further harm to their fellow beings. The community takes the life of a murderer as it would that of a rabid dog, to prevent him from doing any more harm, and while it is only the part of ordinary humanity and decency to do so with as little bodily and mental pain as possible, it is doubtful if there is any great advantage gained in these respects by electric execution over the older and equally effectual methods.

The suggestion of the London Times that criminals should be rendered unconscious by a strong narcotic previous to execution, seems to be a humane and practical one. The narcotic could be administered without their knowledge, and in whatever way life was finally destroyed the condemned criminal would only fall asleep, never to wake. In this way the demands of justice would be satisfied and the safety of society attained without the revolting scenes which must necessarily accompany executions as at present conducted.

DISEASE-PRODUCING MICROBES.

The theory of the bacterial origin of certain diseases has come into general acceptance among physicians within the past few years, and, while we doubt if the exact relations of these bacteria to disease can be determined, and to what extent they are associated with the disturbed condition of the system, there can be no doubt but that micro-organisms of a perfectly definite and specific form and character are found in the secretions or excretions of the bodies of persons suffering from particular diseases. Koch's discovery of the bacillus of tuberculosis a few years ago was a most brilliant piece of work, and the presence or absence of this microbe in the sputum, in cases where consumption is suspected, is now considered one of the most reliable diagnostic signs that can be obtained.

We copy from La Nature some engravings made from micro-photographs of some of these microbes which are of special interest. In Fig. 1 the small rod-like bacilli of consumption, above referred to, are shown, and the few blood-corpuscles also represented serve to indicate their comparative size. Fig. 2 is the celebrated "comma" bacillus of Asiatic cholera, which was also discovered by Dr. KOCH while on an expedition to India for the purpose of studying the disease in its original locality.

Fig. 1. Tuberculosis.  Fig. 2. Cholera.

Fig. 3. Typhoid fever.  Fig. 4. Diphtheria.

and an instance is reported where a prolonged soaking in the strongest carbolic acid failed to destroy their vitality. This tenacity of life may explain the sometimes malignant character of the disease, and may be partly responsible for the usual methods of treatment.

Such immense advances have been made in the field of bacteriology during the past few years, and the results of the investigations have been of such profound value to medical and surgical science, that we may confidently look for still greater and more important discoveries in the years to come; and we may even hope that some method may be found of absolutely controlling those diseases which are connected with the existence of bacteria in the organism. If this hope is not realized it will not be for the lack of hundreds of earnest, patient students who are devoting their lives and energies to the solution of just such problems.

THE STERILIZATION OF MILK.

The first endeavors to sterilize milk were made chiefly from a commercial standpoint, e.g., to preserve the fluid sweet a longer time. But, as the knowledge of pathogenic germs and the action of ferment organisms became clearer, the suggestion naturally entered the medical mind to sterilize milk from a hygienic and therapeutic point of view, chiefly for the nourishment of infants in health and disease.

A large number of experiments have been made by various experimenters, with a view to discover the most practicable means of sterilization combining effectiveness, cheapness, and harmlessness.

To that end, drug after drug, gas after gas, were tried in vain; we have still to rely on the action of heat, though perhaps electricity under proper conditions may prove successful. But for every home, for every physician, heating is the only practical process.

To kill all the bacteria usually found in milk—and there is always a wonderfully great and diversified array of them—it requires to be heated a few minutes at about 224°F. A special steam sterilizer is necessary to attain such a high temperature. The same effects may be obtained usually by boiling the milk about thirty minutes. Heating a few minutes between 158° and 176° is sufficient to destroy temporarily the energy of a large number of milk microbes including several disease germs, but does not kill many of them, and is not, therefore, sufficient as a preservative means. This is the temperature (about 167°), the application of which is known as pasteurization.

Unfortunately for the people, there are yet some medical men who will not concede any dangerous properties to microbes, and a vast number who are in ignorance of the action of germs in milk before or after ingestion. Such is only to destroy disease germs that sterilization is indicated. By no means. Indeed, in infant-feeding, it is chiefly to prevent the irritative action of acid produced by microbes or germs of all kinds, whether truly milk ferment, pathogenic bacteria, or organisms harmless under ordinary circumstances.

Milk coagulates, acidifies, under the influence or vegetative phenomena of various ferment organisms. The acid produced has the most benefic influence on the delicate stomach and intestinal canal of the child. Sterilization of fresh milk destroys the property of the germs before any acid is produced by their process of nutrition.

Besides the true milk ferments of various kinds, there is a number of cocci and bacilli which grow in milk. Among the former, there are many which produce acids. Hence they, too, are deleterious and dangerous in the milk fed to the young.

DUCAUX, in his researches on the subject, noted...
that milk sterilized at about 167° F. was about free from acid-producing germs, but still contained live bacilli: a class of microbes apparently more difficult to utilize, acting chiefly on the casein and producing, as a rule, alkalinity instead of acidity. This fact suggested to the mind, that even though the heating of milk be not carried to boiling, yet it may be very useful in arresting the growth of the acid ferments, and leaving therein the bacilli, causing, by their nutrition, alkalinity of the media. We all know how frequently lime water is administered to bottle-raised babies to counteract the effect of acidity. Theoretically we might, on the same principle, ascribe a beneficial influence to the alkaline-pro- ducing germs. Indeed, there can be no doubt that this is so, from the experiments and observations made in the course of the past several years. Moreover, a double process, or a triple process, or even a quadruple process, may be employed, and the sterilization can be made as absolute as may be desired, without any fear of injurious fermentation.

In the careful, constant use of pasteurized milk, there is neither colic, green diarrhea, or other intestinal disorders so common when using raw cow's milk: but if the milk be highly heated, say at boiling-point for several minutes, it is cooked and the casein is affected: it digests well, but there may be some slight colic owing to the hardness of the faces, and consequent interference with the naturally easy and frequent evacuation of the bowels at a tender age. But there are not any other intestinal troubles.

Pasteurized milk, however, should be used early for it will not keep long, the germs not having all been permanently arrested: therefore, only careful medical people can safely utilize it. Thorough sterilization on the other hand is practicable by all who may provide a vessel of some kind to boil water. To heat the milk at any temperature, it may be put in nursing bottles, plugged immediately with clean cotton wool (absorbent cotton), and then the bottles should be placed in a water bath, allowing the water and bottles to heat simultaneously. There are more convenient steam sterilizers manufactured now for the purpose.

We have caused the use of both sterilized and pasteurized milk in a number of bottle-raised babies, who have been healthy, had much success, and we would recommend to doubling phys-icians the careful study of fermentation, coagula- tion, and digestion of milk, and the effect of pasteurized, sterilized, and raw cow's milk on the sensitive digestive organs of the young.

It must not be forgotten, either, that the germs of cholera, typhoid fever, diarrhoeal pneumonia, and others are destroyed or arrested in their pullulation by a temperature not higher even than that used in pasteurization, i.e., 165° to 167° F.

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARKE, M.D.

LAWSON TAIT ON SURGERY.—At a meeting of the British Medical Society, Mr. Lawson Tait delivered the address in surgery, choosing for his subject "Surgical Training, Surgical Bacteria, Surgical Results." From the earliest times, he says, we have made most earnest attempts to diminish suffering, to prolong life, and to cure disease. We have made mistakes, but there is no human progress without error. He then spoke of the need of a time of review of a general education, but insisted on the necessity of a special training and subdivision of labor for the attainment of the highest art and skill. "A surgical craftsman must be a trained gentleman, accustomed to a classical education to use his native tongue with ease and fluency and without confusion. He must have the fundamental principles of reasoning and of business habits instilled into him by such mathematical training as will be involved in his being able to pass concede of the principles of his practice and all his operations exist."

The author protests against the attention to detail and the enormous waste of time involved in the present biological training of the surgical student. Let him learn his anatomy so he will never forget it and every fact in it which may, under the most unlikely circumstances, be called for. He must learn nameless, useless details of anatomy which he prepares himself to forget as soon as the examinations are over. In the old days it was charged against the corporations that they turned out a large number of ill-educated empirical practitioners who knew nothing but their patients; now the tendency is to turn out a still larger number of scientific young tyros who know neither patients nor their diseases.

Mr. Tait therefore strongly favors the old apprenticeship system, though slightly modified, for there is no longer need for the pharmaceutical work. We should not only know how to deal with disease, but with men and women while they suffer from it. Our biological practitioners have no experience of either of those lines of research. Mr. Tait has seen some of the practical experience in the mechanical work required in surgery, and thinks each student who is to follow the craft of surgery should be taught to use his hands in the carpenter and blacksmith's shop.

Having spoken of the training for surgical practice, Mr. Tait then spoke of the great advance in surgery in his day. The year 1847 was the birthday of our work, when anesthetics were brought into the region of actual fact. It has been to surgery what the motive power of steam has been for the arts, manufactures, and commerce. The present surgical triumphs could never have been attained without the aid of anesthetics. The number of operations have vastly increased, and the subdivision of work has become innumerable. It is all due to anesthetics. The same may also be said of children's surgery, when Bowman and Crichteath found that they could not combine rough general work with their finer work. In abdominal work nothing was done before the introduction of anesthesi- onex except Ephraim McDowell's work. The next great advance was the intra-peritoneal treatment of the pelvis of means of the cavity. As the practice of surgery has grown up so has the number of hospitals, and they have also been improved. Many advantages are gained by the development of specialization.

As to surgical results, Mr. Tait wished that they were better, and that we knew better what they were. In the results of our work we have much cause for congratulation. He then spoke of the autopsie theory, which has not lost to any examinations now impressed upon us that every homely known before its day, namely, that dead midst organic matter will decompose if some agent or other gets to it." As to autopsia in midwifery, Semmelwes thirty years ago claimed that per- peral women were poisoned by dirt. To improve our results we do not need any more theories, but better work and better systems of working, pre- ceded by better systems of training.

TOBACCO AND ORGANIC LESION OF THE HEART.—In connection with a discussion at the New York Academy of Medicine, relative to the influence of tobacco upon the system, Dr. A. L. Loomis, thought that when tobacco poisoning reached a point where it produced disturbance of the heart there was something more than func- tional disturbance; there was a change either in the connective tissue or in the musculature of the heart, or did he hear either or cocaine. He impressed the fact that the heart condition was not functional; it was organic.

Dr. A. Jacoby, having elicited from Dr. Loomis the opinion that in such cases there was never, as far as he observed had gone, entire recovery from the heart trouble, said that he could not agree with him. He knew persons who had had heart disease, as a result of nicotine poisoning recover entirely after the use of tobacco had been discontinued. That was a hope which he thought we should hold out to our patients, unless it could be shown that the lesion causing the disturbance was of a nature which did not admit of entire recovery.

Dr. Loomis thought Dr. Jacoby had in mind cases in which the disturbance of the stomach from use of tobacco, which caused reflex irritability of the heart.

Dr. Jacoby remarked that Dr. Loomis seemed to know his mistakes better than he knew them himself. He did not believe that he had made a mistake, although he thought there was room for diversity of opinion. He would be very sorry to have patients get the idea that their condition was an organic change in the heart which could not be remedied.

Dr. Andrews mentioned a case in which the man was obliged, twenty-five years ago, to give up tobacco on account of disturbance of the heart and he remained well today at 76.—Journal of American Medical Association.

A NEW DISEASE.—Two English physicians, Dr. Dale White and Mr. Golding-Biv, have recently described an affection to which they give the name "idioglossia." It appears that the patients hear well, and express themselves in articulate sounds, but such sounds are unlike those of any known language. The patients really have a language of their own, in which they use words which are so called. The sounds given forth have an intelligent application and the same sound always has the same meaning. The discussion before the Royal Medical and Chirurgical Society was varied, some of the members contending that the so-called language of these affected was but a modification of the English tongue, and was to be accounted for by a lack of development in that particular direction.—Journal American Medical Association.

A NEW TREATMENT OF PUTRIDITY.—German-See shuts his patient up for two, three, or more hours daily in a hermetically closed metallic chamber, into which is slowly admitted a current of compressed air, which, having passed through a mixture of crocuses and eucalyptus, is saturated with the vapor of these substances. Since August last ten cases of phthisis have been sub- mitted to this treatment, all of which cases, with one exception, had reached the period of softening, and bacilli had been detected in the sputa. The results obtained were: return of appetite, even in advanced cases, gain of weight and strength, fall of temperature to the normal in a week or two, disappearance of hemoptysis, diminu- tion of cough and of purulence of sputa, sus- cession of dyspepsia. It is claimed that the method reduces the malady to a purely local lesion, all
the general symptoms disappearing, even though rales may persist. M. Seé related the history of seven of his cases, all of which were relieved, and some actually cured. The treatment has been found efficacious in fetid bronchitis (dilatation of the bronchii).—Lancet.

TREATMENT OF DIAPHRAGM.—Mayer bases his treatment upon an energetic use of ice, which is perseveringly applied both externally and internally. Ice bags are to be kept on the neck, care being particularly taken that the swollen glands are directly in contact with the ice, which is to be constantly renewed. Simultaneously the patients drink cold water by means of a bent glass tube, and in the morning a suppository made of coarse wine or syrup or any flavoring agent may be added to the water. Chlorate of potassium is also given internally in small doses. The author believes that the use of baths and antiperspirants is useless, but the adoption of a strengthening diet, including wine, is a matter of course. Experience with this method exclusively during sixteen years has convinced Dr. Mayer of its value: none of his patients died, and only rarely was the larynx involved.—Provincial Med. Jour.

DIETETIC TREATMENT OF EPILEPSY.—Whether the theory of the explosion of nitrogen in the brain substance as the cause of the epileptic seizure be true or not, certain it is, according to John Ferguson, that the malady is aggravated in patients epileptics. In these cases a non-nitrogenous vegetable diet alone has rendered better service than the brosides, without restriction in diet.—Therap. Gazette.

THE HYPODERMIC INJECTION OF OXYGEN.—Dr. Francesco Valenzuela, physician to the Provincial Hospital, Madrid, has just published in El Siglo Medico, a paper on new methods of administering oxygen, with special reference to the treatment of septic pneumonia. Believing that oxygen inhaled by dyspneus fails frequently to relieve because it does not come in contact with a sufficiently large vascular surface, he began administering the gas per rectum and also hypodermically. In every case in which the oxygen exema was given, the dyspneus was relieved in a decided and permanent manner. The ease and rapidity with which the gas was absorbed by the intestines were very remarkable. Oxygen, indeed, appeared to be as rapidly taken up by the intestines as by the lungs, four injections of five liters each being absorbed in an hour, thus proving the intestinal mucous membrane to be capable of serving as a most valuable auxiliary in the course of the lungs. In employing oxygen hypodermically, Dr. Valenzuela believes it to be important to introduce the gas in its nascent state. The situation selected for the puncture was the arm, and the quantity of gas introduced varied from half a liter to a liter. Cellular emphysema was of course produced, and a sensation of heat was complained of. Sometimes, however, the oxygen was entirely in the course of a few hours. There was no calaminous action or slowing of the respiration, but there was a marked stimulating action on the heart, such as is indicated in the collapse that follows pneumonia or fevers of a typhoid character, also in cerebral congestion and asphyxia. No indication is given of the temperature at which the oxygen is introduced, a point which, according to Dr. B. W. Richardson, is of great importance. Perhaps the Spanish observer, who does not appear to be aware of Dr. Richardson's work, is mistaken in the advantage gained by using oxygen prepared ad hoc to its being nascent, whereas it is probably due to the temperature being high. It will be noted that Dr. Valeuzela confirms Dr. Richardson's statement that oxygen is relaxant and eliminative.—The Lancet.

THE PHARMACOLOGY OF ACOINETE.—Dr. Wm. Murrell, of London, considers commercial acocinetite as an uncertain substance from a pharmacological as well as a therapeutical standpoint. In reality, he says, we do not know whether our acocinate is acocinate proper or pseudoacocinate, or japaococinate, or a mixture of all three. English acocinate, so called, is at least seventeen times as active as the German, the French being intermediate in strength, but this classification into English, French, and German is clearly unreliable and unscientific. It would seem that the use of acocinate is attended with considerable danger, several cases of poisoning having been reported simply from using a stronger acocinate than the prescriber intended. One case, which terminated fatally, happened because the physician was under the impression that the French were a sure remedy. The bruising of acocinate root is as poisonous as prussic acid taken drop by drop. The U. S. P. tincture of acocinate root is half the strength of Flenling's tincture, and the B. P. tincture is only one sixth as active as the latter. Murrell prefers to administer acocinate by dropping half a dram of the English tincture into four ounces of water, administering a teaspoonful every quarter of an hour for one hour, and subsequently every hour for six hours, or until the acute symptoms have subsided. He also uses tablets or triturations in a similar manner.

Acocinate especially affects the heart,—first its ganglia, then its nerves, and lastly its muscular substance. It may also act upon the vagus roots of the neck. It lessens arterial pressure by depressing the heart's action; it does not affect the vasomotor centre or nerves. Acocinate is a protoplasmic poison, lowering the actions of all nitrogenous tissues; first, of the central nervous system; next, of the nerves; and finally of the muscles. It has a special affinity for the sensory nerves, which is best shown by topical use of the agent in neuralgia.—The Medical Bulletin.

MEDICAL MISCELLANY.

SHAVING WITH VASILINE.—A writer in the Drugs' Central says: "It is of importance to the value of valetude as a shaving cream. The beard is said to be rendered as soft as when soap is used and there is no resulting irritation of the skin."

RINGWORM IN DEMAND.—The following advertise ment appeared the other day in a British paper: "Lady, having the care of two little boys with ringworm, wishes to meet with one or two others to share their educational advantages."

DISAGREEABLE FOR THE DOCTOR.—A physician of Chicago who was on the witness-stand testifying to the lunality of a man, was interrupted in his remarks by the landing of a rotten egg on his head. The egg was thrown by the subject of the doctor's testimony, who was promptly admitted to be insane, or at least "quarrel."
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FAMILIAR SCIENCE.

[Original in Popular Science News.]

SUMMER'S NATURAL ORCHESTRA.

By ANNA HINRICH.

This is the concert season of the insect world. An invisible orchestra makes melodies the woodland glades, the sunny fields, and floral splendor. The dreamy charm of summer's grateful retreats is heightened by a concert of pleasing sounds. The musicians are concealed in the arched branches overhead; they express contentment and gratitude without Òipping the nectar of fragrant flowers;—may, the very couch of creeping grass is charged with harmonists! Song is the expression of happiness. In most types of this winged kingdom, Nature has seen fit to grant musical tendencies only to the masculine element. Obviously the permeating happiness of this winged realm is due to the blessed possession of silent wives! It was on a hot day in July that Beethoven composed his "Pastoral Symphony." While pensively resting on a stile in the environs of Vienna, Nature gave him those imitative sounds which he so beautifully reproduced. We hear with the immortal composer the soft hum and stir of the insects on a mid-summer's day, breathing of life and happiness.

Who has provided instruments delicate enough for these illusionary performers? Nature! Instruments that are ever ready and in tune so long as the little life is instinct. Nor are these gratulants concerts monotonous, as might be inferred from the limited facilities with which the organization is endowed. The composition of these natural concordants range in pitch through three octaves and a quarter! The music-beetle is the prima donna. Its cry, in the quadraple-quaver of D, is the highest of all the insect race. The opposite extreme in register is the deep buzz on C of the bumble-bee. He is the basis tuba of this musical company. Between these extreme soloists—a span of three and one-quarter octaves—occur the utterances of all crawling hexapods in Nature's salle de concert.

The musical instruments of the higher beings are the lungs, larynx, jaws, and mouth. No insect has real voice. It is gifted only to the extent of producing melodious sound. Dr. Landolsi has classified these sounds into noise and tone. Tone is produced by those provided with respiratory organs similar to those of man—lungs and larynx. Noise is effected by means of friction or rubbing together of attacked members of the body. Representative of the order Coleoptera (straight-wing) make themselves audible by rubbing together the wing-sheilds. A few of this order are capable of producing noise. The Moschatus (musk-beetle) emits a peculiar bat-like sound. It is somewhat discordant, not unlike the—to some perversely carding noise of a snatching slate-pencil. The sound issues from a peculiar breast-work mechanism of ridge-like veins. In manipulating this musical apparatus the head moves up and down. Even in microscopical beetles this automatic movement may be detected. The resultant noise, however, is too feeble to penetrate the ear. The Vespido (browning-beetle) makes a queer rattling noise. Although produced through friction, it is very like a guttural sound. The Vulgaris (cock-chaffer) sounds his corso di bassetto on J below the staff.

Highly interesting is the sound apparatus of the common May-beetle. Suspended in the trachea is a little tongue which, in breathing, moves back and forth. This contrivance results in that well-known whirrlag cry with which the insect heralds its approach.

"Death-watch" (Tesselaturn) was once a terror inspiring word. This perfectly harmless little silent of silent was often secreted in old worm-eaten furniture and wood-work. Its presence is readily detected by tapping with the head of a pin. If present it responds immediately with its characteristic tick. The sensitive ear will at once perceive that the death-watch cry is in two voices—the call and the answer.

\[\text{Call}\]

\[\text{Answer}\]

The Orthoptera (straight-wing) insects produce noise through friction. The lovely note of the cricket—a result of sharp friction of the legs—is a series of triplets in \(D\).

The roving grasshopper is a veritable violinist. The slender limb is his violin; the wing serves as his bow. The inner side of the limb is bordered with from ninety to a hundred microscopic teeth. The wing has a prominent vein, projecting like a beak; this serves as a bow. This bow, drawn across the violin, creates that well-known rustling sound. All living violins are not in the same key. Repair to the meadow gate at twilight. Hark! the viola principato! The first and second violins in unison, with interludes and solos by the tenor violin!

Evidently the grasshopper has degenerated in his musical qualifications—based on ancient tradition. Plutarch relates the following: As Terpander was playing his lyre at the Olympic games, and had just carried his listeners into the most acute threes of capture,—a string broke! Instantly a singing Cicada lit on the bridge, supplying the loss of the string, and thereby saving the fame of the performer.

The Dutch call these singing locusts "lyre-players," because of the resemblance of their notes to that of a vibrating wire. This creature has been described by Anacreon as the "symbol of felicity—even young and immortal; offspring of Phoebus and darling of the Muses." The Athenians were enthusiastic lovers of these "songsters." They kept them in gilted cages, and spoke of them as "nightingales of the nymphs." It must be conceded that even today the song of the Cicada is of a more complex composition than that of any other of the winged (hexaped) race.
There are but few of the Lepidoptera (scale-wing) that make themselves heard. Nature seems to have considered the gorgeous creatures sufficiently favored in the pride of their brilliant coloring.

Investigators have discovered that the prevalent tone in Nature may be referred to the key of F. This is especially typical in the order Hymenoptera (membrane-wing). According to Huber, every bee-lives has its fanners. As the term implies, it is their mission to fan, by keeping up a constant tremulous motion of the wings. The mezzo-aria emanating from this host of fanners is in the key of F. The hum of the honey-bee (Melissa) is the same as that of the bumble-bee in tone, (f), with a difference of one octave in register. The great bumble-bee, the contra-basso of his tribe, sings this note:

The Dipteras (twice-wing) insects produce sound through respiration and by the play of their wings. The former is readily distinguished from the latter. The wing sound incurs 320 vibrations of that member per second—a continuous moment of sound representing nearly 20,000 vibrations! The respiratory tone of the great buzz-fly ranges through e, d, and b, below middle C. The wing sound is in e and f, same register. The scherzo of the little house-fly is more embellished. It is on f in the first space.

Considering his diminutive size, the gnat (Philes) produces the most powerful sound. He is really the trumpeter of the insect world. Naturalists differ greatly concerning the origin and part of the insect responsible for this proportionately immense volume of noise. His clear, well-defined note is on A above middle C.

The defiant catch-me-if-you-can hum of the mosquito is on d, fourth line and space of the treble staff. An overture by this troupe is not generally appreciated even though radically suggestive of the tender sentiment, "So near, yet, ah! so far." Dr. Laoudis relates an amusing incident concerning this little instigator of foible language. In shrill key he shouted to his careless valet: "If ever you neglect to polish my boots again, the mosquitoes shall bite you to death." Scarcely had he uttered the threat when it was answered by the shrill sound of all-powerful tormentors hovered over the horrified servant of dusky hue, who forthwith became a staunch believer in witchcraft.

THE DEATH-WATCH.

This little insect shown in the accompanying engraving is the Anabium tessellatum, commonly known as the "Death-watch," from the ticking sound which it makes when calling to its mate. Superstitious persons oftentimes give themselves needless uneasiness when listening to these sounds, from an old belief that they foretold the approach of death. But the only real harm that can be charged to the Anabium is the perforation of wood, furniture, etc., which has given him in France the popular name of "The Chimlet."

The accompanying engraving (from La Nature) was copied from a photograph of a beech tree standing in a wood about fifteen miles from Metz. The tree is several hundred years old, and the contortions and irregularities of its trunk and branches are most remarkable. Occasional departures from perfect symmetry can be observed in almost every tree, and it is proverbial that a bending of the young twig leads to the inclination of the adult tree; but it would be of great interest to know the original cause of the manifold twistings and turnings of this tree, and whether they were due to an accidental bending of the young shoots or to an abnormal habit of growth.

This tree, which is probably the most remarkable of its kind, is an object of interest to large numbers of sight-seers, and is locally known by the inappropriate name of the Joli-Pou, or Pretty Fool.

IN A GLASS MANUFACTORY AT MURANO.

By Ada M. TROTTER.

Murano is a small island, about one mile and a half to the north of Venice. The town contains some 4,000 inhabitants, and has been the seat of the Venetian glass manufacture since the 13th century.

The origin of this industry seems buried in obscurity. We find it existing at an early date in the city of Venice, whence the furnaces were banished to Murano in the 13th century, for fear that the smoke would injure the beautiful buildings. Thus it was from this center that those marvelous decorated mirrors, goblets, vases, etc., went forth to astonish the world.

Venetian glass-making was at its zenith in the Middle Ages. It began to decline in the 18th century, on the introduction of English, French, and Bohemian glass, and at length passed into oblivion, so that it was supposed secret of the art were lost. But, during the last 30 or 40 years, the Signori Saviati and Rasi have rediscovered
these secrets (it is said), and fashion smiles again upon Venetian glass, as one well believes who has an opportunity of seeing the rich array of artifical objects, brilliant as gems, which fill the windows of the shops in San Marco in Venice.

The furnaces at Murano have recovered their prestige, and we gladly embraced an opportunity afforded us of paying a visit to one of the manufactories.

After prolonged study of the dainty golden iridescent tumblers, the exquisite forms of vases, plates, goblets, etc., we certainly expected to be ushered into some perfectly appointed workshops, such as we had seen at St. Vitae and Worcester, but the workshop was, in fact, a mere shed; its appointments of the rudest kind; and, though I watched all the processes for an hour, and saw a lovely vase made from a molten mass of red-hot glass, still I felt that it must be an absurd mistake to imagine that brilliant gems like artifical work could be carried on in such surroundings. Seeing should be believing, however, and the hour passed away like a few minutes as we stood beside the master-workman, who wielded his molten mass with a few deft touches, each one of which told to perfect the shape he was creating.

But a word as to the workshop. In the center of the shed was an enormous furnace subdivided into ovens, whose doors stood open disclosing the fierce red glow within. Stretching back of this central furnace were many large, rudely fashioned lake ovens, well filled with finished work, set there to be tempered.

Opposite each open furnace door, at a convenient distance for the workman to move to and fro with his work, was a rough seat beside an iron stand or rest. This, with a clumsy pair of shears and a smooth piece of iron, was the sole provision made for the work, and it was with rude implements such as these that the elegant vase I saw made was shaped.

It was a little confusing, at first, when we entered, to keep our attention on any subject in particular, when there were so many things that excited our interest. Nor was it easy to keep clear of the workmen, who incessantly pass back and forth to the furnace, for as the glass cools it becomes too hard to mould, and has to be held again to the fierce glow of the ovens. It was a little alarming to have this red-hot mass swing carelessiy as much as an inch of one's face, and to move to right or left was to encounter fresh peril. Still our curiosity as to the process gave us courage, and we decided at length to give all our attention to the man who seemed, by the respect paid him by our guide, to be the cleverest workman there.

He had just finished one vase, but told us he had an order to make a hundred like it. Just then two boys passed carrying a molten mass between them, twisted on iron rods. This they proceeded to pull and twist until they made a slender strip several yards long, which they laid on a pile on the floor. As these strips of various colored glass cooled, they were cut into lengths of about six inches by another boy, and our workman taking up a handful said they were for his use, in making his vases.

He then put his iron rod (about a yard long) into the oven, and pulled out a molten mass, which he proceeded to manipulate. The rod must have been hollow, for at certain parts of his work he held it to his lips and blew through it, swelling out the mass at the end. The strips, though molten, kept distinct, making the pattern which gave the finished work such a brilliant appearance.

It was a wonderful experience to see this rough, slagggy-looking mass, with the hands of an artist, making deft, almost subtle, touches with his rude instrument. Not an unnecessary touch was given; he worked with swiftness, yet without apparent haste, and with an ease which showed his consummate skill. Just a turn here, a touch there, and a lovely lip was formed to the cup, giving it an appearance of inexpressible elegance. Then the slender shaft was added, and to this the foot. Finally some ornaments, strawberries I think, were dropped upon the shaft. During this time the workman rose every few minutes and thrust his lovely creation ruthlessly into the pit of fire, while we watched the result breathlessly, fearing some of its fragile beauty would disappear in the maddening red glow. But nothing ever happened; it was merely brought back in malleable condition, and ready to receive some finishing touches. Once the artist held a rough piece of wood against his work. He was not even provided with a measure.

At last the vase was finished, and we followed doubtless a good portrait of a favorite greyhound of that estimable lady.

A curious document has been translated, written by a government official stationed at a town in the delta of the Nile a few years after the death of the Pharaoh H., in which he complains bitterly of the number of dogs kept by the citizens, five hundred or more in all, which congregated in front of his house in the daytime, and at night attempted to prevent him from passing through the streets, so that he was obliged to borrow the dog of Nahhoun—another official residing in the house with him—as a protection, before he could go out to join his friends at a drinking bout. Travellers in Egypt say that a similar state of affairs exists in many Egyptian villages at the present day.

The dog was even worshipped as a god under the name of "Anubis, the Barker." There are numerous canine cemeteries in Egypt, and mummies of dogs, as well as of cats, lemnos, ibises, hawks, and other animals, are quite common. In Fig. 2 is illustrated one of these dog mummies, recently discovered. It was that of a little greyhound about eighteen months old. Little of the body remained but skin and bone, the flesh having become reduced to a powder. It was enveloped in a large piece of coarse cloth covered with a coating of bitumen. This was covered with a network of dried rushes bound with a long cord of twisted grass.

The most curious covering of the body was of fine linen cloth, plaited into the peculiar pattern shown in the engraving. The head was surrounded by a hairbrush painted dark brown, with the eyes, lips, and nostrils left white. The mouth was left open, exposing the teeth, and the eyes were turned towards the upper part of the head. Similar animal mummies have been found among the remains of the Ineas, or ancient Peruvians, although there is little possi-
bear upon the habits of the social insects, especially of ants, which, living in communities, present so many of the conditions of human life, and the development of the "tribal self" from these conditions, to which Professor Clifford attributed the genesis of moral sense.

In order to pass in review these interesting features, we must carry our considerations a step further. I must go over ground which is doubtless familiar to most of my readers.

The winged ants, which often excite surprise, are simply the virgin queens and the males. They are entirely dependent upon the workers, and are reared in the same nest. September is the month usually selected for the marriage season, and in the early twilight of a warm day the air will be dark with the winged lovers. After the wedding trip the female tears off her wings,—partly by pulling, but mostly by contortions of her body,—for her life under ground would render wings not only unnecessary, but cumbersome; while the male is not exposed to the danger of being eaten by his cannibal spouse, as among thousands nightly eaten by the subterranean spinsters, as among bees, but drags out a precarious existence for a few days, and then either dies or is devoured by insectivorous insects.

There is reason to believe that some females are fertilized before leaving the nest. I have observed flights of the common Fornicia rufa, in which the females flew away solitary and to great distances from the nest. The first brood consists wholly of workers, and the numbers between twenty-five and forty in some species, but is smaller in others. The mother ant seeks food for herself and her young till the initial brood are matured, when they take up the burden of life, supply the rapidly increasing family with food, as well as the mother ant, enlarge the quarters, share in the necessary duties, and, when the brood become too large for the nest, have eggs ready to lay before they are scarce out of the shell. The mother ant is seldom allowed to peer beyond her dark quarters, and then only in company with her body guard. She is fed and cared for by the workers, and she in turn assists them in the rearing of the young, and has even been known to give her strength for the extension of the formicary grounds. Several queens often exist in one nest, and I have seen workers drag newly fertilized queens into a formicary to engorge their resources. As need be, the quantity of eggs laid is very great, for the loss of life in the ranks of the workers is very large; few survive the season of their hatching, although queens have been known to live eight years (Lubbock).

The ant-life has four well-marked periods: First, the egg; second, the grub or larva; third, the chrysalis or pupa; fourth, the imago or perfect insect. The eggs are small, ovate, yellowish white objects, which hatch in about fifteen to thirty days. The larvae are small legless grubs, quite large at the apex of the abdomen, and tapering towards the head. Both eggs and pupae are apparently eaten by the workers, helmeted birds, and, carried to a place of safety in time of danger. The larvae are ingeniously sorted as regards age and size, and are never mixed. The larval period generally extends through a month, although often much longer, and in most species when the larvae pass into pupae they spin a cocoon of white or straw color, looking much like a shining pearl. Other larvae do not spin a cocoon, but spent the pupal state naked. When they mature they are carefully assisted from their shells by the workers, which also assist in unbolting and smoothing out the legs. The whole life of the larva in the termite is but brief, which proves they have reached a degree of civilization unknown even in some forms of higher life.

It is curious that, notwithstanding the labor of so many excellent observers, and though ants swarm in every field and wood, we should find so much difficulty in the history of these insects, and that so much obscurity should rest upon some of their habits. Forel and Eberhard, in their repeated and most careful observations, maintain that in no single instance has an isolated female been known to bring her young to maturity. This is in direct contradiction to Lubbock's theory, which repeatedly tried introducing a new fertile queen into another nest of Lasius niger, and always with the result that the workers became very excitable and killed her queen without her being in any wise a rival to the queen. Of the other kinds, he isolated two pairs of Myrmica ruginodis, and, though the males died the queens lived and brought their offspring to perfection; and nearly a year after their captivity, Sir John Lubbock watched the first young workers carrying the larva about, thereby proving the accuracy of Huber's statement, with some exceptions in the number of ants. These are capable of absorbing large quantities, which they digorate into the mouth of their companions. In winter time, when the ants are nearly torpid and do not require much nourishment, two or three ants told off as foragers are sufficient to provide for the whole nest. We all know how ants keep their larders in the shape of aphides, or ant-cows, which supply them with the sweet blood these insects excrete. Lubbock observed an ant gently stroking the back of an aphide with its antennae to coax it to give over its sweet fluid, much in the same way as a dairy maid would induce a cow to give down its milk by a gentle manipulation of its udders. Some species, particularly the masons and miners, remove their aphides to plants in the immediate vicinity of their nest, or even introduce them into the ant-houses. In the interior of most nests is also found the small blind beetle, (Claterus) glistening, and of a uniform red, its mouth of so singular a conformation that it is incapable of feeding itself. The ants carefully feed these poor dependent creatures, and in turn lick the sweet liquid which they secrete and exude. These little Coleoptera are only found in the nests of some of the aphides species; when introduced into the nests of others they excite great bewilderment, and, after having been carefully turned over and examined, are killed in a short time as a useless commodity. Another active species of Coleoptera, of the family Staphylinidae, is also found in ant nests. I have discovered one in the nest of Zohyrius ruber in the Jermyn Street, London. Furnished with wings, it does not remain in the nest, but is forced to return thither by the strange incapacity to feed itself. Like the Claterus, it repays its kind nurses by the sweet liquid it exudes, and which is retained by a tuft of hair on either side of the abdo-
The amateur microscopist must often occur to exhibit the power of his instrument to friends who are not familiar with it. On such occasions the selection of unsatisfactory objects is most disappointing. The foot of the common house-fly, although a wonderful structure, has been described so often in juvenile literature that the audience is apt to yawn over an explanation of claws and suction disk. So with the circulation of blood in the frog's feet, the rabbit's ear, and the salmonander's tail. So with the irrational motions of many in Potomac water.

It is the unquestionable object of this item to enumerate some other readily obtainable objects for extemporaneous use on such occasions. They require no elaborate preparation and no reagents. The feather dust from the wing of the "dusty miller" is, perhaps, too commonly used to need mention. The feet, eyes, antenna, and wings of cockroaches, bees, wasps, mosquitoes, and butterflies furnish a great variety of wonder-inspiring views.

Often you will be compelled to disappoint some one who expects to see "lots of little bugs" in a drop of well-water, but a drop of slime from the under surface of a lily pad will fully meet such an expectation.

The tail of the newt still remains the most convenient object for showing the circulation of the blood. In the same jar where the newts are kept a few sprigs of cilia should be kept growing. The stem of cilia shows cytoplasm beautifully. Thin feelings from the bulb of the common onion also show sap circulation well. In cold weather the onion should be kept in a warm place a few hours to quicken the circulation of the sap.

Cross sections of rubbery woods make interesting specimens. They can be cut with a keen jack-knife, if one has the "knack." Corus stolonifer, a shoot one-quarter inch in diameter, makes a good one to begin on, but any soft wood will answer.

Stellate and glanular hairs of plants, the breathing pores of such plants as the white lily, the translucent leaves of mosses, and the pollen of flowers should not be forgotten.

Minute seeds, with their infinite variety of form and marking, are things of beauty and a joy forever. They require a condenser, but no cover glass. Try the seeds of Acmatia serpirollifolia, and you will be encouraged to seek further. A most delightful object of objects can be easily made from the small seeds of Conopsea loco. The germs Euphorbia furnishes another fine series in which you can often determine the species by the seeds alone. Juncus gives us still another series.

In J. effusa and J. bufonius the ribs and cross lines of the seeds are delicate indeed.

The pappus of many species of Composite is a charming sight under the microscope, especially when the pappus is plumose, as in Kukhia, the thistles, etc.

Most of the common grasses have plumose stigmas, which, with their coloring of purple, show finely with objectives of moderate power. The hairy pales of grasses make first-class objects. Lycopus, the powder which druggists use to keep pills, etc., from sticking together, will prove of interest and is easy to obtain. It consists of the spores of the common club moss, or evergreen. The spores move over each other so freely that the powder in bulk shakes like a liquid.

This article seems like an oily liquid. But if you examine under the microscope it appears as innumerable yellow globes, somewhat shrunken and irregular when dry. Any species of Lycopodium will furnish a supply from August to October. The spores of ferns and mosses are equally interesting.

But if you wish to elicit from your audience expression of delight at the sight of a finely ruptured spore-case of one of the larger Hepaticae. Marchantia, asterella, or conocephalus will answer. The lively way in which the spiral chetas toss the spores about is sure to "bring down the house."

Diatoms you will find in abundance in the stomach of the oyster; but a more convenient source is the beaver polishing-power, which consists largely of their remains.

Raw silk, cotton, and wool, hair and feathers, are rich sport for the amateur exhibitor of the microscope. Common drugs, like morphine, quinine, and strychnine,—you need not go far for ready-made objects.

INDUSTRIAL MEMORANDUM.

For a good cement that will stick muslin to bunting, but together two parts shellac, one part borax, and sixteen parts of water. The surface must not be greasy.

A good recipe for making waterproof cement, to be used in constructing aquariums, is to take twenty-five parts gutta percha in shreds and melt it carefully. Add seventy-five parts ground pumice stone, and then mix in one hundred and fifty parts Burgundy pitch and melt well together.

HAPPY THOUGHT.—One day, in 1830, when a working jeweller, Joseph Gillott, now the famous manufacturer of steel tools, was experimenting with his fine steel tools, and being suddenly required to sign a receipt, not finding his quill pen at hand, he used the split tool as a ready substitute. The happy accident led to the idea of making pens of steel.

COOLED IRON.—A process has been recently invented by which iron may be coppered by dipping it into molten copper, the surface of the iron being protected by a layer of melted electrolyte and phosphoric acid. It has been found that if the article when lowered is connected with the negative pole of a battery the coppering is done more rapidly.

SUBSTITUTE FOR LEATHER.—A German inventor has devised a new material which is intended as a substitute for leather in many of its uses. This material consists of panels of wood with wire netting between, the whole being glazed together under heavy pressure. The sheets thus made are said to be very tough and pliable, and suited for making trunks and other uses that require strength.

WIDENING THE SUEZ CANAL.—The Suez Canal is being widened in some parts to the extent of 50 ft. The widening was completed at the close of 1889 for a distance of about 10 miles from Port Said. In the course of last year the widening was completed for a further distance of five miles. By the close of 1891 the widening works are expected to reach a point twenty-two miles and one-quarter from Port Said.

A GOOD NON-ACTING VARNISH, says the Maitre de la Photographie, is obtained by dissolving aurine cake in methylene spirit. Another varnish of the same kind is got by dissolving gamboge in a mixture of methylene spirit and ether. Léon Vidal uses a solution of bitumen in benzoil for impregnating those parts of a proof it is desired to render non-actinic, and, when the varnish is dry, covers it either with magenta or aqua mentis solution. On drying over sulphuric acid, and then heating, it exploded violently.

DEFINITIONS OF THE SCIENCES.—Lord Salisbury is quite a distinguished savant as well as a renowned statesman. In a recent lecture before the Chemical Society of London, he said: "As science blossoms, the science of things as they probably are, geography is the science of things as they probably were; chemistry is the science of things as they are at present." To these adds the Electrical Engineer, "electricity is the science of things as they probably will be."

SMOKE SCREEN.—Through experiments made by English military authorities it has been found that whenever the atmosphere is laden with smoke or mist the power of an electric light is greatly diminished by crossing the beam of light by that of another at a certain angle. At the point of intersection the illuminated space is practically made a screen. It is proposed to utilize this knowledge, since the electric beam can thus be made to serve as a screen, back of which tactical operations might be conducted in secret.

METEORITE.—Prof. Feoite of Philadelphia has collected some remarkable Meteorites, at Canol Diablo, Yavapai Co., Arizona. The largest mass weighs 250 lbs., and another 154 lbs. A specimen which he sent to Dr. Koenig was recently described by him before the Academy of Natural Sciences. Dr. Koenig's analysis gave 9.19 per cent. nickel, and in the only piece which has yet been cut a cavity was exposed containing small diamonds. As this is the first instance of the occurrence of this gem in meteoric iron, the find will be of great interest to scientists.

PURIFICATION OF CHEMICALS BY COLD.—Pickett, who has taken out a patent for the process, has discovered that from the purest chloroform of commerce, if cooled down to about — 70°, there separates out a crystalline body, which is then drained from the part which remains liquid. The solid seems to melt at a temperature below — 100°, when the chloroform itself crystallizes out, and can be separated from an impurity which remains liquid. Chloroform purified in this manner is a colorless liquid, having at 15° the sp. gr. 1.51. It is indefinitely permanent on exposure to light. Whilst the so-called pure chloroform of commerce takes a greenish color if shaken up with solution of potassium dichromate and sulphuric acid, if Pickett's chloroform is similarly treated the chronic mixture retains its yellowish color.
A MIDWINTER TRIP IN SEARCH OF SHELLS.

January 8—This morning seven enthusiastic lovers of Nature—all ladies, save one small boy—boarded the train in Los Angeles bound for San Pedro. The day was all we could desire, and when we saw the blue ocean spread out before us at San Pedro we could hardly take time to go to the hotel in the city to make the necessary preparations for collecting. On our return to the beach we hunted up a boatman, and two small sailboats were necessary to convey us all across the water to Rattlesnake Island. As this island is one long sand bar, not more than a quarter of a mile across, it did not take us long to walk to the beach on the ocean side. We separated into little parties at short distances apart, and began our hunt for shells that had been washed in by the tide. There were plenty of dead Carditidae and Petasus. Finding only dead shells on the ocean side, I crossed over and walked along the mud flats opposite the city of San Pedro. Here the Chione were throwing up little jets of water in the muddy flat in every direction. Not far from the Chiones, Cerithidea Californica and Melampus olivaceus were found on the surface, the Cerithidea making little zigzag lines in the soft, sandy mud in several directions. Occasionally a Mexonica nauta, wash ashore by the tide, lay half buried in the mud. Finding nothing new to my collection it was to be seen here, I joined the party, and we all called at the home of our "boatman" to see his collection. I found nothing in his collection that was new to me, but took pleasure in looking over his shells. We bought some of his shells for star-fish, etc., and left him and his fat Mexican wife in good humor over our visit. As we did not wish to return to the city for lunch, we had brought some oranges, sandwiches, etc., with us. After lunch we collected Monoceros engstromus and Lituituria plana off the rocks on the short breakwater on Rattlesnake Island. Being anxious to reach Dead Man's Island, we walked along the bay side of the breakwater between Rattlesnake and Dead Man's Islands, the distance being one and a quarter miles. On the beach in the muddy sand an occasional miniature mound of sand indicated that a Bulla nobilis was ready to be collected. The Potamæna cubicularis also outlined his valve in the hot sun and at times of low tide his valve—the outer one—was visible on the surface of the mud flat. I never saw Pectes so near the shore. Occasionally we found Heterobranchia bimaculata along the beach, and also Solenectes Californi anus, but none large. Arrived at the island, we saw Pomandere undosa in the shallow water, each shell crowdfed with a little tuft of algae on its apex whorls. On the long help in the tide pools, the Nassa norrisi, with his bright red mantle border and foot, was a pretty picture—for in the water the Nassa is of a bright red. The operculum of this shell is not a smooth, many-whorled, hornay structure, like those of our other trochids, but the whorls are elevated and scalloped, turned over many stones in the rock pools and searched in the coarse sand in quest of minute shells. In the rock pools—dead white shells of Nassa munda, var. Cooperi, darter hither and thither at the will of the little hermit crab which inhabited them. When I see a spiral shell move rapidly in the water, I know the true owner no longer lives there. I have watched these little marauders. I found Fissurella velox more plentiful than ever before at this place, though by no means abundant. The time passed so rapidly I had no thought of returning, when G——, looking at her watch, declared it was time we were starting eastward, as it would take a long time to reach Rattlesnake Island if we expected to do much collecting on the way to it. I wanted to get some Chiton, as I needed some for exchange, but could only find a very few. As there were few shells to be found,—we were now on the exchange side of the breakwater,—we hunted for star-fish, and were rewarded by finding some very fine ones. E—— found two that were at least twelve inches across. In a rock pool under one of the large rocks I saw what an artist would call a star-fish that was new to me. I caught hold of as much of it as was visible, and now this novelty in the tide pool assumed another form: it was not an Asteroides. Could it be a Actinosea? To what order could this strange inhabitant of the sea belong, with its soft, smooth, pinkish purple-tinted cups that seemed to grow in size, and number as it resisted the grasp of my hand, as I breathlessly grasped all of the animal that was visible? When I relaxed my hold of it the soft, leathery mass seemed to separate like the fingers on a hand; the flower-like disks were no longer in irregular bunches, but spread out in a double row in different directions. But the tide was now too strong for further useless efforts. Whatever it was, I could not possess it. I heard a call from G——. She was not far behind me. I turned to look at the number of star-fish she had found while I had been wasting my time and strength over nothing at all! This was the thought that passed through my mind. Nothing! What was that not one foot away from me in the tide pool as I turned around? What form of the shell of this dark, penechelykm, shell-bodied beauty was that eight long, whip-like arms? Under these arms to my wandering eyes were revealed the cup-like disks of my rock novelty! The devil fish, Potolle, or Octopus, was before me! What should I do? I must have him. How could I get him? Mrs. Lucile Haritz’s experience with an Octopus in Brazil, as I remembered to have read in Tryon’s "Conchology," comes to my memory. Are these species harmless? "Shall I take him?" I said to G——. The tide covered him; I must decide quickly or he would be gone. His long arms lie limp on one side of his body. I fancied he was looking at me through his round, sleepy-looking eyes. The tide again covered him; in another moment he was under the water. But in that brief space of time Octopus was down in my collecting-bag, and I, with the help of G——, was pluming the bag together at the top with some shield pins that I carried in my pocket! Although I felt I had a prize as I hurried to reach the cabin on the island where we had left some of our baskets, shells, etc., I felt that I was in much the same predicament as the man who drew the elephant. I had alcohol and a jar at the hotel; but how could I get him into the jar? I did not want him alive; I could not kill him. (I left Octopus punctatus in the bag on the veranda of the hotel all night, but in the morning he was dead. When we reached home I measured him. He was over thirty-four inches long; longest arm, nearly twenty inches; shortest arm, nearly fifteen inches; body, nearly six inches long and two and three-quarters inches wide. His arms, eight in number, were all connected to his body by a web-like mantle.) Just before dark—our days are now so short—we came across from Rattlesnake Island in the skiff. We reached the hotel, changed our wet shoes, etc., made ourselves presentable, and were soon all seated around our little table eating our dinner, all satisfied with our day’s triumph.

ANNUAL REPORT OF THE NEW YORK CITY ASSEMBLY OF THE A. A.

The fourth year in the history of this Assembly finds it more prosperous than any previous one. The Assembly now includes nine of the city chapters, being all the regularly organized ones.

These are:

(67), (A), Saxifrage Chapter.
87, (B), Manhattan Chapter.
307, (B), Columbia Grammar School Chapter.
414, (C), Ballard Chapter.
406, (N), Hyatt Chapter.
303, (Q).
268, (W).
142, (Z), German-American Chapter.
940, (Z), Students’ Chapter.

Together they have a total membership of nearly two hundred, and constantly increasing.

At the meeting held Saturday, November 22, 1880, Mr. Theodore G. White read a paper on "Methods of Chapter Work," and Mr. Heinrich Ries lectured on the "Results of Biological Research at the Summer School at Cold Spring Harbor, L. I."

The lecture was illustrated by lantern views, followed at the close of the meeting by a microscopical exhibition and display of specimens, as examples of the work done at the laboratory by A. A. members.

On Thursday, January 15, 1891, the Assembly met at the home of Miss L. G. Levy, of the Saxifrage Chapter. This being the annual meeting, considerable important business was transacted.

The election of officers for 1891 resulted as follows:

President—Dr. G. H. Busbom, 609, (W).
First Vice-President—W. T. Demarest, 67, (B).
Second Vice-President—Miss L. G. Levy, 65, (A).
Recording Secretary—H. Tieckman, 352, (W).
Treasurer and Corresponding Secretary—T. C. White, 940, (Z).

After the election, a paper was read on "The Gehal Ag," by Mr. C. G. Cole, and one on "Irrigation," prepared by Miss N. C. Lennett, was read by Miss Levy. Each paper provoked an animated discussion, in which nearly all those present participated. At the conclusion of the scientific portion of the programme, those present were invited to a collation, kindly provided by Miss Levy, who in this way contributed no small part to the sociability of the occasion.

By a long provision of the by-laws the regular quarterly meetings of the Assembly will be held at the rooms of the various Chapters on the second Wednesdays in the months of February, May, October, and December. Visitors and representatives of Chapters not in the Assembly are cordially invited to attend the meetings, notices of the place and programme of which will be regularly sent to anyone requesting the same from the Corresponding Secretary.

At the May meeting, held on the evening of the 12th, in the hall of Chapter 940, (Z), 40 West 26th
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street, (Chapel entrance), Mr. G. S. Stanton delivered a lecture on the "Geology of Manhattan Island and Vicinity," illustrated by the stereopticon. On the same evening Mr. W. T. Demarest read a paper on "Popular Science."—THEODORE G. WHITE, Sec.

39 West 36th street.

The next quarterly meeting of the New York City Assembly will be held on Wednesday, October 14, at 8 P. M., at the Friends' Seminary, East 16th street and Rutherford place. Mr. J. D. Hyatt, of chapter 400, will discuss the question, "Do Plants Show a Degree of Intelligence in Their Movements?" A paper will be read by Mr. John Cox, Jr., of Chapter 862. All are cordially invited.—THEODORE G. WHITE, Sec.

KEY TO THE MORE COMMON FAMILIES OF INSECTS.

Prof. L. C. Wooster, of the State Normal School, Whitewater, Wisconsin, has prepared a pamphlet of fifty-two pages, which is designed to enable the student to trace any insect to its proper family as readily as one identifies a plant by a manual of botany. It also contains check tables for the convenient description of specimens, and much valuable information regarding insects hardly accessible elsewhere without considerable expense. Professor Wooster kindly offers this pamphlet to members of the Agassiz Association at the cost of printing and postage, i. e., twenty-five cents each, and at this rate his edition ought to be exhausted in a week. Address him directly at Whitewater, Wis.

WANTED—NATIVE PLANTS OF MAINE.

The publishers of the Mining and Scientific Register, 1,260 17th street, Denver, Col., offer to send their journal for one year to any member of the A. A., who will send them by mail a few of any of the following native plants of Maine, viz.: Orchids of any kind, jack-in-the-pulpit, wood lilies of any kind, ferns of any kind. Address H. L. Walworth, as above.

WILL THE A. A. ASSIST?

Brown University Herbarium desires seeds and fruits of every kind; also fibers, wood-sections, etc.; all for a rapidly growing Economic Museum.—W. W. BAILEY.

[No one has done more for our Association than Professor Bailey, who for several years has freely contributed for our delight and instruction articles both on plant and insect life. We trust that our members will be quick to seize this opportunity of doing him a small favor in return.—Ed.]

[Banner for the "Out-Door World."

BUTTERFLIES.

BY W. WHITMAN BAILEY.

Butterflies were my first love. In years which, judged by events, seem now pre-Adamite, I used to chase butterflies by field and field. "Through tangled juniper, beds of seads," through brake and the little scaling cliffs with the agility of Bertram Risselhagen, now leaping from tuft to tuft of swamp sedge, I have pursued the elusive Papilio, and him of the swallow-tails, yepturn, for miles. Creature comforts and appetite become secondary considerations, and if, after a morning of such devotion, I lost my fly at last, I returned home crest-fallen, pœvish, and hard to please. Amiability grew with success. The capture of a new moth made me absolutely dance with joy. I used to draw and paint these gaudy fellows, and then, had to obser the natural and Latin names. Curiously enough, what I then learned remains in my memory now. Although circumstances long ago drafted me into other occupations, I have always been afraid that in some way I would be led back into the old paths, and now, indeed, am using the spoof-net for my little boy, who has strongly inherited the craze.

When out on a botanico-entomological trip I am always interested to find others engaged in the same occupation. Rarely am I, under these circumstances, repulsed. Curious and diverse experiences has one going into the chase after Lepidoptera. Nothing trains one to more acute observation. To any leaf there may be a chrysalis pendent; every chink in a wall may conceal something of interest; almost every flower may hold some insect worthy of capture. Then, as soon as it is known to one's friends that he rides such a hobby, upon him are poured contributions of all sorts; hawk-moths, gauze-winged darting-needles, beetles, bugs, and all creeping things of the earth. Thus I find it hard to confine my attention to Lepidoptera, for the donors always desire afterward to recognize their own gifts in my collections. The ground-squirrels will be the way from every museum, for the elimination of trash. Yet, in putting aside the worthless, one must take care not to wound the sensitiveness of any. Editorial tact and delicacy must be considered. It might, indeed, be well to have a printed form to the effect that "we regret that this really admirable bug is at present, owing to the pressure on our shelves, unavailable."

What can be more marvellous to watch than the transformation of a butterfly? No wonder the Greeks called it Psyche, or the soul! There is a caterpillar feasting on a branch of elm. He daily waxes larger; he may several times change his wall-coat; finally he suspends himself by a little rill to a leaf. We return to him next day, and there is a worm no longer, but a dry mummy. Days or weeks elapse, and then emerges a beautiful creature, winged and joyous. Its whole nature is changed and glorified. Where it fed by means of jaws on crude foliage, it now sips the nectar of flowers through a long proboscis.

One can secure very fine specimens by feeding the caterpillars in a box covered with netting or gauze, and is then able to observe the transformation. Rub off a little of the dust from a butterflies wing and consider it under a compound microscope. Each scale is now seen to be a fan of exquisite finish, burnished and glittering with a hundred hues, broad or attenuated, entire at the apex or serrated. While the instrument is set up, let us look at the plumed antennae of some moth, or his compound eyes. There is no limit to the wonder revealed.

Everyone knows how moths are attracted to a light. We have had many good specimens fly in at night, but the best way is to attract the nocturnal kinds by a light out-of-doors to some sweet substance, as sugar or molasses. There is an uncanny feeling as one awaits results. As even insects probably suffer some pangs and cast a longing look behind—if we must catch them, let us be merciful about it. The best way is to take with one a bottle of chloroform, or a bottle with some clyndle of potassium, kept in the bottom by pliator of pars. This clyndle, however, is a deadly poison and I never let my children use it. While chloroform wets the bodies and wings, it soon evaporates, and for ordinary collections does no harm. It is better to err on the side of safety.

There are many excellent books on butterflies. We may still employ with advantage Harris's "Insects Injurious to Vegetation." There are the useful series prepared by Professors Packard; Seudder's small book on butterflies, and his immortal three-volume work, as well as the superb volumes of Edwards, and the works of Riley and others. Any good library will furnish one with working books. Almost every large city possesses some skilled entomologist, to whom one can refer for guidance, advice, or assistance.

SQUIRRELS EAT RATS.

EL MODENA, CAL.,
July 13, 1891.

I noticed in the latest issue of POPULAR SCIENCE NEWS an article entitled, "A Squirrel's Unusual Meal," which, though out of my line, interests me very much, for I once saw something of the same kind, but had not thought it worth printing. It was three years ago. We were breaking up some land, and one man was plowing while the rest of us were grubbing cacti. He had been plowing around the land, leaving an unbroken piece of about three acres in the center. As he went down, he smelled a number of kangaroo rats out of their holes. These rats started for the center, where there were a number of squirrels. The ground-squirrels veered to the right. As one rat came toward them, two squirrels started after it. When the ploughman, who was watching the rats as they bounded over the ground, saw the squirrels in pursuit, he thought they were playing, but soon other squirrels took a hand in the game, and it began to get exciting. He called to me, for, as he had caught snakes and other things for me, thought I would like to see this sight. While the time was going on, however, there was no one standing, the squirrels had caught the rat and commenced to eat it. I had seen squirrels eat berries, grain, and seeds, but this was something new. We watched them a while; then we went over to them, when they all ran into their holes, leaving the carcass, which was devoured except the hide quarter and the head.

GEORGE BOYD,
Cor. Mem. Chapter I.

CARNIVOROUS SQUIRRELS.

I THINK H. H. Piper is hardly correct in attributing to starvation the eating of earth-worms by the striped ground-squirrel, or chipmunk. My home as a boy was in Saratoga County, New York, and I well remember watching a chipmunk as, seated upon an old stone wall by the roadside, he made a meal of an angle-worm, holding it in his fore paws and eating from one end while the other dangled to the stone on which he sat. On either side of the road was an apple orchard, while butternut trees, berry bushes, and grasses grew along the fences. But a few rods in either of two directions stood a farm house, with its garden, barns, granaries, stables, pig-pens, etc. It is also curious to find squirrels, even the chipmunk abound, fragments of earth-worms, as though left from the last meal,—J. T. MOORE, Kearney, Nebraska.

UNITED STATES IN ACCOUNT WITH THE AGASSIZ ASSOCIATION.

DR. TO ONE SCIENTIST, —?

Each reader must fill in the blank left above according to his own estimate of the value to the country of lifting a young man from a lower to a higher plane of life. The following is only one case out of hundreds that might be cited:


To understand our special interest in the subject of our current discussion, we should first consider the historical context in which this problem arose. It is important to note that the methods and conclusions presented in the 1891 paper by E. A. H. Ballard were based on observations made during the early 19th century, a period marked by significant advancements in botany and entomology. The work of early scientists, such as A. Leopold Hufnagel and Thomas Say, laid the foundation for future research in the field of Lepidoptera taxonomy. Their observations and descriptions of species were crucial in establishing the classification system we use today.

In particular, the 1891 study by E. A. H. Ballard focused on the biological characteristics of certain species, including the physical traits and behaviors of the butterflies. The author's methods were based on field observations, which were compared with existing records to identify new species. This approach was innovative at the time and set a precedent for future entomological research.

The conclusions reached by Ballard were significant because they contributed to the understanding of the diversity and distribution of Lepidoptera species. The study also highlighted the importance of continued research in this field, as there was much yet to be discovered about the butterflies. The work of Ballard and his contemporaries paved the way for modern entomological studies and continues to influence research in the field today.
In a few localities in the world, notably one in Massachusetts at Manchester-by-the-Sea, there are deposits of sand which, when pressed or rubbed, give out a clear musical note, and are known as "singing sands." The cause of this peculiarity has remained unexplained, although extensive and long-continued investigations have been made with a view of discovering the mystery. Mr. Carle Wilson now writes to the London Chemical News that he has succeeded in producing musical notes from sand that was never before musical, and is also able to produce similar results from those mute, or "killed," musical sands which have been temporarily deprived of their musical properties. Mr. Wilson will soon be prepared to publish his experiments with the explanation of the phenomenon in detail, and they will undoubtedly be of the greatest interest and importance, and furnish a solution of a problem which has hitherto baffled investigators.

Most of our readers have doubtless noticed the two short bits of wire melted into the glass of incandescent electric lamps, and which serve to convey the current to the carbon in the interior. These wires are of platinum, a metal which is now nearly as valuable as gold, and constantly increasing in price, owing to the demand for it for this very purpose. No other metal has hitherto been found available, as platinum expands when heated at nearly the same rate as glass, thus keeping the joint air-tight through all variations of temperature. But it is now announced that a process has been discovered by which other and cheaper metals can be firmly welded to glass and answer as well as platinum in the electric lamps. If this reported discovery is a genuine one, it will materially reduce the cost of electric lamps, and also reduce the price of platinum to a point where it can be more extensively used for chemical and physical apparatus. Complete details of the new process will be awaited with interest.

An interesting paper was recently read before a medical society by Dr. Willis Cummings, of Bridgeport, Conn., giving the history of nearly one hundred consecutive cases of pneumonia treated by him without the use of alcohol without a single death. This is a remarkable record, and indicates that in the majority of such cases alcohol is at least unnecessary. Dr. Cummings is by no means an advocate of the total ablation of alcohol from the materia medica, and, in fact, prescribed wine of cocoa as a tonic in some of his cases during convalescence; but he takes the ground that alcohol is a true medicine and only to be used as efficiently as is desired to obtain its characteristic physiological effects, and is only opposed to its general and indiscriminate use as a stimulant and tonic without regard to the nature of the disease under treatment. From the remarkable record presented by this list of cases it would seem that it is only in very exceptional cases of pneumonia that the use of alcohol is indicated.

What is hydrochloric acid? A question which it would seem that every student of chemistry could answer, but some inquiries made by a valued correspondent show that such is not the case. The hydrochloric acid gas (HCl) is a substance of well-known and definite composition, but the liquid hydrochloric acid in common use is prepared by passing the gas into water, by which it is absorbed in large quantities. Now is this liquid a simple solution of the gas, or has the water united chemically with it to form a definite hydrate, as in the case of sulphuric acid? This is as yet an unsettled point, although the subject is now under investigation. Some chemists state that hydrochloric acid gas, when perfectly free from water, will not turn litmus red, thus showing the absence of acid qualities; others have failed to obtain this result, and find that the gas always turns the blue litmus to red. The question, therefore, remains unsettled, whether the true hydrochloric acid is a gas or a liquid; and it is rather curious that the exact constitution of a substance which is so simple in composition, and has been known and studied by chemists for so many years, should yet remain unsettled.

An interesting and novel application of the process of fermentation to the industrial production of lactic acid has been made by Jacques, who prepares a saccharine fermentable wine fermentation, from milk, introduces pure lactic ferment produced by the method of Pasteur, as also a quantity of pure sterilized calcium carbonate, and allows the mixture to ferment at 40° to 45° C. The fermentation lasts five or six days. The fermented liquid is filtered and evaporated, when an inodorous calcium lactate crystallizes out, which can be decomposed by sulphuric acid setting the lactic acid free. The fermentation time of eight days, which decomposes glucoce into alcohol and carbonic dioxide is, as is well known, of extreme importance in the arts; and the successful application of the lactic ferment, which is found in sour milk, on a commercial scale promises to open up a new line of industrial processes of great value.

The decision of the government weather bureau to allow local observers to aid in making up the "probabilities" for their districts, is most commendable, and should result in a greatly increased efficiency in this branch of the service. Local meteorological conditions are so constantly varying, and exercise such an important effect upon the succeeding weather, that it is difficult and often impossible for an officer stationed at Washington to predict with accuracy the changes in the weather for all sections of the country from such data as may be telegraphed to him. The private observatory at Blue Hill, near Boston, has issued for several years a series of weather predictions based upon local observations, which have been much more correct than those issued by the United States signal service. The success of their predictions has undoubtedly been due to the above cause, in addition to the more favorable conditions which so severely interfere with all governmental undertakings.

The introduction of the concept of "chemical evolution" into science is, perhaps, one of the most important of recent years, and the idea that the elements are not absolute and distinct forms from the start is a thing of the past. The idea that nature, from a single primitive form of matter, is constantly gaining in favor with chemists, and strongly confirmed by the results of experiment and investigation. Keukel foreshadowed this hypothesis when he wrote: "The relations of a body to that which it once was, and to that which it may become, form the essential object of chemistry." The crucial test of this theory would, of course, be the actual transformation of one element into another; but this has not only never been done, but, up to the present time, no facts have been observed which would indicate that it is possible. But the fact that a transformation is impossible under the present conditions which prevail upon the earth is by no means an indication that it might not occur under conditions prevailing in some former period of time, and such a "missing link" of evidence would no more disprove the theory than does the apparent lack of change of form and function in existing living organisms disprove the theory of organic evolution.

WATER GAS.

The above name is applied to a kind of gas which, in many cities, is largely used for illuminating and heating purposes. The cost of manufacture is, apparently, somewhat less than that of other gases. The water gas is an air and steam mixture, and, for this reason, some gas companies have altered their plant so as to manufacture the water gas exclusively.

The term "water gas" is misleading, for water does not contain any of the gas, although it is used in the process of manufacture. The use of such a name tends to confirm the erroneous belief held by so many people, that, by some chemical process, water may be made to burn; and many have been the fraudulent inventions claiming to accomplish this impossibility. Water is a product of combustion, and all the chemical affinities of its constituent atoms are neutralized. It is a perfectly neutral, impasive body, and contains neither fire nor force.

Water gas is the product of a peculiar chemical reaction which takes place when steam is passed over red-hot coals. The steam is decomposed by the carbon of the coal, and a mixture of carbonic dioxide, carbonate oxide, and hydrogen is the result. The reaction, expressed by chemical symbols, is as follows:

$$4H_2O + C = CO_2 + 2CO + H_2$$

The last two gases are inflammable and constitute the valuable constituents of the mixture.

Water gas, as constituted above, burns with a hot but non-luminous flame. It is exceedingly well adapted for use as fuel without further preparation, and, in some cities, is largely used for that purpose. To render it luminous, crude petroleum is allowed to flow into the retorts; and the heavy hydrocarbon vapors resulting from its decomposition so "enrich" the water gas that it is rendered as luminous as coal gas, and, after being purified, can be burnt from an ordinary burner in the same way.

The only objection to the general use of water gas is the larger percentage of carbonic oxide it contains. This gas is extremely poisonous when inhaled, and many cases of death from this cause have been reported. Coal gas contains a much smaller percentage of carbonic oxide, and, on this account, is less dangerous in case of an accidental leak. Considering the large number of consumers of water gas, however, the number of cases of death and injury would seem to be very slight. Water gas is also quite inodorous and without the characteristic smell of coal gas. A leak occurring in a building is thus likely to escape detection until a dangerous quan-
The close connection between the two groups thus rendered evident by a study of their reproductive organs, is borne out by a comparison between them in regard to the kinds of tissues, or cell-groups, which enter into their composition. Between the outer and the interior of the leaf, it appears to be that of any common flowering plant, as the buttercup, we find that while the two differ greatly in general form, they are yet very similar in tissue structure. In both there are present an epidermis, a parenchyma, and a vascular tissue. In both there are present in the leaves small openings, called stomata, which afford communication between the outer air and the interior of the leaf. In both the framework of the leaf consists of fibro-vascular bundles which extend into the branches and thence into the main axis down to the roots, thus affording an interchange of gases and fluids between the leaves and the roots.

**Union College, Schenectady, N. Y.**

[Original in Popular Science News.]

**POTATO CULTURE.**

An important contribution to agriculture has been recently brought out in France by M. Aimé Girard. Although it concerns experiments and results obtained in France only, as yet, the facts and conclusions are of so very general character that they doubtless apply to all countries——potatoes surely have no nationality!—and must be of very real benefit to our stock. In 1891, M. Aimé Girard, in his *Recherches sur la Culture de la Pomme de Terre Industrielle* and *Potaages*, (Paris, Gauthier-Villars, 8 francs), is to show that potato culture, as it stands at present in France, can be largely perfected, so as to yield the largest crops possible. Potato culture in France occupies the fourth place in agriculture—wheat, fodder, and the vine coming before it. It extends over 1,454,797 hectares, (the hectare is about two and a half acres), and represents 350,000,000 francs,—a very miserable state of affairs, since the hectare yields only 200 francs benefit ($35.00). This is due to the fact that the crops are small. While England obtains 15,000,000 kilograms of potatoes to the hectare, Belgium 12,000 or 12,000, and Germany 8,000 or 8,000, France has only 3,000, while a single hectare yields only a little over 7,000 kilograms. Such being the condition of affairs, M. Girard has been working for some five or six years in order to ascertain whether better crops cannot be obtained; and the result is that the thing is quite feasible, if certain conditions which he advises to observe are strictly kept. The fact that new methods of culture are apt to yield better results, may be true in America as in France, and therefore some words may be said concerning the methods.

The basis of the new method consists in some facts concerning the physiology of the potato and of its growth. For, while it certainly is always better to secure the best stock or variety among the numerous existing ones, the excellence of the stock has and always will be the result of the tubers. And there is an important relationship between leaves and tubers: the more abundant the leaves are, the more abundant is the production of starch. Starch originates indirectly in the leaves; the saccharose of the leaves goes to the potatoes and then becomes starch. It would require too much space to go into the details of
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M. Girard’s various experiments in the study of growth, etc., and, in fact, for practical purposes, the practical advice is certainly the most useful part of his work. So I abstain his advice to those who are interested in the matter and are fortunate enough to have a potato-field of their own.

First of all, it seems that the nature of the soil is of small importance. Potatoes generally thrive in all sorts of soil, unless exceptionally bad, or exceptionally poor as concerns some chemical constituents—such as phosphoric acid, potash, and nitrogen. But the physical condition of the soil is important; it should not be too heavy. As everyone knows, potatoes yield a large number of radicals, and these cannot develop unless the soil is light and permeable. So a good ploughing is necessary—not a slight, superficial one, as is often the custom of French peasants, but a deep one of some thirty or forty centimeters (twelve or fifteen inches). Manure is more or less necessary, according to the chemical composition of the soil, and on an average it will be well to use the following mixture:

Superphosphate…………………………………62 parts
Sulphate of potash………………………………25 parts
Nitrate of sodium………………………………18 parts

Of this mixture one must use from 500 to 800 kilograms per hectare, more or less according to cases. A very common error consists in choosing for planting, tubers either very large or generally very small. This practice must be abandoned, and care must be taken to select average-sized tubers yielded by strong plants. Another common practice consists in cutting up the tubers, and planting tuber-ends. This practice is also to be deplored, as the crop is always inferior in amount. Whole tubers must always be used; it is more profitable.

The time of year for planting is between March 15 and April 15; not later; earlier is useless. The planting must be quite regular, and the distance between successive files, or rows, has much importance. The parts of rows should be sixty centimeters (two feet) apart, and in each row the tubers should be planted fifty centimeters apart. These distances are reasonable; if diminished or increased, inferior results follow. In France it seems there is a tendency to plant at too large distances apart. Good care must be taken to weed as usual, to build the little mound everyone is acquainted with, and if the height comes over 6 cm, it must be ready for it. A good remedy consists in:

Water………………………………………100 liters
Sulphate of copper……………………………8 kilograms
Lime…………………………………………3 "

Use 1,700 or 1,800 liters per hectare. Never unearth the potatoes so long as a single green leaf remains on the stalk. A single leaf is enough to keep the tubers increasing in weight, and it is useless to prevent them from doing so. But as soon as the leaves have all withered, the time has come for the harvest; it is useless to keep the tubers any longer in the earth.

Such are the advices given by M. Girard, and the persons who have followed them have seen their crops become double and even treble what they used to be with the ordinary routine process. Numerous amusing instances of the real import of every particular have been yielded by the pro-
tected reader, while following M. Girard in some points, we have deemed it better to follow their own ideas on others. The result has always been immediately apparent, consisting in a serious falling off of the crop, when, for instance, neglecting the directions as to distances, or preferring halves or quarters of potatoes to whole ones for planting. It must be added that M. Girard’s advices are not based on experiments only, but that they have been followed in many parts of France, in the field, and not in mere experiment stations, and that they are all the result of a careful investigation. Farmers in all parts of the world can profit by them.

II. DE V.

PARIS, FRANCE.

[Original in POPULAR SCIENCE NEWS.]

THE GIANI SLOTHS OF THE PAST.

By KATHARINE B. CLAYPOLE.

PART II.

While the South American megatherium and mylodon received their names from two of Europe’s most eminent anatomists, it was a distinguishable opinion of no other than Thomas Jefferson, twice President of the United States, who stood sponsor for the first of the ancient ground-sloths found in this country. At the time of the discovery of the gigantic half-bones in a cave in Greenbrier Valley, West Virginia, Jefferson was President of the Philosophical Association founded at Philadelphia by his friend, Benjamin Franklin. To him, therefore, were a few of the bones, among which three enormous claws were so conspicuous that he at first sight regarded the animal as “appearing to be of the tiger, lion, and panther species.” Later, however, he announced only “the discovery of certain bones of a quadruped of the clawed kind,” suggesting for the remains a name compound of two Greek words—megalis, large, and opos, a claw. So suitable was this designation considered that it was afterwards adopted by Dr. Wistar in his account of the bones; and when later they were described by Dr. Harlan, he also retained the name, adding to it Jeffersoni to commemorate the illustrious man to whom the happy appellation was due.

Remains of the Megalonyx Jeffersoni have come to light but slowly, and, until recently, in too fragmentary a condition to build up a skeleton therefrom. In December, 1869, however, at least a third of one of these animals was discovered in excellent condition in Holmes County, Ohio, in a swamp to the northeast of Millersburg. Excavation, suspended by the oncoming of winter, may yet disclose more of this great animal and some fortunate museum becomes the owner of its complete skeleton. Meanwhile the discovery itself is of special significance, not only in the history of the megalonyx but of the whole family to which it belongs. Megalonyx Jeffersoni, not hitherto found north of the Ohio excepting on the Atlantic coast, is now known to have extended its wanderings at least one hundred miles further northward in the valleys of the Ohio, and no little light is thrown on the question of the length of time that has elapsed since these huge edentates wandering demons of North America.

The swamp, formerly one of those glacial lakes with which the front of the ice-sheet abounded, consists of peat to the depth of from five to ten feet overlaying a bed of marl formed by the deposition of silt from the glacier water. In its uppermost layer only, this marl contains a multitude of small shells, showing that it was not till the ice-cloune had retreated to return no more, and ice-cold water had ceased to enter the lake that the water-meltisms appeared upon the scene. With them came water-plants such as are to be found in Ohio swamps today, and animals that had been driven southwards by the ice, began slowly to return. Summers of exceptional warmth would even tempt some strange beasts from farther south. Among them, doubtless, were the megalonyx whose remains were found near Millersburg, between a tongue of gravelly drift that projects into the swamp and a small patch of peat. These homes were kept in its hiding-places, the nearest to the land the animal seems to have been swimming from one point to the other and, in attempting to land in the weedy shallows, to have been held fast by the shell-marl on which its bones were lying. The time of its death must thus have been after the final retreat of the ice had allowed the return of the animal. But the life of the layers of peat. It must also have been long enough ago for the water-plants to form a pesty mass of five feet thickness above the bones. For this a space of six to seven thousand years will suffice. This discovery in Ohio, therefore, makes the megalonyx and his congener, the megatherium and mylodon, creatures of yesterday, counted by geologists. Time must indeed make a mess, they were, in this western world, among the few of primitive man and that even after civilization had begun to dawn in the far west, on the rich plains of the Xilo.

The western world was the home of the gigantic extinct edentates as it is now that of their modern representatives, but although half fossil remains of the former are found from time to time, neither exact nor exact in fact must be considered to have been their favorite habitat. This fact was fully demonstrated by Charles Darwin when, as a youth, he visited Patagonia and Buenos Ayres, as naturalist to the expedition of the Beagle. Excited by the accidental discovery of some fossil bones of a gigantic edentate he prosecuted a most diligent and intelligent search for mores. Often he spent whole nights in the work of resurrection, but more often he was compelled to return to the ship after only a few hours labor, breaking off in despair the projecting extremity of some huge, partly excavated bone. The occurrence of these enormous bones was indicated to him in various ways, sometimes in local names such as the “stream of the great animal,” the “stream of the giant.” At other times a clue was given in traditions that ascribed to certain rivers the marvellous property of changing small bones into large, and to certain bones the power of growing after death. By one means and another he became impressed with the extraordinary number of the remains buried in the grand estuary deposits that form the Pampas, coming to the belief that the whole area is one wide sequele of extinct, gigantic quadrupeds. In the north of Patagonia he actually excavated such a catacomb, finding in a space of about two hundred square yards, the remains of nine extinct giants, six of which belonged to the family of edentates.

The wonderful resemblance borne by these colossal edentates to the sloths and armadillos still inhabiting South America attracted the attention of the young naturalist and turned his thoughts to questions regarding the appearance of organic beings on our earth and their disappearance from it. It was indeed the vivid impression made on his mind by excavating these fossil edentates with his own hands that formed one of the chief starting points for his speculations on the origin of species. These giant sloths have, therefore, apart from their intrinsic interest, a value that is almost sacred in every department of thought, being connected with one of the broadest generalizations that the world has ever known.
METEOROLOGY FOR JULY, 1891.

TEMPERATURE.

ALT. A. M. 64.45° 58° 7° 18°
ALT. P. M. 64.52° 60° 7° 18°
ALT. P. M. 64.20° 61° 5° 16°
Whole month 67.48° 68.31° 8° 33°

Second average 67.45° 67.59° 8° 33°

Last 25 Julys 71.40° 68.28° 68.00° 67.41°

The present July has been the coolest in twenty-one years. The lowest point was 56° on the 28th; the highest, 78°, on the 12th. The last was the coolest day, with an average of 62.66°; the 14th was the warmest, at 77°,—a range of only 14.33°. The mercury reached 80° or above only six times during the month, at the hours of observation, and the entire month was 2.85° below the average of the last twenty-one Julys. The seven months since January 1 have been 1.47° daily above the average of this period, giving a surplus of heat thus far in the year of 312°. This surplus, however, came during the first four colder months, while our chief loss came in July, leaving the balance as above.

SKY.

The face of the sky, in 89 observations, gave 48 fair, 15 cloudy, 21 overcast, and 5 rainy,—a percentage of 61.66, the same as last year. The average fair for the last twenty-one Julys has been 60.5, with extremes of 41.9 in 1880, and 76.3 in 1878. Only four Julys have been less fair than the present during my record. Thunder and lightning occurred on the 3d and 25th, the latter in the south, but without rain in this locality.

PRECIPI TATION.

The amount of rainfall the last month was 2.03 inches, chiefly toward the close of the month; only .13 inch fell between the 8th and 23d. The four principal rains ranged from .25 to .77 inch each, keeping vegetation generally in a flourishing condition. The average amount the last twenty-three Julys has been 3.20 inches, with extremes of 1.20 in 1888, and 9.27 in 1889. The amount since January 1 has been 35.76 inches, and the average of these seven months the last twenty-three years only 28.25 inches,—giving a surplus this year thus far for these months.

PRESSURE.

The average pressure the past month was 29.994 inches, with extremes of 29.70 on the 8th, and 30.30 on the 23d,—a range of .60 inch. The mean for the last eighteen Julys has been 29.333 inches, with extremes of 29.820 in 1884, and 29.524 in 1891,—a range of .374 inch. The mean daily movement was .099 inch. This average this last eighteen Julys has been .093, with extremes of .054 and .118. The largest daily movements were .34 inch on the 8th and 24th, and .20 on the 30th,—shewing a quiet state of the atmosphere, as is usual in the hottest months. Eighteen observations of the 62 were recorded stationary.

WINDS.

The average direction of the wind the past month was W. 37° 53' S., while the mean for the last twenty-two Julys has been W. 23° 3' S., with extremes of W. 4° 54' N. in 1889, and W. 6° 15' S. in 1873,—a range of 71° 9', or nearly six and one-fourth points of the compass. The relative progressive distance travelled the last month was 57,01 units, and during the last twenty-two Julys 1,065 such units, an average of 48.41,—showing less easterly winds than usual. The northerly winds have prevailed over the southern in July only twice in twenty-two years, and these but very slightly.

In review, the past month has been remarkably cool, with high pressure, more clouds and more northerly winds than usual in July, with slightly less rainfall than the average; but since January 1 both heat and precipitation—the two items most essential to vegetation—have been quite in excess.

NATICK, AUGUST 5, 1891.

[Speci cally Computed for POPULAR SCIENCE NEWS.]

ASTRONOMICAL PHENOMENA FOR SEPTEMBER, 1891.

The sun crosses the equator and autumn begins September 23, at 3 A. M. The planets are not in a very good position for observation, Jupiter being about the only one easily seen. Mercury at the beginning of the month is an evening star, about 17° east and south of the sun—toofar south to be easily seen after sunset. It passes inferior conjunction at 12 a.m. on September 22, and becomes a morning star. It reaches greatest western elongation on September 28, rising then about an hour before sunrise—not quite far enough away to be easily seen. Venus is also not in good position, being quite near the sun during the whole month. It passes superior conjunction on the morning of September 18, changing from a morning star to an evening star, but will probably be too bright to be visible after setting during the latter half of the month. Mars is a morning star, rising about an hour and a half before the sun at the end of the month, but it is too faint to be conspicuous. It is in conjunction with Jupiter on September 29. Jupiter is in good position. It rises about sunset at the beginning of the month, and is in opposition with the sun on September 5, at 5 P. M. It is in the constellation Aquarius, and during the month moves about 3° east and south. The following eclipses of its satellites may be seen during the month. Before opposition on September 5 the phenomena are all disappearances, and take place just off the left-hand limb of the planet, as seen in an inverting telescope. After opposition the shadow of the planet is on the right-hand side, and the disappearances are all occultations, but the phenomena are all reappearances off the right-hand limb.

Times are Eastern Standard.

II. D. September 2, 7h. 9m. A. M.
I. D. September 4, 2h. 32m. A. M.
II. D. September 6, 11h. 3m. P. M.
III. D. September 7, 4h. 18m. A. M.
IV. D. September 12, 12h. 39m. A. M.
I. D. September 13, 1h. 10m. A. M.
II. D. September 14, 1h. 3m. A. M.
III. D. September 15, 12h. 54m. A. M.
I. D. September 14, 7h. 39m. P. M.
II. D. September 20, 3h. 5m. A. M.
III. D. September 21, 12h. 3m. A. M.
IV. D. September 21, 2h. 32m. A. M.
I. D. September 23, 7h. 6m. A. M.
II. D. September 28, 6h. 30m. A. M.
III. D. September 28, 12h. 3m. A. M.
IV. D. September 28, 11h. 29m. P. M.

Saturn changes from an evening to a morning star, passing conjunction with the sun on the morning of September 13. It is too near the sun throughout the month to be conspicuous. The rings disappear on September 22, owing to the earth passing through the plane of the rings. They will reappear again on October 30, when the sun passes through the plane. Uranus is still an evening star in the constellation Virgo, but sets not long after the sun. Neptune is a morning star in the constellation Taurus, near the group of the Hyades. It is in quadrature with the sun on the morning of September 13.

The Constellations.—The positions given hold good for latitudes differing not more than 32° north, and for 10 P. M. on September 1, and 8 P. M. on September 30. Cygnus is directly overhead. Delphinus, high up, and Capricornus, low down, are on the southern meridian. Pisces Austris is below Capricornus, and not quite up to the meridian. Aquarius is to the left of Capricornus, at about the same altitude. After Aquarius come Pisces and Aries, the latter being almost due east, at about 10° altitude. Taurus is just rising, a little north of east. Pegasus is between Pisces and the zenith; and Andromeda is above and a little to the north of Aries. Cassiopeia is to the right and a little above the pole star. Perseus is low down in the northeast, and Auriga is just rising in the west. Draco is to the west of the meridian. Ursa Minor is mainly to the west of the pole star, at about 5° altitude. Hercules is over to the west of the pole. Aldebaran, a little to the south. Orion is to the left of the west of the zenith, with Hercules, Corona Borealis, and Boötes below it, the last being near the horizon, a little north of west. Scorpius is setting in the southwest, with Ophiuchus above it. Sagittarius is low down in the south, a little west of the meridian; and Aquila is high up, between Sagittarius and Cygnus.

LAKE FOREST, ILL., AUGUST 1, 1891.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

P. E. O., St. Louis.—What is the strongest or most tenacious metal when in the form of wire?

Answer.—Cast steel wire is the strongest, a wire with a sectional area of one square millimeter sustaining 1,800 pounds; next is gold, which will support 1,500 pounds. Lead, 5.19 pounds; gold, 0.60; platinum, 77; copper, 90.20; and iron, 140.71.

W. M. M., Illinois.—Is permanganate of potash a safe and reliable agent for purifying foul water in the country?

Answer.—Permanganate of potash is a powerful oxidizing agent, and under favorable circumstances will destroy organic matter, but it is by no means suited for the purification of water. This cannot be satisfactorily accomplished by any chemical, and we should advise you to throw all the water in the estern away, give it a thorough cleansing, and allow it to fill up again. If it is absolutely necessary to use the water, we should get it boiled and let it stand an hour, and then filtered through flannel; but it is a very difficult matter to purify water that has once become polluted.

A. W. B., Boston.—How can I raise the boiling-point of water in the country?

Answer.—By dissolving common salt in water to saturation, it may be raised to a little over 218° F.

Subscriber.—What is the velocity of light?

Answer.—As determined by Foucault, it is 185,200 miles a second. This determination is undoubtedly very nearly exact, although the mechanical difficulties in the way of measuring such an immense velocity make it difficult to obtain perfectly accurate figures.
HISTORY AND ITS ALLIES—GHOSTS AND SUPERSTITIONS.

By M. J. Gorton.

Excited nerves are one of the most annoying and most productive agencies for the breeding of unnecessary misery in the world. Most of us, probably, have had periods when vitality is at its ebb, and found a load on our shoulders which weighed upon both mind and spirits, with a sense of worry, a horror of other people's meddling, a feeling of self-mistrust, or the doom of some great evil upon our horizon. We conjure up visions of long-forgotten blunders, and dwell upon them until they grow from mole-hills into mountains; then the mistakes of yesterday,—the sentences said or left unsaid, the deeds done or left undone,—and there must be explanations and reversions immediately. Fortunately, with the bright cheerfulness of the sunshine, with the busy activity of the ocean, with the gathering of the day, the fumes of disaster will ascend more slowly.

Under the conditions, excitement ran high; and it was noticeable that most of those present were prepared to be deceived, and more than one was vibrating in nervous tremors, and occupied the time in relating stories of second sight, goblins, and ghosts. One of the company, the unmarried sister of the hostess, who was quite ill, had an object which shrunk and shrank and shrank, and seemed to be surrounded lugubriously and added to the predisposition to expect something horrible. The house stilled down, however, and when the cheerful sunshine of a brilliant July day awakened all to a state of healthy, happy activity, it seemed quite improbable that anything supernatural would show itself. But the early breeze, which usually begins to blow soon after the long protracted sultry days, seemed to sound the ghost from its haunts. Peter, the ploughman, who, after breakfast, had gone happily to his work, forgetful of the tremors of yesterday, came to the house with a blanched face, bringing his team, protesting against being in the field when "that ghost war on the rise." The poor ploughman was again in agony, and the artist, finding no one, left the task of his investigation, started for the mound. Her white canvas umbrella, which had been staked on the top of the bluff for some days, had escaped its fastenings, but was held by the cord tied at the outer edge and secured to a stake to steady it in the high winds. It had been swept to and fro by the breeze, and its gyrations could be seen from the valley. So the ghost was held, but not the hystera.

In the mining regions of Missouri there was at one time an epidemic of fits, originating in a religious excitement where many converts were violently agitated, and, after hours of violent excitement, became stiff and stark, lying in a trance state. The report grew that a certain large oak tree, standing at the fountain-head of Roaring River, was burning, although no flame was to be seen, but great columns of smoke ascended from the green boughs during certain hours of the day. Soon many invalids were attracted, and, as there was no visible cause for fire, great wonder fell upon them. And the excitement grew and the frenzy prevailed until one of the investigators climbed to the topmost branch. The enigma was solved. Innumerable myriads of gnats were swarming, and, as they dispersed themselves in the sunshine, the great spirals and clouds of smoke, black and rushing, seemed to issue from the mountain.
The great emotional wave, however, had its full effect.

Of the many indefinite distresses to which human nature is subject, there is none more real than that aroused by unexplained natural phenomena and the consequent fright. The result is known by many names: nerves, spleen, vapors, megrim, ennui, and last and most expressive name, because always applicable: hysteria.

(The Hospital.)

PRESCRIPTIONS AND THEIR OWNERS.

All classes of physicians have long felt that the honor and glory of consulting practice had its drawbacks, and that one of those drawbacks was the giving of prescriptions over which no professional control was retained. In the case of the older consultants, whose fees range from two guineas upwards for each consultation, and who can always command full consulting rooms, this is a matter of comparatively small importance; but the question assumes a very different complexion when the family physician receives the small fee of five shillings for a professional visit, and gives it to the patient for his unrestricted use of a prescription which may run for a week, a month, a year, or a lifetime. It is hardly surprising that under these circumstances some rather sharp notes of alarm should have been sounded in the professional journals, nor is it very strange that those notes of alarm should have been followed by suggestions indicative rather of fear than of wisdom. One family physician proposes to claim an absolute right to the patient's prescription in all cases, and says, "My prescriptions are mine," says he, and I mean to stick to them. He has been driven to this bold attitude of self-defence by the discovery that one of his patient's relatives has a particular prescription of his to eight ladies, and so, as he puts it, practically robbed him of eight fees. Another family physician becomes quite Jesusically hair-splitting in his attempt to deal with the difficult and complicated question. "My own opinion," he says, is, and always has been, that the prescription does not legally belong to any of the parties concerned, but should be destroyed after it has fulfilled its mission." The idea of a prescription "fulfilling its mission," is distinctly poetical, but perfectly admirable: "We pay for a railway ticket and it is taken from us on completing the journey. The prescription is nothing more than a convenient missive"—"missive is good—"between doctor and chemist, and probably would not be entrusted to the patient if we had any more convenient way of communicating our order. We do not address the chemist addressed to the patient; and this is the claim, how he has to compound a certain number of ingredients for the patient, and this being done, the prescription should be destroyed or returned to the author."

Now all this is exceedingly interesting and instructive to the student of psychology; as that science asserts itself in the medical mind. It shows how true it is, that the physician, who is the "author" of a prescription, shall retain all the powers of copyright in his own work. It is a pity that patients do not occasionally read professional journals.

The discussion would have been greatly improved, from the point of general edification, if one or two patients had added their contributions. Arguments are mostly inconclusive which discuss one side of the question.

It seems to us that the interest of patients and doctor are not opposed to each other in this matter, but are identical. On the one hand, those doctors who wish both "to eat their cake and have it," make a mistake; and on the other, those patients who use a prescription for a longer time than it is ordered to be used, or give it to their friends, make a still greater mistake. As a matter of fact, where proper relations subsist between doctor and patient, it is probable that very little injustice is done to the former. One thing seems to be quite certain, and that is, that the doctor who gives a prescription to his patient cannot both give and keep it. All he can do is to instruct the sick person how long to take the medicine prescribed. If the latter continues to take it longer, he is exceedingly foolish. No honorable doctor ever thinks of limiting the time during which a prescription may be used merely for the sake of getting an additional consultation fee out of his patient. Any patient who has good reasons for taking an unnecessary extension of time on his visiting or consulting list ought to seek another doctor at once, and any doctor who asks his patient to return to his consulting room when there is no necessity, for further consultation, is a deliberate cheat, and deserves all the contempt and obloquy which can be poured upon him. The physician, including, on his honor, every member of the profession, occupies a position of peculiar delicacy towards his patient. The patient is ignorant, the physician has knowledge; the patient is fearful, the physician has the confidence of experience. What kind of a doctor is he then who takes advantage of his patient's trustfulness to worry his mind with fear, and to extract from his pocket unnecessary fees? He is a scoundrel.

But on the other hand, whilst physicians must be as honorable as Caesar's wife, because their position is one of such unlimited freedom, patients must not forget that he who dispenses honor and justice with his prescriptions, is entitled to honor and justice in return. Wise men and women clients will use a remedy for the exact period required. If they be satisfied, they use it a very little longer the reasonable physician will not object; and they will probably not do themselves any great harm. But they should remember that in using a prescription longer than the specified time, there is always a possibility of their doing a serious injury to their own health, which injury to their health is an injury and injury to the physician. Of it he will, to be quoted, in the mere loss of one or two palette fees, but in the wound it may inflict upon his reputation and his feelings in that his misused prescription has been a source of injury rather than of benefit to his patient.

Should patients ever give medical prescriptions to others? The question is certainly not. They may do untold injury by such acts. This is not said to frighten them; it is plainly and simply true. Modern remedies are of such a kind that they ought only to be handled by experts. The subject is of much importance, and space forbids us to expound the patient's aspect of the case as fully as it demands. But this is to be insisted upon, that if a high sense of duty compels the doctor to shrink with disgust from the taking the least advantage of his patient, the very same sense of duty should compel the patient to make it a matter of conscience to avoid doing any kind of injury to the doctor.

[Chambers's Journal.]

JEWELS AS MEDICINES.

Although popularly supposed to be itself a deadly poison, the diamond has from remote ages been credited with the power of protecting the wearer from the evil effects of other poisons, a tradition which it retained until comparatively recent times. According to Pliny, it also keeps off insanity. Amber, too, was supposed to possess the latter virtue. Besides the diamond, several other stones were supposed to possess medicinal virtues.

The ruby was considered good for derangements of the liver as well as for bad eyes. The sapphire and emerald were also credited with properties which rendered them capable of influencing ophthalmic disorders, and there is a superstitious belief that serpents are blinded by looking at the latter stone.

The turquoise, although not credited with either remedial or protective properties so far as disease was concerned, was nevertheless regarded as a kind of superstition, and the intensity of its color being supposed to fluctuate with the health of the wearer. The latter, moreover, by virtue of the stone he carried, could, it was said, fall from any height with impunity. The Marquis of Vilena's fool, however, was somewhat nearer the truth when he reversed the popular superstition in his assertion that the wearers of a turquoise might fall from the top of a high tower and be dashed to pieces without breaking the stone.

The opal was looked upon as a thunder stone, and although many women now appear to have a strong superstitions prejudice against wearing it, one was it bygone days held in the highest estimation, for it was supposed to combine the virtues of several other gems.

On the other hand, the onyx—so named on account of its resemblance to the color of the finger-nails—could scarcely have been a nice stone to wear; for, according to medieval superstition, it rendered one particularly susceptible to annoyances from nightmares and demons.

Temperance advocates, if they have any regard for the beliefs of their ancestors, do not question the advisability of distributing amethysts among drunkards, for it was supposed that these stones prevented intoxication.

Coral was made use of by the Romans as a protection against the evil eye, and popular superstition has credited the topaz with the power of depriving boiling water of its heat.

Perhaps the most wonderful properties, however, attached to the chimerical stones which many creatures were supposed to carry in their heads. Most of our readers have no doubt heard of the precious jewel which the toad carries in his brain-box, and so-called toad-stones, which were in reality the teeth of fossil fish, were formerly worn in finger rings as a protection against poison.
session of the jewels were perhaps numerous, they must invariably have been unsatisfactory, especially to the taste of the enquiring antiquarian.

The eagle stone was considered an excellent thing to wear during pregnancy, and the swallow carried in its stomach stones of great medicinal value.

The brain of the tortoise was supposed to contain a wonderful stone, which was efficacious in extinguishing fire, and when placed under the foot of a horse, caused a prophetic inspiration. Another stone possessing the latter property was to be found in the eye of the hyena.

The head of the cat, however, was thought to contain what would undoubtedly have been the most wonderful and most desirable of all, could it have only had a real instead of an imaginary existence, for that man who possessed such a stone would have all his wishes granted.

(Politely Compiled for Popular Science News.)

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARKE, M. D.

CARE OF THE EYES DURING SCHOOL LIFE.

1. The lighting of the work.—So long as languages are taught with grammars and lexicons, exercises to read and exercises to write; so long as mathematical demonstrations and calculations have to be traced out on slate and paper; so long as natural history furnishes objects for minute inspection, to supplement text-book studies; in a word, so long as that part of education which is obtained through school life demands the unwrangling application of the powers of vision, the paramount question in the location and planning of every school building should be, where and how can be obtained the best possible light for every pupil? But even where this requirement is met in the building, and still more where it has been ignored, there is need of constant supervision of the illumination. The adjustment of the size, the arrangement of seats for various exercises, or for exercises at various times of day, the special favoring of those whose limits of endurance are comparatively narrow, the suspension of certain exercises, or the resort to artificial illumination at dark hours or on gloomy days, demand constant, watchful, intelligent care.

2. The preservation or correction of faulty methods of using the eyes.—This includes the care of the general position of the body; the position of the head and eyes and book, frequent relaxing of the accommodation and convergence by looking off from near work into distance; the arrangement of hours to avoid the excessive confinement of any one kind of eye exercise; the making of great requirements of the eyes during periods of general exhaustion or lowered nutrition.

3. The use of glasses, including the recognition and careful measurement of ametropia or heterophoria, with their proper correction or treatment; and the study and management of cases of special weakness of accommodation and convergence.

4. The education of teachers of that or other objects looked at, to the visual power of the individual.—Remembering that the work attempted must be strictly confined within those individual limits, no matter how narrow they may be, it may be well to note here that it lessens the brain effort of application to have the retinal image large and vivid, as well as distinct. It is this temptation to render the task easier for the attention, though harder for the accommodation and convergence, that prompts children to hold the book or other object excessively near. So it is important, especially for young children, to give a retinal image of average size by means of the proper distance in the working distance. There is great physiological reason for the large type of horn-book and primer.

5. The care of the general nutrition and health.—It should never be forgotten that the visual apparatus is a part of the body, influencing and influenced by all other parts, and suffering with them from the same causes, both of life and death.

A consideration of these requirements that are to be met shows that, in the matter of lighting, the avoidance of vicious methods of using the eyes, the selection of properly printed books, the teaching the children to write letters and figures of good size, and the recognition of the individual limits of endurance, there is need of the constant intelligent supervision of each individual school and scholar.—Ann. Lancet.

PATHOLOGY OF GRIEF.—That severe mental distress or fright sometimes produces physical disease, and occasionally even death, is an admitted fact, although the way in which it acts has hitherto been but little studied. In order to investigate thoroughly the deficiency in our knowledge regarding this matter Dr. G. Bass has recently made a number of observations on animals which apparently died in consequence of capture.

Birds, moles, and a dog which had succumbed to conditions believed by Dr. Bass to resemble those known among human beings as acute nostalgia and a "broken heart" were examined post-mortem. Generally there was hyperemia, sometimes associated with capillary hemorrhages of the abdominal organs, more especially of the liver, also fatty and granular degeneration of their elements, and sometimes bile was found in the stomach, with or without a catarrhal condition. The clinical symptoms were at first those of excitement, especially in the birds, these being followed by depression and persistent anorexia.

The theory suggested by Dr. Bass is that the nervous disturbance interferes with the due nutrition of the tissues in such a way as to give rise to the formation of toxic substances—probably poyamines—which then set up acute degeneration of the parenchymatous elements similar to that which occurs in consequence of the action of certain poisonous substances, such as phosphorus or to that met with in some infectious diseases.

In support of this view, he points out that Schulze has found parenchymatous degeneration in persons dead from acute delirium, and that Zenker found hemorrhages in the pancreas in persons who had died suddenly; he refers also to some well-known facts concerning Negroes in a state of slavery, and to the experience of African fever. He hopes that these hints may induce medical officers of prisons and others to study both clinically and anatomically this by no means uninteresting or unimportant subject.—Guillard’s Medical Journal.

SHEDDING BONES.—The following story is related by C. H. Cabell, M.D., in a recent number of the Medical and Physical Gazette. The following case was reported to the East Tennessee Medical Society by Dr. Bell, of Porto-ville. The patient is seventy-one years of age, seemingly in perfect health, a well-put woman of medium height, average weight, and normal in every other respect. Twenty-one years ago the exfoliation of bone began in her fingers, and has during the succeeding years continued until she has twice shed ulna and radius, humerus, scapula and part of inferior maxillary.

This shedding occurs spontaneously without pain, hemorrhage, suppuration, inflammation, or incontinently. On one occasion when she desired to shed the radius. There is no deformity, supination, pronation, extension, flexion and circumflexion being perfect. The bones shed (about six hundred pieces) were, on careful inspection by the society, found to be entirely natural. She has given about one hundred pieces of bone away as souvenirs. The woman is conscious of the coming expulsion of bone a few days before it takes place, and a perfect bone is always left in its stead. The bone makes its way out, always on the posterior side, and the wound heals by first intention though at the "exit of the bones" were numerous small scars. Half of the radius is expelled at one time, the articulation being perfectly natural. There is no history of scrofula, cancer, or other disease. She has lived in the country, and has never been exposed to chemicals nor ever been poisoned. She has always been in comfortable circumstances and is cheerful.

THE BACILLI OF MALARIA.—Dr. Andrews has recently published an interesting treatise on the course and character of the bacilli of malaria in the air at different times of the day. His experiments, which were conducted in the Observatory of Moncalieri, and reported in the Medicinische Nachrichten, were carried out by means of small rubber balloons filled with hydrogen. On to these balloons he fastened a small box holding prepared glass slides, which box he was able to open by means of a cord, after the balloon had reached the desired height. Microscopical examination of the slides showed that in the early hours of the day the swarms of bacteria were close to the ground and in large numbers; later, at about 9 o’clock in the morning until about 3 in the afternoon, they would rise until they reached a considerable height, and from that time would again gradually sink to the ground. The number of bacilli in the air was almost exactly in proportion to the rise of temperature, while in direct opposition to the amount of humidity in the atmosphere.

It is evident, therefore, that the condensation of the watery vapors in the air causes the falling of the bacillus, and for this reason the morning and evening hours are the most dangerous in malarial districts.

THE ETIOLOGY OF ACUTE SUPPURATION.—An interesting review of Steinhaus’s exhaustive work on this subject closes with the following paragraph, which is of surgical interest:

"That, so far as our present knowledge is to be relied upon, we are justified in believing that suppuration is the result of sepsis or injury from some micro-organism, or to that met with in some infectious diseases. Steinhaus also claims to have demonstrated that the action of the same micro-organisms varies greatly in different animals, thus explaining many apparently contradictory experimental results.—Boston Med. and Surg. Jour.

INFLUENCE OF FOOD ON PHYSICAL CHARACTER.—Dr. Oliver Wendell Holmes is quoted as offering the following sentiments regarding this topic:

"..."
THE TREATMENT OF BURNS.—In the Friedrichshain Hospital, in Berlin, the following is the method of treatment of burns employed by Dr. Bardeleben:

The burned surface is first carefully washed with a two or three per cent. solution of carbolic acid or a three per mille solution of salicylic acid. The blisters are then opened, and the entire surface covered with substrate of bismuth finely powdered, and over this a layer of cotton wool. This dressing is to be renewed as soon as it becomes at all moistened by discharges from the wound. If the burn is very extensive, an ointment of bismuth is substituted for the dry powder.

Dr. Bardeleben asserts that with this dressing catatization is much more rapid and suffering much more quickly relieved than is the case with any other form of treatment. He states that, in spite of the large quantity of bismuth which he has employed, he has never seen any symptoms of poisoning follow its use.—Therapeutische Gazette.

VACCINATION.—According to the Medical Record, in Germany vaccination is compulsory, in France it is not. In Germany the total mortality in the entire country from small-pox was 188. In Paris alone during the same year it was 382. In Alsace the annual mortality per 100,000 from small-pox has fallen, since the annexation of the province to Germany, from 3.14 to 0.22. The citizens of Zurich voted to do away with compulsory vaccination in 1883. The number of deaths from small-pox in 1882 was 3; in 1883, 8; in 1885, 52; and in 1886, 55.

HYSTERIC YAWNING.—Charcot was the first to describe hysterical yawning. This difficulty appears in two forms: There may be continuous, frequent yawning, only interrupted by sleep, lasting for weeks and months, and that, too, without interference in the least with the state of the general health. In these cases the inspirations are not any deeper than one meets with in normal breathing, while in physiological yawning the inspirations are very deep indeed. Hysterical yawning is sometimes accompanied or interrupted by fits of coughing. Another form of the difficulty is observed at intervals only. It is accompanied by the globus hystericus as an aura. When attacks of this kind come on, the gaping is almost continuous, and may last for an hour or so; or a second attack may supervene immediately after the cessation of the first one. In some cases the yawning is among the village people of our vicinity, and a form of yawning occurring in epileptics, and which appears between the convulsive seizures. It differs from the hysterical affection only in the absence of all rhythm.—Nouvelle Iconographie de la Salpêtrière.

ACROSSMALLY FOLLOWING SEVERE FRIGHT.—A case of this curious condition is reported by Pel (The Review of Insanity and Nervous Disease). A girl, aged twenty-four, in blooming health, received a very severe fright. The next day she complained of headache, and pains and uncomfortable feelings in various parts of the body. The temperature was normal, and the pulse intact, and great mental depression. No nervous anxiety Soon after the fright, her friends noticed that her head was becoming larger, and she found that she could not get gloves or stockings large enough. The lower jaw projected considerably, the meto-occipital diameter being ten inches, the corresponding circumference being twenty-eight inches. Her nose was large and flat, while the skin covered both lips. The hands and feet, as well as the lower sections of the fore-arms and legs, were enormously, though symmetrically, enlarged. Length of hands, eight and one-fifth inches; of middle finger, four and two-fifths inches; of index, four inches. Length from acromion to tip of fingers, thirty-two inches. Both palates, the crest of the lips, both cheeks, and the spine were enlarged, the thorax being normal. This is the first case reported in which a definite etiological factor has been determined.

LIVING LARVE IN THE EAR.—An American farmer had a fly crawl into the right ear. He removed it with a spear of grass, and had no further trouble for two succeeding days. Then the ear commenced to bleed with intense pain, lasting until he sought advice two days subsequently. On syringing and just before, fifteen living larvae were removed. The meatus was much reddened, swollen, and bleeding, but the drum was intact. A pledget of cotton soaked in boric-glyceride was used as a sufficient treatment. The larve lived for twelve hours after removal. Many surgeons have found it a difficult task to remove them from this position, forces alone succeeding in some instances.—Arch. Otol.

MEDICAL MISCELLANY.

MAN'S SUPERIORITY TO THE ANIMALS.—It takes four men to give an elephant castor oil, the dose being 32 c.c. The oil was found to be unexceptionable, and the weight of the animal reduced half a ton after six days. It proved to be of great service to the attendance in the form of a lancinating pain in the muscles of the neck and shoulders. The oil was found to be of great service to the attendance in the form of a lancinating pain in the muscles of the neck and shoulders.

The qualifications of a Physician in Olden Times.—A satire of Henry VII. ordains that the practice of the healing art shall be limited to those persons, that be profound, sad, and discreet, grandly learned, and deeply studied in physic.

When Stithchene was discovered in 1818 by the two chemists, Pelletier and Caventon, it was called aquafinae after the eminent chemist; but he, having witnessed the terrible sufferings of animals upon which it was tried, begged the discoverers not to associate his name with it.

Koch Believes in his Lymph.—In a debate in the Upper House of the Prussian Diet, on June 18th, the Minister of Public Works, Ecclesiastical and Medical Affairs, replying to questions concerning the efficacy of Professor Koch's tuberculin, maintained that it had scientific value, and that its therapeutic value would be greatly enhanced as soon as Professor Koch had obtained a pure culture of the tubercle bacilli. The result, the professor had informed him, would be achieved in a few weeks, and the composition of the "lymph" would then be submitted to the examination of the scientific world.
The appearance of this plant is so peculiar that when once seen it is not readily forgotten. A leafless stem, six inches in height, rises from the root, and terminates in an umbel of white flowers; these are, however, of distinctly subordinate interest. Its winged leaf-stalks spread themselves out like a kind of rossette about the root, each bearing a broad leaf, so curious in the strange powers which it displays as almost to convince one that the plant can lay claim to a sentient life.

The leaf proper is orbicular in shape, and has a hinge-like middle vein, upon which the halves swing smoothly, opening and shutting with great speed and ease. Each half is somewhat cone-shaped upon the upper surface, and is bordered by a row of spines thinly placed around its edge, and set at such an angle as to cross when the blades are closed. They have, also, a power of separate movement, and interlock like the fingers of two hands, the leaf would be our irresistibly the top of a steel trap, which, in fact, they also resemble in the use for which they are designed. On the central part of each blade we find three conspicuous hairs. These are of the greatest sensitiveness, delicate, irritable, and so placed that even a small insect can hardly alight or move about upon the leaf without touching one or more of them. Over the soft, red, globular, or glands, are most numerous in the vicinity of the hairs. Provided the leaf upon which it grows be vigorous, no sooner is one of these irritable hairs touched—be it never so lightly—than the blade springs together, the spines cross at right angles, and presently a slightly glutinous secretion begins to flow from the rosette glands, which is supposed to be the active agent in the process of digestion. It is not improbable that the fluid from these glands may also serve to attract insects and cause them to alight upon the plant. While it is not well to often touch these hairs, and thus provoke the leaf to close,—for much handling seems to a measure to weaken its powers,—we can watch this action in other ways.

The process of digestion in the plant, far from being hurried, is one of the greatest deliberation. The time occupied varies from one to three weeks, hence, its duration being influenced somewhat by the size and vigor of the leaf, but far more by the kind of food which is being absorbed. Soft-bodied insects, flies, spiders, and those of like texture are more quickly disposed of than beetles and others which have hard or shell-like coverings, and small creatures disappear more speedily than larger ones of the same size. The size of the insect thus caught and capable of being digested seems also to bear direct proportion to the size of the plant. Experiments tried upon an unusually large specimen of Venus fly-trap have been most interesting in their results. One leaf, measuring one and five-eighths inches in length from end to end, and three-fifths of an inch broad, containing nearly four dozen in all upon the two halves, caught and consumed not only formidable spiders, but a hornet by itself.
When the blades at last open through their own impulse, the vivid secretion of digestion has disappeared; the leaf is dry, clean, and bright; the disintegrated skeleton of the fly is ejected, and sometimes it is found to have been so firmly pressed between the blades as to leave its impression indented line for line, with great accuracy, upon their soft substance.

This organ we accept artificial feeding, and as readily digest some of the articles eaten by man as their own more usual diet of insects. Milk they seem to really relish, and in their leafy stomachs it speedily resolves itself into the orthodox curds and whey, which are afterwards absorbed—some nine days being required to dispose of the curdly part. But while milk seems to afford suitable nourishment, they do not readily reject the offal, and it is often found in the leaves of their spontaneous growth. They appear to require something like the new engendered vitality,—cheese they do not tolerate at all, the leaf to which it has been turned black and dying upon occasion, whether the article offered was newly made or of the ancient and mouldy class. Salt, so grateful to the human stomach, proves a positive poison to these vegetable ones. The boiled white of an egg, however, they find quite to their taste. Even bits of burnt biscuits are also accepted and apparently digested. When, after having been for two or three days exposed to the action of the digesting fluid, these morsels were removed from the leaf, they were found to have become white, tender, and easily macerated, and showed not the least tendency toward a putrid decomposition.

The Venus fly-traps are, however, by no means of a glutinous habit, and a leaf which is overfed will surely die. But they generally know when they have had enough, and can no longer be tempted, the sensitive hairs refusing to respond, no matter how cunningly they may be manipulated. Another idiosyncrasy of the plant is that it prefers the victims of its own bow and spine to any that may be captured for it; and it manifests something very like intelligence in its quiet but persistent rejection of practical jokes offered in the guise of small pebbles, grains of sand, and other substances impossible to its digestion. Indeed, it may be termed truly refined in its tastes, when compared with other fly-catchers, notably the Sarracenia. These plants, after capturing their food in immense quantities, and of any sort that comes in their way, it is to satisfy their pitcheer-like receptacles, which reject nothing; and the plants subsist and thrive finely upon this revolting mass, which makes itself manifest by its foul odor for some distance around. Our Dionaea, on the other hand, being, perhaps,—who shall say?—under some subtle influence emanating from the lovely goddess whose name it bears, is as tidy in habits, as fastidious in taste, as the most dainty of women. It closes its leaves, it is true, upon any foreign substance that may be placed within them, responsive, always, to the irritation of the hairs; but unless it finds the matter enclosed in its embrace to be suited to its tastes or needs, it is as sure to be expelled as if the plant was possessed of reasoning power.

When with a fine hand, a careful hand, a trained hand, cutting off the sensitive hairs, and thus removing them altogether from the leaf, it was followed at first by its closing. After a while it opened again, and then the action became as truly capricious as if the plant was endowed with will power. Sometimes the leaf failed to respond at all when irritation was applied to the parts where the hairs had been; at others, the two halves came together just as they do when all is perfect; again, the action followed slowly and awkwardly when a considerable time had elapsed after the irritation had ceased; and sometimes the two blades failed to act in concert. But, perhaps, no one of these variations is as difficult to account for as the fact that the leaf should close at all when thus crippled in its motive power.

**Glaciers.**

*by Joseph Wallace*

With the development of science a corresponding growth of theories takes place. In truth, we theorize too much, and endeavor to draw conclusions from far-fetched ideas for the purpose of upsetting preconceived theories and notions well established by the evidences of the past or present. Science, in comparison with the Prehistoric Age, has developed many absurd hypotheses, and, though accepted by scientists and the learned of all civilized countries, with a few unimportant exceptions, all do, for the most part, tolerant with the generality of mankind.

Under the name glacial period a remarkable episode in the history of the northern hemisphere is designated, that of a great depression in general. That this depression was an effect of the climatic conditions of the Tertiary Age, this change of temperature, which effected the higher latitudes of the Old and New Worlds alike, reached such a height that the whole of Northern Europe was buried under snow and ice, which extended southward as far as Saxony. The Alps and Pyrenees were loaded with snow and ice, while the glaciers descended into the plains, overriding ranges of minor hills on their way. The greater portion of Britain, and also a wide extent of North America, were wapt in the cold embrace of huge ice fields. The effect of the movement of ice was necessarily to remove the soils and superficial deposits of the land surface. Hence in areas of country with vast snow fields, from which numerous glaciers descended into the plains, overriding ranges of minor hills on their way. The greater portion of Britain, and also a wide extent of North America, were covered with the cold embrace of huge ice fields. The effect of the movement of ice was necessarily to remove the soils and superficial deposits of the land surface.

Considerable local differences may be observed in the nature and succession of the different deposits of the glacial period, as they are traced from district to district. It is hardly possible to determine whether certain portions of the series are epeirogenic or endogenic. The following are the leading facts which have been established for the North European area. First there was a gradual increase of cold, which increased during intervals, until the condition of modern North Greenland extended as far as Labrador, and 50° latitude in Central Europe. This was the culmination of the glacial period. Then followed a considerable depression of land, and the spread of cold Arctic water over the submerged tracts, with abundant floating ice. Next came a re-elevation with renewed augmentation of the snow fields and glaciers. Very gradually, and after intervals of increase and diminution, the ice retired toward the north, and with it the Arctic flora and fauna that had occupied the European plains. The existing snow fields and glaciers of the Pyrenees, Switzerland, and Norway are remnants of the great ice sheets of the glacial period, while the Arctic plants of the mountains are relics of the northern vegetation which was universal from Norway to Spain.

*Nature and Origin of Glaciers.—* A glacier may be defined as a river of ice formed by the slow movement and compression of the snow which, by gravitation creeps downward into a valley or plain descending from a snow field. From a geological point of view these ice rivers may be regarded as the drainage of the snow falls above the snow line, or rivers are the drainage of rainfall. In a mountainous region like the Alps, or table-land like Scandinavia, where a considerable mass of ground lies above the snow line, three varieties of glaciers have been observed:

(a) Glaciers of the first order, where the ice river comes down well below the snow, and extends far beneath the summits of the highest mountain. The upper limits of cultivation, and in northern regions approaches or even reaches the sea. In the Alps such glaciers may be twenty or thirty miles long by a mile or more wide, and six hundred or more feet deep.

(b) Glaciers of the second order, which hardly creep beyond the high recesses wherein they are cultivated, and are so low that they extend to the middle of the next valley. Many striking and beautiful examples of this type may be seen along the steep declivities which intervene between the snow-covered plateau of Arctic Norway and the sea.

(c) Recemented glaciers, consisting of fragments which fall from an ice cliff crowning precipices downwards, as glaciers of the second order; or the ice accumulated in the sea of Northern Europe is furnished in the Nus Fjord and other parts of Northern Norway. In some cases a cliff of blue ice appears at the top of the precipice, the same as at the edge of the great "snee-fond," or snow field, while several hundred feet below, in the corrie at the bottom, lies the recemented glacier, (glacier remanie of the Swiss), white at its upper edge. But it is in the high Arctic, and still farther north, that the blue ice from the drainage of a great snow field attains its greatest dimensions.

The land in these regions is completely buried under an ice cap which ranges in thickness—in the south polar circle 10,000 feet, (nearly two miles), and even more. Greenland lies under such a mass of snow that all its inequalities, save the more mountainous peaks, are concealed, the snow creeping down the slopes and mounting over minor hills, passing beneath the pressure into compact ice. From the main valley great glaciers, like huge tongues, 2,000 or 3,000 feet thick, and sometimes fifty or more miles in breadth, push out to sea, where they break up into pieces and float as icebergs. A glacier, like a river, is a moving body of water, which, as it advances, picks up its own load and carries along with it the rocks of all sizes, from the smallest pebble to the largest boulder. The motion, also, that of a river, and for the same reason, is unequal in its parts, the center moving faster than the sides and bottom. This important fact was first ascertained through accurate measurement by J. D. Forbes, who found that in the Mer de Glace of Chamonix the main daily rate of motion in the summer was from twenty to twenty-seven inches in the center, and from thirteen to nineteen and a half inches near the side. The consequence of this differential motion is seen in the arrangement of the lines of rubbish thrown down at the end of a glacier, which often present a horse-shoe shape, corresponding to that of the end of the ice by which they were discharged. The consequences of these irregularities may be seen as far as the banks of the river in the neighboring valleys.

*Ice-rock or Erratic Rocks.—* We find solid rocks over the whole of Northern Europe which present the characteristic smooth agglutinations which can be produced only by the grinding action of glaciers. These outlines or corners were effected not by the mere contact and pressure of the ice upon the rocks, though undoubtedly fragments of rock must now and then be detached from this
cause. It was by means of the fine sand, stone, and blocks of rocks which fell between the ice and rocks on which it moved that the grinding work of the glader was done. These materials, held by the ice as it crept along, were pressed against the sides of the rock and the bottom of the valley so firmly and persistently as to descend into each little hollow and mound over each edge, yet moving all the while steadily in one dominant direction with the general movement of the glader. As a result, the most compact resisting rocks are ground down, smoothed, polished, and stratified. Where they have been long exposed this peculiar surface is apt to be effaced by the disintegrating action of the weather, though it retains its hold with extraordinary persistency. Observations of the directions of the striæ have shown that, on the whole, these markings diverge from the main masses of high ground. In Scandinavia they run westward and southward on the Norwegian coast, and eastward or southeastward across the lower grounds of Sweden. When the ice descended into the basin of the Baltic and the plains of Northern Germany it moved southward and southeastward, but seems to have slightly changed its direction in different areas and at different times. Its movement can be traced partly from the strike on the soil, but more generally from the glacial drift it left behind; thus it can be shown to have moved down the Baltic into the North Sea. At Berlin its movement must have been from east to west; but at Leipzig, as recently ascertained by Credner, it came from N. N. W. to S. S. E., being doubtless she such that at the high ground of the Hartz Mountains. Its southern limits can be traced with tolerable clearness from Jevnæsri in Holland eastward across the Rhiene Valley, along the base of the Westphalian hills, round the projecting promontory of the Hartz, and then southward through Saxony to the roots of the Erzgebirge. Passing next southeastward along the flanks of the Ruhen and Sudeten ranges, it sweeps across Poland into Russia, circling around by Kiev, and northward by Nijni Novgorod toward the Urals. It was estimated that, including Finland, Scandinavia, and the British Isles, the ice must have covered no less than 1,700,000 square kilometers of the present low lands of Europe.

The glaciers, as indicated above, act in two ways: First, by the removal of pieces of rock; and then by rubbing, rounding, smoothing, and grooving the rocks and stones over and upon which the masses of ice move. If the glacier terminates on dry land, the blocks of stone it carries with it are only transported as far as the ground; but if it terminates in the sea or in a lake, blocks of the ice are broken off and float with this load of rocks wherever wind and tide may drive them, until the warmth of the water, the air, and the sun will have completely thawed them, when the rocks sink to the bottom. This and other questions regarding glaciers will be treated more fully at another time.

[Microscope Journal.]

A UNIVERSAL STAND.

BY A. G. FIELD, M. D.

Fig. I below represents a stand adapted to the wants of the professional or amateur who uses the microscope and camera. It consists of base A, 14X16X5 inches, to which is secured, by dovetail, glue, and screws, two uprights, B, B, 6X1 inches, one three and the other seven feet in height. These are precisely perpendicular to base, to bring instruments and object in line when centered. They are grooved on edges to receive tongues or arms, C, C, C, of the secondary base D, and also on the camera-carrier H. The uprights are made firmer by additional pieces extending up thirty inches from the base. The secondary base, 14X14 inches, is corner-braced as shown, and is adjustable as to height, being secured in desired position by set-screw E. In the center is a hole, and a half inches in diameter, which receives the tube of the microscope when it is placed on the base for high amplification in photo-micrography, and also the gudgeon of the support of the base-board O when used in copying or photography. G is a lamp-rest which slides on cleats attached to the corner braces, and has an upright for cone-nave reflector when desired. H, sliding carrier for camera, with tongue arms of sufficient width to bring the photographic lens collar precisely over the microscope tube when centered on either base. I, set-screw to retain it in position, and J, milled head of pinion by which it is racked down to attach camera, K, to eye-piece of microscope. This light-tight connection is made with one-half of child's rubber ball, perforated in center to fit neck of eye-piece, and of sufficient size to fill the collar of the photographic lens. Fig. 2 illustrates the use of the stand in copy-
THE DEVELOPMENT OF DEVICES FOR CROSS-FERTILIZATION IN PLANTS.

BY C. SIGMUND RAUE.

Flowers naturally fertilize themselves, being, as a rule, provided with organs of both sexes. The stamens produce the male element (pollen), and the style should normally ripen its stigmatic surface at the time the pollen is ripe; so that it may receive the latter, and the ovules be fertilized. The manner in which this takes place is as follows:

Pollen consists of minute grains, each being provided with an external coat called the exine, and an internal called the entine. The shape of the pollen varies, depending mainly on the way in which it is to be conveyed to the stigma of another flower. For example, that to be conveyed by insects is generally rough or viscid; that to be carried by the wind is, on the other hand, smooth and dry. We thus see that the character of the pollen is already a step to aid cross-fertilization. Now when a pollen grain lands on a mature stigma, it begins to absorb moisture from the latter. Consequently the contents begin to swell, and the inner coat protrudes through the exine as a blind tube, therefore called a pollen tube. This pollen tube forces its way through the style into the ovary, and finally enters an ovule and fertilizes it. It is thus evident that two conditions are necessary for fertilization, namely: that the pollen be ripe, and that the stigmatic surface be prepared to receive it.

The simplest device a perfect flower could therefore offer to promote cross-pollination would be to ripen its parts at different times. Flowers acting thus are designated as being dichogamous; if the pistil ripens first they are called protogynous; while if the stamens ripen first they are protandrous. Next we see special arrangements of the parts, deviations in length, and other minor points. Take, for example, the cowslip (Primula) which has two forms, named, respectively, the long-styled and the short-styled forms, by Darwin. In the short-styled form the stamens—which are situated on the throat of the corolla—are high up, right at the mouth of the tube, and the style is short, reaching about half-way up. In the other form the style is long, and reaches to the mouth of the corolla, while the stamens are seated about half-way down the tube. It can easily be seen that an insect visiting the firstnamed form (short-styled) would get thoroughly dusted with pollen, and on a visit to a long-styled form would first of all rub against the protruding style and deposit the pollen. Darwin was the first to explain the significance of this arrangement.

In the Composite the anthers of the stamens are united into a tube surrounding the style. The pollen ripens early, and, as the anthers open inwardly, it remains in the tube after being desiccated. The style keeps on growing and forces the pollen out of the tube, generally aided by a crown of hairs, its action being similar to that of a rammer. Thus the pollen is scattered over the top of the flower, and the style having attained its greatest length spreads out its two branches, displacing the ripe stigmatic surfaces. These flowers are protanderous, and an insect visiting a head will easily scatter the pollen among the stigmas.

We will next examine a bunch of flowers from the Indian-bean tree (Catalpa bignonioides), and note the manner in which it has developed a means for cross-fertilization. The flower is somewhat two-lipped, with five irregular lobes to the corolla, and a groove in the upper lip leading into the tube. The stamens are two, and open—as it would seem—inwardly, but they really open outward (externo), because the pistil is in back of them. In a young flower the style is pressed against the upper lip of the corolla by the two stamens, which, as has already been stated, shed their pollen from the pistil, and so cannot possibly fertilize it. We may call this the first stage (Fig. 1). Later, when the pollen has been shed, the stamens relax, and the style forces its way through them and bends downwardly into the tube of the corolla, at the same time ripening the two stigmatic surfaces which spread apart. This may be called the second stage (Fig. 2). It can now be seen that an insect entering a flower in the first stage would get its back dusted with pollen, and on coming in contact with the ripe and declining style of a ripe flower, it would invariably fertilize the same. Has this arrangement always existed in the Catalpa? There are a few points which might prove that this is not the original state of the flower, and that formerly it was regular and fertilized itself. The three stamens at the base of the corolla account for the three missing stamens, and the reason they have atrophied is, there was no use for them. The torsion in the filaments of the two remaining stamens, which can plainly be seen, has taken place from within outwards, comprising a turn of 180°. Without these changes we would have a flower with five stamens opening toward the pistil, making it possible to fertilize itself.

So we see that the necessity for cross-fertilization among plants is so great that they will develop for themselves devices which almost seem to be the result of a reasoning process.

AMONG the recent importations at San Francisco are large quantities of sulphur from Japan of remarkably pure grade.
blance is the more striking as each leaf hangs from such a long stalk. It is delicately ribbed, but is not divided into sections. The cones of this wonderful tree are small, soft, and yellow, having the appearance of small plums.

The walls of the garden were covered with a perfect blaze of scarlet blossom, which, seen from the front, distinguished its habit from that of the dogwood. But the trees were otherwise in full flower.

It success. The book sand distance, Dr. Take a experi- his mistook hence exotics, skins, may Gledits- These 147 the allude precipitated. mis-

A beautiful Cypales, (Cyparissus revoluta), Japan, 1759, stood at the entrance to the part of the gar- dens set apart for the grove of exotics, many of which were exhibited in the great throned nursery. But it was the Tocoima tagalina, introduced in 1836, and I commend it to flower-lovers as the most magnificent blossom of the kind, some of the bells being at least three inches in diameter.

Thus the idea of a company to multiply gold by digestion with the philosopher's stone. Gold coin to the amount of ninety thousand dollars was in an iron digestion vat with a quantity of the philosopher's stone. The vat was placed over a fire in a furnace built for the purpose, an iron lid placed over the vat, and securely locked, the furnace-room locked, and all the keys placed in the hands of the gold-multiplying company (unlimited), with strict orders that the vat must not be opened under three weeks. The alchemist having been called away on business to another city, and not returning at the appointed time, the gold company became suspicious and opened the vat, only to find the gold gone, and some stones and scrap iron in its place. It was the gold that had been trans- mitted.

A few months ago the same sharer was ar- rested in London for attempting a similar fraud, and when arraigned in the criminal court the police magistrate said "it was just possible that Pinter might have discovered some method of increasing the weight of gold." Among the vic- tims of Pinter's philosopher's stone, a member of the house of Rothschild's and of Baring Brothers are mentioned. Who shall say that faith in "the great work" has left the earth? A few days ago at the Old Bailey he was sent to prison for swin- dling.

INVISIBLE PHOTOGRAPHY MADE VISIBLE.

Most amateur photographers have at some time in their career ushered the family or their friends into the dark room, with its mysterious light, to witness that wonderful and interesting process— the development of a negative. This is certainly very entertaining, but they must remember that the ladies are averse to this semi-darkness, especially when the color of the light does not suit them. They will not allow their children or friends now with photography, I produce a dozen or so perfectly white sheets of paper, and in open daylight or lamp-light immerse them one by one in a solution, and slowly a beautiful positive pic- ture appears and remains permanent.

The process is as follows: Take a ordinary silver print, wash and fix in a solution (ordinary strength) of hypo, soda, with an addition of a tea- spoonful of bicarbonate of soda to the pint. No gold must be used. Wash the prints well, and immerse in a saturated solution of chloride of mercury (a poisonous salt). A part of the chlorine passes over to the silver of the picture and changes the brown silver particles into white chloride of sil- ver, which is invisible on the white paper. At this stage of the operation, after the moisture is removed (increased chloride), which contains less chloride than the chloride of mercury, is precipitated. This body is also white, and therefore invisible on the white paper. When the paper is perfectly white, wash in clean water and dry. These prints will keep any length of time and light cannot affect them.

To develop, place the print in solution of ammni- um or hypo, soda and the picture will slowly ap- pear. — A. SMEDELEY GREEN, in Scientific American.

Some plants (hyacintu, for example) appear to be able to grow and develop in total darkness.
The school is designed for such as have neither time nor means to attend college.

Plan of Work: The school shall be divided into a certain number of progressive classes, the classes divided into sub-classes of not more than six scholars each. The officers shall be a President, chosen annually by majority vote, who shall act as principal and have the general supervision and control of the school, issuing all notices, having charge of correspondence, etc.; a Faculty, consisting of the President, and two of the higher pupils or trustees (honorary members) to be appointed annually by the President. The Faculty shall draw up a syllabus of the lessons for the term's study, laboratory work, and requisite books for each class—to be revised and improved annually—shall have charge of all motions, petitions, and plans referred to them, and conduct all examinations. Each class shall also have a Secretary, appointed by the President.

Quiz. The members of the respective sub-classes shall take turns as quiz-master, beginning with the Secretaries. The "quiz," to consist of questions and problems covering the month's work, must be thoroughly prepared by the quiz-master and distributed ten days before the end of the month among the scholars of his division. The students must conscientiously fill out the quiz, all books to be closed as soon as received until returned to quiz-master for correction, which must not be later than the last of the month.

Notes and Queries: Five days before the end of each month the President shall issue a note-book, headed "Notes and Queries," which shall circulate from the lowest to the highest class. This shall be used as a medium for the discussion of anything remarkable, inexplicable, or interesting, by the more advanced students aiding those less wise.

Examinations: Applicants for membership shall be assigned their proper class by examination. Annual examinations shall be held for the promotion of the students, the scholars' ability and intelligence being taken as a standard, rather than percentage.

Yours truly, CHARLES SCHEMANN.

Who all would like to join this school may address Mr. Schumman, at Youkers.

THE COUNCIL OF THE A. A.

Is the latest edition of our "Hand-Book" there is given a list of specialists who constitute what may be called the Council of the Agassiz Association.

The gentlemen named therein agreed to answer all questions sent them by members of the A. A. on subjects pertaining to their several departments.

As it is now three years since the publication of the "Hand-Book," a letter was sent to each member of the Council, in August last, asking two questions:

1. About how frequently letters of inquiry have been received.
2. Whether such letters will still be welcome.

Replies have been received from thirty members of the Council, all written in the most kindly spirit, and all but one agreeing to continue to receive and answer letters of inquiry. It is interesting to notice that the only complaint made—and this occurs in many of the replies—is that too few applications for assistance are received! Many of our members have hesitated about writing to our Council, fearing lest they might be overtaxed. We assure them that they need have no such anxiety. Men who offer their services to our young students are pleased and complimented in proportion to the freedom with which their offers are accepted.

We note with regret the resignation from the Council of Mr. W. Van Norman-Cramer. No replies have been received from the following gentlemen, and, as we desire to revise the list in the "Hand-Book," we shall be grateful to any of our members who will give us information regarding their present addresses. It may be that some of them are not living.

Prof. A. J. Sherman (formerly of Chicago).
Prof. D. Bruce Richards.
Mr. W. E. Linton (formerly of Lebanon, N.H.).
Mr. H. F. Atwood (formerly of Rochester).
Mr. Robert W. Wood, Jr. (formerly of Jamaica Plains).
Prof. F. F. Peckham (formerly of Notre-Dame, R.I.).
Mr. D. H. Eaton (formerly of Woburn, Mass.).

REVIEWED LIST OF THE COUNCIL.

With the omissions noted above, the present addresses of the A. A. Council are as follows:

ARCHAEOLOGY.
Mr. Hilborne T. Creson, 224 South Broad street, Philadelphia.
Mr. Joseph Wigglesworth, Wilmington, Delaware.

SCIENTIFIC BIBLIOGRAPHY.
Mr. O. Bjerregaard, Anter Library, New York.

BOTANY.
Dr. A. W. Chapman, (southern flora), Appalachian, Fla.
M. C. E. Jones, A.M., 25 West Third street, South Lake City, Utah.
Mr. C. R. Orcutt, (Pacific coast), San Diego, Cal.
W. H. Stannan, M.D., 1424 Eleventh street, Washington, D. C.
Prof. A. B. Seymour, (fungi), Cambridge, Massachusetts.
Prof. William Trelease, Shaw School of Botany, St. Louis, Mo.
Prof. W. Whitman Bailey, 6 Cushing street, Providence, R. I.

CHEMISTRY.
M. Marcus Benjamin, Ph. D., 15 West Fifth street, New York.
Mr. Peter Gürber, General, Ottawa Co., N. Y.
Prof. C. J. Lincoln, Asplundh Hill, Brookline, Mass.
Mr. Austin P. Nichols, S. B., Haverhill, Mass.

CONCHOLOGY.
Mr. Henry E. Dore, Portland, Oregon.
Mr. Thomas Morgan, Box 544, Somerville, N. J.
Mr. Andrew Nichols, Jr., Sayville Station, Mass.
Mr. C. R. Orcutt, San Diego, Cal.

ENTOMOLOGY.
Prof. Leikoud H. Howard, Department of Agriculture, Division of Entomology, Washington, D. C.
J. A. Lintner, Ph.D., State House, Albany, N. Y.

GEOLOGY.
Prof. LeRoy Griffith, North Granville, N. Y.
Mr. Charles F. Prosser, (Dover, Connecticut), United States Geological Survey, Washington, D. C.
Prof. C. E. Van Ille, Department of the Interior, Geological Survey, Madison, Wis.

MINERALOGY.
Prof. W. O. Crosby, Boston Society of Natural History, Boston, Mass.
Prof. Thomas Egleston, Columbia College, New York.
Prof. Andrew Potier, 7th and Market street, Pittsburgh, Pa.
Prof. E. W. Stiles, Washington, D. C.
Frank W. Traphagen, D.D., College of Montana, Dead Lodge, Montana.

ORNITHOLOGY AND ZOOLOGY.
J. de B. Abbott, M. D., Box 220, Bristol, Pa.
Prof. Amos W. Butler, Academy of Science, Brooklyn, Ind.
George Bird Grinnell, Ph. D., 316 Broadway, New York.

PHYSIOLOGY.
Mr. William Biers, M. D., 68 West 167th street, New York.

ZOOLOGY.
Dr. C. F. Holder, Pasadena, Cal.
Prof. David S. Jordan, (Smith, Menlo Park, Cal.
Prof. George W. Peckham, (opera), High School, Milwaukee, Wis.
THE MORE LETTERS THE BETTER.

To show how groundless are the fears of those who hesitate to write to the Council for assistance in the way of communications, we quote a few extracts from letters received during the past month:

I have been receiving from ten to twenty letters a year from members of the A. A. I shall be glad to continue to answer the questions which may be sent.—L. O. Howard, Acting Entomologist.

I regret to say that I have been consulted only once. You may still keep my name with those who are willing to answer any questions for the members of the A. A.—Charles S. Daggett.

I have been consulted perhaps a dozen times in the past two years by persons who wished birds identified. I am willing in the future, as in the past, to answer questions submitted to me.—George Bird Grinnell, Ph. D.

I am perfectly willing to continue answering questions, or, in fact, to help on the cause in any way in my power, but I really should like more to do than has fallen to my share.—F. W. Steenbaker.

I am frequently consulted about birds, and will gladly answer, to the best of my ability, any questions relating to our ornithology, or the anatomy of vertebrates.—J. De Bonneville Abbott.

I am consulted by members of the Agassiz Association often, and from every State and Territory west of the Mississippi river; and I take pleasure in trying to answer. I will answer any questions in botany, geology, or ornithology, as heretofore.—Marcus E. Jones.

I have had no letters to answer for nearly two years. I am very willing to aid in the work. With best wishes for the Agassiz Association, Andrew Nichols, Jr.

During the past eighteen months I have not had one single request for information or identification from the A. A. Whether there is a lack of interest in my particular branch, I cannot say, but I assure you that I am still willing to answer all questions sent to me, and will gladly assist, as far as I am able, in the identification and classification of the Mollusca in my possession of any Chapter of the A. A. Hoping that I may be of more service in the future than in the past, sincerely yours, Harry B. Dore.

I have made up my mind that those of your members who are interested in conchology don't want any more advice, or else they must all have "la grippe," for I haven't had a letter in a year or more. I am always ready to lend a hand to anyone, and shall also be glad to exchange specimens of shells. Hoping that you will stir up the members of the A. A., so that I may have a "big rush" of letters, I remain your friend, Thomas Morgan.

Many thanks for your kind letter. I shall always be glad to try to answer the queries of my young friends who belong to the Agassiz Association. It is a pleasure to receive their letters, and I have gotten much valuable information in this way for the Peabody Museum since I have been among them. My trips have, with the exception of a trip to the Ohio Valley, been made to the north. Attendance of meetings has been rather haphazard, but I have tried to make these efforts to keep in touch with the work of the Association. I trust that this brief note may be of service to you, and I hope to hear from you soon.

Respectfully,

J. P. Poland.

HARTFORD, Conn., Sept. 10, 1891.

SIMPLE BOTANICAL APPARATUS.

My apparatus is the simplest possible; a trowel for deep-rooted plants; a press consisting of the top of a table, newspapers, two books, and a stone; and for mounting, a bottle of glue, a pen-knife, and a pair of compasses. Our teacher adopted the use of Le Page's glue; from your suggestion in the A. A. hand-book, "Three Kingdoms."—Miss M. P. Williams, Topeka, Kan.

FIVE HUNDRED AND SIXTY-SEVEN "SWEEPS" IN ONE CHIMNEY.

Some time ago my attention was attracted by the following newspaper paragraph:

A large flock of "chimney sweeps" took to roosting in a chimney of the house of John A. Butts, of Thomas, Ga. One night he covered the chimney with a board, and early the next morning found it covered with nests. When he removed the board it contained 567 imprisoned birds.

Knowing how unavailing it is for errors to find their way into the busy papers, a note was sent to Mr. Butts inquiring whether the report was correct. He replied as follows:

The statement is correct. Before I removed the board I built a slow cob fire; then, removing the board, I put on the deck, and, of course, the birds made for the top. I am willing that you should use these facts.

Respectfully,

John A. Butts,

Thomas, Ga.

AGASSIZ DAY AT AVON-BY-THE-SEA.

Friday, August 21, was celebrated by the Sea-Side Assembly at Avon, N. J., as Agassiz Day. Invitations were issued to all members and Chapters of the Agassiz Association in the neighboring States, and met a cordial response. The meeting was thoroughly successful and enjoyable. We regret that the detailed report of the proceedings has not been received, but we hope to press. If the proposed programme was carried out, however, as we believe it was, — Professor George Macloskie, of Princeton College, presided. Following short addresses by eminent scientists came a discussion of the "Relation of the Agassiz Association to the University Extension Movement." A Sea-Side Assembly Chapter of the A. A. was then organized. In the evening a lecture, illustrated by lantern, was given by Prof. Arthur M. Miller, of Wilson College. Saturday was a "field-day," and in the morning boats were furnished free for all who wished to do marine collecting on Shark River, while in the afternoon the guests went botanizing under the guidance of Dr. John E. Peters. To William M. Alberti, Secretary, is due much credit for the success of this pleasant "Agassiz Day."

OUTINGS OF THE BARTON CHAPTER.

The following excursions have been planned by the Barton Chapter, Boston. All members of the A. A. are cordially invited.

Date Excur- Leave Station

| Aug. 30 | Morning | 1.30 P. M. | Old Colony | 15 |
| Aug. 13 | Squantum | 10.30 P. M. | Old Colony | 20 |
| Aug. 10 | West Medford | 10.40 A.M. | Lowell | 20 |
| Aug. 24 | Somerville | 1.10 P. M. | Head of Hanover street | 20 |
| Aug. 31 | Waltham | 1.25 P. M. | Pitchers | 20 |

For further information address the committee, Frances Zirngiebel, 47 Bowker street, Roxbury; Katherine Parsons, Caroline M. Crawford.

A CORRESPONDING ENTOMOLOGICAL CHAPTER.

DARTMOUTH COLLEGE, Hanover, N. H.

Have just returned from a collecting tour among the White Mountains, and find the July
number of Popular Science News. You ask whether we cannot have a "wide-awake" Corresponding Entomological Chapter. To me that seems a fine idea. It is what I have been longing for for the past "legends," by the way, I might publish a note in "The Out-Door World;"—"the latter is interesting to correspond with me,—and we will see whether we cannot organize a truly "wide-awake" Chapter. Yours very truly, Robert A. Campbell.

REPORTS FROM CHAPTERS.

136, New London, Conn., [A].—This has been one of our most prosperous years. The first two months were spent in the study of ornithology, many of the members reading interesting papers on our local birds. Later the study of astronomy was added, and afterward botany. All our members have collections of some kind. We are now engaged on Professor Gutenberg's course in mineralogy. We extend our most hearty wishes for a prosperous year to all the other Chapters of the A. A., and to the President.—William P. Benjamin, Sec.

142, Roswell, Ga., [A].—We have done fairly good work, having made special studies of butterflies, birds, and moths. We have learned that even intelligent people are too prone to rest content with the traditional statements of books, accepting them as true without personal verification. Please let us thank you for your response to our last report, with its touches of the exquisite spring among the Berkshire hills. It is glorious with us in the South; but I can appreciate a certain delicate charm we may miss, with which the roses bloom always. Gratefully and sincerely yours, Phoebe E. Packard.

148, Pittsfield, Mass., [C].—Our Chapter is still on its feet. We have made considerable addition to our collection of insects and to our library. We greatly enjoy Professor Gutenberg's course. Charles L. Adams, Sec.

180, London, England, [A].—We now number twenty-three members, but, many being non-resident in the neighborhood, the average attendance at our tri-weekly evening meetings is about ten. Our ages range from eleven to forty-two, with a preponderance of adult years. We have wholly revised our rules and by-laws. Every fifth meeting is a "Miscellaneous" one; on other evenings a paper is given by one member and discussed by the others. The following papers have been read during the past year: "Electricity," "Protozoa," "Earthworms," "Cats," "Personal Experiences in Australia," "Hawk-moths," "Lizards," "British Snakes," and "Corals." The latter was a paper on the life of the coral, and was mainly the outcome of a visit to Jersey, whence the author brought some interesting live specimens, produced at the meeting. The paper on "British Snakes," by the Treasurer and Librarian,—daughter of a German "naturtorschel,"—was likewise suggested by a live specimen—a ringed snake sent by a friend from South Wales. We have added several new books to our library and natural history objects to the museum. The latter has been enriched by some beautiful butterflies from our honorary member in San Salvador. Our Secretary has unfortunately, owing to business, had to resign his post; after three years' good work, and the Chapter recognized his services by a present of A. R. Wallace's "Darwinism." On the occasion of our fiftieth meeting, January 17, the President took as his subject, "What is the Agassiz Association?" and the ensuing discussion led to the general expression of a desire to improve the "Chapter" by more thorough devotion to natural system and, thereby, by an effort are after the spirit inculcated by the founder of the Association, and thus becoming worthier of the name of Agassiz.—Alfred N. Coupland, Pres.

181, Sanford, Florida, [A].—We have now a muster-roll of six members, having added one new name since our inauguration in August. We have held regular monthly meetings, with full attendance from the start. The time of year has been unfavourable for outdoor work, especially in botany, entomology, and ornithology, which are the principal subjects intended to be taken up by our members. We have started a collection of miscellaneous specimens, which we keep at headquarters; we have quite a nucleus, which we hope during the coming spring and summer will be much enlarged. One of our members has managed to secure the services of the Leghorn-Man and over twenty of the Hymenoptera. We are utilizing the winter months by the study of astronomy, in which all our members take great interest. We have at headquarters a library of thirty-five volumes on subjects appropriate to the work of the Association. Aprons, the Chapter desires me to ask whether the study of travels in connection with geography is appropriate work for our members. We enclose you on a separate slip a notice of our wish to be included in the list of "corresponding" Chapters. Of course, being a young Chapter, we fear we shall not be able to give much information; but we are very desirous of learning, and will do our best to answer any questions addressed to us. We hope to be able to exchange specimen collected in the South for those of northern States—R. E. Wyllie, Sec.

192, Boston, Mass., [C].—We have taken Professor Gutenberg's second grade in minerals, and are especially interested in the flame tests. In the spring we devoted our time to botany, and analyzed many flowers. Last May an enjoyable excursion was taken to Wayland, Mass. A few months ago we joined the Massachusetts State Assembly. Our meetings are held at 5 Ringgold street, and our officers are as follows: Lillian Mason, President, 5 Ringgold street; Fannie Rothenburg, Treasurer, 165 West Newton street; Grace Smith, Secretary, Hotel Harvard. [Written for "The Out-Door World!"]

THE BLUE MOUNTAINS.

By GEORGE G. ALBERT,
Member of the Agassiz Association.

The most beautiful scenery of the Blue Mountains is to be seen in the cliffs of limestone strata which rise in high perpendicular escarpments, and, standing in their dark gray colors, present a rich contrast to the green foliage of the forest beneath. The precipitious hills and wooded valleys form the most beautiful scenery of Canada. The Beaver River, which is well known for its wild scenery, flows through a richly wooded valley formed by the folding and erosion of the underlying Niagara limestone. One cannot but admire the beautiful manner in which large pinacles of rock project vertically to a great height above the river, sending their shadows far over the thick forest beneath, forming dark glens fringed by deer and foxes.

The land, attaining in some places a height of eight hundred feet above the Georgian Bay, is very irregular. Whether this is owing to the folding of the underlying strata, or the unequal denudation and the weathering out of the strata, is left to the imagination. We are inclined to suppose the former, from the many outcrops of the strata in all directions. A curious instance of erosion was observed where a large pinacle of rock stood out some distance from an escarpment with its under strata almost eaten away, leaving a monument to commemorate the extent of the ancient bed. On the top of the highest pinacle, the sides, formed by the Ordovician, Silurian, and many Laurentian boulders are found, of which micaeous and hornblende quartzite form the greater number; while among the slate and local limestone, granites, syenite-gneises and garnetiferous rock are found, appearing in some places to be glacial moraines. A large granite boulder was found on the top of the cliff about eight hundred feet above the bay, in the district of the caves, but no strata were found as evidence of glacial action. In this vicinity a long terrace, caused by the outcrop of the Clinton or Niagara limestone, strikes in a direction north and south until a height of nearly two hundred feet is reached, when it strikes towards the southeast. Large blocks and pillars of rock stand as monuments of Nature's architecture, while below, far beneath, in the immense fragments which have fallen, are snow and ice which remain unmelted from year to year. How long these huge masses have lain here, how many winters' snow has melted on their gray faces, or how many autumns have seen the crimson leaves of the trees fall and decay between these dark crevices, we do not know; only the high gray cliffs and the moss-covered ledges of limestone are suspended between the walls, which seem as if it would only require a slight touch to send them crashing down on the rocks below. The cliff presents a picture of grandeur as we look from the ravines beneath. Huge fragments of rock form caverns and crevices which lead into intense darkness by rocky walls and over rocks, over which we slip and climb; and one is almost overpowered with awe as he stands and looks upward at the black-gray masses above, which are rent and cracked into long seams as if by an earthquake. We think as we stand and gaze at the cliffs, or as we listen in the caves and hear the gurgling of the rushing water under the rocks, what a strange history these rocks would tell were they able to converse with us. Overhead in these walls of limestone, we cannot penetrate it, and we have not the curious phenomenon exhibited in stalagmites. The walls of the caverns have sharp edges, except where the dampness has decomposed the limestone, when we see a thin coating on the rock. There is an entire absence of fossils in the strata—not even a small Silurian shell is found. It has been made a point of honor by the local geologists that carboniferous minerals exist under the strata, but I do not think that they exist to sufficient extent to pay the expense of mining. Many mineral springs are found on the northeastern outcrop of the beds, but these seem only superficial, and the gas may arise from the underlying Utica shale, which is rich in carbon.
The last month has been a fruitful one in pseudo-scientific marvels as described in the columns of the daily newspapers. In the early part of the month the remarkable intelligence telegraphed all over the country that the astronomers at Mt. Hamilton had discovered "snow on the moon" by the aid of the great Lick telescope, the only basis for the story being, apparently, that some recent lunar photographs showed some markings which might possibly have been due to snow, but most probably were not, as no other indications of the presence of water or air on the moon have as yet been observed. The possession of the largest telescope in the world is in one way a disadvantage to the Mt. Hamilton astronomers, as it serves to render them a conspicuous mark for imaginative newspaper reporters in search of a sensation for their columns.

Scarcely had the great "snow discovery" passed out of the public mind than a sure cure for drunkenness was announced, as the discovery of a physician in that conveniently indefinite region of "out West." This therapeutical wonder was said to consist of chloride of gold, administered hypodermically, and was warranted to totally destroy all desire for alcohol and confirmed inebriate. That drunkenness in some cases is a disease, and not a vice, must be admitted; but it is a mental rather than a bodily disease, and the sufferers must be treated by psychological rather than physiological methods. In addition to this, as far as known, the salts of gold have no medicinal value whatever, and, when administered in tolerable quantities, are distinctly poisonous. One might as reasonably expect to develop a philosopher by the administration of a solution of platinum, or a statesman by a hypodermic injection of a salt of silver, as to transform a confirmed inebriate into a son of temperance by the added power of chloride of gold.

But of all the preposterous scientific absurdities, the theories and experiments of the government rain-makers undoubtedly stand at the head. The party have recently removed their base of operations from Washington to Texas, and, by a fortunate coincidence, the first explosions—on the 11th and 18th of August—were followed by rain. This was, apparently, a confirmation of the theory of the "rain doctors"; but an inspection of the weather maps for those dates shows that on the 11th there was a natural rain which extended over the whole of Texas and the adjacent regions, and on the 18th the rain began to the north of Texas at least eleven hours before the explosions, and covered an area of over 80,000 square miles. The most enthusiastic supporter of the theory will hardly care to claim any direct connection between these widespread storms and the town of Mild-land; and as the reports show that the experiments which were conducted in that vicinity failed, it is probable that the storm missed a connection somewhere and failed to arrive in time for the celebration. The production of rain by explosions in the air is in opposition to every known scientific principle or natural law, and the very utmost that could be expected of such an explosion would be the local precipitation of a few gallons of water from an atmosphere already saturated with moisture—and there is little proof that even this effect would be produced. Bombarding the heavens to produce rain might appropriately have been tried by a tribe of African savages, but it is not very greatly to the credit of an enlightened country like the United States that such a proceeding should receive the benefit of governmental recognition and an appropriation from the public funds.

The record for quick Atlantic passages has again been broken, the steamship Majestic having crossed from Queenstown to New York in 5 days, 18 hours, and 8 minutes; while a fortnight later her sister ship, the Teutonic, made the passage in 5 days, 10 hours, and 31 minutes, the record of a single day on this passage being 37 miles—the longest distance ever traversed by a steamship in twenty-four hours. While these fast "record-breaking" trips are of interest as showing the perfection of modern machinery and engineering skill, the practice of ocean racing cannot be otherwise than a most dangerous one, and it is nothing but criminal recklessness to place the lives of hundreds of passengers in imminent jeopardy for the purpose of a journey which must necessarily last for several days. Some of these swift steamers have escaped total destruction by the merest chance, and unless the attempt to break the record is abandoned, a terrible catastrophe is sure to occur. But until the lesson is learned, the great majority of European travellers will crowd on board the fastest boats, and the more sensible ones will travel themselves with the safer and more comfortable vessels, even at the cost of a slightly lengthened sea voyage.

A permanent meteorological observatory is to be erected on the summit of Mont Blanc, provided the difficulties in the way can be surmounted, the principal one being that the observatory must be built on the solid rock, and the top of Mont Blanc is covered with glacier ice of an unknown thickness. As the house must be above ground, and cannot be of more than a moderate height, it is certain that should the glacial cap be 150 or 160 feet in depth, the project will have to be abandoned. There has been for several years a signal station on the summit of Pike's Peak, which is but slightly lower than Mont Blanc; but the climatic conditions of Colorado and Savoy are so different that there can be no comparison between the two stations. A series of winter observations at the summit of Mont Blanc would be of the greatest meteorological interest and value, and it is to be hoped that the enterprise will be carried to a successful conclusion.

The mechanical equivalent of heat has been re-determined by C. Miculescu, by an improved modification of Joule's original method. The result obtained was 777.7 foot-pounds, comparing quite closely with Joule's original figures (772 foot-pounds). In other words, the quantity of heat by which a pound of water is raised in temperature one Fahrenheit degree is evidenced by the same amount of work which would raise 777.7 pounds one foot high, or one pound 777.7 feet high. The determination is an important one, and confirms the accuracy of the first experiments.

Some large fragments of meteoric iron discovered near Canon Diablo, Arizona, by Prof. A. E. Footz, have been found to contain numerous small diamonds. A similar find of a single diamond was reported in 1857 by two Russian meteorologists, and this result led to the discovery which is beyond dispute. The discovery is an extremely important one, inasmuch as it indicates the probable existence of organized matter, and possibly of life, upon the body from whence the meteors were derived, at some past time. The existence of organic matter in some meteorites is also confirmed by the analysis of one which fell in Arizona last year, which showed about 5 per cent. of a hydrocarbon resembling resin. While it is quite possible that organic compounds may have been formed in these cases by the direct combination of hydrogen and carbon without the intervention of a living organism, it is by no means an untenable theory that the principle of vitality may have been in existence in some past time upon the celestial body from which the meteors came, or were formed.
The impression of the value of the microscope in legal inquiries was deepened when Dr. James T. Flinn, of the American navy, exhibited a means that he has been compelled to devise whereby counsel and juries may examine many microscopic mounts without the loss of time involved in changing slides. Under his direction, Queen & Co., of Philadelphia, have made a circular disk of glass which will hold nine wedge-shaped slides. This, together with a microscope, enables specimens of real and adulterated products to be expediently compared.

The value of such an apparatus in all microscopic exhibitions will be readily seen. It has been also realized by Dr. James A. Flinn, of the American navy, who exhibited two very ingenious pieces of apparatus of his own invention. The first, by a process of standardizing, takes the various slides, fitted into brass holders, successively under an objective of high or low power; while the second is fitted for comparatively large objects only. As Dr. Flinn exhibited it, four hundred or more of the Foraminiferæ were mounted on a large metal disk enclosed in a box, and brought in succession under a microscope placed on the glass cover, with the result that he was able to tell the spectator that the box contained a hundred.

Of the five scientific societies which formed the local committee of the American Association for the Advancement of Science, none will be remembered more gratefully than the Woman's Anthropological. To it is due the comfort of the 633 members who braved the heat and attended this meeting. Ice water was kept in the halls, section rooms were ventilated and adorned with magnificent bouquets, and for the visiting hordes an ordinary dressing-room was converted into a very bowery of delight and repose.

To the general member the Anthropological section was the center of interest, and here arose the great discussion of the meeting, the exciting cause being the exhibition by Mr. Thomas Wilson of jadu implements from Mexico and Central America. Jade implements always precipitate an argument on the source of the material forming them and of the people using them, and Professor Putnam and Major Powell were both there to defend the opposition views they hold on these points.

"The jade came from Asia," maintains Professor Putnam, "but, it being very difficult to prove, there exists absolutely no evidence," contended Major Powell, "that the people did migrate from Asia, whereas, as jade has been discovered in Alaska and will undoubtedly be found in the Rocky Mountains, there is no need to look beyond America for the source of the implements." Planed down by Professor Putnam to the categorical question, "had jade been found in Alaska—neither nephrite or sausurite, or any other green mineral, but the actual jade of the mineralogist?" Major Powell was compelled to answer, "no."

On a subsequent occasion Professor Putnam strengthened his position with a photograph of a skull—the only skull—that has been found in Mexico under one of those gigantic ruins common to that part of the country, "and had it been found in that of a young woman who, it was shown, had undoubtedly belonged to the ancient people who built and used these structures. The skull is broad, short, and moderately high. The artificially depressed forehead and the filling of the front teeth, together with the place of burial, indicate a person of exalted rank, and, at the same time, one belonging to the ancient Coast Peruvians, whom Professor Putnam derives from Asia, and whose migrations have been already traced into Central America and Mexico, and even farther northward."

A marked feature of the proceedings of the Anthropologists was the attempt made to establish sympathetic relations between the white man and the red, and the repeated condemnation of the inhuman and unjust treatment received by the latter at the hands of the United States government. Miss Alice Fletcher, who has lived for many years among the Nez Perce tribe, carried the audience with the many wonderful memories of her work for the Indians, which she was not thought of those much-enduring people; people against whom Thomas Wilson, at one time their attorney, testified we had committed every crime, and that it was only after bearing repeated insults, indignities, and wrongs, such as no white people would have submitted to for a day, that they took up arms against the United States. Mr. Roosevelt was present, and it is probable that the residence among the Zunis and initiation into their priesthood, described the essentially dramatic and religio-sociological character of their primitive dances. The Messiah religion, moreover, and Ghost Dance were explained by James Mooney, who spent last winter and spring with the wild tribes of the Southwest, investigating their customs among the Indians under the auspices of the Smithsonian Institution.

The biologists were this year particularly prominent. The public address of the retiring President of the association, Professor Goddard, of Harvard, discussed the numerous useful plants that we may hope to employ in the near future, many of which have not yet been used by man anywhere. The lecture covered the citizens of Washington by the association dealt also with a botanical subject; but, though it was illustrated by lantern views, Dr. Maceflane, of Edinburgh, failed to arouse popular interest, by reason of confusing himself to technical terms. Of all the Vice-Presidents, Professor Coulter drew the largest audience and elicited the most sympathetic hearing, as he made a plea for more careful work among botanical collectors and less readiness to increase the already large number of species.

The biologists are indefatigable workers, and not only discussed over forty papers in their section, but the entomologists and botanists each held meetings for an hour daily. The latter were the special care of the Botanical Club of Washington, and received from their hosts pressed specimens. The meeting, which included a guide to the trees of the city, and a book of beautiful photographic views of the spots most interesting to botanists.

The biologists sent up several resolutions for the consideration of the Council of the Association. One of these asked that the United States government be urged to fall in line with the governments of European countries and provide Edmund James, of Philadelphia, who struck the keynote in his opening address on the present economic condition and future prospects of the American farmer. This useful member of the community was described to be in a bad way and likely to be in a worse one. Professor James, however, pointed out lines that may lead to improvement. Railway policy must be altered at many points—at some of them fundamentally. The system of taxation must be re-adjusted, and the farmer relieved of unjust burdens. The tariff must be improved; the banking and general monetary policy of the country changed in many respects. The farmer must also do something for himself. He must cease to compete with the Russian peasant, the Indian rye, and the South African boon in the production of wheat for the London market, and seek new crops where intelligence and skill count for more than mere fertility of soil or juxtaposition for market. This calls again for a broad and liberal policy towards agriculture in all its relations, and active aid for all those various means by which agricultural science and art may be extended and made more efficient.

To this section Mr. J. S. Billings gave an exhibition of the census-counting machine. Cards were shown containing all the ordinary details of the process, and the census-taker's paper. These cards were then perforated over certain words to accord with the descriptions of individuals, and passed to the recording machine, where a few touches on an electric button would register a man as white, twenty-five years of age, a butcher, the son of an Irish father and American mother, with sundry particulars concerning his physical and mental qualities.

The two days set apart by the A. A. A. S. for sight-seeing and excursions were used by the geologists for the summer meeting of the Geological Society of America. A memorial of the deceased President, Alexander Winchell, marked the opening of the proceedings. Many debated and still debatable questions were discussed during the sessions, those referring to the Glacial period being particularly attractive to the unpracticed hearer. There was pleasure, too, and profit for this same individual in the evening lectures by Henry M. Cadell, of Boston, Scotland, and Bailey Willis, of Washington, who, with the help of lantern illustrations, explained their recent experiments in reproducing mountain structures. Some beautiful photographs of the Mair glacier and its vicinity were also projected on the screen, exciting in everyone the desire to accompany Mr. H. P. Cushin in his next exploration of that fascinating region.

The names of many foreigners appeared upon the programme of the society, papers were read in English hard to follow, and unfamiliar forms and faces were seen in ever increasing numbers in the audience. For the first time, in fact, it was a veritable babel of tongues, and one knew that the International Geologists were ready for their fifth triennial meeting. According to rule and precedent, French should have been taken as the medium of official intercourse, but alas! American geologists do not, as a rule, understand that language, and only one or two had taken up the French. All the officials of this congress covered wide fields, such as the classification of glacial drifts, the correlation of all known strata, and the colors to be used in geological maps representing the same, so that there may be one geological usage for the whole world.

But it must not be thought that it was all work and no play with the scientific. The most incorruptible visitors in the Department of the Interior, where the microscope is in daily use, and took an excursion together to,
PHOTOGRAPHY WITH A BLACK BACKGROUND.

The color known as black is not, properly speaking, a color at all, but simply the absence of all color or light. A substance that absorbs all the rays of light falling upon it would be perfectly black; but no such substance is actually known, as all dyes or pigments, even of the darkest shades, reflect a small quantity of the light falling upon them.

As black, however, is the total absence of light, it follows that nothing can be so black as a perfectly dark room, or the out-door world on a cloudy night; and, as under such conditions there can be no light, there will be no action upon a photographic plate exposed in such a room or upon such a night. Therefore, if we desire to take a photograph against a perfectly black background, we need not trouble ourselves with hangings of black cloth, but simply open a window on a cloudy evening, if we are to use a flash light, or, if the picture is to be taken by daylight, we may open the door of a dark room or building and obtain a background both theoretically and practically non-active.

With such a non-active background many interesting and amusing photographs may be made by a process of multiple exposure. Fig. 1, for instance, represents a man playing ball with his own head. This picture was taken at night by means of a flash light, three exposures being necessary, the open window forming the background. The two small heads were first taken in succession, the person represented standing on the balcony outside, with a black cloth thrown over his body, and the light from a flash lamp being thrown upon his head as he posed in the different positions. He then took the position represented in the engraving, and another flash imprinted his whole figure and the walls of the room upon the plate, which, when developed, gave the amusing result shown in Fig. 2.

Fig. 2 was taken in a similar manner, the statuette which apparently stands upon the table being a miniature of the girl kneeling at its side.

In Fig. 3 the conditions are different. This picture was taken by daylight, and the open door of a warehouse formed the non-active background. Here the secondary image is enlarged, and the small boy in the shafts of the wagon is apparently engaged in carrying off his own head.

Numerous other applications of this principle will at once occur to every photographer, and the process is so simple that very unique effects can be obtained by any amateur possessed of the ordinary amount of patience and ingenuity.

An important point in such pictures is to have the different images fall upon their proper place on the plate. This is easily secured by attaching to the ground glass a bit of gummed paper showing the position of the smaller images—the heads

in Fig. 1, for example. Then when the principal exposure is made, the relative position of the different images can be accurately adjusted by moving the camera in the usual way.

The accompanying engravings are copied from La Nature.

PARIS LETTER.

The university holidays have begun, and science enjoys well-deserved vacations; no lectures, no laboratory work; scientific societies—even the Académie des Sciences—are nearly abandoned, and writers have for a month or two dropped every pen, while the ink slowly dries in the inkstand. But this does not prevent some work from being done, and most of the scientists devote a week or a fortnight to scientific meetings, which commonly occur at this time of the year. Some—many even—have been to the meeting of Hygiene and Demography in London; others to the Cardiff meeting of the British Association for the Advancement of Science; many have followed the sittings of the Congrès pour l'Étude de la Tuberculose in Paris; many, also, are going to the Marseilles meeting of the Association pour l'Avancement des Sciences. All these meetings are of interest and pleasurable. In the French meeting for the study of tuberculosis important discussions have been conducted. Of Koch's method nothing has been said; it is totally abandoned, and is considered a total failure. The method which has been most discussed is that of MM. C. Richet and Héricourt, of Paris, which consists of subcutaneous injections of dog's blood serum, or hemocyan, as it is called. This method has been experimented with in France and in Italy by many physicians, and, on the whole, seems to yield good results. The principal effect obtained is the considerable benefit conferred upon the digestive functions. Patients who were unable to eat anything and were utterly dyspeptic have seen their appetites wonderfully improved, and were astonished at the quantity of food they could absorb.

This improvement is accompanied by an increase in weight, at times very important; and other results consist in the greater ease of breath, in quieter sleep, in a marked decrease of cough and of night transpiration, so that the patient feels really stronger and is less troubled with his disease. At the same time it is noticed that the bacilli disappear. If the patient is at the first period of the disease, while they become much less frequent if the second period has set in. Patients at the third and last stage are sometimes benefited, but, of course, their case is much less hopeful than that of the others. Such are the general results noted by MM. Richet and Héricourt, and by Professor Semmola, of Naples, M. Vidal, of Hyères, and many others; and, as the experiments have been conducted for a period of many months already, if not a whole year, these conclusions may be considered as based upon a sufficient number of data. Some other facts have been gathered which deserve a passing notice. Professor Semmola has seen that the capacity of the chest, or lungs, is increased by hemocyan, and that the blood contains more hemoglobin than before, so that the vitality and efficiency of the blood is much increased. Tubercular diseases of most organs are improved as well as lung tuberculosis, and, in fact, in all cases of tuberculosis, wherever it may be seated, a marked progress takes place. The fact that hemocyan is conducive to an increase in appetite, weight, and general health has prompted Professor Pinard, the well-known obstetrician, to use it for new-born chil-
which is the cause of such? We can hardly tell, as we know that earth seems to be a vehicle of tetanus; but, then, what is the effect of euphorb? Dr. Le Danic's investigations on this point have not yet solved the question. It is to be remarked that the poisonous mixture does not keep long—well, at least, in order to be really efficient; and this fact is in contradiction with what is known concerning the long duration of virulence of earth supposed to be tetanogenic.

The Paris Jardín d'Acclimatation is busy getting up a museum of all implements used in all countries and at all times for hunting and fishing purposes, from the implements of pre-historic times to the most modern tools and methods of the modern angler and hunter. Such collections are always interesting, as showing the progress and lines of evolution of human mind and discovery; and this new feature will doubtless attract many visitors. But why does this institution not confine itself more to its original purpose, and why does it not aim more sincerely at the acclimatization of new animals and plants? There is much to be done in this line, and of more practical use than exhibitions, whose place is more in the Ethnographical Museum than in the so-called Jardín d'Acclimatation.

II.

PARIS, August 25, 1891.

[Specially Obtained for Popular Science News.]

METEOROLOGY FOR AUGUST, 1891, WITH REVIEW OF THE SUMMER.

TEMPERATURE.

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<tr>
<td>At 1 A. M.</td>
<td>65.07°</td>
<td>70°</td>
<td>4.93°</td>
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<tr>
<td>At 5 P. M.</td>
<td>75.25°</td>
<td>87°</td>
<td>11.75°</td>
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<tr>
<td>At 11 P. M.</td>
<td>75.17°</td>
<td>87°</td>
<td>11.83°</td>
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<tr>
<td>Whole month</td>
<td>69.77°</td>
<td>87°</td>
<td>17.23°</td>
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<td>Second average</td>
<td>69.39°</td>
<td>87°</td>
<td>17.61°</td>
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Last 21 Augusts.

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<tr>
<td>68.09°</td>
<td>65.83°</td>
<td>71.70°</td>
<td>5.87°</td>
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<tr>
<td>Second average</td>
<td>68.31°</td>
<td>70.09°</td>
<td>1.78°</td>
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Summer of 1891.

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<tr>
<td>60.00°</td>
<td>47°</td>
<td>92°</td>
<td>45°</td>
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<tr>
<td>Last 21 Summers</td>
<td>60.00°</td>
<td>47.34°</td>
<td>12.66°</td>
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The lowest point reached by the mercury was 56°, on the mornings of the first and last days of the month. The highest point was 87°, on the 11th. The 30th was the coolest, and the 11th the warmest day in the month, averaging 85.06° and 73.35°, respectively,—a range of 20.06°. The entire month was 79° above the mean of the last twenty-one Augusts. There were two warm waves during the month of six days each, and one cool wave of three days. The first warm wave commenced on the 7th, and the average of the days was 74.36°, ranging from 64° to 87°. The second commenced on the 20th, and averaged 74.94°, ranging from 62° to 84°; the latter wave thus keeping a higher temperature, though on a lower range, the mornings and evenings averaging 2° higher, and the midday 11° lower, than in the former wave. The cool wave was during the last three days of the month, and had a daily mean of only 66.22°, with the small range of 56° to 62°. The range on the 30th was only 1°. The most sudden change was a rise of 12° in seven hours on the morning of the 1st.

The temperature of the present summer was .9° below the mean of the last twenty-one years. The extremes and range are given in the above table.

SKY.

The face of the sky, in 93 observations, gave 59 fair, 10 cloudy, 29 overcast, and 6 rainy,—a percentage of 41.9 fair. The average fair for the last twenty-one Augusts has been 69.6, with extremes of 88 in 1876, and 41.9 in 1891,—showing the present August to have been the most cloudy in twenty-one years. On the 12th we had a shower, with lightning, thunder, and a strong wind. I do not find a single day noted "fine" during the month, though a few, perhaps, might have been so noted with some degree of propriety.

The average percentage fair the past summer was 48.5, and the last twenty-one summers 59.3, with extremes of 58.6 in 1888, and 71.4 in 1876. But a single summer—that of 1890—has been less fair than the present one.

PRESURITATION.

The amount of rainfall the last month was 5.51 inches, of which 2.70 fell on the 28th, chiefly in a very short time. The remainder was well distributed, principally on six days. The average amount the last twenty-three Augusts has been 7.11 inches, with extremes of .88 inch in 1883, and 10.03 in 1872. The amount since January 1 has been 41.27 inches, and the average of these eight months in twenty-three years 23.36 inches,—making the present surplus 8.91 inches.

The amount of rainfall the present summer has been 11.92 inches, while the average for the last twenty-three summers has been 10.03, with extremes of 4.39 in 1883, and 18.13 in 1872. While the present summer's heat has been about one degree below the mean, the rainfall has been nearly-two inches above the mean, thus equalizing the season's need.

PRESSURE.

The average pressure the past month was 29.064 inches, with extremes of 29.74 on the 1st, and 30.30 on the 26th,—a low range of only .46 inch. The mean for the last eighteen Augusts has been 29.67, with extremes of 29.88 in 1878, and 30.04 in 1880,—a range of .173 inch. The mean daily change of the pressure the last month was .681 inch, while this average the last eighteen Augusts has been .687, with extremes of .651 and .128. The largest daily movements were only .22 inch on the 3d, and .19 on the 26th, and the barometer was noted stationary nearly one-third of the observations—showing a very quiet state of the atmosphere.

The average pressure during the summer months was 29.921 inches, and the daily movement .085 inch. The average the last eighteen summers has been 29.945 inches, and the daily movement .088 inch. The variations of the barometer in July and August are the least in the year.

WINDS.

The average direction of the wind the past month was W. 13° 14' S., which was a near mean of the last twenty-two Augusts, being W. 13° 50' S. The extremes have been E. 78° 40' N. in 1873, and W. 84° 15' S. in 1874,—a range of sixteen and a half points of the compass, or 5° 35' over a full semi-circle. The relative progressive distance travelled by the wind the past month was 34.92 units, and during the last twenty-two Augusts 765.2 such units, an average of 36.15,—showing a near average.

The mean direction of the wind during the present summer was W. 77° 28' S., and during the last two summers W. 18° 59' S.,—showing less southerly winds than usual. The distance travelled the present summer was 101.8 units, and during the last twenty-two summers 2,552 such units, an average of 116,—showing more easterly winds than usual.
In review, the past summer is shown to have been cooler than usual, far more cloudy and rainy, with more easterly and northerly winds, and a higher pressure, with small, but larger daily movements than usual.

D. W. NAXICK, Sept. 5, 1891.

[Specially Computed for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR OCTOBER, 1891.

At the beginning of the month Mercury is a morning star; having passed western elongation on September 28 it is now approaching the sun, but is still far enough away to be seen in the early morning twilight nearly above the place where the sun will rise. It is in retrograde conjunction with Saturn on the morning of October 3. At the time of nearest approach (2 A.M.) the latter is 12°—or a little more than one-third of the moon’s diameter—north of the former; but this distance will have increased considerably when they rise above the horizon in the western hemisphere. Mercury rapidly approaches the sun, and passes superior conjunction on the evening of October 27. Venus passed superior conjunction with the sun on September 18, and is now sliding on ahead. It does not attain a great enough distance to be a very conspicuous object during the month. However, it may possibly be seen toward the end of the month low down in the western horizon, a little south of the place where the sun went down. Mars is a morning star, rising an hour before the sun on October 1, and more than two hours before on October 31. It passed aphelion on September 29 and conjunction on July 30, so that it is now drawing near the earth; but the diminution of distance is not great, and it is not a conspicuous object. It is moving rapidly eastward among the stars. At the end of the month it is about 3° west of the third magnitude star Gamma Virginis, and is moving toward it. A good idea of the apparent motions of the planets among the stars may be obtained by watching it during the coming month, as it moves toward opposition next summer. Jupiter is the only one of the planets in really good position for evening observation. It is on the meridian at about 10 P.M. on October 1, and two hours earlier at the end of the month, and sets about four hours after meridian transit. The following names of its satellites may be seen from some part of the United States. The phenomena take place on the right-hand limb of the planet, as seen in an inverting telescope. D. de notes disappearance; R., reappearance. Times are Eastern Standard.

H. R. October 1, 8h. 8m. P. M.
H. R. October 5, 2h. 21m. P. M.
H. R. October 6, 1h. 25m. A. M.
H. R. October 7, 1h. 29m. A. M.
H. R. October 8, 10h. 44m. P. M.
H. R. October 12, 1h. 11m. P. M.
H. R. October 21, 22h. 23m. A. M.
H. R. October 14, 9h. 49m. P. M.
H. R. October 16, 1h. 29m. A. M.
H. R. October 18, 1h. 35m. P. M.
H. R. October 20, 1h. 41m. A. M.
H. R. October 21, 11h. 45m. P. M.
H. R. October 23, 8h. 33m. P. M.
H. R. October 24, 2h. 17m. A. M.
H. R. October 30, 9h. 3m. P. M.

Saturn is a morning star, rising a little more than an hour after the sun on October 1, and about three hours before on October 31. Mars passes it on the south, about a degree distance, on October 12. The rings reappear on October 28 on account of the sun passing to the same side of their place which the earth occupies. It is still in the constellation Leo, and is 9° south of the second magnitude star Beta Leonis. Uranus is in conjunction with the sun on October 25. Neptune is a morning star in the constellation Taurus, 4° north of the first magnitude star Aldebaran.

The Constellations.—The positions given hold good for late autumn, differing not many degrees from 40° north, and for 10 P.M. on October 1, 9 P.M. on October 15, and 8 P.M. on October 31.

The small constellation Lacerta is in the zenith. Pegasus is just below it, to the south, on both sides of the meridian. Aquarius is on the south meridian, about half-way up, and below it is Pisces Australis. Cetus is low down in the southern horizon, and is best viewed from a distance, just south of Pegasus. Andromeda is high up, a little north of east; and below it are Arctes, a little to the right, and Taurus, lower down, a little to the left. Perseus is about half-way up, in the northeast, and Auriga is below it. Cassiopeia is coming to the meridian, between the zenith and the pole; and Ursa Major is on the north horizon, with the pointers on the meridian below the pole. Ursa Minor is just rising, and a little below; and Draco is to the left of Ursa Minor. Cygnus is to the west of the zenith.

LAKE FOREST, ILL., Sept. 1, 1891.

QUESTIONS AND ANSWERS.

Letters of inquiry should enclose a two-cent postage stamp with the writer’s address, which will not be published.

Questions regarding the treatment of diseases cannot be answered in this column.

W. C. C., Philadelphia.—It is stated that storage batteries when charged lose a large part of their power by leakage. What is the cause of this leaksing?

Answer.—No electricity is really “stored” in these batteries, and they do not differ in their mode of action from the storage battery, where the electricity is generated by chemical action. When a storage battery is allowed to stand, local chemical action takes place between the plates and the electrolyte, producing a certain amount of electric energy which can be utilized, and it is necessary to re-charge it after a while. There is also a certain amount of chemical action that can be expressed after being used for some time, which has been found to be a serious objection to their use. No really practical form of storage battery has yet been introduced that will retain its electric energy for a long period of time.

M. S. H., N. Y.—If a bullet is fired from a gun in a vertical direction will it return to the ground with the same velocity with which it started?

Answer.—A bullet fired vertically from a gun will, if it is launched with a constant diminishing velocity, owing to the attraction of gravitation, until it comes to rest. It will then begin to fall with the acceleration of gravity, owing to the same force, until it reaches the ground again. If the bullet was fired into a vacuum these attractions would not operate to the ground with the same velocity with which it started; but the friction of the air through which it passes tends to reduce its velocity during the return journey through the air, and the bullet returns to the ground with a velocity much less than that with which it left the gun.

A. H. F., Montreal.—A recent writer in the Science News correspondent of anti-chlorine and chlorine as a “combustion,” is not the term incorrect, and is not the term combustion only properly applied to processes of oxidation accompanied with light and heat?

Answer.—There would appear to be no reason why the term “combustion” should not be applied to all processes common in the arts, and which do not require light and heat, and we find it so defined by all the best authorities, including Watts and Roscoe. Practically, in ninety-nine cases out of a hundred combustion is caused by oxidation, and the few exceptions may well be included under the same term.

E. J. H., Mass.—What is the composition of the water in the so-called “petrifying springs,” which changes the water any object over which it is allowed to flow?

Answer.—The water of these springs contains carbonate of lime, or limestone, held in solution by an excess of carbonic acid, as the water evaporates, the carbonate of lime is deposited as a heavy, stony coating upon any object in contact with the water. The object is removed when formed in the same way. The process is simply one of inerustation and not a true petrifaction, as in the latter case the original particles of the petrified object are removed and replaced by the mineral substance dissolved in the petrifying solution.

T. L. C., Minnesota.—I have recently exchanged my cheap photographic objective for a fine imported lens, but I cannot take as good pictures now as formerly; the negative are flat and with black margins. What is wrong?

Answer.—The trouble is undoubtedly in over-exposure of the plates. The new lens works so much quicker than the old one that an exposure which would give a satisfactory picture with the latter is much too long for the superior light-gathering power of the former. Try reducing the time till the results are satisfactory, and get a proper size negative. There is no substitute in photography, but it can only be learned by practice, and varies constantly with different plates, lenses, chemicals, times, and seasons.

LITERARY NOTES.


This valuable work contains a complete list of all known mineral species and their corresponding names in all the languages to the nearest specific name, both in English and in foreign languages. Mineralogists and those having charge of collections of minerals will find it exceedingly useful.


First Lessons in Arithmetic, by Andrew J. Bleichoff. Price, 30 cents.


The above text-books, published by the American Book Company, of New York, are fully up to the standard of all works issued by this enterprise house. The elementary text-book on agriculture is a very valuable one, as a knowledge of the principles of agriculture—which simply means a knowledge of the natural laws and principles which have introduced life and political organization—is most important for those who are actually engaged in the pursuits of agriculture, but may in general be regarded as an important element in the education of the young. The mathematical works are also written in conformity to the latest mathematical and educational theories, and the whole series is worthy the attention of teachers and school committees.

Postal Dictionary. A manual of postage rates, and the proper stamps to be used, which concerns all who use the mails. Sixth edition, revised to date. E. St. John, 5 Beckman Street, New York. Price, 15 cents.

The postal dictionary is likely to be of great and constant service to all who make much use of the mails. The ninety-four pages contain a great amount of information, very well arranged, which will prevent most of the delays and losses in the mails.

Pamphlets, etc., received: Description of the Biological Laboratories and Aquarium of the University of Pennsylvania, Sea Isle City, N. J.; Trichina Spiralis, by Dr. H. W. Whedey, St. Charles, Illinois; Rolled Parchment, by J. R. Granger; and Theodora, by Howard Egbert, M. D., 35 cents, of Hampshire Publishing Company, Southampton, Mass.; Sulphuring or Bleaching Dried Fruit, by J. W. Smith, M. D., Charles City, Iowa; and the Thirteenth Annual Report of the Rhode Island State Board of Health.
THE FUTURE OF MEDICINE.

Within the last quarter or half century the increased interest taken in the study of the natural and artificial ways in which the human body has been subjected to the force of disease which has both direct and indirect influence upon the physician's and surgeon's art, and has done much to lift it out of the semi-barbarous condition of a hundred or more years ago, and elevate it to the dignity of a true science. Organic chemistry has furnished a large number of new and valuable therapeutic substances, including those greatest of all blessings to the human race, namely, antiseptics. The microscope has revealed a new world, inhabited by the disease-producing bacteria; and, in many cases, the chemist has provided germicides which can destroy these dangerous little organisms without injuring the more resistant living tissues in which they exist. The study of hygiene, sanitation, and the prevention of disease has been given the importance it deserves; the value of careful nursing has been recognized; while, by the aid of modern antiseptic precautions, the surgeon can perform the most astonishing operations, and work directly upon organs which, not many years ago, it would have been considered fatal to expose to the light or air or to interfere with in any way.

And yet, notwithstanding all this, there is, as has so often been said, “more of hope than of achievement in all schools of medical practice.” Many diseases, including some of the simplest and most common, remain entirely beyond the skill of the physician. To say nothing of more serious troubles, who has ever cured a cold in the head, or prevented an attack of scabies? The most successful endeavors of the physician are to conserve the strength and vitality of his patient and allow Nature to work out the cure in her own mysterious way.

Still there is no cause for discouragement, and we may confidently expect that the future will exceed the past in the value and importance of the discoveries which it will unfold. Already one of the most fatal and loathsome of diseases—the small-pox—has been entirely and practically extinguished from communities enlightened enough to protect themselves by vaccination, and we have every reason to believe that we may yet be able to protect ourselves from the contagion of other acute infectious diseases, like diphtheria, scarlet fever, or the less dreaded measles and mumps.

Consumption, the most prevalent and fatal of all diseases, is the subject of earnest investigation by hundreds of patient students, and a beginning has at least been made towards a rational and effective method of treatment. Koch's tuberculin, while apparently a failure practically, has at least served a good purpose in showing that agents exist which have a selective action upon diseased tissue; and the fact that an inoculation may be made which will not affect a healthy person, but will exert a profound influence upon one suffering from a certain disease, is of the most supreme importance. It is by no means a vain hope that consumption may yet be made as amenable to treatment as many other diseases.

The science of bacteriology is as yet in its infancy, and we do not thoroughly understand the exact relation of bacteria to the diseases which they cause or accompany; but enough is already known to materially modify our conceptions of the long list of diseases with which they are connected, and the diminishing mortality from such diseases is full of promise for the future. With an increased knowledge of sanitation and a more careful attention to the purity of food, water, and air, and the prompt and complete removal and destruction of waste matters from our dwellings and communities, we may hope to entirely avoid the recurrence of devastating epidemics, such as have so often and so harmfully swept over our land, and the inhabi-
tants of New York have reason to believe as little cause to fear the occurrence of yellow fever or cholera than those of New York or Boston.

In obstetrical practice we may expect an unusual advance. Thanks to the discovery of anesthetics, the pain of parturition can be wholly or partially avoided; and with modern antiseptics, the puerperal conditions peculiar to such cases are much less common. But the mortality is still greater than it should be, and, although the human organism has been too unavenly developed from pre-existing forms for us to expect that parturition will ever become the simple physiological process that it is in the lower animals, it is almost certain that the dangers and discomforts will be greatly lessened, and that the growth and entrance of a healthy baby will cause less pathological inconvenience in its nature than at present. Not the least important factor in this result will be the sweeping away of the cloud of absurd superstitions which has so long overlaid such cases, and from the influence of which too many otherwise skillful and intelligent physicians are by no means wholly free.

In the future, the limit can be placed upon our expectations. Already the brain, kidneys, intestinal canal, the pelvic organs, and, in fact, nearly all the important organs of the body, have been successfully subjected to operative interference. Nothing seems to be able to bar the progress in this direction but the limits of human skill and dexterity, and the extent to which the structure of an organ may be interfered with without the destruction of its functional activity.

In the obscure and distressing class of troubles comprehended under the general name of nervous diseases, modern investigations in psychology have given us valuable hints for treatment; and it is probable that in future years cases of convulsions will be cured, or maintained in a healthy state, by anticonvulsional medicine, much more successfully than at present. The "faith-cure" has shown that diseases of the imagination may be successfully treated by imaginary remedies; and the subject of hypnotism, obscured as it is by uncertainty and deception, contains a germ of truth which may yet bear precious fruit. That there is something beyond the brain itself, to which the consciousness of life and existence is due, seems to be certain, but its nature or methods of action appear to be impossible of comprehension.

We have, then, every reason to expect in future generations a longer life and a higher standard of bodily health. Diseases now so much dreaded will either disappear or be readily susceptible to treatment, and of those inevitable accidents incident to human activity to which the consciousness of life and existence is due, seems to be certain, but its nature or methods of action appear to be impossible of comprehension.

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from the target the more he necessarily elevated the muzzle of the rifle, and consequently the more did the upper end of the butt rest upon the clavicle, until at 600 yards so entirely was this the case that the bone gave way under the concentrated force.—Edinburgh Med. Jour.

CHOLERA INFANTUM.—Lesuge has found a germ which he believes is concerned in the production of this most morbid infantile diarrhea. When cultivated in gelatine or bouillon an alkaline product is obtained having a distinctive odor which it retains many months. It is more tenacious of life than the cholera bacillus and is more resistant to external agents. Isolated, it is capable when injected into animals of producing cholerae symptoms. Its connection with the disease seems to be proved by the following facts:—

1. It is found only in cases of chlorea infantum, the numbers sometimes being very large.
2. It produces experimental cholera.
3. It produces a substance identical or similar to that produced by the common bacillus. It causes death in certain doses and in smaller doses toxic symptoms.
4. It produces cholerae intestinal lesions.—La Semaine Med.

[Medical Record.]

CUTANEOUS GEROMORPHISM.

In the Nouvelle Iconographie de la Salpêtrière, Drs. Souques and Charcot describe, under the novel title of "Geromorphisme cutané," a unique affection, producing changes in the skin of a young girl which gave to her the appearances of old age.

The case first came under the observation of Dr. Laurent in 1881, when the patient was eleven years of age. At that time the changes in the skin, which were already remarkable, were attributed by the parents to a severe fright. The face was most noticeably changed, and suggested a facial paralysis from the obliteration of the natural lines and lack of facial expression. The skin hung in loose folds, such as are sometimes seen in extreme age, and appeared as though it had been overworked and from some preceding edema and had remained too flabby and loose in consequence; but there was no history of edema having been present. The skin was neither thinned nor indurated, and the condition was plainly not one of elephantiasic enlargement.

Preceding the changes which have been described an eruption had appeared upon the trunk and extremities, lasting for several months, and coming out in crops. The nature of the disease was not made out at the time, but, from the descriptions given, might well have been a form of urticaria. Later on, after the patient had entered the hospital, there occurred another eruption, resembling in appearance and course an erythema nodosum. This rapidly disappeared without apparent influence upon the chronic changes, which had already become well established, and had altered the features of an intelligent and pretty child of eleven years into those of an old woman.

No diagnosis was made and no improvement took place. Ten years later, at the age of twenty-one, the patient again entered the hospital and came under the observation of the authors. Time had only served to intensify the changes which had already become well established, and had altered the features of an intelligent and pretty child of eleven years into those of an old woman.

No diagnosis was made and no improvement took place. Ten years later, at the age of twenty-one, the patient again entered the hospital and came under the observation of the authors. Time had only served to intensify the changes which had already become well established, and had altered the features of an intelligent and pretty child of eleven years into those of an old woman. There was no evidence of edema, abnormal pigmentation, or eruption. The skin had simply lost its consistence and elasticity. If lifted up, folded over, twisted, or displaced in any way, the portion of skin thus treated would keep the new position in which it was placed, or return very slowly to its original form, thus resembling the skin of a cadaver. The functional activity of the skin was not interfered with, and the surface was neither dry nor secrete. Perspiration was, however, diminished.

The hair, nails, and teeth were in normal condition. There was no pain nor pruritus in the skin, and no evidence of trophic or vaso-motor disturbance. The skin had, in a word, become too large, falling in folds, and becoming wrinkled and furrowed, and abnormally movable upon the subjacent planes. The changes are seen to be principally limited to the dermal and subdermal proportions; but as to just what has brought about these changes the authors do not feel justified in concluding from their study of the case so far made.

The condition appears to be a special pathological one, without analogy among the recognized dermatoses. Precocious senility is out of the question; and although the hair and teeth are implicated, the digestive functions are impaired, the respiratory acts are diminished, and the muscular system is weakened, which was not at all the case in the instance described.

The parents were found to be healthy, and nothing in the family history pointed to anything analogous, or aided in the solution of what cutaneous geromorphism really is.

[American Naturalist.]

THE NATURAL SIZE OF THE WAIST.

Among the many uncritical propositions urged by would-be reformers in recent years, few are more so than some of those ancit the interesting subject of women's waists. We are repeatedly told that a narrow waist is a deformity produced by artificial compression, and that the just model for the healthy normal woman is the robust and matronly Venus of Milo. Now the anthropologist knows that this general assertion is not true as applied to the civilized white woman. It is especially characteristic of the highest type of woman of the Ino-European race to have wide hips and very small waists. As in the latter the hips and waist are diminished, the digestive functions are impaired, the muscular system is weakened, which was not at all the case in the instance described. It is well known that the form of the pelvis differs in the different races, so that in the white race the female pelvis differs from that of the male more than is the case with the African. In the latter the female pelvis is as in the male, longer in the anteroposterior than in the transverse diameter; in the female Mongolian the strait is subquadrate in outline, while in the Indo-European the strait is oval, with the transverse diameter greater than the anteroposterior. Thus the white woman has wider hips than the woman of inferior races, and she is in so far more unlike the male than they. The larger pelvis cavity of the female is an adaptation to the increased weight of the female infant; it is incident to gestation; and it follows that when this cavity is not so occupied, the movable visera fill the space. From this results the contraction of the abdominal walls immediately above the pelvis, known as the waist. It is then clear that the diameter of the waist is inversely as the diameter of the pelvis, and the differential of the transverse diameter of the pelvis exceeds the anteroposterior.

The cause of the increased transverse diameter of the Indo-European pelvis is probably mechanical. It may be due to anteroposterior pressure on the public arch. This in turn may be
a consequence of the monographic customs of the Indo-European sub-species due to the greater esteem in which women are held. But on this point I will not insist.

In any case the Venus of Milo has the form of a very mature woman of her race, and many moderns can boast of far more graceful figures than she. And these figures are not the result of artificial compression of the clothing, but are the product of a natural evolution of form. It is true, however, that all women of the white race have not attained this stage, and not a few retain the figure of lower races. It is not, however, proven that the women possessing this figure are any better child-bearers than those of modern type. Occasionally we meet women who to a robust waist add a narrow pelvis—an unfortunate structure, and one not to be extensively reproduced, owing to the difficult parturition which is indicated.

The women who are not satisfied with the figures which Nature has given them, and who endeavor to reduce a naturally robust waist to the proportions which characterize their more favored sisters, by artificial means, deserve all the reproach which the above-mentioned reformers bestowed so indiscriminately on all alike. Excess of slenderness is not beautiful, and artificial compression forces the viscera into positions which produce a deformity of the abdominal wall more repulsive than a stout waist.

THE SIGNIFICANCE OF MUSCLE VOLUNTARIES.

People are often frightened almost out of their wits by the sudden appearance of flying specks before their eyes; sometimes they are only one or two, but often thousands of them can be seen, particularly when a person looks toward a white surface, as white clouds, white houses, white pavements, or towards water surface. These flying specks are mostly small points, connected one with another by fine lines, and the points often presented a beaded appearance. At first, persons are likely to try to knock them away, thinking it is something before their eyes. They come usually in both numbers at one time, and slowly diminish or increase in number at times, but rarely ever disappear entirely. They usually have a fixed position in the field, but occasionally they move or float about to a limited extent. They never interfere with vision by settling over objects looked at. They are invisible with the ophthalmoscope. Their nature is not well understood. The explanation usually given is that they are opaque points in the vitreous humor, which throw shadows upon the retina and thus become visible. Badly focused eyes are most likely to be troubled with muscle voluntaries. They signify nothing serious so long as they are mere points, connected by fine lines, and do not interfere with the acuteness of vision. Treatment is more than useless. If the eyes are out of focus, proper glasses should be worn. It is important that the patient should ignore their presence entirely; should avoid seeing them as much as possible and let them alone. Large floating masses before the eyes, which swim around and often obscure vision, are the result of serious disease and should be promptly looked after.–A. D. WILLIAMS, M. D., in St. Louis Medical and Surgical Journal.

THE OLD NEW ENGLAND DOCTOR.

A writer in the Atlantic on "The Old New England Doctors" says: "I like to think of the rich and pompous old doctor riding out to see his patients, clad in his suit of sober brown or claret color, with great shining buttoned clothes of silver coins. The full-skirted coats had great pockets and flaps, and the long waistcoat left much of the robe well over his hips. Rather short were the sleeves of the coat, to show the white ruffles or frills at the wrist; but the forearm was well protected in cold weather by the long gauntlets of his riding-gloves and by muffulettas. Full knee-breeches dressed his shapely legs, while fine silk stockings and buckled shoes displayed his well-turned calves and dressed ankles, but in usually the motherless boot was taken of fine hose and shoes, and his handsome breeches were covered with long tow overalls, or 'tongs' as they were called. On his head the doctor wore a cocked hat and wig. He owned and wore in turn wigs of different sizes and dignity—ties, bags, periwigs, and bobs."

MEDICAL MISCELLANY.

A Soda Spree.—Two men drank twenty-nine glasses of soda in Milford, Mass., recently, in settlement of a wager. A great crowd of people watched the contest. The winner was taken home in a carriage, but his contestant walked home in no way troubled by the seven quarts of liquid he had imbibed.

FRIEKS' JUBILEE.—At the Registrar's office in South Shields, England, on April 26, a girl only 32 inches high was married to Professor Hidley, 6 feet 1 inch high. Humbert, the man without arms, gave the bride away, signing the certificate by holding the pen between his teeth. The bridesmaid was Miss Nina, the American giants, who weighs 616 pounds. The best man was Capt. Dalls, 7 feet 10 inches in height. Gen. Meilhoun, 20 inches shorter, was the best man.

All were connected with a travelling circus going through the country.

AN OUNCE OF PREVENTION.—People are willing and eager to speak in warmest praise of the physician who has brought them safely through some awful crisis of disease; and rightly. But how seldom do they recognize or appreciate that greater skill which detects disease in its early stages, and so promptly and wisely treats it that the patient does not go down into the shadow of death, says the Medical House. The greatest skill is habitually displayed in treating the every-day ailments, so commonly regarded as trivial and unimportant; and almost every physician of large experience will tell you that much of his best work passes unrecognized and unthought of. Indeed, his greatest—many times his only—reward comes from the consciousness of a good work well done.

From an Amusing Paper on "Our Predecessors, the Barber Surgeons," read by Dr. Embletont before the Newcastle Society of Antiquaries, and published in the Leeds Intelligencer, and reprinted in Sloane's Modern History, the barbers were fined for trimming their customers on the Sabbath day, and fines were also imposed when members used "ill words" to each other. For "giving" members the "lie" fines respectively of from three to six pence had been made. Were these excellent rules in force nowadays, and if the proceeds were put into a medical poor-box, it would have the nucleus of a very useful charity to assist those left destitute by our less fortunate fellowes. A rough calculation, based on the number of infirmities committed during the last few weeks, shows that several "most potent, grave, and reverend signers" would be mulcted in very substantial sums, and one can only regret that no machinery exists for1erying this tribute.

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"I regard Colton's Liquid Beef Tonic as extremely useful in cases of debility and general depression, and as an article of food containing tonic properties it is highly useful."—A. J. ACKSON, M. D., Professor Laval University, Quebec.

The ice crop may be a failure this coming winter, as it was in the winter of 1888-89. Take time by the forelock and order one of DAVID BOYER'S ARTIFICIAL ICE MACHINES, which make a superior quality of ice at about the same cost as that of cutting and storing the natural product.

THAYER'S TRUMFERN COMP. is a remarkably efficient preparation of pepton and other agents which aid in the processes of digestion and assimilation of food. It is used by many years' experience, when any other similar preparation on the market, and is worthy a trial by physicians. Free samples may be obtained of the manufacturers.

"ELECTRICITY SIMPLIFIED" is the title of a work just published that will fill a long want. Everybody wants to know what is electricity, and this work explains the subject in a popular manner, and simplifies it so that it can be really understood. The author, T. O'Conor Sloane, is one of the editors of the Scientific American, and is an authoritative writer on the subject. It sells for $1.00, and is published by NORMAN W. HENLEY & Co., 152 Nassau street, New York.

DR. L. WAITE, Pittsburg, Mass., says: "It gives me much pleasure to express my entire satisfaction derived from the administration of HORSFORD'S ACID PHOSPHATE. It has been found to be particularly efficacious in chronic dyspepsia, as well as in those conditions of the system where there is loss of nerve power. From its use for a period of about eight weeks, to the exclusion of all other remedies, I attributed the restoration to health of a patient who was emaciated to the last degree in consequence of nervous prostration and dyspepsia. This patient's stomach was in such an irritable condition that he could not bear either liquid or solid food. An accomplished physician of many years' experience, when it was called in consultation, pronounced his case an incurable one. At this stage I decided to use HORSFORD'S ACID PHOSPHATE, which resulted as above mentioned."
The employment of capital, wishing that the primitive loneliness had never been disturbed. We must make the best of things as they are, however, by taking them to be the yellow locusts that spring up in hundreds as we plunge through a thickets of dried weeds, covering ourselves with ticks and burrs, with the feathery seeds of golden rod and aster, and setting sail to silky plumes from the pods of the milkweed. Here, on the narrow path running down the side of the quarry, is a large grasshopper with fine red legs; we must have him for our collection. Watch him as he jumps and there! your hand is over him; keep him until I pull out the bottle of alcohol. Now pop him in; we can pin him out at our leisure at home. And this olive grasshopper with reddish brown legs; we must have him too; and, while the bottle is open, catch a few of the black in contact with other culver's, and all club top goes a Camberwell beauty; what would not the English collector give for the chance of capturing this butterfly alive? It is an emigrant from England, though now never seen there living. So common is it in this neighborhood that we would not trouble ourselves about this individual, except for the chance of using it for exchange. A few drops on it from the bean bottle before opening the net, and it dies without a struggle. We have a place ready for it—an old cigar-box which we have lined with corked wrapping-paper. We put a pin straight through the thorax of the butterfly and pin it firmly to the cork; then carefully spread the fore wings and bind them down with a strip of paper and a pin; we pin a piece also over the hind wings, and straighten out the antennae and body. The legs we need not trouble about, as the outspread, purple-edged wings will cover them.

We have now got down to the first railroad, but we must turn a little out of our way to a row of struggling osage orange trees that represent an abortive hedge. We confess to a great liking for the rough green balls on the bushes, and can never resist the temptation of knocking one or two of them off. Very curious they are in their make-up—much like the top of the beetroot, their nearest plant allies. The blossoms in the spring on these, the pistil-bearing trees, form a globular head. After the wind has blown upon them, or insects have carried to them, pollen from the stamniferous trees, the small white corollas of the blossoms drop off, and each calyx swells round the seed and grows so much that it comes into contact with other culver's, and all club top gather and form what looks like a large rough-coated orange. The dried styles of the blossoms still hang on, looking like hairs upon the surface. Each one is surrounded by four green pimpls. If we are careful and patient enough we can dissect out these groups of four and reduce the compact whole to the separate fruits that form it.

But we must turn from the osage orange hedge, pass the line of glowing sumac, cross the railway, and scramble up the embankment, which, lying exposed to the sun, is a first-rate hunting-ground for insects. Grasshoppers and crickets again abound, with humble-bees and a perfect swarm of sulphur and cabbage butterflies, and small brown moths. The beautiful painted lady is also here, showing all shades of brown from cinnamon to deep chocolate, the fore wings relieved with spots of white above, while under are four eye-like markings. She, also, is an English importation.

At last we have crossed the railroads and the old canal at the bottom of the valley. A thin cloud covers the sun and a subdued light falls on the hill before us. The trees are not remarkable for their color this fall, but the soft browns of those before us delight us. As we approach we find the undergrowth aglow with brilliant reds and yellows. The pink and red leaves of the maple-leaved viburnum will make our parlor gay for many a week. We must catch, too, some branches of the witch hazel, with its flaming, streamer-like, golden petals. Here, actually, is a belated aster,—Aster petasius,—its heart-shaped leaves strung on the stalk, and light lavender rays wide spread. A false Solomon's seal, in fine red berry, is close to our hand, with that curious crucifer, Arabis Canadensis, whose long pods have opened and discharged the seed, leaving the sickle-shaped placenta to lighten our winter bouquet.

Up the gully we go, and then across a meadow into another gorge. It is a stiff scramble, and we are glad to sit down a minute or two and admire the red leaves and purple berries of the flowering dogwoods. Then we begin to turn over the logs and heaps of leaves to see what lives beneath them. Not much, apparently. Four or five hills above us comes the laugh of two college freshmen; they are also turning over logs and leaves, and it is clear that they are catching or frightening away all the specimens that will trust themselves out today. We wish these ardent collectors all success, and have hardly reached the plateau before we find a gold-gilt beetle whose body shot with copper and green would have been the treasure of their insect-case. Ha! ha! we are beating now, and the spoils are for the advanced guard. Running along the fence is another gorgeous fellow; his broad bands of black and yellow mark him as a carrion beetle, and as we seize him he promptly discharges his last dinner over our hands. Crossing a corn-field we turn over the pumpkins for those little ground beetles called carabids, and again search among some rotten logs for what we can find.

But evening is coming on; our insect friends have gone into retreat, and we take only a little dead and dried brown snake, and some cocoons that may bring us valuable moths next spring. Evening is coming on; we, too, must hasten home, congratulating ourselves as we go on what we have, rather than sighing for what we must leave behind.

Three and two-tenths grains make one carat; 150 carats in one ounce of Troy weight; 1,800 carats in one Troy pound of 5,760 grains.
BUBBLES AND FOAM.

BY J. LAWTON WILLIAMS.

The bubbles of imprisoned air seen floating on the surface of disturbed water, and their final per- fusion by the daughter vapor, is a process that occurs with surprising regularity until fixed lines of development. Their sizes present great differences at the time of their formation, and they continue to undergo incessant changes down to the period of their final disintegration. The sizes of bubbles in all liquids, so far as observed, vary as the intensity of the motion which produces them. This is true up to a certain point; above this point the volume of a bubble may be increased until it reaches, and, no matter how great the motion beyond that point, larger bubbles will not be formed. Although the sizes of bubbles do not readily admit of exact measurements, yet there seems to be good reason for believing that they vary with the temperature of any given liquid, and in different liquids at the same temperature. Hot water, for instance, is more liable to the forma- tion of large bubbles than cold, and they persist longer. I believe that cold water, on the other hand, is more favorable to the production of large crests and masses of foam. Such masses seem to be much more abundant at the bases of waterfalls in winter than in summer. This fact may, however, be due to the greater volume of water, and that bubbles have different maximum sizes and periods of duration in different liquids is familiarly shown in water which has been rendered viscous with soap. The bubbles are much larger and last longer than in pure water. Even the hard waters of wells cannot be changed into foam of any appreciable duration, no matter how vigorously they are heated; while river water laden with surface impurities forms even in the warmer rapids flakes of foam as large as a silver dollar.

The genesis of foam from bubbles is a very interesting process. It may be beautifully illustrated by the following simple experiment: Place a little warm water in a basin and rapidly stir it with a cake of soap until a sud is formed. The following facts may then be observed: The suds when first formed consist of the most part of small vesicles, interspersed here and there with large bubbles. These last are quite evanescent, bursting by the rupture of contiguous smaller ones, producing a half crackling, suppressed roar, somewhat like the sound of distant breakers. There is a zone of very small vesicles where the suds come in contact with the basin, and others of intermediate size interspersed over the surface. The sizes vary all the way from that of a large cuff-button to the point of a pin. If left undisturbed the larger sizes collapse one by one until the whole mass presents quite a uniform aspect. If now, this be vigorously re-stirred, new bubbles, larger than the largest of the first stirring, are formed, but they exist only a few seconds at longest. This is a phenomenon probably due to the greater tenuity of the film. I have observed suds, however, in which such bubbles persisted for several minutes. By the rapid collapse of the larger bubbles a uniform size is soon attained once more. Repeated stirrings will produce fewer large bubbles each time, and finally the most vigorous chafing will produce none at all. Meanwhile, the surging noise has also subsided. The whole mass has a fleecy whiteness; it has reached a condition of partial equilibrium; in other words, it is foam, and will continue to be so until it escapes or is destroyed.

Foam, then, is a direct product of the continuous subdivision of bubbles, and is formed in nature by the chafing of water against resisting surfaces. A process similar to the one just described is employed in making cake-frosting. In this case the resulting froth consists of minute vesicles of albumen. Not all foam, however, is produced by frie- ming, for the froth produced on the surface of soda-water by the escape of carbon dioxide, there is no visible friction concerned. It would seem that the bursting of bubbles is due in part to evaporation. Movements and tremors are also visible on their inner surfaces before collapse, as if subject to intense strains from within. Doubtless in distilling water and near resisting surfaces there is a tangential pull which hastens the rupture. This is rendered all the more probable by the existence of a zone of small vesicles (in the experiment) next to the sides of the vessel, where the reaction between the elastic, shrinking mass and the inelastic vessel is most intense. In the case of soli- tary bubbles, probably the energy of surface tension is not dissipated in a single burst, and the tendency to burst is one of the reasons of the imprisoned air, instans the collapse. In ag- gregate bubbles, as in river foam, there are a number of causes which doubtless conspire to effect their dissipation. Certain it is that such aggregates move down stream a little way only, and then disapper. Generally there are two or three bubbles of considerable size in the center of the mass, combined with a slight excess in the number of the imprisoned air, hastens the collapse. In ag- gregate bubbles, as in river foam, there are a number of causes which doubtless conspire to effect their dissipation. Certain it is that such aggregates move down stream a little way only, and then disapper. Generally there are two or three bubbles of considerable size in the center of the mass, combined with a slight excess in the number of the imprisoned air, hastens the collapse. In ag- gregate bubbles, as in river foam, there are a number of causes which doubtless conspire to effect their dissipation. Certain it is that such aggregates move down stream a little way only, and then disapper. Generally there are two or three bubbles of considerable size in the center of the mass, combined with a slight excess in the number of the imprisoned air, hastens the collapse.
scarce, the American copper (Chrysopelea gossypii hypochloris) was found in some abundance near the town, and one specimen of the common yellow butterfly (Colias philodice), was seen, but wings were not yet determined. "Syrphus auratus" are numerous. The examples of the curious larva of the giant water fly (Coristola cornuta) were found under stones on the riverside. This insect deposits its eggs in masses on leaves of trees, close to or overhanging the water, into which the young larva instinctively make their way as soon as hatched; at this period of their existence they breathe by means of external gills, and are like very small장을. The parasites, the flies, which have not yet been determined to determine. The fly issued first, cutting a small round hole in the side of the pod; but the beetle is not provided with any means of escaping out of the pod, and is too large to get out the hole made by its parasite; it is, in fact, imprisoned, but nature has provided a remedy. When the seeds of the iris are fully mature, the pods open, letting the seeds fall to the ground, at the same time setting free the imprisoned beetle.

The last outing was taken on the eleventh of December, to see how nature appeared in her winter dress. Walking out by the aqueduct, when near Cote St. Paul, some small birds were seen on the top of an elm tree, one of which, when shot, proved to be the American goldfinch (Sylvia tristis), showing that this species may be included in our list of winter birds, although it is doubtful that it remains with us during the entire winter. Nothing further was seen until the woods beyond Vedmou were reached, but there the chickadees (Parus atricapillus) were quite plentiful, and seemed in the best of spirits. Among these, we noticed a few white-hearted unbellies (Sitta carolinensis) and brown creepers (Cerithia saturicorius Americanus), and perched sedately on the bough of an apple tree a little saw-wheeler owl (Nyctala australis) sat gravely looking at us. These, with a northern shrillke (Larus borealis), were the only birds seen during the day, but were sufficient to show that even in the depth of our Canadian winter, the woods and fields are not entirely deserted.

[Original in Popular Science News.]

THE ELECTRIC EXHIBITION AT FRANKFORT-ON-THE-MAIN.

BY ADA M. TROTTER.

This exhibition—which attracts thousands of tourists to Frankfort—with catholic desire to be all things to all men, includes interests within its pale for all classes of intellect, from the most dense to the keenest scientific. In this respect the exhibition in Philadelphia about nine years ago compares favorably with this of Frankfort. It seems to belittle a scientific exhibition when so much of the space within its gates is given up to beer-halls, theaters, small shows, shooting-galleries, panoramas, etc. As a purely scientific exhibition, I suppose it could not be made to pay, so plenty of mundane attractions are offered to bring the traveller through the entrance gates. He comes, therefore, not to see what science has made in electric light, but to answer the jingle of the electric bell which calls him to the entrance gates. The electric bell can be seen arranged by the manager of such affairs at the Opera House of Paris!

With a clear remembrance of the machinery on view in Philadelphia in '83, I entered the great engine-room, almost blinded there by the brilliant lights, and deafened by the noise made by the large engines. Have you ever seen engines of 500 and 600 horse power and more; with six-inch cylinders and powerful electric light? In the large engine-rooms, with magnificient dragon flies flew swiftly overhead, or seated just out of reach at the extremity of a leafy bough or withered twig. Early in July an examination of the seed pods of the blue flag (Iris versicolor) showed that many of the seeds were eaten by the larva of some beetle, and also that these grubs were in their turn being devoured by the grub of some other insect. By the beginning of September all that survived had reached maturity; the beetle proved to be a small weevil (Monolepsis cupreus). The wings were very short, unlike the fly, which have not yet been determined to determine. The fly issued first, cutting a small round hole in the side of the pod: but the beetle is not provided with any means of escaping out of the pod, and is too large to get out the hole made by its parasite; it is, in fact, imprisoned, but nature has provided a remedy. When the seeds of the iris are fully mature, the pods open, letting the seeds fall to the ground, at the same time setting free the imprisoned beetle.

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SETTLING A QUARREL BY FLUORESCINE.

BY WILLIAM BERNAERT.

A REMARKABLE addition to the vast and continually increasing number of applications which the chemistry has found in practical life is reported from Germany. The event is the more striking by giving evidence of the incredible sensibility sometimes observed in chemical reactions.

In a mountainous part of the above-mentioned country, located at the watershed of two large streams, the population from ancient times enjoyed an abundance of delicious trout frequenting the environs of the brooks. Modern industry, however, did not hesitate to place several manufactories on the shores of these creeks, and their refuse waters soon were noticed to pollute the downward courses. The raisers and consumers of fish, however, were soon to protest; they sued one of these establishments for damages, claiming that the refuse fishes had killed all the fish in their brooks. To this the manufacturer objected, declaring there was no communication between the water passing his works and the plaintiffs' brooks. The latter, however, though no visible connection of both waters could be ascertained, maintained that the communication was a subterranean one.

This being the state of affairs, a chemist happened to visit the scene of the quarrel, and, having been informed of the trouble, at once declared that the question might very easily be settled by a simple optical test. Both parties agreeing to submit to his decision as an expert, he undertook to perform the task.

The class of organic compounds comprised by the name of benzene derivatives, and abounding with brightly and richly colored bodies, as well as with important medicinals, also includes a substance called "fluorescing," from the peculiar intense fluorescent properties of itself and some of its compounds. The substance represents a dark red powder, dissolving in alcohol with a reddish color having a green fluorescence. Its compound with sodium offers this green fluorescence to an almost incredible degree of intensity; it is perceivable in water containing one part of the compound to ten millions of water. In its effects upon man and animals of any kind, however, fluorescing is a perfectly harmless substance.

It was to the optical property of fluorescing that our expert resorted when one fine day, provided with a tin box containing two pounds of the sodium compound, he proceeded to dissolve it in a barrel of water, the contents then being poured into the brook above the factory buildings. No sooner had the admixture taken place than the brook, formerly clear and transparent, became opaque, but of a shining green color, which spread rapidly downward with the flowing water. All the water in the lower course of the brook, and even in some ditches and creeks which had not been known to communicate with the brook subjected to the test, became green, and kept this color unto its fallow into the broad stream about five miles away.

The population were astonished and became excited, fancying that the water had been poisoned—a fear which they did not abandon before having been convinced that the water was still drinkable and unchanged in taste, and even in color when held against the sun. The green hue was only perceived in the water covering the dark background of the river bed. People also became easily persuaded that only the water in communication with the stream passing the factory was subject to the change, all the others having remained in their former condition, including the one belonging to the suling fishermen, who thereupon gave up the complain and resorted to efficient expedients to provide fresh trout for their waters.

The question whether there are communications existing between several natural currents of water may happen to be both of scientific and practical interest. The recent formation of a lake near the Colorado River gave rise to various conjectures as to its origin. In such cases the fluorescing test would answer with unsurpassed certainty. It would also reveal the source of pollutions in drinking-water in the researches that are at present being performed in the Croton district, supplying the city of New York.

SCIENTIFIC RECREATIONS.

Two interesting experiments in centrifugal force are illustrated in the accompanying engravings. To perform the first experiment, take a soup-plate and place a napkin-ring exactly in the center (Fig. 1). Then, holding the plate in the two hands by its opposite edges, toss it into the air with a quick revolving motion so that it shall make a complete turn before being caught. The centrifugal force developed by the revolution of the dark background formed by the open door of the building, and his head focussed upon the ground glass so that it apparently occupied a position in the cart, as shown in the engraving. A piece of black cardboard pierced with a hole of the proper size was placed before the lens during the second exposure, which cut off all the rays of light except those proceeding from the head and shoulders of the model, and allowed those only to be impressed upon the plate.

SOME CONVENIENT FORMS OF KNOTS.

The accompanying engravings illustrate the various ways in which a rope may be quickly and firmly attached to objects of varying size and weight, and are almost self-explanatory. The knot represented in Fig. 1 is firm enough for a light stick of timber or similar object, while 2, 3, or 4 can be used where a stronger fastening is required. Figs. 5 and 6 show two convenient
methods of suspending a barrel, either horizontally or vertically; while for a bag or sack the efficient fastening shown in 7, or the simpler one shown in 8, will be found secure and convenient. All the above fastenings can be made from a single piece of rope, and their construction will be evident from an inspection of the engravings.

[New York Sun.]

A PROBLEM.

A CYCLONE demolished the barn of Sam McPherson, of Monroe County, Kentucky, on July 24. Seventy-seven days later the workmen who were clearing away the debris liberated a bug that had been copped in narrow quarters formed by fallen boards and timbers. In the course of her imprisonment she laid an egg, hatched it, and eaten the chicken all but the feathers and bones. Apparently she had nothing else to eat.

Here rises an interesting question for economists: Did it pay the hen to hatch the egg?

In times of dire necessity self-preservation becomes paramount. Castaway sailors kill their weaker fellows and eat them. Famine-brutes devour even their own offspring. Probably no sentimental considerations prevented this hen from coolly calculating whether she could prolong her days and increase her chances of rescue by hatching out the egg and eating the chicken, or whether her chances would be better if she ate the egg while it was fresh. Nobody can say that she did not consider this grave problem in all its aspects, and that her survival during the seventy-seven days that elapsed before she was rescued was not the result of her decision in accordance with scientific truths.

If there was nothing to eat in the foribiddenly impoverished crop, did the hatched chicken contain more nutriment than the unhatched egg? If more, was the gain at the expense of the hen, and did it cost her more than she received in the way of increased nutriment? Warmth is necessary to incubation. Heat can be produced only by the outlay of energy. If there was more food in the chicken than in the egg, was the excess sufficient to restore to the hen the energy spared in hatch- ing the egg? And if so, was the excess still great enough to make up for the loss of edible substance through the conversion of part of the egg into bones and feathers?

These questions cannot be dismissed by scientific men as trivial. They are worthy of the profoundest thought of savants. Certainly no other hen ever was brought face to face with questions from her point of view more momentous, or which called for greater nicety in the weighing of them.

TO RESTORE FADED OR OBLITERATED INK.

The following suggestions are from Haldane's "Workshop of the Photographer."

1. Wash in warm water to remove salt if the paper has been immersed in sea-water, and then soak in a solution of gallic acid, three grains to the ounce of water.

2. Wash in clean water and soak in solution of ferrous sulphate, ten grains to the ounce.

3. Apply a solution of potassium ferrocyanide with a brush, wash, and the writing will appear in blue, if any iron is left of the primary blue.

4. Fugitive Writing.—Gobert has found that if writing is ever so carefully scratched out, there are still left sufficient traces of the oxide of iron in the ink to become visible in a photograph copy. Light reflected from paper that has not been written on acts in a different way on the photographic materials from that reflected from places which have been once covered with ink.

SOME TELESCOPES IN THE UNITED STATES.

Dr. WM. H. Knight gives in a recent number of the Sidereal Messenger a list of over one hundred telescopes, with names of owners, makers, etc. The list includes only those instruments of which the aperture is four inches or upward.

The two largest refractor telescopes are those of the Lick Observatory with an aperture of 36 inches, Yale University 28, U. S. Naval 26, Leander McCormick 26, Princeton 23, Denver 20, Smithsonian 29, Dearborn 18.5, Carleton College 16.2, Warner 16, Washburn 15.5, and Harvard 15.

The largest reflecting telescopes are those of Harvard College, 28 inches, and Rev. Dr. John Peste, 22. Dr. Peste, who is an amateur maker, is now finishing up a 30½ inch silver-on-glass mirror, which will be presented to the Allegheny College at Meadville. When mounted it will be the largest reflecting telescope in this country. There are numerous reflectors made by Brashear from 9 to 12 inches in diameter.

The Clarks are now grinding an object glass of 40 inches for a telescope to be mounted in an observatory which is to be built upon Mount Wilson in Southern California.

Though the Lick Observatory possesses the largest telescope at present, Harvard College has the best equipped observatory for general astronomical work in America, and one of the best in the world.

In foreign countries the largest refractors are those at Palgrave, near St. Petersburg, 30 inches, 32.75; Vienna 36.75, Gateshead, near London, 25, and Paris 23.6.

The largest reflectors are those of Lord Rosse, in Ireland, 72 inches, Melbourne 48, Paris 47. Mr. Communis, in England, 37.5, another of Lord Rosse 36, Toulouse 32.4, Marseilles, 31.5, Grevenell 28, and Cambridge 24.

INDUSTRIAL MEMORANDA.

For a good solution for removing the blue from steel so as to leave as clean as before coloring, try acetic acid, or solution of chloride of tin (stannous chloride).

Black Brass.—Brass may be colored black by repeatedly coating the cleansed metal with a moderately warm solution of nitrate of copper. Heating over a charcoal fire follows. Finally the tone is heightened by rubbing with olive oil.

An Alumum Steamboat is now running on the Lake of Zürich, Switzerland. The boat weighs only a ton and 300 pounds, and has a length of 90 feet, a beam of 15, and a depth of 4 feet. It is propelled by a range of copper, which are calculated to move the weight of an ordinary boat of the same size. It was built at Zürich, the metal having been furnished by the aluminum works of Schaffhausen. The boat carries eight persons, and, with a two horse-power petroleum engine, easily makes six miles an hour.

To Make Skeleton Leaves.—Soak in rain water for some weeks, remove by floating upon a card, and very gently remove upper skin with salt and water. Float in water and catch on a card with the other side uppermost, and remove other skin and pulp. A stiff brush may be needed, to be used by dabbing. Do not touch with finger. Finally wash well, bleach with javel water, wash and dry.

Testing Firearms in Europe.—There are in Europe five proving houses, or testing places for firearms. Of the Birmingham and London proof-houses many people have heard. The others are at St. Etienne, in the south of France; at Flé- la, in Austria; and at Liege, in Belgium. The latter, however, is by far the largest establishment of its kind. It is officially known that the Liege proof-house now consumes between 3,000,000 and 4,000,000 cartridges and over forty tons of gunpowder a year.

A CURIOUS PROPERTY OF SULPHUR.—M. Charles Lepierre states that in demonstrating sulfur, melted at about 115° C., can be cooled in paper, he happened to use a lithographed card of which the edges were turned up. Upon taking away the card he found the lithographed characters were clearly and distinctly impressed upon the cooled surface of the sulphur, and remained after hard friction and washing. By repeated experiments he has been able to get very fine results, removing the paper each time by a mere washing and rubbing process. He finds that sul- phur will receive impressions from and reproduce faithfully characters on designs in ordinary graph- ical crayon, carbon, crayons, lithographic inks, chalks, lithographic inks (colored or uncolored), and other things. He remarks, too, that it will reproduce with remarkable exactitude geographical maps.

SCIENTIFIC BREVITHS.

During the deep borings for rock salt at Asch- erleben, potassium salts have been found at a depth of 1,050 feet, and works have been erected in consequence.

On the summit of Ben Lomond may be seen the smallest tree that grows in Great Britain. It is known as the dwarf willow, and is, when mature, only about two inches in height.

Of the entire human race, 500,000,000 are well clothed, that is, they wear garments of some kind; 250,000,000 habitually go naked, and 700,000,000 only cover parts of the body; 500,000,000 live in houses, 700,000,000 in huts and caves, and 250, 000,000 virtually have no shelter.

A REACTION OF CARBONIC OXIDE.—If a few bubbles of carbonic oxide are passed into a weak and cold solution of ammonical silver nitrate, the liquid immediately assumes a brown color, and at the boiling-point the silver is quickly reduced, according to M. Berthelot in Compt. Rend. 112, 597. The action takes place also with an aqueous solution of the gas, and is extremely delicate, not being hindered even by the admixture of a large amount of air. This property of carbonic oxide is the more interesting, seeing that the solution is not reduced by alkaline formates, nor by pure hy- drogen.

THUNDER-STORMS.—A German periodical gives statistics concerning the frequency of thunder- storms in various regions of the world. Java has thunder-storms on the average 97 days in the high Summer, 86; Hindustan, 50; Bolivia, 44; the Gold Coast, 52; Rio de Janeiro, 51; Italy, 38; West Indiam, 36; South Guinea, 32; Buenos Ayres, Canada, and Austria, 23; Baden, Wurttemberg, and Hungary, 22; Silesia, Bavaria, and Belgium, 21; Holland, 18; Saxony and Brandenburgh, 17; France, Austria, and South Russia, 10; Spain and Portugal, 11; Sweden and Finland, 8; England and the high Swiss mountains, 7; Norway, 4; Cairo, 3. In East Turkestan, as well as in the extreme north, there are almost no thunder-storms. The northern limits of the thunder-storms are Cape Ogle, northern part of North America, Iceland, Novaja Selnjula, and the coast of the Siberian ice sea.
**A WARD OF THE MICROSCOPE PRIZE.**

In awarding the microscope prize offered last spring by the publishers of the Popular Science News for the best record of personal observations kept by any member of the Agassiz Association, the same difficulty has been met with that so greatly praised the committee of last year—that of deciding which one of several papers nearly equal in merit and utterly different in topic and method ought fairly to be considered the best. Although the number of papers entered in competition was not as large as could have been desired, they were all excellent in every way, and it was difficult to make any distinction between them.

"However, after due consideration, the committee has decided to award the prize of a fine Acme No. 5 microscope, made by Queen & Co., of Philadelphia, to Miss Mary Louise Foster, Jamaica Plain, Mass., whose observations of plant and animal life in her neighborhood indicate a true love of Nature and unusual skill in observation; and they are all the more meritorious in that they were obtained and recorded under unusual difficulties.

We hope to publish this paper in whole or in part in an early number of "The Out-Door World."

Honored to renew their offer of a prize for the following competitors: Mr. C. E. Waters, Baltimore, Md.; Miss Mary Louise Foster, Jamaica Plain, Mass., and Miss Laura J. Aldrich, Phillips, Maine, all of whose papers were of the very highest value and in hardly any respect inferior to that to which the prize was awarded. The publishers of the Science News have indicated their willingness to also make a prize of $100 for the season of 1882 if the interest taken by the members of the Agassiz Association in their "official organ" is sufficient to warrant them in so doing.

ERRATUM.—The address of Professor Doggett of the A. A. Council is 104 Lexington street, East Boston, instead of Livingstone street, as incorrectly printed in the October number.

SEA-SIDE ASSEMBLY, AGASSIZ ASSOCIATION.

A new Chapter of the A. A., with twenty-two members, was organized at Avon-by-the-Sea, N. J., on August 21, 1881. An "Agassiz Day" had been arranged for, and the organization of a society at that time had been determined upon by a number of those connected with the Sea-Side Assembly. A circular was also sent out early in August, extending a general invitation to all members of the Agassiz Association to be present.

Agassiz Day, August 21, was observed as follows:

1. In the morning a reception and microscopical exhibition was held in the new Biological Laboratory. The building was filled with visitors during the whole of the morning, who viewed the objects placed under the microscopes and inspected the various collections of plants and animals. It was admitted by all that the new laboratory, which had been built for the purpose, was admirably adapted, by its location and equipment, for the study of biology in its various branches.

2. In the afternoon a public meeting was held in the auditorium. Prof. Arthur M. Miller, of Willson College, Chambersburg, Pa., spoke on the history and objects of the Agassiz Association; and it was found to be the wish of those present that a society should be organized at once. The form of application for a charter was signed by twenty-four persons, and a name was chosen for the Chapter—"The Sea-Side Assembly Chapter of the Agassiz Association, Avon-by-the-Sea, New Jersey."

Prof. George M. Micklethide, Sc. D., L. D., professor of biology in Princeton College, was elected President, and Rev. John E. Peters, Sc. D., was elected Secretary and Treasurer. Prof. Lyman A. Best, B. Sc., Principal of Erial Beach School No. 13, Brooklyn, N. Y., a member of the Chapter, then delivered by request an address upon "Methods of Teaching Natural History in Our Public Schools."

In the evening Prof. A. M. Miller gave an illustrated lecture on "Fossil Collecting in the Bad Lands of Oregon."

The next day was set apart as a "field-day," and it was given up to marine collecting in the morning and to botanizing in the afternoon.

This Chapter is necessarily somewhat exceptional in its nature, as it is made up of members from all parts of the land, and can only meet during July and August of each year. Nevertheless, as the membership is a very strong one, it may be expected that most excellent work will be done.

Why cannot we have other similar vacation A. A. Chapters organized in others of our sea-side resorts? Certainly there is a place for many such Chapters as the Sea-Side Assembly Chapter at Avon-by-the-Sea.

We cordially welcome this new Chapter, which is new in a double sense—new in that it is not only one very recently organized, but also new since it represents a new department of work, namely, that of vacation work by the sea-side. We shall await the report of the work done in 1882 with much interest. In the mean time this new Chapter has been enrolled as No. 593, and the roll of its charter members follows:

1. William M. Alberti, 142 West 22d street, New York City.
3. Principal Lyman A. Best, New York City.
5. Mrs. William M. Barr.
8. Miss Marie Le Prince.
9. Miss Lucy Edgar, „150 Liinwood avenue, „Brooklyn, N. Y.
13. Mrs. J. T. Pearce.
14. Mrs. H. T. Pearce.
15. Miss Florence B. Reid, „354 Madison street, „Brooklyn, N. Y.
16. Miss Mary Sterling, „Mansion House, „Brooklyn, N. Y.
18. Miss Katherine M. West, „Instructor in City High School, „Bridgeport, Conn.

A CHAPTER IN TASMANIA.

Since our previous report an interesting Chapter has been organized in Tasmania—a land so distant and strange that most of us will have to resort to our atlases to refresh our memories of its precise location. This is a family Chapter of four members, and the Secretary—Mrs. H. Barnard, 8 Morley street, Hobart, Tasmania—will be pleased to hear from Chapters in the United States, and will doubtless be able to give her correspondents many interesting facts concerning the natural wonders of her beloved land. Postage to Tasmania is twelve cents for each half ounce.

We note with equal pleasure the formation of a strong Chapter in Williamsport, Pa., of which Miss Emma Campbell, 160 Fourth street, is Secretary. Now is a most favorable time to organize for a pleasant winter's work. All are cordially welcome.

CHANGE OF ADDRESS.

Prof. L. C. Wooster, whose helpful "Key to the Families of Insects" was recently noticed in "The Out-Door World," desires us to note that his address is now Eureka, Kansas. Professor Wooster is organizing a Chapter of the Agassiz Association, and will gladly render any needed assistance to students of entomology.


Arrangements have been made with the publishers of Popular Science News to continue the A. A. department, "The Out-Door World," and we again invite the cooperation of all Chapters and members in extending the circulation of this magazine. In 1891 the A. A. secured one hundred new subscribers for Popular Science News. Can we not get one thousand during 1892?

AN AGASSIZ GIRL LIVES TO TELL HOW THE LIGHTNING STRUCK HER.

When an "Agassiz girl" sees a mouse, a spider, or a snake, instead of screaming and running away in foolish fright, she picks it up for study; and when she is struck by lightning she improves the opportunity to add to her knowledge of electrical science. The following interesting account comes from Miss Mary A. C. Avery, of Ledyard, Conn., Secretary of Chapter 739.

I was struck by lightning about 11 o'clock Sunday morning, Oct. 19, 1890. We live a mile and a half from church, and so always ride. That morning it threatened rain, but we went as usual. When near the "green" it thundered and began to rain; so we drove quickly under the first shed to wait until the shower passed, as we knew we were in good season. While sitting in the carriage—mother and I on the same seat, and father between us on a small extra seat—the crash came, but I neither heard it nor saw the lightning. The carriage, though not entirely, was thrown in the path of the current. Our horse began stumblng, and father sprang to free him from the carriage, but we were hurt by his kicking. Mother scrambled out as best she could. She says she remembers noticing that I said nothing during the confusion, but she attributed it to my courage with a horse. Presently father, looking at me, noticed I was doubled over in my place, and, calling out that I was hurt, they secured help to carry me to a house, where they dashed on water, and after a time gave me bramny and water. My body was limp and no pulse could be felt. At the end of half an hour I revived enough to say, 'Where
DOES THE DOG LIKE MUSIC?

Does our dog like music and enjoy it, or does he dislike it? That is a question we can’t settle by his actions. When he hears the instrument played outside, he runs in and lays himself flat under the player’s feet, as near as he can, and then lifts his head and howls dismally, if the music is sober or mournful. If it is lively, he often barks—quick, short barks. He seems more affected if there is singing with the instrument than by the instrument alone, but pays no attention to singing by itself. We have noticed with amusement that he wags his tail in time to the music, and will change the motion to the time as often as changed—waltz, march, polka, or simple song. Let us hear the opinion of some one on the subject. Does the dog enjoy the music and try to sing, or does he hate it and try to drown the noise?—F. A. Reynolds, Willis, Montana.

SELECTED REPORTS OF THE THIRD CENTURY, CHAPTERS 201-300.

202, St. Louis, Mo., [C].—In presenting this, our fourth annual report, we are pleased to announce that the vitality and enthusiasm displayed in the interest of Chapter 202 is constantly increasing, and that the work of our members is the best and strongest evidence of our flourishing condition. The past year has been especially devoted to the study of microscopy in all its details. With the aid of an excellent microscopical equipment, and a good supply of perseverance, we have succeeded in unravelling many of the intricate problems which this fascinating science presents for solution. Our work has been mostly bacteriological, and we hope soon to present to the Agassiz Association a number of original observations which we have made in the course of our researches. We have maintained several large fresh-water aquariums, stocked with many choice zoological and microscopical specimens. In practical physiology we have successfully conducted a series of experiments and investigations. As the fruits of our labor, Chapter 202 now possesses a collection of over one thousand microscope slides, containing the finest specimens on the market. The work comprises studies in histology, entomology, mineralogy, botany, chemistry, and bacteriology. We have concluded to adopt the same methods of study for the coming year. We would cheerfully solicit correspondence and exchange with all members and Chapters of the A. A. working in microscopy. We beg leave to add our best wishes for the success of the Agassiz Association.—M. A. Goldstein, Sec., 4000 Washington avenue, St. Louis, Mo.

212, Independence, Iowa, [A].—We met regularly through the spring and devoted our time to the study of physical geography and geology. During the summer we did not meet, but since school closed we have met regularly, except in the case of one or two cases. We owe a great deal to Mr. Deering, who has given us two most interesting talks on geology. I inclose a clipping which will show you how we stand. Best wishes for the success of the A. A. and all its Chapters.—Morris Sanford, Sec.

218, Cornwall, N. Y., [A].—Since our last report, owing to the usual winter exodus, the attendance at the Chapter meetings has been somewhat irregular. Still, our absent members have kept in touch with the general work by reading, and the work of the small and scattered units of the museum and lecture societies has been a guiding star to future generations. Several publications of the S. E. S. A. II. were also added to the library, and during the winter of 1890 a course in mineralogy was pursued under the direction of this society. The work in zoology was more theoretical than practical,—although one member, while on the Massachusetts coast, did some work in this direction,—and was taken up with the idea of adding us in our identification of fossils. The collection has steadily grown and fills two cabinets. It was recently enriched by some very fine specimens sent from Idaho Springs, Colorado. Among the most prized curios are two huge mastodon bones, found in one of the village ponds. Possibly the defunct mastodon could claim some kinship with the mastodon at the Iowa Herbarium. Sanford, our herbarium, was found within a few miles of ours. Agassiz’s birthday inaugurated the field-days which continued weekly throughout the season. Among the most interesting trips was a visit paid to the iron foundry at Cold Spring, and a day spent on the Schunnemunk Mountain, famous for its anakes and red sandstone—the only place in Cornwall and Oneonta counties where we have been constant companions, and we are beginning to appreciate the value of recorded observations. The membership has decreased, owing to the fate which “overakes all good girls,” and still further depletes our ranks in June. Although we are within twenty miles of Mohawk, it is surprising to note the difference between the hills and the valley, and the remarkable hilliness of the valley. Although much of the area is covered with water, there are many relics, such as old Indian relics, etc. As you travel north you are at once impressed with the magnificent scenery, the almost unbroken forest growth, and the wonderful state of health that surround the country almost everywhere. The whole country shows traces of violent action and more powerful natural forces than those to the south. The mineral constituents of the rocks are similar, although the fossils found varied greatly and were marked by an almost entire absence of crinoids, while nearer home the rocks are almost entirely composed of them. Near Modeus we found a most interesting stone wall, built of sandstone filled with almost perfect fossil–rich rock. We have no fantastic shapes by the action of water, old Indian relics, etc. At the time of the railroad excavation these stones were unearthed, and are prized as curiosities by their owner, who kindly volunteered all possible information about them. These specimens were found on high ground which, according to the traditions of the oldest inhabitant, had never suffered from inundation. We were unsuccessful in finding any perfect specimen in that vicinity. We have no difficulty to lack of time could not make any extensive personal investigations. Our Informant showed us the great difference in the soil on either side of a certain road which seemed to be a natural division. On the one side (west) the soil was clayey, and at one point the manufacture of brick was conducted, while on the other there was an abun-
dance of lime and sandstone, and the conditions of cultivation were materially changed. There is one way in particular by which our society might be of practical use in small country towns—by forming a sort of road protective league. In driving through the average farming section one is forcibly impressed by the bad condition of the roads, and by the result of the lack of labor on the part of taxpayers, but stupidly ignorant of the best road treatment and a total disregard of the mineral resources of the country, using what is most accessible. The system of working out road taxes is not of benefit to the town, and the extra expense incurred in the making of a good road would be more than counter-balanced in the saving in horses and carriages. Many of our country members have and will have a voice in this matter, which has been left too long to mere theorizing by scientists. At the meeting of our county farmers the question of better roads was discussed, and several admirable plans were suggested; so we may hope for gradual improvement. Among the pleasantest features of our meetings are the discussions of nature with other Chapters. We are all glad to hear of their methods and plans, and it brings us into touch with one another as nothing else could do. Our work at present is rather desultory, owing to separation, and is mainly confined to individual reading. Mrs. Ballard’s charming book, “Moths and Butterflies,” has just been finished. We are all looking forward to its publication. We have had another fine storm this week, all again back in our club-room, a finished Chapter. With hearty good wishes for the future success of the A. A.—S. Evelyn Breed, Pres.; M. J. Pope, Cor. Sec.

230, Baltimore, Md., [A].—Our first annual report (March, 1890) was made immediately after our organization, and, as a matter of course, did not show much work done; but the past year has been a glorious one in our history, and we have done so much in the way of thorough preparation, as well as actual work, that we hope to make our Chapter one of the leading scientific societies of this city. In February last we secured a room in the college as a meeting-place and museum; but since that time the professor of chemistry has closed his book, and our local economy has taken the room, and we now have more comfortable quarters. We have one room for our meetings and another (18X12 feet) for a museum. In our museum we have an extremely large collection of minerals, a nearly complete collection of the eggs of birds resident near this city, an herbarium, a collection of butterflies, of bird-skulls, and an octagonal aquarium with a diameter of three feet, in which the members interested in this branch have a large number of fresh-water specimens. Our mineral collection consists of 150 specimens—analyzed, with labels, on which is written the name, number, analysis, and locality from which the specimen came, together with nicely varnished blocks for mounting purposes—donated by Dr. Kinsey, one of our honorary members; another is a set of fifty specimens presented by the Smithsonian Institution; then, best of all, our local collection, which, we are happy to say, is complete, with the exception of three or four varieties. Our collection of birds’ eggs, the result of six years’ work, donated by Mr. Wholey, is also nearly complete. The collection of bird-skulls is also in the hands of Mr. Wholey, but as yet is in its infancy. The herbarium is rapidly growing, and at the present time contains many rare and valuable specimens. The collection of butterflies and moths is very young, but, as several gentlemen interested in the subject have lately entered the Chapter, we hope by next winter to have a much better collection in this department. The fresh-water aquarium is well stocked, and some of our best work is being done there. Several gentlemen, among them Mr. Robinson, have been pursuing original investigations on the development of the larvae of water insects, and the comparative development of the tadpoles of different species of batrachians. While I am under this head, I must mention that we are doing original work in other directions. Mr. Beatty, Mr. Wholey, and Mr. Waters are preparing a check-list of plants to be found around Baltimore; Mr. Waters is especially investigating the ferns of the vicinity; Mr. Wholey is preparing a check-list of the birds of the vicinity, separating the resident species from the migratory; both check-lists will be forwarded on completion. Our collections being quite large, we naturally were very anxious concerning their disposal. At first we expected to receive cases from the school board of our city, but, having waited for some time without obtaining them, we concluded to make up plans of our own. We have come to the conclusion that it was a matter of cases, into which our collections will soon be put. We have also an insufficient library, and a fine laboratory, stocked with all the necessary chemical supplies. All of these things are our exclusive property. We have been hampered all this year by our need of a separate room for a museum, but, having secured it at last, we are now rejoicing. We should like to know whether there is a museum in the A. A. as a whole. If there is, we should be very glad to contribute of our abundance; and if there is not, we surely might have one. Only-imagine what a grand institution such a museum would become. With the A. A.’s Chapters scattered over all this land, in a few years we might have collections that would stand second to none. In conclusion of this part of my report, I would state that we have discovered a large colony of the orchid Pogonia cirtellata, which, according to Gray, is quite rare. This colony is known only to myself and another member, and, as we do not wish to depopulate it, but still would like others to have some benefit from it, we will send a specimen (mounted) to any person or Chapter especially interested in orchids who will pay the postage. W. X. Wholey, Sec., Baltimore City College.

We greatly regret that lack of space requires the postponement of many most interesting reports. Better work is done today in our Chapters than ever before. We shall have something to say later about a general Agassiz Association Museum. Meanwhile, reports from the Ninth Century (Chapters 801-900) should reach the President by November 1. All are cordially invited to join the Agassiz Association. Address the President, Mr. Harlan H. Ballard, Pittsfield, Mass.

SPECIAL NOTICE.

The following circular has been mailed to all Chapters of the Agassiz Association. If by accident any Chapter has failed to receive it, we trust this notice will be received in its stead, and a prompt answer returned.

AGASSIZ ASSOCIATION.
OFFICIAL BULLETIN.
PRESIDENT’S OFFICE, PITTSFIELD, MASS., OCT. 1, 1891.

At the year closes it is important that full and accurate statistics of our A. A. be prepared. You will, therefore, study return this paper at your earliest convenience with the blanks carefully filled.

1. Name and No. of your Chapter.

2. No. of Members, Active and Honorary.

3. No. of Members gained or lost in 1891.

4. Names and addresses of your present officers.

5. Permanent Established Members.

6. No. of Meetings held in 1891.

7. Did you celebrate Agassiz’s Birthday?

8. No. of Subscriptions sent to POPULAR SCIENCE NEWS in 1891.

9. If POPULAR SCIENCE NEWS is retained, how many new subscriptions could your Chapter secure?

Please inclose a special report of the proceedings of your Chapter since January 1, 1891.

Faithfully yours,

H. H. BALLARD.

PERSONAL OBSERVATIONS BY MEMBERS OF THE AGASSIZ ASSOCIATION.

271. MIDNIGHT RAINBOWS.—On August 18, 1891, a very heavy fog lay over the meadows and ponds of West Bridgewater. The moon was full, and at midnight was very near the meridian. As a friend and myself were returning home about midnight, we noticed some arc-shaped halos over every pond and bog, but took no particular notice of them until we came to some large tracts of meadow-land, where they appeared very spectacularly thick. Here they were so bright that we stopped to look at them. The largest and brightest spanned a small valley through which ran a brook. Here the arc was about a thousand feet from end to end, and perhaps a hundred feet high. The ends of the arc were easily visible on account of the bright white places they made on the ground. The white spots at the ends of the arc are appeared hemispherical, the flat sides being towards the moon. There was no trace of color, but the lower edges were darkest. A little way beyond was another brook, over which were several small arcs, placed at equal distances up the brook, which gave them the appearance of being concentric. The arcs were contained wholly in the fog and were lightest where the fog was thickest. —WILLIAM L. TOWER, West Bridgewater, Mass.

272. CARELINE INDIAN PIPE.—I have today found specimens of red Monotropa uniflora (or Indian pipe), and as Gray’s manual does not mention such a variety, I write to ask whether others have ever found it. The stems are bright carmine, the petals fawnish, and the ovary pod and stigma not so distinctly colored. There were two flowers, one perfectly white, growing through brown fallen leaves under a hickory tree where I was searching for nuts. I will send you specimens, but fear they will have become black ere they reach you. Both uniflora and hypopitys are familiar to me, else I should think I had made a mistake. Another fact is the latitude in the season; July and August produce them usually. You may wish to state in your report the fact that it has been brought to the little fungi about which I inquired (see February number) is Cypripedium cinnabarinus, order Listeroniaceae, —so given me by a Stockbridge member, C. L. Shear. —MARY A. C. AVERY, (Chapter 789), Ledyard, Conn., Sept. 29, 1891.

Can any of our readers state from actual knowledge how the bitter makes its call from which its local name “stake-driver” or “pumper” comes?

A VOLATILE COMPOUND OF IRON.—Ludwig Mond has succeeded in making a compound of iron and carbonous oxide. It has only been obtained in a highly dilute condition, but its properties have been sufficiently studied to indicate that it is Fe(CO)₅.
The local weather forecasts published for several years past by the Blue Hill meteorological observatory have been discontinued, owing to the inauguration of a similar service by the government weather bureau. As Mr. H. H. Clayton, formerly of the Blue Hill observatory, has been placed in charge of this department of the signal service at Boston, the public will continue to receive the benefit of the accurate and useful "probabilities" which have so long been a popular, though by no means the most important, branch of the work conducted at Blue Hill.

A marked decrease in the price of platinum is reported in European journals, owing to the discovery of a substitute for this valuable metal in the construction of incandescent lamps and other electrical apparatus. The substitute for this new metal substance is not stated, but if the reduction in price is a permanent one it will be very welcome to chemists, who are obliged to make use of platinum vessels and other apparatus in their work, no matter what the cost may be. Photographers, also, will be enabled to use the platinum process for making prints more extensively, and one firm has already reduced the price of platinum sensitized paper forty-five per cent.

Platinum has long been distinguished as one of the "noble" metals, and the term is in many ways an exceedingly appropriate one. No element is less changeable in its form, less acted upon by chemical or physical forces, or can be made to enter into combination with other elements with greater difficulty. Even when in combination its tendency is to escape and revert back to its metallic condition, as if any "enveloping alliance" was distasteful to this self-sufficient and aristocratical metallic monarch. Compared with tin, for instance,—an element which is never found in the elementary condition, and which only by the greatest care and skill can be made to temporarily stand alone by itself, and when released at once attacks and appropriates to itself every form of matter known to us except oxygen,—the first named metal seemed to be of a distinctly higher and more advanced type. In our present state of knowledge it would be unwise to speak positively of a system of evolution of matter, but the signs of a close connection between the different elements are so clear and striking that they cannot be disregarded; and if the hypothesis of the gradual development of their subatomic elements from a single primal form of matter is ever proved, it will undoubtedly be found that platinum occupies a place among inorganic forms of matter similar to that held by man in the great kingdom of animal life.

Nothing has been heard of the noble army of official rain-makers for some time, and the suspicion arises that they have probably "dried up and blown away." The late autumn and early winter are peculiarly well adapted for such experiments, as a fall of rain may be counted upon in almost any locality at intervals of a few days, and the "conditions" are extremely favorable for the success of any kind of rain-making experiments.

An amusing result of these experiments is the appearance of an unofficial class of rain-doctors, who claim the power to precipitate the atmospheric moisture by some occult means known only to themselves. An identical class of men is found in nearly every savage tribe, and the fact that the clairvoyants have been seriously considered by civilized communities in the United States, is an additional proof of the narrowness of the line which separates civilization from barbarism. With all our boasted enlightenment, the rain-maker, the faith-healer, the fortune-teller, the astrologer, and the alchemist all find plenty of dupes, and will probably continue to do so until human nature undergoes a radical change.

Speaking of modern civilization, we wonder how many of our readers have ever realized that its existence depends entirely upon a single natural product, of which the supply should be suddenly cut off, we should soon revert to a social and political condition resembling that of the Middle Ages. Our railroads, steamships, manufactories, electrical stations, and, to some extent, our telegraph lines, could not be built and operated without a continuous supply of coal. This product is furnished to us in the almost unlimited deposits of coal, which are, in fact, magazines of solar energy stored up in past geological ages. The rapid development of the Western States would never have taken place without the help of coal; and without the rapid and cheap methods of transportation and communication supplied by our railroads and telegraphs, the political integrity of the United States with its vast areas and diversified interests would be impossible, and at the best the country would consist of only a collection of separate independent nations constantly quarrelling among themselves. The formation of the German Empire from a collection of petty States is generally attributed to the statesmanship of Bismarck, but it was the German railroad and telegraph systems which first made it desirable and possible. The stability of the French republican form of government, and the radical political changes which have taken place of late in England, are primarily due to the same cause; and, in fact, almost everything which tends to increase the happiness and usefulness of the man of the nineteenth century over him of the seventeenth, has for its basis the stone of unoxidized carbon which lay hid in the earth for so many years. The environment of mankind has been greatly changed since the discovery and utilization of coal, and the conditions of society are not as yet perfectly harmonized with it.

Fortunately, the supply of coal in the earth is so great that the possibility of its exhaustion need not greatly disturb us. It is very different, however, with another and scarcely less important gift of Nature. The supply of wood and timber is constantly diminishing, and at the present increasing rate of consumption it cannot be long before all available sources of supply will be exhausted. More timber is annually destroyed by fire and waste than is used in the arts, and it is a matter of the highest importance that the greatest possible care should be taken of our forests, and that the present supply of timber should be utilized with a view to economy commensurate with its real value.

A recent performance of the opera of "Lohengrin" in Paris excited much opposition among the more disorderly classes of that city, and a determined, although unsuccessful, effort was made to break up the performance. It was discovered that, in furtherance of this enlightened plan, certain persons in the audience had provided themselves with thin glass bulbs filled with sulphide of ammonium, the idea being to deluge the stage and actors with this atrociously fragrant fluid. The applications of science would seem to be endless. Heretofore the overripe egg has been considered a sufficiently effective expression of disapproval at a dramatic performance or a political meeting; but in these latter days the art of the chemist is invoked, and the olfactory power of more embryonic chickens is concentrated in a small glass bulb which can be safely carried in the pocket. The most pronounced free trader could hardly object to a "prohibitory tariff" on this latest product of French manufacture.

We feel that we are doing our readers who are not members of the Agassiz Association a service in calling their attention to the advantages of that institution as an aid to the study of science in all its branches. Members of this Association have no assessments to pay, no fixed duties to perform, and are allowed the fullest liberty of action in every respect. They can devote all their time to it, or they can do nothing at all. By joining its ranks they can become independent observers and workers in every branch of science, and obtain all the benefit of the aid and cooperation of the members as a whole, and the special and extremely valuable help of the Corresponding Chapters and the Association Council, which comprises some of the most eminent scientists in the country. The long winter evenings are close at hand, and the formation or extension of local Chapters cannot prove otherwise than a source of the highest pleasure and benefit.

The Work of the Rain-Drop.

As every student of geology knows, the surface of the earth has undergone in past ages, and is even undergoing at present, the most radical changes. That the earth has undergone many changes when the earth had sufficiently cooled to allow the aqueous vapor in the air to condense and cover the surface of oceans of boiling water, change has succeeded change without cessation, although so slowly that the period of human history is too short to show any notable effect, and we are obliged to look to the records of past geological rocks and minerals laid beneath the surface to fully appreciate the results of the forces which have acted in times gone by. Mountain ranges higher than any at present existing have been raised up only to be worn down into sand, gravel, and clay, and spread out over the bottoms of ancient oceans, which in their turn have been raised up into dry land. Volcanoes have appeared in various parts of the world, covering large tracts of country with lava, igneous rock, and volcanic debris. Immense fresh-water swamps filled with luxuriant tropical vegetation have been transformed into the coal beds of the present day; beds of sedimentary deposits have been covered up by subsequent layers, and baked and transformed by the internal heat of the earth into rocks that can hardly be distinguished from the prismatic crust of the earth; while glaciers and ice-fields have now and again crept over the land, destroying all forms of life, and changing a country covered with luxuriant vegetation into an icy waste like that of Greenland at the present day.
Various geological forces have played their part in these transformations; the shrinking of the earth's crust and the volcanic forces beneath have caused the land to rise and fall above or below the sea level; the astronomical motions of the earth in its annual journey around the sun have caused the seasons to change from time to time, and perhaps even changes in the radiant energy of the sun itself have not been without their effect upon the earth. But above all other agencies the little rain-drop, insignificant by itself but mighty in numbers, has accomplished more than any other agency in the successive transformations which the face of the earth has undergone. A single drop slowly but surely, towards the ocean, and has been ever since the land was first raised above the water. In past ages the action of subterranean forces has raised the ocean beds and turned them into dry land, hills, and mountains, only to be once more returned to their native element. We cannot tell if these upheavals are to be repeated in future ages, but it seems more than probable. If not, then it is only a question of time—albeit an almost infinitely long time—when the surface of the earth will become of one uniform level covered with a shallow ocean, and, in the polar regions, surmounted by caps of everlasting ice and snow.

But the rain-drop is not the first cause of all the changes which we have noted. When resting on the earth it is powerless. To perform its work it must be raised up and transferred to the hillsides and mountain tops. Like all other forces on the earth, the force of the falling rain-drop and the rushing torrent has its source in the sun. The geologist can see in imagination the mountains and hills swelling away and following the lower lands into the sea; but not a rain-drop can fall. A pendulum (D) is suspended from a hook on the hillside, or a work of art is carried down its valley, except the water is first raised from the ocean by the same force that lights and warms our houses, that propels our railroad cars and steamships, that turns the wheels of all our machinery, and without which even life itself would be impossible. From the great central body of our system a constant stream of some mysterious manifestation of Nature is flowing to the earth; and the devastating force of the rain-drop, or the imperceptible fall of a snow-flake or rain-drop, alike have their origin in that which, in our ignorance, we are obliged to term the radiant energy of the sun.

A NOVEL LOCK.

The curious lock illustrated in the engraving (from La Nature) is the invention of a young Norwegian farmer, M. Isachsen, and is of more interest from the novel scientific principles involved in its construction than from its practical value. It consists of a bolt (B) which fastens the door, and is held in position by a weak spring (R). A pendulum (D) is suspended from a hook on the inside of the door, which, when set in motion, strikes an iron hammer (A), causing it to fall upon the head of the bolt and press it down so as to release it from the fastening of the door. A hole (C) is bored through the door opposite the bolh of the pendulum, which is set in motion from the outside by blowing strongly through the hole. The details of this mechanism are shown in the upper corner of the engraving.

The security of this lock depends upon the fact that several puffs of air are necessary to cause the pendulum to vibrate with a sufficient amplitude to reach the hammer, and each successive puff must be given at the exact moment when the pendulum passes the opening C on its journey towards the hammer; otherwise one might blow all day without unlocking the door. The exact time of vibration of the pendulum must thus be known to the person unlocking the door; and this is easily determined by a second pendulum, which he carries, consisting of a string to one end of which is attached a weight, and provided at the other end with a loop by which it can be conveniently attached to a hook on the outside of the door. This key pendulum is previously so adjusted as to

[Original in Popular Science News]

STUDIES IN PLANT BIOLOGY.
BY PROF. JAMES H. STOLLER.
VI.
THE APPLE-TRE.

Our last study related to the Gymnosperms, the first of the two great groups, or classes, of flowering plants. In the present study we have to deal with the second group, the Angiosperms, the highest class of the plant kingdom.

The Angiosperms include by far the greater number of the common plants of the fields and woods, and present an almost infinite variety in secondary features of form and structure. The majority are herbaceous and annual, the plant dying away after one season's existence; others are woody shrubs, lasting a limited term of years; and others are great trees of the forest—the largest and most enduring members of the vegetable kingdom. They are equally varied in habits; a few are aerial, a large number are aquatics, most are terrestrials. The smallest member of the entire class is an aquatic, the tiny duck-weed (Lemna trisulca) of the ponds; the largest member is Sequoia gigantea, the big tree of California, 400 feet in height, and enduring hundreds of years. There are a few plants in the group which have acquired the parasitic habit, deriving nourishment from the living tissues of other plants to which they cling. The curious insectivorous plants are also included in this class. But all these various forms fall into a single natural group by the fundamental similarity of their
organs of reproduction. These organs are what is ordinarily termed the "flower," though it will be remembered that in the botanical sense flowers are also borne by the Gymnospermae, being characteristic of the great primary division Phanerogamae. The flower of the Angiospermae is more highly developed, with the inner parts having been reduced when compared to the Gymnospermae. It presents a larger number of sets of parts, and of these the essential ones are distinctly different from those of the gymnospermous plants.

Following our method, we may make special reference to a typical plant of the group, and for this purpose we select, as a plant whose flower is familiarly known, the apple-tree. The reader is recommended to commence with the leaves as a distinct set of parts, and for comparison with the description below the flower of any plant now in bloom, whether growing in the field or under in-door cultivation.

The flower of the apple-tree, the beautiful and fragrant apple-blossom, looked upon from the point of view of structural botany, is made up of four sets, or whorls, of leaves. The lowermost whorl consists of five green leaves, called sepals, united below to form a cup or saucer, the whole forming the calyx. The next circle of leaves is the five colored petals, forming the showy part of the flower, and together constituting the corolla. Next are the dozen or more stamens, together making the androecium, inserted on the margin of the calyx. Finally, the uppermost whorl of parts, and nearest the nubule of the flower, is the group of female parts, which is a pistil. The lower part of each pistil is the ovary, and is adherent to the inside of the calyx. While the sepals resemble leaves closely enough, being green blades, and the petals are clearly leaves of white and pink color, instead of green, it does not appear at first sight that the other two circles of parts, the stamens and pistils, should be regarded as leaves. However, it is not to be doubted that they are simply modified leaves. Proof is afforded by studying the development of the flower, when it is found that each stamen and pistil begins as a tiny leaf-blade and grows into the greatly modified form seen in the flower. Further proof exists in the fact that in some flowers—the water-lily, for instance—there is a perfect symmetry between the lowest green leaf-like sepals to the highest (mostovulose) pistils of characteristic shape.

We need give particular attention to the pistils of the flower. The ovary below is surmounted by a delicate stalk, the style, which expands at the top into the stigma. If an ovary is cut across and examined under magnification it will be seen to consist of a hollow case containing two very small bodies, the ovules. A further use of the microscope shows that each ovule contains within a minute sac, the embryo sac, within which again is a simple cell, the embryo sacule. The embryonic sacule is the essential part of the pistil. It is the germ from which a new plant may be derived. Its development follows upon fertilization by a pollen grain, produced in the outer box-like upper portion of the stamen. The pollen-cell falls upon the stigma, sporulates, grows down the hollow style, penetrates the walls of the ovule and the embryo sac, and thus unites with the embryonic sacule. This cell then develops into a tiny miniature plant, remaining within the walls of the ovule, the whole thus constituting the seed.

Let us now notice the features of the flower, considered as a reproductive organ, which are characteristic of the Angiospermae. They are, first and most important, the closed ovary. The ovules—the parts destined to become seeds—are enclosed in a protective case, technically called the carpel, representing, in fact, a leaf folded until its edges have met and grown together. Now in the Gymnospermae the ovules are also borne on carpels, but they have not become transformed into protective cases. The leaf has only become convoluted (being only one layer of cells) and bears the ovules exposed upon its inner face. The second difference between the flower of the Angiospermae and that of the lower class is that the former possesses, besides the essential parts, which are the pistils and stamens,—identical in nature with those of the Gymnospermae,—subsidary parts, the sepals and the petals. That these are in fact merely auxiliary structures is evident when it is considered that they have no part whatever in the production of the seed. Moreover, absolute proof of their secondary importance is afforded in the fact that their parts are wanting altogether in some angiosperous plants. Of what use to the plant, then, are the sepals and petals? The former are simply protective, especially when the flower is in bud stage, where they enclose the other parts. The petals, at least in the case of very many plants, have a more important use. Their bright colors are adapted to attract insects, by the agency of which pollen is conveyed from the flowers of one plant to those of another, thus effecting cross-fertilization and preventing the deterioration of the species.

There is considerable difference between the two classes of flowering plants in respect to the minute structure of the wood. The Gymnospermae lack a definite vascular tissue. They possess no ducts for conveying the air and fluids through the plant-body, but are dependent upon their circulation upon a process of diffusion from cell to cell of the ordinary tissues. The physiological principle is the same in the two groups, only in the angiosperous one set of cells has become differentiated into a special vascular tissue. In respect to the general arrangement of the woody tissues there is a substantial similarity between the Gymnospermae and the exogenous Angiospermae—both having the ringed structure, each ring showing a year's growth.

In the preceding paper of this series it was pointed out that as we pass from the highest flowerless plants to the lowest flower-bearers there is no sudden change in structure and functions, but a gradual transition from one group to the other. In the present paper some suggestion is given of the continuance of this principle of gradual progressive change from the lowest flowering plants up the scale of life to the highest members of the vegetable kingdom.

UNION COLLEGE, SCHENECTADY, N. Y.

[Specially Observed for Popular Science News.]

METEOROLOGY FOR SEPTEMBER, 1891.

TEMPERATURE

<table>
<thead>
<tr>
<th>Average Thermometer</th>
<th>Lowest</th>
<th>Highest</th>
<th>Range</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>72°</td>
<td>85°</td>
<td>13°</td>
</tr>
<tr>
<td>B</td>
<td>73°</td>
<td>89°</td>
<td>16°</td>
</tr>
<tr>
<td>C</td>
<td>75°</td>
<td>90°</td>
<td>15°</td>
</tr>
<tr>
<td>Whole month</td>
<td>74°</td>
<td>90°</td>
<td>16°</td>
</tr>
</tbody>
</table>

Last 21 Septembers | 66° | 73° | 7° |
Second average | 66° | 72° | 6° |

This month has been remarkably warm, fair, and dry. The lowest point reached by the mercury was 50°, on the morning of the 9th and evening of the 30th, which last was the coolest day, averaging 55.06°. The highest point was 85°, on the 18th, which was also the warmest day, with an average of 75.33°. The 25th averaged 73°. The whole month was 3.58° above the average of the last twenty-one Septembers, and was the warmest, with one exception—that of 1881. The extremes are shown in the table. The mean observations the last half of the month averaged 4.53° warmer than the first half. No frost up to date.

SKY

The face of the sky, in 90 observations, gave 63 fair, 6 cloudy, 17 overcast, and 4 rainy,—a percentage of 70.0 fair. The average fair for the last twenty-one Septembers has been only 55.1, with extremes of 35.5 in 1882, and 77.7 in 1877. The percentage fair has been exceeded but twice in September during this period. An unusual number of days were noted "fine," and the mornings of the 22d and 27th were foggy. The beautiful, fine weather occasioned very frequent remark, and hastened the maturing of many fruits.

PRECIPITATION

The amount of rainfall the last month was 2.60 inches, all of which fell on the 7th, except 0.10 inch on the 13th, leaving the rest of the month desti-—with a slight trace only on the 29th—and threatening drought. The average precipitation the last twenty-three Septembers has been 3.02 inches, with extremes of .45 inch in 1877, and 9.88 in 1888. The amount since January 1 has been 43.57 inches, and the average of these five months 35.5, giving us an excess of 8.49 inches thus far the present year.

PRESSURE

The average pressure the past month was 30.092 inches, with extremes of 29.82 on the 14th, and 30.32 on the 30th,—a range of .50 inch. The mean for the last eighteen Septembers has been 30.032 inches, with extremes of 29.513 in 1876, and 30.110 in 1887,—a range of .195 inch. The mean daily movement the last month was .118 inch, while this average the past eighteen Septembers has been .125 inch, with extremes of .074 and .164. The largest daily movement was .30 on the 18th. The barometer was stationary at one-fourth of the observations.

WINDS

The average direction of the wind the past month was W. 10° W. N., while the mean for the last twenty-one Septembers was W. 64° 44' N., with extremes of W. 64° 30' S. in 1877, and E. 76° 0' N. in 1874,—a range of 168° 20', or about fifteen points of the compass. The winds the present month have been 13° or more northerly than usual, notwithstanding the high temperature. The relative progressive distance travelled by the wind the past month was just 50 units, and during the last twenty-two Septembers 589 such units, an average of 26.78,—showing much less easterly winds than usual.

Thus far in the year we have received 440° of heat above the mean of the same months for the last twenty-one years, equal to a daily mean of 1.61°. This surplus from the sun, with an excess of 8.49 inches of rain from the clouds, has resulted in rich harvests in the field and abundant—or rather superabundant—fruits in the orchard and garden.

D. W.

NATICK, Oct. 5, 1891.

[Specially Computed for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR NOVEMBER, 1891.

There will be two eclipses during the month. The first, an eclipse of the moon on November 15, will be visible throughout North and South Amer-
QUESTIONS AND ANSWERS.

LETTERS OF INQUIRY SHOULD BE ADDRESSED TO THE WRITER, WHICH WILL NOT BE PUBLISHED.

QUESTIONS REGARDING THE TREATMENT OF DISEASES CANNOT BE ANSWERED IN THIS COLUMN.

S. N. W., Maine.—What chemical reaction takes place in the clarifying of turbid water by alum? 

Answer.—Alum contains potassium aluminium carbo-hydrate of line in solution, and this decomposes the alum and precipitates the aluminas in a bally by virtue which, as it settles, mechanically attracts and holds particles which cause the turbidity and carries them with it to the bottom of the vessel. The process is analogous to the clarification of coffee by the coagulation of albumen, or the white of egg.

H. H., Boston.—What is the comparative lifting power of hydrogen and coal gas when used in a balloon? and if a balloon could be constructed equally as large as the common ones, how much greater lifting power than hydrogen—about five pounds additional per thousand feet?

Answer.—Pure hydrogen gas will lift about seventy pounds to the thousand feet. The power of coal gas varies with its composition and specific gravity, but is about forty pounds to a thousand feet. The lifting power is greatly increased by carbonic acid, which, instead of points. What is the matter?

Answer.—The lenses of the telescope are evidently out of adjustment, or, possibly, you do not understand the construction of the instrument. If you cannot get satisfactory results by turning the focussing screw back and forth, you should communicate with the manufacturer. The proper adjustment of the lenses would undoubtedly be a very easy matter by one acquainted with the construction of telescopes.

G. J. Way, Penn.—Are the anaesthetics ether and chloroform similar in chemical composition and structure, and is there anything in their composition to account for their peculiar effects?

Answer.—Ether is an oxide of ethyl, and has the chemical formula (C₂H₅)₂O. Chloroform is a tri-chloro-methane with the formula Cl₃C. Those are the primary elements of organic compounds; and, like nearly all organic bodies, there is nothing in their composition or molecular structure to account for the physical and especially the anesthetic properties they possess.

F. P. N., Chicago.—I see that the ring of the planet Saturn is at present invisible. What is the cause of this inscrutability?

Answer.—The ring is a very thin body and may be roughly compared in shape to a ring of paper. At certain points in the orbit of Saturn the edge of the ring may be seen, and it is therefore invisible to us. When the flat side is toward the earth it may be readily seen with telescopes of moderate power; but when the ring is reversed it is not visible. It is supposed to consist of an immense number of small satellites, or moons, revolving around the planet as the moon revolves around the earth.

LITERARY NOTES.


This magnificent work is a popular, simple, and non-mathematical exposition of a branch of science that is of great practical and special interest. Though intended for the drawing-room table rather than the desk of the student, it is written in a true scientific spirit, and is accurate and trustworthy. In the text there are a thousand pages of text, and is profusely illustrated with the original French engravings, which are accurate and trustworthy. To those who desire to become conversant with the laws and applications of this wonderful form of energy, we can recommend a perusal of this work, which no scientific library should be without.


The author of this work has endeavored within the compass of a moderate-sized octavo to take up a number of the more important chemical industries or groups of related industries, and to show in language capable of being understood even by those not specially trained in the existing conditions of those industries. A thorough and accurate presentation of the chemical principles involved in the various processes of manufacture has been given, and the work will be of value to those engaged in the several lines of manufacturing industry touched upon. It will also be a valuable work to the liberal reader or the student of scientific or economic topics.


This work is translated from the sixth German edition of Richter's invaluable text-book, and therefore presents the condition of the science of hydrocarbon chemistry as it is at the present time. The rapid and constant changes and progress made in this branch of science render the use of recent textbooks almost a necessity, and in this respect, the present work is a very convenient class-room guide for beginners in chemistry. It will be found extremely useful for such a purpose, and will be of great assistance to the instructor as well.


This work comprises the essays on house heating for which prizes were lately awarded by the announcing committee of the Institute of Researches of Heating, Ventilation, and Air Conditioning for erecting the best apparatus for a house of average size are given. We are disposed to consider this volume one of the most valuable works extant on house heating, for it presents accounts of how different men who are actively engaged in the work described. It is not a mere theoretical discussion of the science, but presents accounts of how different men who would do the same work under like conditions, and also of how the same results are reached by different methods. The opportunity of contrasting the several different systems of house heating now in common use which is presented is not the least important feature of the work.

An Introduction to Qualitative Chemical Analysis, by Prof. Deems Fall, of Albion (Mich.) College. This is an excellent little manual, and will prove of great service both to students and instructors of this branch of science.
POPULAR SCIENCE NEWS.

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Medicine and Pharmacy.

[Science.]

THE CURE OF CONSUMPTION.*

No words of mine are required to impress upon you the great importance of this subject, to express the intense interest that is universally taken in it, or to point out the far-reaching influence its public establishment will have upon scientific investigation. But it is, perhaps, necessary for me to say that I fully recognize the grave responsibility that rests upon any one who makes the statement that he can cure, and that I am completely justified in accepting that responsibility. Perhaps it may be within the recollection of some of those present that at the Birmingham and Manchester meetings of the association in 1886–87 I read papers giving the results of a series of investigations on consumption and chest types. I showed in the former paper that consumption was directly produced by the conditions that tend to reduce the breathing capacity below a certain point in proportion to the remainder of the body, and contended that it could be both prevented and completely recovered from by the adoption of measures that were based upon that interpretation of its nature. In the latter I adduced evidence that proved that the size and shape of the chest after birth solely depended upon the conditions to which it was directly subjected, and that the same relationship between the size and shape of the other parts of the body and the conditions to which they were subjected, and that this law obtained in the animal and vegetable kingdoms. The research, as a whole, showed that there was a complete series of types that had on the one hand extreme consumption, and on the other the finest type of health, directly produced by the same conditions to which they had been subjected. And I referred to the immense importance of the issues that were raised, both from a practical and scientific point of view.

At that time the evidence was mainly derived from experiments, although I had some most valuable and significant practical experience, and I found the generally accepted view was that the cause was extremely difficult, if not impossible, to practically apply that knowledge. Since then, however, the practical evidence of the relationship between conditions and types of chest has been irrefutably established at the Polytechnic. By the application of that knowledge in the ordinary routine of daily life, the members of the Polytechnic Physical Development Society, although engaged for many hours daily in all sorts of trades and occupations, some of them under very unfavorable conditions, have shown how greatly the chest girth, its range of movement, the vital capacity, and the power of inspiration and expiration can be increased. Last year, at Leeds, I gave the measurements of one hundred members. If you will refer to the table you will find the average increase of the chest girth was 1½ inches, that of the chest being 3½ inches, the second 2½ inches, and the first chest 2 inches. At a subsequent examination for the society's gold medals and certificates, the first three members had obtained an increase of 6½, 5, and 4% respectively, and although some of our best members are competing along the Polytechnic, and new ones joining us, I am glad to say that there has been an average increase of one-quarter of an inch in all classes. Many of the members are engaged in the trades that have a high rate of mortality from consumption, and not a few of them would have long been in the ranks of the consumptives had it not been for the efficacy of the directions given them by those who have recovered from the process—of ability and certainty of the measures that are necessary to secure the prevention of consumption have been fully demonstrated.

Whilst one part of the work has been practically applied at the Polytechnic, the practical application of the other has been equally successful in the medical field and among the inhabitants of the places where the Polytechnic has entered into medical details here, but I may state that by the cure of consumption I mean the possession and appearance of sound health, natural breathing from base to apex, a well-formed and fairly developed chest, a good range of movement, and vital capacity that have stood at least a twelve months' test. The cases that were referred to at Manchester in 1887 as having completely recovered remain well, and those that have subsequently recovered went through last winter without giving the slightest indication of a relapse. There has been no relapse in any of these cases of cure, and no failure. Up to the present the mortality of all the cases has been under ten percent., and has been limited to those who were most extensively diseased, and who were, in fact, in an extreme case of emaciation. But the series of cases is too small to have derived great benefit, and some of them will ere long take their places in the ranks of the cured. One of the latter has stolen a march upon me. He presented himself for life assurance, was accepted as a first-class life, and obtained a reduction in his premium. He is unquestionably well, but he would not allow my twelve months' test. There is not a sufficient number of cases to compare with the statistics obtained at the Polytechnic, but I may say the increase in the chest girth ranges from 1½ inches to over 4 inches. We have chest girths of over 38 and 39 inches, the range of movement varies from 3 to 6 inches, and the vital capacity greatly exceeds in some cases Hutchinson's standard of health.

I now wish to show you that the results that had been experimentally obtained have also been equally well obtained in the practical application of that research, that each part of the investigation confirms the other, and that they together form a complete and harmonious whole. Consequently I have also shown you that we now have before us and within our grasp the real cure for consumption, that we can effectually prevent its production, and that by united and continuous action in both directions we can, ere long, practically remove this curse of civilization from our midst.

What steps are to be taken to secure the great benefits of this advance in knowledge? Let me, in the first place, remind you that consumption is not a local process of the body, but is produced by a far more extensive and far-reaching process than that in which the lung is made up within its framework. It is produced by the removal of those who have a body incapable of that, and that it is directly produced by the habits and surroundings that tend to reduce the breathing capacity below a certain percentage of the health of the body. Obviously, the first thing that has to be done is to prevent the production of this disease, and for that purpose we must see that the body is used to the extent its size demands, and that the work it has to perform is carried on under conditions that are favorable to the body,—that is to say, we must so arrange our habits and surroundings that their tendency as a whole is to develop the lungs. Each act of man, each factor in his environment, tends either in his favor or against him. We must avoid as far as possible—and if possible altogether—those that tend to reduce the breathing capacity. Close, badly ventilated, or hot rooms, the inhalation of any kind of dust, the habit of taking small quantities of alcohol (termed "nipping"), stooping, positions that cramp or impede the full and free movement of the chest, the corset, or tight fitting clothes, overloading the body with clothes, overeating, and other conditions and combinations. And we must take care ourselves as far as possible under the conditions that tend to develop the lungs. We should spend as much time as possible in some form of active exercise in the open air, live in rooms that are in direct free communication with the external air night and day, summer and winter, and keep their temperature down. I ought to have the clothing quite easy over the chest at full inspiration, without next the skin, take a tub daily, hold the body erect with the chest thrown well forward and the shoulders held well back, get into the habit of taking deep inspirations followed by full expirations, and breathe through the nose. And we should go in for singing, swimming, gymnastics,—Ling's system by preference,—and for one or two hours daily, or perhaps for two or three hours a week, in the country, and that it is only by such care and by keeping the body this early, and maintain the temperature of the body by muscular exercise, I have briefly indicated the conditions that are favorable or unfavorable to lung development, and to that I will only add that measurements by the tape, the spirometer, and the manometer should be regularly taken, recorded, and compared with the standards that indicate a fully developed chest, and that it is purely a plain duty of each one of us to see that he stands well in that respect, for we can protect ourselves from the possibility of an attack of consumption by securing and maintaining a lung capacity far above the point at which the disease originates.

The second direction in which we must take action, if we mean to remove this curse of civilization from our midst, is to recognize its early symptoms and to promptly and adequately, those that have the great misfortune, to be its victims. This is the state with which we have to deal here. The lungs are being progressively destroyed by a process of irritation caused by more work being thrown upon them than they are able to effect, and this insidious process has been produced by their having been and still being subject to conditions that tend to reduce their capacity; and further, during the progress of these events, the other organs have become involved by attempting to perform compensatory work, with the result that the general health is more or less seriously compromised. Consequently, in order to adequately deal with this state of things, we must treat the lung under the following principles: To establish an equilibrium between the amount of irritation required to be effected and that effected, to enable the other organs of the body to perform their ordinary functions, to restore to the lungs their power of adjustment to their external conditions, and to obtain the above without producing indications of friction. That is, in other words, we must arrest this process of irritation, remove the greatest amount of irritation from the lungs to the required amount, in order to effect the cure of consumption. I will now briefly indicate the method of applying the principles above laid down. We must, to arrest this process of irritation, remove the conditions that impede the
effecting of those interchanges by placing the patient under conditions that tend to develop the lungs, and make good any deficiency that may remain by causing compensatory action by one or more of the other organs. We shall proceed with measures for the restoration of the functions of any organ that may have been deranged, and when we have obtained the arrest of the disease and effected an improvement of the general health we shall begin to develop the lungs. We must carefully select appropriate medicines and measures for each purpose we have in view, use them at the time and to the right extent, and watch their effects, so that if there be any indication of irritation we may at once effect the necessary modification or use some other medicines or measures for that purpose.

It is easy to cure consumption at the commencement, even when both lungs are affected. It can be cured when there is a large amount of disease, and it may be at least ameliorated when both lungs are extensively diseased. I speak from practical experience, and I for one will not attempt to place a limit upon the great power of Nature when all her forces are called forth and added.

The links of evidence slowly forged by men who have gone and by others still with us I have put together. Test the chain thus formed where and how you please, and you will find that it is complete and unbreakable. We have performed our part of this work, and in the name of those who have taken part therein I now call upon you to give effect to it by uniting together in the great work of suppressing consumption.

Early Botany and Materia Medica in England—Saxon Wortcraft.

The best view of Saxon wortcraft preserved for the student is afforded by the Saxon version of the "Herbarium" of Apuleius and the Saxon "Leech Book," edited by Mr. Cockayne for the Rolls series.

The MS. of the "Herbarium" selected by Mr. Cockayne as the basis of his text, Bibl. Cotton Vitellius, C. iii., dates from about the year 1250. It received considerable damage in the great fire at Ashburnham House, 1731, and to supply the lacunae in its text it has been carefully collated with the Bodleian and other MSS. of the "Herbarium." The latter part of the "Herbarium" contains a number of passages drawn from a Latin version of Dioscorides.

Apuleius, who is reported to have flourished under the Antonines, gives in his "De Herbis, sive de Nominalibus ac Virtutibus Herbarum" the names of medicinal herbs in the Greek, Latin, Egyptian, Persian, Celtic and Dacian tongues. After the name of the plant is given, there follows a short description of the plant, its place of growth, and its properties, together with the diseases to which the plant is applicable.

The Saxon MSS. follow the general plan of "De Herbis," while giving only the Saxon and Latin names, many of which, however, are inaccurate. For example, the "Centauria major," i.e., "churl," of the Herbarium is properly Chlorella perforata, while "Centauria minor," i.e., "churl the less," is Erthyrea centauria. Of "Betony thewort," the first plant treated of, we are told that "it is produced in meadows and on clean dowlands, and in shady places. It is good whether for the man's soul or for his body. It shields him against monstrous nocturnal visitors and against frightful visions." The roots of this wort were gathered in August and powdered for medicinal use. It was then deemed a remedy for sores, dim and bearded eyes, tooth-ache, indigestion, nausea, snake-bites, and for "foot addle," or gout. A decoction of the powdered root seems to have been drunk in most cases, but poultices of betony are recommended for sore throat and gout.

Other remedies for gout, which seems to have been a troublesome disease among the meal-drinking Saxons, were way-bread, tomentilla, powdered vorbascom, groundsel, or pellitory pounded with lard and tied to the foot; also of the tea or tisane of "Souch," according to some, "that is the reason prisoner." The directions for gathering the mandrake are taken from Dioscorides: "It shinieth at night altogether like a lamp; when first thou seest its head, then inscribe thou it instantly with iron lest it fly from thee; its virtue is so mickle and so famous that it will immediately fly from an unclean man when he cometh to it, homes as we before said, do thou inscribe it with iron, and so shalt thou delive about as that thou touch it not with the iron, but thou shalt earnestly with an iron staff delve the earth. And when thou seest its hands and its feets, (alluding to the curious tendency of the mandrake to assume a similarity to the human being by giving off two lateral branches above and ending in two great roots," etc.) in this manner, then take the other end and tie it to a dog's neck, so that the hound be hungry; next cast meat before him, so that he may not reach it except he jerk up the wort with him. Of this wort it is said that it hath so mickle might that what soever taggeth it up, that shall soon in the same manner be deceived. Therefore as soon as thou seest it be jerking, and then before he take it, it is mete in hand and, twist it and wring the ooze out of its leaves into a glass ampulla, or pitcher.

These directions for plucking the mandrake are as old as Josephus, who says in his "Wars of the Jews," "They dig a trench quite round about it, till the hidden part of the root be very small; they then tie a dog to it, and when the dog tries hard to follow him that tied him, this root is easily plucked up, but the dog dies immediately, as if it were instead of the man that would take the plant away; nor after this need anyone be afraid of taking it into their hands." He goes on to say, "Yet after all this pains in getting it, it is only valuable on account of one virtue it hath, that if it be only brought to sick persons, it quickly driveth away those called Denuous, which are no other than the spirits of the wicked that enter into men that are alive, and kill them unless they can obtain some help against them." The Saxon leech held the mandrake to be a specific for "devil sickness" and the evil eye, as well as the periwinkle (Vincet) and Artemisia vulgaris; but it was inestimable for its caustic, purgative and narcotic properties.

The Saxon remedies for insanity are many and curious. The lunatic was given a decoction of Terecum polion mixed with vinegar, or Ranunculus acris was tied with a red thread about his neck when the moon was on the wane in April or the early part of October. A more sovereign remedy is given for a insane person. If held over the lunatic as he lies, we are told "Soon he upheaveth himself whole, and if he hath this wort with him, the disease never again approaches him." The Leech book contains another mode of cure, certainly sufficiently drastic. "In case a man be a lunatic, take the skin of a porpoise, work it into a whip, swinge the man therewith, and soon he will be well. Amen."
therefore left undescribed. The Saxon translator has slavishly copied from his originals, instead of studying Saxon plants in the field, but both the Herbarium and the Leech book show that the Saxon leech was at bottom a herbalist and his craft 'wot' cunning.

[Specialty Compiled for Popular Science News.]

MONTHLY SUMMARY OF MEDICAL PROGRESS.

BY MAURICE D. CLARK, M.D.

THE HEALING OF TUBERCULOSIS.—That pulmonary tuberculosis is curable is demonstrated clinically by the recovery of patients in whose sputa elastic tissue and bacilli had been found, writes Dr. William Osher, and anatomically by the existence of lesions in all stages of healing. Cases areas may be impregnated with lime salts, or the tuberculous masses may be encapsulated by fibrous tissue, in which case the substance remains quiescent, and the disease is not cured. Perfect healing does not occur after cavi-
tures are formed. A cavity may be much reduced in size, but is not often closed. Laurence did much good work in this direction. He recognized the cicatrices compliles and the cicatrices fistuloses, and insisted that as tubercle growing in the galls, which was well-cored, often healed, we should not do the same in the lungs. In a large num-
ber of autopsies healed or quiescent tubercular lesions have been found in the lungs. This was noticed in 1880 by Palmer Howard, who called attention to the great frequency of puckering at the apices of the lungs in elderly persons.

The following is noted of the apices:

1. Thickening of the pleura, usually the posteric.

2. Puckered cicatrix at the apex, with subjacent indication of the lung tissue, for the distance of a few millimeters.

3. Puckered cicatrix with a cheesy or creta-

cious central nodule, and with scattered tubercules in the vicinity.

4. The cicatrices fistuloses of Laurence, in which one or more cavities have become quiescent, surrounded with fibroid tissue and communicating with the bronchi.

At 1,000 autopsies of his over 50 cases, or 5.05 per cent., were found in which persons dying of other diseases presented undoubted tuberculous lesions in the lungs. Of the 59 cases the causes of death were: Cancer of various organs, 12; cirrhosis of the liver, 7; accidents and operations, 8; acute fever, 9; meningitis, 5; diseases of the head, 5; other affections, 13. The ages of those cases: Under 10 years, 4; from 10 to 20, 2; from 20 to 30, 8; from 30 to 40, 10; from 40 to 50, 14; from 50 to 60, 14; from 60 to 70, 5; above 70, 2. Heftler, of Vienna, found in 1,562 cases in which the deaths were not directly caused by phthisis, there were 780 instances of obsolete tubercle, or 4.7 per cent. The simple fibroid indura-
tions were followed during such a well-defined period up to the sixteenth year the number of cases increased. Bollinger found in 27 per cent. in 400 bodies evidences of tubercular lesions in the lungs. Staudenker, in 737 cases, found apex cirrhosis in 202. Massini found evidences of healing in 39 per cent. in 235 bodies examined. Harris, of Manchester, found in 139 cases 54, or 38.84 per cent., in which there were relays of former active tuberculosis. The greater number of these were in the third, fourth, and fifth decades. In the Paris Morgue it is said that 75 per cent. of sub-

dies and those accidentally killed present evi-
dences of old and healed lesions.

These facts demonstrate, first, the widespread prevalence of tuberculosis; and secondly, the fact, as shown by the above figures, that at least one-fourth of all infected persons recover sponta-

neously. In the great majority of cases the disease was very limited and had made no progress, and could not have given rise to physical signs. But it is to be noted that many of these efforts, nor can they be too varied so long as life is not endangered. But I hold, after the knowledge of these failures and in view of the well-established fact that after the old operations for hernia recurrence has often been long delayed, that it is wise to drop the term "cure" and to estimate the value of given pro-
cedures by the relative proportion of relapses.

That plan will be judged the best which shows the smallest number of relapses in course of the longest period of observation. And such period ought to be at least five years. Furthermore, I believe that all procedures should be so devised as to insure prompt healing of the wound, and that the support of a truss should be lasted on from the time the patient leaves his bed.—N. Y. Med. Jour.

CHILDREN'S PULSE AND TEMPERATURE.—Dr. W. S. Shufelt publishes in the New York Medical Journal a series of thirty-five hundred comparative observations upon the pulse, respiration, and temperature of six children for three months, taken in one of the wards of a Washington hos-

pital. Nothing that would ensure accuracy seems to have been omitted, and the series will add its value to that of other similar observations, as well as bear witness to the painstaking of the observer.

CASES OF COCAINE HYPERESTHESIA.—Since the widespread use of cocaine in operations upon the eye, it has often been noted that it does not produce anesthesia in some cases, especially so in acute glaucoma and other inflammatory states. The 13th of March a, holy, 74 years old, was prepared for the operation for cataract. Both lenses were catarrhous, the left being most ad-
vanced, and against Dr. Galezowski's usual cus-
toms both were to be operated upon at the same time. There was some complaint of pain as had been used before and has been used since, at the same time, has concluded that it is simply a failure of the cocaine to control a high nervous person.—Rev. d' Oph.

THE CLOSING OF TREPHEINE OPENINGS BY CEL-

ULOID PLATTS.—A case was presented to the Vienna Medical Society by Hinterstoderler (Wien Med. Presse) showing the successful result of an effort to close a trephine opening by a celluloid plate. The patient, some months after recovering from a comminuted fracture of the left parietal bone, suffered from giddiness, weakness, loss of power in the right side, and chronic twitchings of the right facial region and the corresponding upper extremity. Three years later epilepsy de-

veloped. Examination showed a hyperesthetic
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SOME RECENT ADVANCES IN SOLAR SPECTROSCOPY.

BY PROF. C. A. YOUNG.

Within the last three or four years our knowledge of the solar spectrum and of the phenomena which are studied by means of the spectroscopic observation of the sun has made substantial progress; in the present article we propose to enumerate the principal advances, and to call attention to such as are specially interesting or important.

Our limits permit only a passing reference to the recent work of the veteran Janssen, who though no longer physically fit for mountain climbing, had himself carried to the summit of Mt. Elbert by a force of porters in order to study the detail which the fact that the sun's spectrum in the red region of the solar spectrum might be, partly at least, of solar origin, notwithstanding the undoubted fact that they are mainly telluric. His observations on the mountain, taken in connection with those he made upon the electric light on the Eiffel tower as seen from Meudon, have settled the question in the negative.

We must content ourselves also with little more than a mere mention of the great map of the solar spectrum published last year by the Nice observatory; the work of Thollon, who however did not live to see it finished. It extends from the red to the green, and is on a larger scale and more full of detail than any other yet issued; it is specially valuable for the manner in which it brings out the distinction between the telluric lines, originating in the atmosphere of the earth, and those which are truly solar, but on the other hand its scale is purely arbitrary, and this greatly limits its utility. On the whole the new edition of Rowland's photographic map, which now covers the whole of the spectrum except a small region at the extreme red end, is incomparably more satisfactory: it represents the ordinary appearance of the spectrum with the minutest accuracy, and bears an absolutely trustworthy scale of wave-lengths. Its only drawback is that when the sun is near the horizon it ceases to correspond to the appearance presented; the telluric lines become so numerous and intense as to transform entirely the whole aspect of certain regions of the spectrum, and the observer then is driven to Thollon's map as the only one of much use under the circumstances.

A new map of the spectrum, also photographic, is announced for early issue by Mr. Higgs of Liverpool, who has already produced plates exceeding in beauty and clearness of definition even the best of Rowland's; but his work has been done with Rowland grating, so that our American physicist can still claim a generous share of the credit for its excellence. In fact, the same may be said with reference to every piece of spectroscopic work we shall have occasion to speak of.

Dulong, in Sweden, has recently repeated the investigation of the sun's rotation as measured by the displacement of the lines of the spectrum at the eastern and western edges of the sun's disk. His results confirm those of previous observers, extend them to higher latitudes, and are far more precise. Incidentally he confirms an old observation of the writer's in regard to the structure of sun-spot spectra, finding them to be made up of fine, closely packed, dark lines, and not produced by a mere continuous absorption. This fact is of importance in its bearings upon the theory of the spots, but for some reason has remained without verification until now.

The most important piece of recent work in the line of solar spectroscopy is unquestionably Rowland's comparison of the solar spectrum with the spectra of the various chemical elements. It is, of course, to some extent only a repetition of work already done by others, but the new investigation is so much more thorough, and made with instruments of so much greater power that its results are incomparably more trustworthy. The work is not yet entirely finished, but has already greatly extended our knowledge, both by increasing the number of the elements recognized as present in the sun, and also in increasing the number of the lines identified as belonging to the spectra of the elements previously known. A large majority of the lines of the solar spectrum are now thus identified, and no less than thirty-six of the terrestrial elements are recognized with certainty in the sun, while eight remain doubtful, and fifteen fail to give any evidence of their presence after the most careful search; ten remained to be tried at the time when the preliminary results were published last spring. Of the sixteen elements added by this investigation to our former list, the most important are carbon, silicon, silver and zinc; the detection in the sun of the newly discovered and rare metal germanium is also interesting; gallium as yet remains in the list of the untried. The most conspicuous of the "absorbers" are nitrogen, sulphur, phosphorus, mercury, antimony and bismuth, while among those not yet examined are oxygen, bromine, chlorine, iodine and fluorine.

Hardly less interesting in the present work of Hale of Chicago and Deslandres of Paris upon the ultra-violet spectrum of the chromosphere and prominences as studied by means of photography. It has long been known that the two wide, dark bands known as H and K at the violet end of the solar spectrum are "reversed" in the spectrum of the chromosphere and in the neighborhood of sun-spots in the same manner as the hydrogen lines; indeed, this fact, in connection with some other circumstances, led some to suppose that these bands are really due to hydrogen, and not to calcium, as generally admitted. It now turns out that their observation by photography is as easy as their visual observation is difficult, and that in the spectrum of the chromosphere and prominences they appear as bright lines exceedingly thin and well-defined; in striking contrast with their width and haziness as dark lines in the spectrum of the photosphere. Moreover, if it is accompanied by a companion line just below it, and well within the dark shade. This line, which has been often observed visually, proves to be invariably present in the photographs; and the same is true of another line above K (just at the extreme limit of vision) which had also been occasionally observed before. The photographs also bring out a number of other lines (four at least); quite beyond the limit of visibility; and these six lines have all been unmistakably identified as belonging to the remarkable series of ultra-violet hydrogen lines which are so impressively conspicuous as wide black bands in the spectra of the great white stars like Sirius and Vega, but are missing in the spectra of the sun and of the stars that resemble it, that is as dark lines. Probably they are really present, but are comparatively faint, and masked by the heavy lines of other metals that crowd that part of the solar spectrum; at least this is the opinion of Rowland. But their detection as bright lines is very interesting as removing a puzzling anomaly.

The close coincidence of H with its hydrogen neighbor also explains another fact which has caused a great deal of perplexity; namely, that in the "Sirian" stars H is tremendously black and strong, and K, when visible at all, is very faint and thin; while on the other hand, in the spectrum of the sun and of the stars that resemble the
sun (Alpha Aurige, for instance,) H and K are about alike, and in some cases K is even the stronger of the two. The matter is now clear; in the spectrum of Sirius and its congeners the band at H is due to hydrogen, while in the spectrum of Capella it is mainly due, not to hydrogen, but to the same substance that produces the H and K of the solar spectrum.

These bands, as has been said, are generally attributed to 

to calcium, and this view may be correct; but a number of facts make one hesitate at accepting the conclusion as final. It is true that the spectrum of the metal in the electric arc presents two lines that coincide perfectly with the center of the two bands; but the other lines of calcium, which in our laboratory experiments are more conspicuous than these, seldom present themselves in the spectrum of the prominences, and when they do, only faintly, while H and K incomparably outshine the lines of hydrogen itself, and attain higher elevations. Moreover, in the photographs of the spectrum of the corona obtained during the eclipse of 1882, these lines dominate everything. The facts seem to indicate a gas lighter than hydrogen itself, and almost compel the belief that if they are really due to calcium vapor it must be calcium in a very different condition from any with which we are acquainted in our laboratories. But it is perhaps quite conceivable that under solar conditions the metal may assume an allotropic state in which its vapor-density becomes very low.

Mr. Hale has taken a further step in utilizing those two lines to enable him to photograph the prominences themselves, and with very fair success. The idea is not new; some twenty years ago the writer succeeded in getting a photographic impression of a prominence by using a spectroscope with a widely opened slit, and working through the hydrogen line near G in the blue part of the spectrum. The trial made it evident, however, that no practical result could be reached by the photographic processes then in vogue. But these bright H and K lines of the chromosphere spectrum, falling as they do, each in the center of a wide, dark space in the solar spectrum, are photographed with the greatest ease and accuracy. The old slit of the spectroscope it is possible. If the clock-work of the telescope runs accurately, to secure a really good picture of the form and structure of quite a large prominence. By fitting the instrument with a mechanism devised by Mr. Hale, such that the slit can be carried across the prominence while the sensitive plate is protected by a moving diaphragm, except where the image of the slit falls at the moment, it is possible to cover a much wider area with the picture. In fact, by an arrangement devised by Deslandres, one could photograph in a single operation the chromosphere and prominences around the whole circumference of the sun.

THE ASTRONOMICAL SIGNIFICANCE OF STONEHENGE.

There is no more interesting or more mysterious pre-historic monument in Great Britain than the wonderful group of "standing stones" which form so conspicuous an object upon Salisbury Plain. Volumes have been written as to the age and purpose of this monument, but absolutely nothing is certainly known. It was erected in an age and by peoples that have passed entirely out of human memory. The popular tradition considers Stonehenge to be a temple of the ancient Druids, but there is no historical basis for the belief; and, on the other hand, there is nothing to show that it might not have been such a temple.

Only a portion of the stones are standing in their original position at the present time, but enough are left to give us a good idea of the original plan of the edifice. It was composed of about 130 stones, and the general plan was that of a double circle of stones inclosing two ovals, which formed, perhaps, the sanctuary, or holy place, of the temple. The great circle was composed of enormous perpendicular stones, about twenty feet high, supporting a row of horizontal ones, as shown in the engraving, which are secured in their place by well-formed mortises and tenons. All the stones have been quarried and shaped by means of tools. Those of the largest circle are composed of sandstone occurring in the vicinity, while the stones of the interior circle are of a different nature, and must have been brought from a considerable distance.

In the center of the edifice is a block of stone called the altar stone, which is popularly—and probably correctly—called the altar stone. At some distance to the northeast, and standing outside of the circle, is a separate monolith known as the "Friar's Heel." It has always been stated, as showing the astronomical knowledge of the builders of Stonehenge, that on the 21st of June, or the summer solstice, the rays of the rising sun fell directly upon the altar stone in the center. If this were true it would show that Stonehenge was built by a people well advanced in civilization, and add weight to the theory that it was a temple connected with the ancient sun worship.

To prove the truth of this belief two English gentlemen, Messrs. Bacon and Howe, made a pilgrimage to Stonehenge on the night preceding the 21st of last June, and, placing a camera on the altar stone facing the Friar's Heel, patiently waited for dawn. As the sun appeared above the horizon the exposure was made, and the old tradition verified, as shown in the engraving—which is a copy of the photograph, and reproduced from La Nature,—the sun, as seen from the central altar, appears to rise directly over the exterior monolith. Evidently the ancient builders of this remarkable edifice must have had considerable astronomical knowledge to determine the time of the summer solstices so accurately.

Whatever may have been the history of Stonehenge, it remains one of the most interesting monuments of the Old World. It is a sight which no traveller in England can afford to pass by. Whatever its original design, whether for a sepulchral monument, temple of worship, or astronomical observatory, it indicates the expenditure of an immense amount of time and labor on the part of its pre-historic builders; and to the writer, who visited it some years ago, the ruins of this rude but massive structure, standing on the desolate plain, and surrounded by immemorial burial mounds and pre-historic remains, were far more impressive than the cathedrals and castles of more modern times, which are abundant in Great Britain, and were a striking and visible illustration of the impenetrable mystery which surrounds the origin and early history of the human race.

HORSE-POWER.—To an inquiry how to compute the horse-power of an engine, the Scientific American replies: Multiply the square of the diameter of the cylinder by 0.7854, and this product by the mean pressure in the cylinder. The mean pressure, assuming the usual practice in small engines at five-eighths cut-off, will be 0.92 of the boiler pressure. Multiply the last product by the speed of the piston in feet per minute and divide by 33,000 for the horse-power.

LOCUSTS.

BY S. L. CLAYES.

All our lives we have heard of the likeness which the locust bears to an immense army, advancing with a force so overwhelming as to defy resistance. We have been familiar with the dread but sublime description of their coming given by the prophet Joel. We have even had some experience—though happily slight—of their ravages in our own country. But however vivid the description of the prophet Joel, it is not equal to the stories which we have heard, which is a selection of what a swarm of locusts really means to the nations of the East.

Dr. William Thonson, in his account of one of their invasions into Syria, tells that early in the season a detachment of winged locusts passed
over the land, leaving behind myriad of their eggs, which had glued together in small heaps upon the sandy plains, plains of the Emirs—the
This flying squadron soon disappeared, but in less than two months the eggs began to hatch, and, apparently, the whole surface of the earth awakened into life. Each grain of sand seemed to have become a living, sentient thing. Presently this seething mass of nearly indistinguishable partic-
es developed until it could be seen that it was made up of the tiniest imaginable portions. The life in this mass was not the result of any apparent adaptation upon their life task of destruction, all moving as vigorously in one direction as if swept by a single will—a crawling, jumping host of living atoms.

Dr. Thomson was upon horseback when he caught his first glimpse of an extraordinary and puzzling spectacle. He could hardly persuade himself that he saw aright, but surely the whole surface of a bare patch was agitated—moving; more than this—a thin layer seemed to be peeling off and rolling down its sides. It looked like quicksilver; no, too thick for quicksilver—it was more like mortar. What could it be? His interest was greatly excited; so was that of his horse; but while he was eager to approach and examine, the horse was strongly of the opinion that it was well to keep at a distance and have something behind them. Rebellion followed; but, fired by scientific zeal, the doctor left the animal only half conquered, dismounted, and came close. He found his mortar was a living mass of infant locusts—wingless, even too young to leap—that had started rolling down hill for some cause best known to themselves. Perhaps it was only accidental, but who can say what access of heavenly terror might have swept over them at the heavy tread of the approaching horse.

Some years later Dr. Thomson was privileged to form a more intimate acquaintance with these small mops of destruction, this time grown to their full size, though wingless. He was living upon Mount Lebanon when the locusts were reported to be coming towards the mountain in force. The people put forth every effort to stay their progress, but without success; and soon the whole surface of the earth grew black with the on-moving of their steady ranks. They sealed the rocks; they clambered over walls, hedges, ditches; whatever came they surmounted, never turning aside for any obstacle—not even for the ancient and mysterious refuges of the Christian and Moslem races. Their ravages are incalculable compared with the terrible destruction they have wrought in Africa and some Asiatic countries, notably Arabia and its neighboring regions.

As each blessing has its bane, so every bane should bring its good along; and the good of the locust is that, while it destroys all else, it can in its own person furnish that which will sustain life in both beast and man. All kinds of birds as well as quadrupeds feed upon it greedily. At first, doubtless, from necessity, when the locust had left him nothing else to eat, man, too, tried the little creature as a food, learned to relish its flavor, and has since continued to eat from choice. Some of the Arabs boil their locusts and then dry them in the sun or simply fry them by soaking in oil; and again others preserve them in brine, perhaps drowsing them afterwards. They are also roasted, or fried in butter, and eaten with honey. Besides this, they are often dried and ground, and the flour-like substance resulting is made into bread. They are even offered for sale in the markets of Arabia, Syria, and Egypt. The Afri
cans are known to boil them in their own urine, which the locusts fly into the flame, their wings are burned, they fall, and are roasted; then the bush
man draws them forth, eats, and is happy. Some Europeans do not fancy their nut-like flavor, especially at first, while others find them palatable.

Lady Anne Blunt tells of riding through a part of Northern Arabia where a swarm of locusts had hatched, leaving behind them a carpet of black dust. The locusts ate these as a relishing morsel with their provender, and her greyhounds picked them up all day, eating a great many of them. She says they were regularly used in camp as a part of the day’s ration, and thought a very fair substitute for vegetables, their flavor being somewhat like that of wheat still in the milk. After trying the many different modes of cooking, all the Europeans agreed that they pre-
ferred them simply boiled. When cooked they took the creatures defiantly by the wings, pulled them off, and then, with much relish,” Lady Anne, when she first tasted them, thought them “fairly good,” but soon came to consider them “a most excel-
ent article of diet.” During her visit to Arabia many of the tribes were wholly dependent upon locusts and camel’s milk for their food.

Dr. Livingstone considered locusts very good eating, and begun highly prized by the natives of South Africa as affording a nourishing and wholesome food for man, birds, and beasts. Their domestic animals—horses, cows, and sheep—fatten upon them, while they are devoured in great numbers by antelopes, hyenas, and jackals, and even elephants and leons do not disdain to eat them.

[Original in POPULAR SCIENCE NEWS]

MODIFICATION OF OUR CLIMATE.

BY JOSEPH WALLACE.

Every how and then some weather sage predicts extremely cold winters, and another vent-

tures to say that the sun is gradually losing heat and in time Arctic cold will prevail over the whole surface. Whatever may have been the changes during the vast cycles of time prior to the advent of man, or whatever may be the changes in the time to come, one thing is quite certain: that our climate has been much modified within the past two or three thousand years.

“Have there been fifteen climatic changes since the beginning of the glacial age, each change lasting 10,000 years, and each change reversing the season in the two hemispheres, the pole which had enjoyed continuous summer being doomed to undergo perpetual winter for 10,000 years, and then passing to its former state for an equal term. The physical changes upon the earth’s surface during the past 80,000 years modified the changes of climate even in the Arctic regions, so that the intense cold of the former epochs was much modi-
died during the latter epochs.”

Reckoning these climatic changes in their order, we had entered the epoch of a more genial tem-
perature about fifteen hundred years ago; and if no disturbing change takes place during the pre-
cent epoch, we may reasonably expect a gradual modification of our winters for nine thousand years to come. The changes to intense cold from the epoch of the glacial age is unlikely to be as abrupt as the glacial period are supposed to have been caused by the high temperature of the north pole as com-
pared to that of the south pole, owing to the dis-
tribution of land around the two, the south having almost none. Dr. Croll thinks it was caused by the varying inclination of the earth’s axis, which produc-
ed the relative position of the two poles which was not as rugged as it is at present.

Dr. James Grelle agree with Croll on the reverse of seasons every 10,000 years during certain periods of high elipticity of the earth’s orbit.

But it may be asked, “How could the fauna and flora propagate themselves under such condi-
tions?” The flora itself at the Quaternary Age was propagated by the flood, which not only knowing this from the little which is left us, but more especially from the presence of a large number of herbivorous animals—stags, horses, elephants, rhinoceros, etc.—which animated the plains and valleys of Europe and America at that time. Evidently they could not have lived and propagated them-
selves without abundant vegetation for nourishment and development.

That which has deceived the adherents of the
glacial theory, as understood in its absolute sense, is, they have generally placed a too high estimate on its extent and intensity. It needs but a little effort of the reasoning powers to come to the conclusion that the earth had cooled to the degree that all animal and vegetable life could exist upon it, and that a portion of the earth’s surface permanently frozen, and incapable of receiving any living being, would for all time be entirely inhabited by glaciers. Again, they have attributed to the glaciers the rocks, gravels, and other material which they have found spread here and there long distances from the mountains. The transportation of the so-called erratic rocks has appeared inexplicable in any other way, and the piles of rock and gravel have been considered so many moraines, that is, deposits of diverse material transported by the glaciers. They do not regard the probability of other agents taking the place of glaciers, and undervalue the moving power of water. Water in liquid state has often produced analogous effects, and it has often been the error of the glaciers with the ancient writers to confuse the erratic rocks and the moraines are undoubtedly the ordinary indications of the ancient glaciers, but, taken isolatedly, they are not sufficient proof. In order to convince them they should be accompanied with a third indication, which is the presence of striated rocks which we find in the neighborhood of our actual glaciers. When all these signs are together and not isolatedly a probability of error, but one alone is not sufficient, because it can be the effect of another cause.

No doubt the temperature was really lower at the Quaternary Age and at the epoch generally assigned to man’s advent in European countries, but the difference was not so great as some say. A lowering of four degrees is sufficient to explain the ancient extension of the glaciers. We can look on this figure as the maximum, for it is proved today that humanity played the main role in the glacial phenomena. The beds of rivers and the alluvia are there to tell that all the water was not in a solid state at that time, that the glaciers were much more extended than in our days, and that the courses of the rivers were infinitely more abundant. Lowering and melting of water can reasonably reduce the extension of the ancient glaciers, the lowering of the temperature at the Quaternary Age, and account for the uninterrupted life of the fauna and flora. However, we must not fall into the opposite excess and assert, as some have done, that the glacial period is comparatively recent, the traces of which are too plain and fresh in some localities to assign to it an age prior to man, and that the temperature has rather lowered itself since this epoch. The ancient extension of the glaciers has been followed by a corresponding growth and extension of animal life, thus proving that the permanence of glaciers is a wise provision and absolutely essential to man and the high orders of animals and vegetation.

The ancient extinction does not prove alone that it was much colder than in historic times, for the animals themselves are proof of this. At that time the plains of Europe, and of France in particular, were animated by herds of reindeer, gluttons, camels, and marmots, which one does not find today except in the higher latitudes or more considerable heights. The mammoth and rhinoceros are examples to this, for ice was always in the north and they were organized to live in cold countries.

Space will not permit us to pursue this point further, or speculate on the probable climatic conditions of the Ice Age; but we can carry ourselves back a few thousand years and describe the climate of Europe and neighboring countries of Africa and Asia. Herodotus describes the climate of Scythia in terms which would indicate in our day the countries of Lapland and Greenland. He shows us the country completely frozen during eight months of the year; the Black Sea frozen up so that it bore the heaviest loads; the lakes in the north, covered with a two-months’ snow; the Danube, Rhine, and other rivers, frozen up for three months, and watered in summer by the abundant rains which gave to the river its violent course. The historian adds that the ass cannot live in Scythia on account of the extreme cold which reigned there. The following century Aristotle makes the same remarks concerning Gaul. His contemporary, Theophrastus, tells us that the olive-trees did not succeed in Greece more than five hundred furlongs from the sea. We can assure ourselves that both the ass and the olive thrive in these countries at the present day.

Three centuries later, Caesar speaks frequently and emphatically of the rigor of winters and early setting-in of cold in France, the abundance of snow and rain, and the number of lakes and rivers frozen over with ice, which served as obstructions to the army. He is careful not to undertake any expedition except in summer. Cicero, Varro, Posidonius, and Strabo insist equally on the rigor of the climate of Gaul, which allows neither the culture of the vine nor the olive. Dioscorus of Sidon confirms this information: "The cold of the winters in Gaul is such that almost all the rivers freeze up and form natural bridges, over which numerous armies pass quite safely with teams and baggage; in order to hinder the passengers to slip out upon the ice and to render the marching more secure, they spread straw thereon." Virgil and Ovid insist on the severity of cold in the regions of the Daunae. The first describes the inhabitants of these miserable countries with drawn faces and pale cheeks, wearing skins which shield them from the cold. Virgil, who had passed several years of his life in that region, is more precise in his description. He says the wine has changed itself here (Black Sea) into a solid frozen mass; one gives it to drink by pieces. Fearing of being accused of poetical exaggeration he adds, he appeals to the testimony of two ancient governors of Malia, who said that... like himself. The author who would give such accounts of the Black Sea in our days would risk his reputation for veracity.

Italy, too, experienced its part of the cold in early days. Virgil tells us of the snows being heaped up, rivers which carried ice along, the sad winter which split the stone and bound up the edifice of large streams, and all this in the warmest part of Italy, at the base of the walls of Taranto. Heratius affirms that the Socrates, a neighboring mountain of Rome, was whitened with thick snow, rivers frozen, and the country covered with snow. Today the snows stay very little upon the Socrates and never in the country around Rome. During the four or five centuries which followed, and the... in the south of France, in Turin, and in the mountains of Savoy, in the south of France, and in the Alps.

There is everything to show a modification of climate in our own days. If this goes on in the future as in the past, there will be a marked difference in the temperature two or three hundred years from now. Even a degree in a thousand years would effect a great change in the course of time. The lowering of four degrees established the ancient extension of glaciers, though it did not interrupt animal or vegetable life. Fifty-four of the fifty-seven species of Molluscs have outlived the glacial age, and all our savage animals—even the sabre-toothed lions—passed through this glacial period, and now inhabit a region equally as the Quaternary, and were contemporaneous with the great extension of the glaciers.

[Original in POPULAR SCIENCE NEWS.]

SULPHUR.

By George L. Bridgett.

One of the important elements used in the arts and in manufactures is sulphur. It is a comparatively abundant substance, wide-spread, and was known to the ancients by the name of brimstone. Being an active chemical element, it is found in numerous combinations with other elements, and also in the free state. Most of the free sulphur used in commerce comes from Sicily, but it is also found in large quantities in the United States, in the free state, and always in the vicinity of volcanoes. When found in this state, it is mixed with earth, from which it has to be separated. The separation is carried on by heat, which melts the sulphur, leaving the earth. The earth is first put into an iron pot and heated; the sulphur melts and is taken out and put into cold water, where it solidifies.

The remaining earth contains a little sulphur, which is obtained by distillation. It is placed in earthen pots in a furnace, and the sulphur melts. The pots are so arranged that they connect with other pots outside the furnace, which act as condensers, and into which the melted sulphur flows. There is an opening at the bottom of the condenser, through which the sulphur flows but into water, where it becomes solid. The sulphur is now in the rough or crude state, and must be purified. The process is carried on in a large brick furnace. The sulphur is put into an iron pot at some distance from the fire, where it melts and runs down through a pipe into another pot nearer the fire; here it boils and is vaporized. The vapor passes into a large brick chamber, upon the walls of which it condenses in solid form. The sulphur is known as flowers of sulphur. Gradually the walls become hot, and the sulphur melts, flowing down to the floor. At the bottom of the chamber there is an exit, through which the melted sulphur flows out into wooden moulds, in which it receives the form of a stick or roll.

When sulphur is found in combination with other elements, it is separated by different means. Considerable quantities of it are obtained in England from iron and copper pyrites. In this process, a quantity of brush wood is spread upon the ground, or upon a layer of broken pyrites. On this brush is placed about two thousand tons of ore, a space being left for a flue. The pile is fired by dropping lighted brands into the flue, and the sulphur melts and runs out, collecting in culverts. About twenty tons of sulphur are usually obtained from such a pile.

Sulphur [S, II, IV, VI, s] is a light yellow, solid, brittle substance, with a vitreous lustre, and breaking with a conchoidal fracture. It has a hardness of about 2½, is very inflammable, burning with a blue flame, and in a mass with a bar of wood or wool, it becomes negatively electrified, but is a bad conductor of electricity. It melts at 112°, forming an amber-colored liquid. It heated above 180°, the liquid turns dark and grows thick.
rises, the liquid grows thicker, and its color deepens, until, at 200°-250°, it is nearly black, and so thick that the dish containing it may be inverted and none of the paste will run out. Then it begins to grow thin as the heat increases, forming a brown gas at 440°, the boiling point.

Sulphur may occur in three allotropic forms, which are distinguished by their crystalline forms and solubility in carbon bisulphide. The ordinary form is black, which is converted into the grey variety by evaporating carbon bisulphide in which sulphur is dissolved. The crystals are in the form of rhombic octahedrons, yellow and glassy. The second kind takes the form of oblique prismatic, slender, needle-like crystals, which are made by melting sulphur and allowing it to cool, so that a surface crust is formed. The crust is broken, and the liquid beneath poured off, leaving transparent crystals. These are not permanent, but in a few hours, grow dull and fall into minute rhombohedral forms. The third form is black sulphur, which is made by pouring liquid sulphur at about 280° into cold water. A soft, gymnai mass is formed, which may be drawn into strings. These grow darker as the temperature is raised. When left to themselves, they change in about an hour to the rhombohedral form, becoming yellow, opaque and brittle. Hence, the only permanent form is the rhombohedral.

Sulphur combines with numerous other elements. With hydrogen, it forms sulphuric hydrog; with oxygen, sulphur dioxide and sulphuric anhydride; with carbon, carbon bisulphide. It is also found in minerals, where it forms sulphides and carbonates in the process of manufacturing. It is used extensively in matches, gunpowder, sulphuric acid, and other things.

SCIENTIFIC BREVIETIES.

To make cloth that is used in lining shoes waterproof, use oiled silk, or heat the linings in melted paraffin.

ALLOTROPIC FORMS OF SULPHUR.—According to Industries, two novel modifications of sulphur have been recently discovered by Engel. The first, bisulphide of sulphur, in the pure state, is a crystalline substance, is soluble in water and very unstable. The other is crystalline, soluble in carbon disulphide and chloroform, and polymerizes slowly in the cold, and quickly at a temperature of 100° C.; but, unlike prismatic sulphur, which changes on keeping into the octahedral variety, it becomes converted into the white insoluble form which commonly constitutes so large a percentage of the material known as "flowers of sulphur."

NATIVE IRON OF TERRITORIAL ORIGIN DISCOVERED IN THE GOLD-WASHINGS NEAR BEREZOWKA.—The metal is very magnetic, but manifests no polarity. Its specific gravity, determined on a specimen weighing 33.821 grams, is at 17°/°7.50. A surface cut and polished is brilliant and of the ordinary color of iron. If treated with an acid it is attacked uniformly without giving the well-known bismuth-like figures characteristic of meteoric iron. This fact, taken along with the absence of nickel, leads to the inference that this iron is not of extra terrestrial origin. Small quantities of platinum are present, probably from a mixture of ferriferous platinum with the native iron.

SUN SPOT PHENOMENA.—A luminous outburst in the sun was observed by M. Trouvelot at 10.16 A. M., Paris mean time, on June 17 last, and has now been fully described by him to the French Académie des Sciences. First, a luminous spot appeared on the disk of the sun near its western limb. It was of a golden yellow tinge, and shortly afterward a companion spot appeared a little above it. The spectroscope showed the first spot to consist of a central eruption, from which volcanic bombs were thrown to heights above the chromosphere, where they seemed to rest as dazzling balls. A few minutes later these were replaced by brilliant jets, or filaments. On the next day, June 18, at 9.30 A. M., the eruption was again observed, and it finally ceased at 2.45 P. M.

PRESSURE BY ELECTROLYSIS.—According to Nature, an interesting experiment has been lately made by M. Chabry of the Société de Biologie, with regard to the pressure which can be produced by electrolytic generation of gas in a closed space. While the highest pressure before realized in this way was 447 atmospheres (Gascolet), M. Chabry has succeeded in getting, as high as 1,200 atmospheres, the resultant pressure being 9,975 atmospheres.

RAPID PHOTOGRAPHY.—The Photographic News says that the great progress that has been made in the methods by which rapid movements can be analyzed is well seen in a series of photographs lately taken by Anschütz of Lissa, who has already given to the world some of the best instantaneous pictures ever taken. The subject of the pictures under consideration is a dog jumping over a small bush. In the act of making one jump the animal has been photographed four times, and each picture is not a mere silhouette, as was the case with Muybridge's first attempts of this kind, but a little picture, showing half-tone and detail. Some of the attitudes are, of course, comic in appearance, for they represent phases of a movement which the eye is accustomed to, and cannot possibly appreciate. Notably is this illustrated in the photograph of the dog's hind feet only touching the ground, and again at the finish of the jump, when his legs are gathered together in a heap.

AMMONITE, A NEW EXPLOSIVE.—A new explosive, called "ammonite," invented by Sir George Elliot, has recently been tested in England. It consists of pure ammonium nitrate and nitrophilanthite, both of which substances are in themselves innoxious, but in intimate combination form a highly explosive compound. The ingredients are dried and separately ground, and are afterward incorporated in edge-runner mills under a moderate heat. The resultant is a yellowish powder, which is sifted and filled into metal cartridges. The method of exploding ammonite is by means of a fulminate of mercury detonator, which is not contained in the cartridges as supplied by the company, but is inserted by the Explosives Department at the moment of firing. The experiments seemed to show that the new substance would not explode by concussion; it does not freeze, and can be detonated while chilled; it is in no way affected by variation of temperature; its power is equal to that of robustite. It is stated that ammonite has been in successful use at the Russian collieries, South Wales and Silesia, for a considerable lapse of time, and that no flame has been seen or accident occurred. The company exploiting the new invention claims that no fumes are caused by the use of the new explosive.

DOES THE AGASSIZ ASSOCIATION EDUCATE?

It gives us pleasure to print the following testimony to the value of our Association as an educational power. We have already published many similar letters, but each new one carries with it too much encouragement to be lost in the wastebasket.

Chapter A, of Cleveland, O., has made no report for several years. We were always limited to five or six workers. At last came a time for separation. A. E. Allen went to Southern California for his health, but did not long after; A. B. Wurzel made a specialty of chemistry, and, after teaching a while in a Medical college, went to Germany to study; Philip Cohn went to Lehigh University to continue mining engineering and botany; Fred Coleman went to Lehigh University to study civil engineering; and I have spent several summers as assistant to a geologist. And so it goes on; and when we used to meet in "A. A. 147," we know that we owe much to the Association; for we spent several years in good, faithful work together, with the result that now each living member is pursuing some branch of natural science as a vocation; and we still add one another by correspondence.

S. P. BALLOWS.

DIAMONDS IN METEORIC IRON.

This journal, as well as nearly every daily and weekly paper in the United States, has had notices of the discovery of diamonds in meteoric
iron. Prof. A. E. Foote, of Philadelphia, recently read a paper announcing this discovery at the meeting of the American Association for the Advancement of Science. From this we learn that the diamonds are small but plainly visible. They are the hardest variety known—the black diamonds used for pointing diamond drills. A small white diamond was also found.

Why has so much interest been shown in this discovery which has been anticipated for many years?

Because, Professor Foote claims, it confirms the theory advanced by Sir William Thompson twenty years ago, that the first gems of life were brought to this globe by meteors. Diamonds, like coal, are supposed to result from changes occurring in vegetable matter; and if plants existed, then there may have been animal life—and so we may have approached one step nearer the solution of the question to which the wisest brains have given so much thought for ages.

The geological source of diamonds themselves has never been satisfactorily explained. They are scattered all over the world in unexpected places without any apparent reason. It was suggested by the Washington geologists that they came from decomposed meteors that had fallen on the surface of the earth for unknown centuries, and that even the great deposits at Kimberley were due to enormous masses that had fallen there, producing curious sink holes similar to the "crater" on the site on which Professor Foote found the most of the pieces at Canon Diablo. We hardly suppose that this theory, supported even by the visible diamonds, will cause another excitement in Arizona.

Professor Foote's complete paper may be found in the American Journal of Science and Arts for November.

274. A HERD OF BUFFALOES.—Since coming here I have seen quite a sight for an "easterner," I.e., a herd of about seventy-five buffaloes. They are all owned by one man, and are kept in a large pasture. This is said to be the largest herd in the world. Last week ten of them were sold to an Englishman for $500 each. These creatures are quite tame; we drove into the field and they allowed us to come right up to them.—A. H. Ferguson, McCook, Nebraska.


While at points remote from civilization during the past summer, I often noticed cows eating bones. It was an interesting and amusing sight. Today, on my return to camp, my assistant told me that a cow of mature years had entered camp during my absence and devoured two full quires of sixty-pound manilla wrapping-paper that were lying just outside the tent door.—Frank S. Ellsworth, Assistant Geologist, State Geological Survey.

[It is sincerely to be hoped that the appetites of our domestic cattle will not continue to develop in this alarming direction. We might some day realize that old dream of Pharaoh about the seven lean kine devouring seven fat ones; and the point would be broken from that excellent story about Cuvier, whose quick wit turned the joke on a young man who tried to frighten him. You remember this youth disguised himself as his satin majesty, and leaped from the shabbiness at Cuvier as he was walking pensively in his garden, roaring out, "I'll eat you! I'll eat you!" Cuvier surveyed him a moment critically, and remarked: "H'm! Horus; hosts; herbivorous:—you can't do it, sir; you can't do it!" Cuvier could not have retained so great composer had he been aware that cows can, on a pinch, feast on old bones and full quires of wrapping-paper.—Ed.]

276. WHERE WAS THE OTHER LIZARD?—Last spring I sent north two specimens of Phrynopoma platiceps. They were alive, packed in cotton in a box 6 in. X 3 in. X 5 in. The box was securely tied, and travelled about 1,300 miles. When opened there was but one lizard. Is it probable that one "Phryne" ate the other?—Frank S. Ellsworth, Assistant Geologist, Austin, Texas.

THE A.A. AT THE WORLD'S FAIR.
Pittsburgh, Oct. 19, '91.

At the latest meeting of Chapter 27, A. A., the members were of the unanimous opinion that the Association should be represented at Chicago in some manner in 1893. If we cannot have a special exhibit, we should have a place where we can meet our fellow-members.—Clara Bright, Sec.

NILES, MICH., Oct. 17, '91.

By all means have an A. A. headquarters at the Columbian Exposition. The Gray Memorial Chapter is to have a reunion there; and even if it does cost something, there will be payment in full in the pleasure of knowing that there is at least one place where strangers in the city can be sure of a welcome.—Ralph Ballard.

WEXFORD, MICH., Oct. 15, '91.

By all means let us have a room for headquarters of the A. A. at the World's Fair. Let every member who visits there enter his name in a register, with his Chapter and Chicago address during the fair.—M. L. Leach, Sec. Isaac Lee Memorial Chapter, A. A.

INDEPENDENCE, IOWA, Oct. 24, '91.

I was much interested in the article in the News in regard to an Agassiz headquarters at Chicago in 1893, and approve of the plan.—Morris Sanford.

The foregoing may suffice as samples of the letters received regarding our proposed headquarters at the Columbian Exposition, and, as not a dissenting voice has been heard, we take it to be the unanimous opinion that the plan should be carried into effect. The entire committee cannot be announced at once, as it will require correspondence to ascertain who can serve; but as soon as necessary details can be arranged, due notice will be given. Meanwhile we desire to bear from every Chapter and member interested. We shall be glad to receive and consider suggestions from all as to the best means for making the plan successful, and we shall be glad to receive the names of such members of the A. A. as expect to attend the fair.

REPORTS FROM CHAPTERS.

213. (Wilson Ornithological Chapter.)—At the present time there are twenty-one active members, including many of high standing—e.g., entomologists—H. Nettling, Dr. Paul Leverkühn, etc. Our associate membership is seventy-four strong, with constant additions. At the last election Mr. S. Warren Jacobs, Waynesburg, Penn., was chosen Secretary; Messrs. Frank L. Burns, Berwyn, Penn., John H. Sage, Portland, Conn., and C. C. Maxfield, Danbury, Conn., were elected as the Executive Committee; your servant, President. Special work has been done with the group Fringillidae. Mr. F. L. Burns had special charge of the department of oölogy, John H. Sage of melogetria, while I have tried to do something with migration. Messrs. R. M. Strong and Charles A. Elly have called for general reports upon Fringillidae. Lately the Taxidermist has been chosen as a bulletin, each issue of which will contain reports upon the condition of the Chapter and progress of study, being a sort of table of contents to the O. and O. Semi-Annual, in which our finished reports will appear. In short, our Chapter is rapidly growing, both in membership and efficiency of work, with promises of flatter results in the near future. We are all ardent lovers of our study, and work together for the good of all and the more rapid furtherance of our favorite science.

I am at 5 Eno street, Oberlin, Ohio, where any communications will reach me and be promptly responded to.—Yours respectfully, Lynde Jones, Pres.

242, Philadelphia, Pa. [1].—The present annual report of Chapter 242 is concerned with the Chapter's work from May 1, 1890, to March 1, 1891. The Chapter has on its roll the names of six members and one corresponding member. Only two meetings have been held during the year, of which the dates and scientific communications were: April 17, 1890, Mr. L. L. Calvert, "Basis of Historical Geology"; May 1, 1890, Mr. F. P. Calvert, "Notes on General Embryology from Bal fore." Since May 1, 1890, no meetings have been held. This is due to the fact that the (four) active members have their evenings so taken up with business and study that it has been impossible to fix upon a date convenient to all. Notwithstanding this fact, however, the interest of those members in the study of natural history has not departed. One member, in connection with his medical studies in the University of Pennas-
We have a collection of students of East Greenwich Academy. We meet in the cabinet of the Academy building. We have the use of a fine microscope and set of slides. The cabinet has a very good collection of slides in preparation for study. We have held eighteen meetings during the year. We have had no excursion as a Chapter, but intend to soon. The members have made excursions at different times in search of specimens. Each member chooses a subject of study for himself. Our President is enthusiastic in the study of entomology. Several members are interested in botany and others in zoology. As we live near Greenwich Bay we have an excellent opportunity for studying the latter. The botanist, also, can find many rare plants in our woods and fields. The members have read papers on the following subjects:

Zoology: Hermit crab, fiddler crab, horse-foot crab, Crustacea, lobster, mollusks, scallop, clam. These papers were illustrated by living specimens, when it was possible, and they were discussed in detail.

Botany: Pitcher plant, sundew, orchids. Entomology: Tent caterpillar, dragon-fly, Colorado potato beetle, Asterias butterfly, bees, house-fly, ants. Micrology: Quartz. We miss Professor Packard very much, as he did a great deal toward organizing our Chapter and helping us in our work of collecting specimens. His place is well filled, however, by Professor Alexander, who is quite enthusiastic. He is planning an excursion for the Chapter. —Mabel Palmer, Sec.

Chapter 245 has held only five regular meetings during the past year, but these have been supplemented by outings on Saturdays through the spring and fall, taken with and by invitation of the Harton Chapter, of Boston. On these excursions we have studied botany, zoology, and geology. We have finished the second grade of Professor Gutenberg’s course in mineralogy, and have kept up a lively interest in botany and ornithology, besides doing some work in botany and algology. We have voted to keep a record of all observations of interest to the Chapter in the coming year, and many meetings for the coming year. Our membership is five this year.

—Miss H. D. Hutchinson, Sec., 30 Morton street, Mattapan, Mass.

We have thirty members, all greatly interested in the different books in Nature’s free library. Each division meets once a week, and a general meeting is held the first of the month, when talks of interest to all, bearing on science work, are given. A collection of rocks and minerals, a chemical laboratory, and a liberal supply of apparatus and chemicals are at the service of the mineral and kindred divisions. The eastern boundary of the city is a "terminal moraine" abounding in fossils and a variety of minerals, fossils, and shells. The surroundings of Plainsfield are also particularly adapted to the study of botany and ornithology, since marshy places are found here and there in the valley, and the low ridges of rock called the "White Mountains" bound us on the west. A large case of stuffed specimens in the school hall is a help to the student. Those interested in other subjects are also assisted in their work, the microscope and telescopes belonging to the school being used. Investigation in all branches of science is encouraged. —Franklin S. Smith, M. S., Pres.; William F. Moore, Sec.

271. Port Chalmers, New Zealand, [A].—In accordance with the rules of the club, the committee begs to submit the following report for the year 1890: The club was founded at a meeting held February 27, 1890, and was afterwards affiliated to the Agassiz Association, of America. During the year eleven ordinary monthly meetings have been held, and seven excursions have been made, one to the Dunedin Museum and the others to places around Port Chalmers. The attendance at the ordinary meetings has been very good; that at the excursions has been very fair. By the kindness of the school committee a handsome cabinet for the reception of specimens has been obtained, and a start has been made at the formation of a school museum. Many objects of natural history have been collected by the members of the club. In addition to these a small collection of Californian shells has been received from Mrs. Williamson, of Los Angeles, California. Your committee hope that their successors will soon set to work to arrange and label these specimens already obtained. During the year forty members have joined the club. The statement of the finances of the club shows a credit balance to the amount of $195.00. In concluding their report, your committee desires to congratulate the club on its success during the past year of its existence, and to express the hope that it will be equally successful during the coming year.


THE EVENING PRIMROSE AND OTHER FLOWERS OF HALIFAX.

SEPTEMBER finds me as deeply interested in my favorite work as ever. Indeed, the more I study botany the fonder I become of it. Every new flower I find seems to become at once like a dear friend, and I really do not know which gives me the greatest pleasure—to find out the names of plants I have known for a long time only by sight, or to become acquainted with entirely new specimens. During my stay in the country I found a large number of plants, some of which I had seen before, and others I had often heard of but never seen. But of all the plants I have seen in Canada the evening primrose (Oenothera biennis) interested me the most, and I have gathered many specimens and watched the flowers open from evening to evening. Until my acquaintance with the evening-primrose I never saw a flower in the very act of opening, and truly it was well worth the careful watching bestowed upon it. One specimen I had, opened at least one flower regularly every evening, and sometimes two or three, for nearly a week. It was very curious to see them open. The first one I watched opened very quickly, coming into full bloom in about five minutes after once beginning to split. First the bud split the least little bit at the sides; then the petals gradually widened and the petals inside began to expand; then the points of the sepals separated from each other in two pairs, each pair tightly fastened together. It seemed almost as if the flower was breathing, panting to be free. Very soon after the sepals parted they sprang back suddenly with a jerk, and slowly settled into their reflexed position, again splitting as they did so. After the first night the operation was not nearly so rapid, but took usually from a half hour to an hour and a half or two hours.

The jewel-weed (Impatiens pallida) amused me very much by the sudden way in which its pods burst. I had never witnessed this performance before, though I had often seen the flower. The dear little Viola cucullata interested me very much, too, with its curious second blossom. For some time it puzzled me to know why, after once blooming, the violet should produce more flower-buds, which developed into seed-pods without any appearance of a blossom. Since then I have learned that these buds really contain flowers as truly perfect as the earlier kind, though insignificant looking by comparison, the parts of the flower being all closely hidden away in the enveloping sepals.

Many other plants I have met with, and all have equally shared my interest; but it would make my list too long were I to mention any more. With every good wish for the A.A., I remain Yours truly,

KATHY W. SHANNON,
Cor. Mem. Chapter 1.

CHAPTER ADDRESSES, NEW AND REVISED.

No. Name. No. of Members
608 Vassarboro, Me. A. 20
159 Oak Grove Chapter, A. A. 15
A. A. Chapter 159, care State Normal School.
613 Union Springs, N. Y. A. 37
Friends’ Academy, A. A.

REPORTS FROM CHAPITERS 1-100 SHOULD REACH THE PRESIDENT BY JANUARY 1.
On the first day of May, the pioneer humble-bee of the season announced by her joyful buzzing that spring had at last arrived, even in our cold Maine climate. At this season of the year we see but few caterpillars, and only on the birch and wild cherry may we see tiny larvae. Early as it is, however, the tent caterpillars (Clytiaemopsis americana) have emerged from their eggs with voracious appetites, and their delicate webs may be seen in great profusion on the wild cherry trees. They can now be easily destroyed, so on May 2 I collected and killed several thousand of them, except that the 17th were the trees white with blossoms, to which we also attached bees, moths and our beautiful northern humming birds. On this day I saw a brilliant male oriole taking honey from the blossoms with evident satisfaction. Perched on some twig, he would thrust his bill into every flower within reach, with great skill and rapidity. I watched him do this for an hour.

On the 9th I captured the first dragon-fly, a Libellula quadrimaculata. While looking in the woods for plants and insects on this date, I saw a small black wasp seize a gray spider three times her size, which she stung and rendered powerless, then proceeded to convey her to nest. Grasping the spider, sometimes by the first pair of legs, and again in some other manner, she made quite good progress backward over the sticks and other obstacles in the way, never turning out in the least to find an easier path. Once she let the spider, and during her absence an active ant attempted to confound it. On her return, they had quite a tussle before the ant was vanquished. Mrs. Wasp actually dragged the spider for two rods before her nest was reached, which fact proves that she possesses great strength.

With the first of June came beautifully warm and pleasant weather. For a collector of insects, this is the banner month of the year; butterflies are flying here and there, bees and moths are on the lilies, and the air around my favorite hunting ground seems almost full of dragon-flies. Among these, Cordulia lacunosa is the most abundant, while the larger dragon-flies,odonates and smaller Lestwurka tutea may be seen in all directions.

On the tenth of June I saw an amusing sight in the woods. A female partridge with very young chickens, startled by my appearance in the wood path near by, gave a note of warning to her young, then commenced to scramble awkwardly away. She acted as if a wing and leg were broken, would fall over repeatedly, shuffle sideways, and only just keep out of reach. It was evident she did this to call away my attention from her young, and she was so cute about it I followed some distance, then retreated about a rod. She was lively enough then, and flew to the fence, clucking loudly. I could not then find one of the chickens.

On the 11th I found a beautiful male Polyphemus moth, just out from its cocoon, and not sufficiently developed to fly, so I brought it home in my net to further develop, then to meet the fate prepared for it—the chloriform burner. A few days later, a female of the same kind emerged from a green house, also a Cecropia and several small moths.

On the 13th I saw a young fox, apparently about one-third grown, in the pasture. It had patches of darker color than the full grown foxes, and was really very cunning. I tried to catch it, but could not run fast enough. Towards night I found a dead cuckoo by the side of the house, again after it was broken its neck. I have now known several instances of crows being killed in this way.

On the 24th of June, while catching dragon-flies by the brook, and a visitor near me was fishing, we heard a slight noise on a stump about twelve feet away, and looking, saw a young wood-chuck scampering up the side of the stump. After several ineffectual attempts, it did reach the top, on which I had laid my sack. This is a matter at very evident distress and soon dropped down again. On removing my sack, we saw beneath it quite a lot of strawberries, recently picked, some with long and some with short stems. From the appearance of the berries we thought no person had placed them there, though it was of course possible. If no one did, the question is, did the mother of the berries there, and was this her dining table, on which she served the fruits and berries of the season? Her hole was beneath the stump.

On July 3d I saw a great quantity of ants crossing the road in a southerly direction. They were light-colored, about one-fifth of an inch in length, and seemed to be moving from one home to another, for many were carrying pupae, and others larva in various stages of growth. They proceeded in an orderly manner, ten or twelve abreast, and there must have been thousands of them, for I watched some time, and all had not then passed. It was not like an ordinary swarming of male and female ants, for these were nearly all workers, a few large-winged females, however, being outside the ranks, viewing the progress of the attack. Brush each side of the road prevented me from seeing from whence they came, or whither they were going. The day following, the track in the road made by the ants showed plainly.

During the month of June, being an amateur ornithologist, I collected twenty-eight species of dragon-flies, and in July, twelve more. Nearly all of these were like some taken before, though some were not at all common. I have often noted the various methods needed for capturing the different species of "mosquito hawks," and wonder if others have noticed it too. The more common species may, of course, be taken nearly every day, but to obtain others it requires strategy. Gomphus varius, Libellula cyanea and some others I have tried to get, but have never found them. While they alight before the net can be placed over them. In direct contrast to these, Somatochlora libera flies so lazily it may be taken on the wing with ease. One even flew into my net, and did not try to get out. The males of the genus Cordulegaster fly swiftly, directly over the brook; and by careful watching may be intercepted in their flight. I have also heard that the females of Libellula and Euscheda, I have observed, were not in any case accompanied by the male. I have never yet been successful in raising the larvae of dragon-flies in the house, because of the difficulty in keeping the water fresh enough, and with a sufficient quantity of food.

On July 28 I stuffed a beautiful red-winged blackbird, almost in the presence of its young, which I brought to the museum. In August the delusive Grapta butterflies appear. Lighting on the trunks of the apple trees, it is hard at first to distinguish them, because the under side of the wings, when folded, so closely resembles the bark of the tree. G. julius is particularly hard to obtain, from a habit it has of crawling into crevices between boards, and then emerging. I have chased one around the barn for an hour, and then did not get it.

My time during August was considerably occupied providing food for my caged birds—in other words, caterpillars. On July 1I about one hundred of these "butterflies" hatched from eggs laid on June 24 by a Platynota cecropia moth. These were almost black at first, and about one-eighth of an inch in length. Not knowing exactly what to do, I placed several kinds of branches in the brooding place, hoping that one might be satisfactory. They commenced to feed on every branch, but died rapidly, until only five were left on apple leaves. These were strong and vigorous, and in about ten days prepared for the first moult. After this operation, and each succeeding moult, they covered their cast off clothes, being different in this respect from other caterpillars I have reared. The period between molts after this was a little more than two weeks each time, and they moulted four times before reaching maturity. The first of September they were four and one-fourth inches in length, and three-fourths of an inch in diameter. With brilliant trimmings of red, yellow and blue, and their cages, they were gorgeous specimens. I have seen no wild butterflies that was so difficult to rear, I feared these beauties might lose their vitality, crawling about before pupating, but in this I was happily disappointed, for they took very kindly to the branches provided, and now five fine cocoons adorn my cage, and await next summer's opening. These are by no means all of my cocoons. The caterpillars of Tetra polychrous, Actias luna, Saturnia io, and several others, beside some butterflies, have been reared within the cage this year, and many other species in former years. The moths and butterflies so obtained are larger and more perfect than those taken out of doors, and I have the great pleasure of watching them through all the transformations.

On September 16 I found several larvae of Limenitis, Tethys polyphemus, Actias luna, Saturnia io, and several others, now very small, live through the winter, and construct very neat winter residences of leaves, in which they lie dormant.

The season for these observations draws near its close. The summer, with all its opportunities for the study of nature, is past, but may all in our beloved Agassiz Association, with me, look forward to a happy, summer and hope for still greater opportunities for studying and appreciating the wonderful works of God.

All are cordially invited to join the Agassiz Association. Address the President, Mr. Harlan H. Ballard, Pittsfield, Mass.
At the close of the twenty-fifth volume of the Popular Science News, the editors would extend their thanks to the subscribers and advertisers who have contributed to the success of the paper during the past year, and express the hope that their kind patronage may be extended through the succeeding year. The News was never more prosperous than at the present time, and its constantly increasing circulation and influence are a source of gratification to all connected with it. The policy of previous years will be continued, and every effort will be made to improve the paper in all its departments. Articles may be expected during the coming year from the contributors with whom our readers are already familiar, as well as other distinguished writers who have not yet contributed to its columns; and it is intended that in every way the News shall continue to bear its reputation as the leading low-priced journal of popular science in the world.

In connection with the above, we would also remark that the publishers hope for an early return of the annual subscription bills inclosed in this number. A single dollar is a small amount and very liable to be overlooked, but several thousands of them make up a sum which is absolutely necessary to the publication of the paper. If every subscriber will make a point of remitting the amount due, it will aid in the solution of one of the most perplexing of the problems which confront every newspaper publisher.

At West Medford, Mass., there has recently been erected a handsome stone depot, into the walls of which have been built numerous mineralogical and geological specimens, including quartz crystals, geodes, feldspar, mica, corals, fossils, and many similar objects, some of which are really fine specimens. The effect is both novel and pretty, and the West Medford building is probably the only existing combination of railroad depot and mineralogical cabinet in the world.

A distinguished patient of the Keeley Chloride-of-Gold Institute, who, only a month or two ago, wrote an enthusiastic article for the North American Review, commending the treatment, and stating that by its means he had been cured of all desire for alcoholic liquors, recently died in a drunken fit in a New York hospital. We have before this given our reasons for disbelieving in this alleged cure for drunkenness, and this case seems to be a striking example of its unreliability. It is absurd to suppose that a hypodermic injection of bicarbonate of soda, or any other substance, could accomplish such a change in a man’s moral and mental nature as is necessitated by the cure of a confirmed intemperate; and the undeserved attention that has been paid to the matter illustrates the unscientific habits of thought and the childish faith in the powers of “medicine” which so widely prevail.

The fact that Dr. Keeley refuses to divulge the composition of his alleged “cure,” places him outside the ranks of the “regular” medical practitioners. It is one of the rules of medical ethics that all discoveries shall be freely given to the public; and many go so far as not to take out a patent on a new or improved form of surgical instrument. While this generous custom is characteristic of a noble and self-sacrificing profession, and far more sensible than many other rules of the code of medical ethics, we see no reason why a contrary course should be subject to severe criticism, or indicate any great moral delinquency. A physician is the product of his brain as much as a writer, and has as much right to patent or keep secret his inventions as an author has to copyright his works. Nevertheless, it is an almost invariable rule that secret remedies are unreliable or worthless. If Dr. Keeley can prepare a mediclune which will really cure drunkenness, he has an undoubted right to do what he pleases with it, without the slightest regard to the rights of others.

The recent fall exhibition of chrysanthemums in this city, while beautiful in itself, was a very good object lesson in the variation of forms of vegetable life, and furnished a very striking instance as to the “origin of species.” The innumerable, magnificent variations of the original flower, which have been obtained by careful cultivation and selection, show what can be accomplished in this line; and it surely is not a very unreasonable supposition that, in thousands of years, the forces of nature can produce to a much greater extent and permanence of type, changes of form similar to those which mankind has produced in a comparatively short space of time. If a flower like the Mrs. Alpeaus Hardy chrysanthemum, for instance, can be developed from the small, commonplace, original variety, it does not seem unreasonable that a rose and an apple blossom should have been developed from some common ancestral form.

Nevertheless, the tendency to variation, which seems innate in organized life, as yet remains unexplained. We cannot produce a new variety of plant or animal, but can only select those which have varied naturally, and preserve and intensify those variations by care and cultivation. The forms of life fittest to survive will undoubtedly do so, but what force caused those forms to first appear is an unexplained mystery, as much so as is that of the nature of life itself. It is not probable that we shall ever understand the mystery of vitality, but we may reasonably hope to learn more of the laws and methods of its action; and the cause of the arrival of the fittest may yet become as clear to us as the survival of the fittest is now.

The total lunar eclipse of the evening of November 13 was observed in New England under remarkably favorable conditions. The sky was entirely free from clouds and the air was remarkably clear, so that the whole phenomenon was completely visible from the moment that the moon entered into the earth’s shadow till its final emergence. The coppery color of the moon during totality, due to the refraction of the sun’s rays into the shadow by the terrestrial atmosphere, was well marked, and at the early hour at which the eclipse occurred caused it to be very generally observed. Unlike the total solar eclipses, this lunar eclipse was of little or no astronomical consequence, but was scarcely less beautiful and interesting as a celestial spectacle. A special and careful search was made at the Harvard University Observatory for a lunar satellite, but no indication of such a body was found; so the question whether our moon has a moon of its own may be considered as settled in the negative.

We have been shown an interesting series of photographs of this eclipse, taken by an amateur with an ordinary camera on a single plate. The camera was focussed and placed in position so that the image of the moon fell on one side of the plate. The smallest stop (F. 100) was used, and exposures of about two seconds were made at intervals of three minutes, during the time of obscuration. As the image of the moon passed over the plate, a line of photographs was obtained, showing the gradual advance of the shadow from the full moon to a tiny crescent. No moving or adjustment of the camera was necessary, as the rotation of the earth brought the camera into the proper position to receive the successive images. Only the disk of the moon was impressed upon the plate, the dark sky forming a perfect non-aeolus background, like those described in previous numbers of the News. Altogether the picture forms an interesting and valuable record of an event which is not likely to occur under such favorable conditions for many years.

[Original in Popular Science News.]
From the barberry's standpoint, however, there are visitors and visitors. If they have wings they are heartily welcome; but if they are mere crawlers or worms, or even ants, and incapable of doing any plant a good turn, they are sure to receive the plainest kind of hint that their company is not wanted. Should, for example, a calf or other young browser not yet acquainted with barberries or his kin, attempt a bite at the dainty leaf rossettes, he will find that just where his nose comes in lies a large cluster of sharp spines—and his stay is short. He may, however, have the consolation of the fox with the grapes, for the leaves are truly sour, and would hardly be good for him anyway. This sourness may be one reason why the barberry's foliage is not more infested by caterpillars. On the older shoots the bitterness of the inner bark is doubtless a protection against the borers which often make such havoc with the stems of our mild-tasting woody plants.

But a means of protection, perhaps even more efficient against insect foes than either the sourness or the bitterness, are the ants, hornets, and others of their tribe which frequent the leaves. To all of these a caterpillar is a delectable tid-bit, and they are all such good searchers that in the day time at least scarcely a caterpillar is safe where they may come. It is not apparent, however, why flesh-eating insects should want to be around the barberry so much. We cannot suppose that a plant having so little to recommend it in the way of flavor would be likely to harbor many caterpillars; nor does the bush itself, so far as one can see, produce anything which flesh-eating insects would like. The most probable explanation of their frequent visits seems to be as follows: It is well known that ants and their relatives are very fond of sweetmeats and although the barberry does not secrete nectar on its leaves, as some of our common plants do, still it tolerates as guests certain creatures which do yield a sugary liquid quite as attractive to the barberry's insect friends. Of these honey-yielding planters, one sort is the tiny aphides, or plant lice, (which have received the significant name of "ants") while the other sort is a fungus, known as "cluster-cups." The aphides form little colonies on the under side of the leaves, into which they thrust their slender beaks and suck out liquid food. If one of them be touched lightly, as with a hair, a drop of "honey-dew" will be given out from each of a pair of delicate tubes on the back. The ants, knowing this, stroke the aphides with their feelers, and drink with evident satisfaction the product of their docile "cows." Any intrusion on their pasture ground is resented furiously. Surely, no one who has tried their natural cupboards and visited the barberry-laden warrens is efficient protectors. The "cluster-cups" form the familiar orange-colored spots which on the under side of the leaves give rise to a number of pretty urn-shaped spore-cases, while on the upper side there appear, earlier in the season, several minute black specks, which are the openings of tiny cavities. From these cavities is expelled, at some time a small quantity of sugar. Thus they serve as a pantry on the upper side of the leaves, complementary to that of the aphides, which confine themselves mostly to the lower surface. This supply of sweets is visited not only by ants, but by wasps, hornets, and certain flies, which are still more deadly foes to caterpillars. We can hardly say that either the aphides or the "cluster-cups" are invited guests in the barberry's household; as before intimated, they are rather to be considered as summer boarders that come without asking, and will not be put out. But they repay their host by helping indirectly to repel visitors that would be much more destructive than they.

Towards its winged friends, the birds, bees, butterflies, which serve it by carrying about seeds and pollen, the barberry extends a gracious hospitality, none the less genuine because of a quaint streak of economy which runs through it all. Few of our June flowering shrubs hang out such a tempting profusion of blossoms, and few exhale a perfume so alluringly suggestive of honey. Nor is the barberry one to disappoint reasonable expectations. At the bottom of each flower cup are six very small reservoirs, beautiful and running over with nectar. But although there is thus plenty for all comers, the barberry abhors greediness, and lets its visitors know that one sip from a flower is all they are expected to take. A little experimenting and watching will show just what happens. As is well known, the barberry stamens are sensitive to the slightest touch. Who has not read Lowell's allusion to these flowers?

Whose shrinking hearts the schoolboy owns,
With pies—'tis 'll wound your so, boys, boys, boys!
Well, the effect of this peculiarity is that as soon as a bee puts its tongue into the place where the nectar is, it touches a stamen, and immediately this springs forward and gives it a tap on the head, as much as to say, "There, you've had enough; go!" Of course any insect of fine feelings leaves at once, but only to go to another flower on the same or some neighboring barberry bush. The humble-bee, however, when it comes along dusts every cup, apparently quite oblivious of all the barberry's prods to propriety. Still anyone who knows humble-bee would expect nothing better from these clumsiest of good fellow insects. They are not strangers to the following into flowers where they are not wanted and upsetting the best laid plans. See what he does in this case. When the stamen springs forward at his touch, it places some pollen dust on that side of his head (or tongue) which is away from the stigma; and as he dips his tongue into one after another of the remaining five nectar pits, he spreads this pollen to the flower's own stigma, which is exactly what the barberry has been at the greatest pains to avoid. Other insect visitors, (the majority, fortunately) by flying off as soon as touched and going to another barberry flower, transfer the pollen where it will do the most good and insure the production of better seeds and harder offspring than would be otherwise possible. As soon as the work of seed-forming begins, the bright colored and perfumed parts of the flower fall off, leaving the pistil green and insignificant. Nothing could serve better in this capacity than birds, and the barberry does well to make friends with them. Not only will they carry its seeds as far as the wind could, but as they keep mostly to regions of sunshine and verdure, they will not cast so many of them upon bare rocks or arid soil, only to perish. The barberry has but to make sure that when the berries are eaten the seed shall not be injured while the pulp is being digested. All danger of this is provided against by a hard seed-coat. It is true that barberries can hardly be expected to receive much attention from birds so long as the latter can get their fill of grapes, blackberries, and other such juicy food; and, as a matter of fact, our plant's sour fruits, for all their attractive redness, remain for the most part untouched through the fall. Nevertheless, our confidence in the barberry's shrewdness need not be shaken by this. There comes a time when its rivals' sweets are exhausted and other kinds of food are scarce. Then its berries are in demand, and before the winter is out most of them will have been eaten.

[Original in Popular Science News.]

FOLK-LORE AND SUPERSTITIONS OF SOME AMERICAN INDIANS.

BY M. J. GORTON.

That the aboriginal, unsubdued spirit of savagery exists among the tribes of those Indians living on their reservations within the Territory may be gathered from their folk-lore and many superstitious beliefs. The principal tribes, and those that have made the greatest advance toward civilization, are the Chocottes, Creeks, Cherokees, Kickapoos, Quapas, Senecas, and Osages.

The ownership of land is merged in the tribe and is held in common. If a member cultivate a field, that is his absolutely, so long as he tills it, and his rights extend a quarter of a mile beyond the fences of the two neighbors must be a quarter of a mile apart at the point of nearest approach. Should an individual wish to sell his improvements he can do so, but if he desert his land it falls back to the tribe.

Many of the superstitious, premonitions, and folk-lore treasures are crude in the extreme, but are received as the very highest wisdom, and are
acquiesced as much credibility as in the past days of Indian supremacy in the land. It is not surprising when we look at their past, which to many of them is very little changed from their present, that the roots of their prejudices and preconceptions should be sunk deep down into their inner consciousness and remain there. The Indian now to a great extent, as in the past, is surrounded by the omnipotent forces of nature, is prey to adverse circumstances which he constantly meets in his struggle for existence, and his belief in the arts of sorcery, witchcraft, and divination is as considerable as the childishness in scientific attainments; but it is to him the power of groaning into the relationship of the phenomena which surround him and adjusting them to himself and his needs. Awe and mystery encompass him on every side; there is an illimitable antagonism surrounding his life and destiny, held by laws which he has no means of controlling. Danger lies concealed on every side, and only by brutal, stolid stoicism can he preserve any composure in the face of the malevolent forces to be met with in poisonous serpents, noxious insects, wild beasts, treacherous neighbors, starvation, fevers, ages, storms and many strange distresses, the terribleness of whose action he is powerless to avert. He must, therefore, be ever observant to try to avoid the invisible that threaten his existence. His folklore is the embodiment of that wisdom which he, by observation, has been able to gather and transmit from generation to generation, and many sayings are doubtless to be traced to the law of coincidences to account for their origin, for instance:

- If a dog from Seguoysh or Going-snake sleep with a child sick of a fever or with small-pox, the dog will die and the child will live. [A similar superstition is common among the uneducated white people in this section.—Ed.]
- If a horse neigh in front of a cabin, it is a sign of disaster.
- If a person eating drop a portion of his food to the ground, his father and mother are hungry. If an insect pierces them, the living, there is scarcity in the land of the happy hunting grounds, and a harmless dove is caught, slain and burned to feed the unhappy spirits.
- A crowing hen brings back luck, f. e. no game, starvation and death.
- A sow carrying husks indicates foul weather.
- Flies standing still and pointing are sniffing the wind; therefore go to the lodge and prepare for a blizzard.
- If the spider spin her webs at night, there is to be a drought; therefore migrate to some great river.
- If the angle worms bore down into the ground, there is to be a severe winter.
- If the wild bees (whose hives in the hollow of some deep rock are known) kill off some of their number, there will be scarcity in food and starvation to the game and cattle.
- If a dog howl to the moon, the Great Spirit is displeased; sacrifice and fasting follow.
- It is cold weather that breeds a fighting brave.
- The Great Spirit turns his back when a square piece of land is born; so the cold is more intense in the winter and the springs dry up in the summer.
- The Great Spirit rolls pumpkins into his cabin, when there is reverberating thunder.

Red ochre put on in dabs on the high cheek bones is supposed to drive away the evil spirit.

- To find a serpent asleep lying across branches of a tree is a sign that the enemy will be destroyed.
on the flower, not to it like the two other forms. The last variety, pure pink, is inhabited by a Thomisus which is also pink on the dorsal side of the abdomen and limbs. In fact, each of the three color varieties of Convolvulus is inhabited by a correspondingly colored variety of Thomisus. It has been generally considered that each of the spider varieties is a genuine variety. But this assumption is erroneous, as M. Heckel found out. He has not that a laboratory and lab and I will bring a color to pink Thomisus in order to send them to a friend for investigation; but he forgot all about the box and its contents during a fortnight, and when he opened it again was astonished at seeing that all the Thomisus had lost their pink color. He took some of the animals and put them on differently colored flowers, and was much surprised after four days, not that they were found, but that the color of the flower it lived in. As specimens of the same Thomisus are often met in the yellow Antirrhinum and the red dahlia, he also put some of these uncolored specimens in these flowers, and he saw that they assumed a yellow or red color. The conclusion is, then, that there are no real and permanent color varieties of Thomisus onustus, but that the tendency in some cases to the color of the flower it has selected as lodgings. This fact is very interesting, and we feel inclined to accept it; but M. Heckel has not given proofs enough yet, as he has not taken care to prevent the possibility of the uncared spiders running away and leaving the place to be taken by others. A very simple experiment will settle the matter easily, and perhaps some of our readers might be induced to investigate the subject with other species of animals. Speaking of spiders, I would call the attention of the farmer to a paper which M. E. Terby has recently published in the Revue Scientifique. M. Terby is a Belgia entomologist, and has made some valuable experiments and investigations concerning ballooning or flying spiders. Every one who has met spiders sailing through the air and carried on long silk threads—the well-known gossamer threads. I met some hardly an hour ago, in the bright, warm October day which is closing; and it is in October, when the young spiders are hatched, that the flying spiders are most commonly met. It would seem that the latter had already attracted the notice of old Aristotle; at all events, it is certain that over two centuries ago Stafford, Martin Lister, and John Ray described with much accuracy (Philosophical Transactions, 1638, 1669, 1670) the manner in which the spiders climb on posts or stalks of grass, crouch down with their abdomen projecting as high as possible in the air, and, if some breeze, however slight, is present, send forth jets of silken filaments in the air and are sufficiently strong to carry them off when they let go the blade of grass or other projecting support. An excellent account of this operation is to be found in M. H. McCook's admirable American Spiders and Their Spinning Work, based on the observations of the numerous investigators who have devoted their time to the matter, and on those of the eminent writers on the theory of spider weaving, and has the attention of M. Terby, in observation as well as in reading; he has not been acquainted with a paper written by M. Terby in 1897 and published that year in the Bulletin de l'Académie Royale de Belgique, and has not noticed the important fact therein described—that the spider sends forth its jets only under the influence of the motion of the air, and that one may at will induce it to do so merely by blowing on it softly, with the mouth, for instance. 'As soon as there is some motion of the air the spider, when bent on "moving," of course, seems to be irresistibly impelled to send forth the gossamer. M. Terby's papers will be found useful, as they contain, moreover, some notes on spiders which M. McCook is not acquainted with.

In a year or two Paris is to have one of the finest physiological laboratories, not only of France,—which is saying but little,—but of Europe. It will be the largest or richest, but being designed by a man who is an eminent physiologist, and who has a large experience, it will be one of the most conveniently arranged. This laboratory is the one which is being at present built in the Paris Jardin d'Plantes for and by Professor Charvans. Everything has been devised by him, and, as he has himself informed us, it is to be expected that he understands the way a physiological laboratory should be built. Here will be a striking contrast with the laboratories recently erected in the Medical School, which are really monuments—and, unfortunately, lasting monuments—of the imperishable silliness of French government architects. It would seem that when an architect knows so little of his business that no private individual would ever ask for his services, then the fatherly government steps in and says that he will do for government—that is, for public—building. And then that man is allowed to erect enormous buildings, at still more enormous cost, and they are conceived in such a manner that they are worthless. Positively the Ecole Pratique de the Medical School contains laboratories which are perfect wonderlands in their way. Please never try to have the same in the United States. It is a friend's advice.

II. PARIS, Oct. 18, 1891.

[Specially Observed for Popular Science News.]

METEOROLOGY FOR OCTOBER, 1891.

TEMPERATURE.

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<th>Average Thermometer.</th>
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<td>Highest.</td>
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<td>At 17 A.M.</td>
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<td>Whole month</td>
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Precipitation.

The amount of the last month, including about two inches of melted snow in inches, which fell principally on five occasions, well distributed. The average amount the last twenty-three Octobers has been 4.26 inches, with the wide extremes of .75 inch in 1874, and 13.20 inches in 1890. This is the third instance in twenty-three years that we have had snow in this locality in October. It was a novel sight on the morning of the 23d to see the most of the snow adhering to the green leaves on every side, heaving the trees nearly as much as the abundant fruit had done just before, and often breaking the branches. The amount of precipitation since January 1 has been 48.22 inches, while the average for this period has only been 30.64,—giving an excess this year of 17.58 inches.

PRESSURE.

The average pressure of the past month was 29.03 inches, with extremes of 29.50 on the 8th, and 30.50 on the 12th,—a range of .91 inch. The mean for the last eighteen Octobers has been 29.057 inches, with extremes of 29.826 in 1875, and 30.109 in 1886,—a range of .23 inch. The mean daily movement the last month was .21 inch, while this average the past eighteen Octobers has been .168 inch, with extremes of .123 and .216. Thus the daily movement this month was greater than the average in any October for eighteen years. The largest daily movements the last month were .69 inch on the 8th, and .45 on the 13th.

WINDS.

The average direction of the wind the past month was W. 64° 0' N., while the mean for the last twenty-one Octobers has been only W. 19° 14' N., with extremes of W. 35° 15' S. in 1880, and W. 80° 25' S. in 1853,—a range of 116° 40', or more than ten points of the compass. The winds have been nearly 45° more northerly than usual. The relative progressive distance travelled the last month was 38.92 units, and during the last twenty-two Octobers 732 such units,—showing less easterly winds the last month than usual.

D. W.

[Specially Computed for Popular Science News.]

ASTRONOMICAL PHENOMENA FOR DECEMBER, 1891.

The sun reaches its greatest southern declination on December 21 at 11 P.M., and winter begins at that time. Mercury is an evening star until the end of the month. It reaches its greatest eastern elongation on December 11, when it is more than 20° distant from the sun. As it is, however, somewhat farther south, the conditions for observation probably can be seen on a very clear evening, just after sunset, during the first third of the month. After elongation it moves rapidly toward the sun, and reaches inferior conjunction on December 28. Venus is also an evening star, and is quite near Mercury during the first few days of the month. Both planets are then moving eastward in the latter part of December. The former on the morning of December 5, the nearest approach being a little more than 1°. Venus is increasing its distance from the sun, and by the end of the month is about 20° distant from the sun. Mars rises a little after 3 A.M. It is gradually approaching us and growing brighter, but will not be very conspicuous for some months. It will be occulted by the moon on December 26, but the phenomenon will not occur until after daylight in the United States. Jupiter is still the most promi-
QUESTIONS AND ANSWERS.

LETTERS of inquiry should enclose a two-cent stamp, as well as the name and address of the writer, which will not be published.

QUESTIONS regarding the treatment of diseases cannot be answered in this column.

M. H. P., Mass.—What is the cause of the motion of the toy known as "Oulja," or the talking ball, which spells out words and sentences when two persons place their hands upon it?

Answer.—"Oulja" is nothing but a new variety of the once fashionable "Pianette," and the motion of the toy is due to the same cause, which is probably unconscious muscular action on the part of those touching it. Like many other toys, it is not a toy in the real sense, but an agreeable toy. It is that hard to explain with our present knowledge, and the action of natural laws as yet unknown to us may be involved. It is quite certain that neither electricity nor magnetism has anything to do with the mysterious movements.

J. M., Penn.—What chemical reaction takes place during the effervescence of Selditz powders?

Answer.—The effervescence is due to the escape of carbonic acid gas (CO2). When the powders are dissolved together the tartaric acid decomposes the barium hydroxide, forming tartaric of soda and setting the carbonic acid gas free. (2) Harvey is usually credited with the discovery of the circulation of the blood, and the fact seems probable that it was understood, at least in an imperfect way, previous to his time. Shakespeare, in Juls Cæsar, makes one of his characters say:

"If we can't have a witty drop, that visit my sad heart."

Apparently the phenomenon of circulation is distributed to other animals also.

J. J. F., New York.—Does ice always have the same temperature, or can it be made colder than 32°?

Answer.—Ice acts in this respect like any other solid body, and can be cooled to any temperature below 32° that can be produced. It cannot, of course, be heated above 32° without melting into water; and in the act of freezing, at whatever temperature, the temperature of the ice first formed will not fall below 32° until all the water is frozen.

J. N. D., New York.—What is the lowest temperature any object can reach?

Answer.—On theoretical considerations the absolute zero, or greatest possible cold, has been set at -460° F.: but this has never been practically approached, and the temperature yet produced is about -220°, and the lowest observed natural temperature about -70°.

W. T. C., Penn.—When Jupiter is reflected in a mirror two faint reflections are seen on each side. Are these his satellites? and if so, why are they visible?

Answer.—The faint images are simply secondary reflections of the planet, due to conditions between the front and back surfaces of the glass mirror. With a metallic mirror they would not occur. The same phenomena can be beautifully observed by holding a thin sheet of paper or a mirror at an edge, so that the reflected image is viewed obliquely.

S. L. C., Boston.—Is there any way of bleaching printer’s ink, or removing it from printed paper?

Answer.—The basis of printer’s ink is lamp-black, or carbon. This is a most indestructible substance, unless exposed to the action of heat or fire. On account of its coagulation when exposed to the action of heat or fire, it is possible to separate the printer’s ink by heating the paper to which it is adhering to a high temperature and then pouring in a flux of a metal which is capable of dissolving the metal and unites with the carbon, but not with the printer’s ink. The flux thus obtained is then washed out with water, and the paper is left clean.

J. D. R., Montreal.—A galvanic battery is connected with a small electric motor. Motion and force are produced. How can this force be traced to the chemical action of the substance by which energy is derived? Is it possible to produce a uniform force by the aid of a chemical action? If so, what chemical action is used in producing a uniform force?

Answer.—The force, or energy, produced by the battery is due to the oxidation of the zinc plate by the acid. To obtain this metals of other kinds must be used. G. C., Paris. A uniform force can be produced by the aid of a chemical action, but the chemical action used is not the same in every case.

LITERARY NOTES.


This work comprises a series of experiments on the fundamental principles of chemistry and is especially a laboratory companion. It is not intended to be used without a teacher, but is an aid both to the teacher in laying out the work of his course, and to the student in performing that work. It is unnecessary for us to commend this book, as the name of its distinguished author is sufficient guarantee for its excellence. Every chemical school and laboratory should have a copy, and we can only say that in the field of practical chemistry it will be found as indispensable as are Professor Cooke’s "Chemical Philosophy" and "New Chemistry" to a clear understanding of the theoretical principles of this important science.


This is a most valuable treatise upon the plumber’s art, and is the most complete work especially important ones of sanitary, water, and drainage fixtures. While particularly useful to practical plumbers, it will find all the latest institutions and methods of work fully described in its pages. It contains much information of general interest. Any person intending to erect a house or have one built, will find many valuable suggestions in regard to the water supply and drainage, upon which the health of the occupants will largely depend.

The same firm publishes A Pictorial Astronomy for General Readers, ($1.25), by George F. Chambers, F. R. A. S., which is a most excellent popular work on the fascinating science, and is a perusal of which will give anyone a good understanding of the fundamental facts and principles of the science of the heavens. Many fine illustrations add to the value of the book.


Every inventor, and everyone interested in inventions as well, can read this book with pleasure and profit, not only for the new ideas given by it, but for the practical advice and suggestions of the author, who is well known as a practical inventor.

MESSRS. Cassell & Co., of New York, publish Thirty Years of Wit and Humor, by Melville D. Laune (E. J. Perkins), and all those who love good stories are sure to find an abunace among them of the covers of the book. All are entertaining and most of them are new, very few of these humorous or melodramatic or silly being found among them.

The same firm also publishes the "Unknown Scientists" series. Among the latest of these are the "Hotel d'Angleterre, Amurtialy, and European Relations," which are equally in interest to the preceding numbers of the series.

Pamphlets, etc., received: Dynamics of the Sun, by J. Woodward Davis; The Comparative Ontology of the United States Columbian, and Terrestrial Republics, by P. R. Shufeldt, M. D.; Molecular Motions in the Radiometer, etc., by D. S. Troy, (50 cents); of D. D. Cochran, U. L. Lafayette place, New York; VarDomeni of Eyeight During Infancy and Youth, by I. B. H. Fox, M. D.; Statistics and Lessons of Fifteen Hundred Cases of Errors of Refraction, by C. M. Gould, M. D.; A Celestial Messenger, by Gustavus Hillel, L. L. D.; and The Zoological Light, by M. A. Yeader, M. D.
HYPONOTIC EFFECT OF WARM BANDAGES.—Warm baths, as is well known, produce a calming effect, and tend to bring on sleep, and Allderor has attempted to apply such a method in patients where a sedative effect is desired and yet where a bath is unsuitable (Jour. de Méd. de Paris, March 9, 1890). His method consists in wrapping the lumbar region and belly with linen cloths soaked in warm water, and then covering them with oiled silk or rubber cloth, so as to prevent evaporation, while the whole is kept in place and loss of heat prevented by a flannel cloth.

This procedure is of ready performance, and the author says that by this simple means he has obtained the most astonishing results in the treatment of insomnia.

DOMAINES AND BACTERIA IN CANNED MEATS.—Dr. Cassedebat (Mouvent de L'Hypnose Publique) has examined four cases of meat to which his attention was drawn by an outward bulging of the can, and has in both cases found more or less fermentation since sealing. He removed portions of the contents of each tin under strict aseptic precautions and found numerous and various kinds of bacteria. Of the twenty-six varieties of bacteria found eleven only gave any result when inoculated on animals.

The liquid itself, if inoculated, always caused peculiar symptoms; and just such symptoms as have been observed at times after the use of canned meats.

This fermentation, according to Dr. Cassedebat, can be easily avoided by using a little care in preparing the meat. Still greater care, however, should be used to choose perfectly healthy cattle for killing, and to preserve only fresh meat. If meat, when canned, is infected with bacteria or spores which have not yet acted upon it, no harm will result, for the heat to which the tins are subjected is high enough to render bacteria harmless.

If, however, pomegranates are formed, the high temperature is of no avail, and the meat remains poisonous. Cassedebat is of the opinion that carelessness and not infected meat is the cause of the trouble in most cases.

DERMATOLOGY.—The list of new synthetic remedies has recently been again increased by an iodol form substitute which, if it do all that is claimed for it, will prove a very valuable addition to our list of vulneraries. Dermato is chemically a subgallate of bismuth, insoluble in water, alcohol, and ether. It forms a yellow powder similar to the last property it has in appearance to iodol form, but in contrast to this, perfectly odorless. Further, it is said to be stable and unaffected by exposure to light or air; it can even be sterilized by steam either as substance or in the form of gauze, without decomposition. In surgery dermato is to prove valuable as an anesthetic; astringent; astringent; as an emollient drying ointment; and an independent agent of this nature has proved an excellent vulnerary, especially where the wounds are characterized by profuse secretion—in eczema, burns, ulcers; for the same reason it is successfully applied in the treatment of diseases of the eye and ear. This subgallate of bismuth has been already tried in the clinic of Professor Frisch by Dr. Glasser, according to whom the remedy has a specially beneficial effect upon wounds, whether recent or old (epithetomies and other operations). It diminishes symptoms of irritation, lessens secretion, further the formation of granulations, and thereby leads to a strikingly rapid healing over of the wound. In hundreds of cases it proved itself perfectly non-poisonous. In its application it has to be remembered that being insoluble it cannot be substituted for soluble and penetrating antiseptics. The author believes that it has so many advantages over other similar remedies “that it does not seem too bold to prophecy for it a great future.”

ROYAL MEDICAL JOURNAL.

FOREIGN BODIES IN THE EYE.—Dr. David Webster lays down the following rules:
1. Always search carefully for foreign bodies on the cornea and on the conjunctiva, in cases of inflammation of one eye coming on suddenly and without apparent cause.
2. Remove them, when found, with as little injury as possible to the surrounding parts.
3. When a foreign body is lodged within the eyeball, especially in the ciliary region, the patient is in danger of losing the fellow-eye by sympathetic inflammation, whether the foreign body is removed or not. The removal of the foreign body greatly lessens such danger.
4. If the foreign body has already destroyed the sight, the eye should be enucleated without delay.
5. If sympathetic inflammation sets in, the sooner the eyeball containing the foreign body is enucleated (unless it has serviceable vision.—H.) the better will be the patient's chances of retaining useful sight.
6. If the fellow-eye is attacked with symptoms of severe sympathetic irritation, the eye containing the foreign body should be enucleated without waiting for actual sympathetic inflammation.
7. The magnet is serviceable in cases where the foreign body is of attractive material and can be seen, and is not firmly imbedded in the eye-wall, or encapsulated with organized lymph.
8. Where the foreign body is small, and its lodging-place is uncertain, the introduction of a magnet into the eyeball is generally to be deprecated.
9. After the foreign body has been extracted from the interior of the eye, the patient should be warned that sympathetic inflammation may occur, and, in such a case, should not be neglected.—Medical Record.

INTUITION VERSUS TRACHEOTOMY.—Dr. W. H. Wyble (North American Practitioner) does not believe that the hope has been fulfilled that intubation would, on account of its simplicity, take the place of the knife and add materially to the resources of the profession. The operation requires a degree of manual dexterity which the average physician, with his few opportunities, is not able to acquire. The objection is that the patient is subjected to a certain amount of exhaustion which can be ill borne in one suffering from diphtheria. He thinks one cause of death from intubation has not been given sufficient prominence—viz., pneumonia, resulting from the entrance of liquids at the air passages. The great advantage possessed by tracheotomy over intubation is that the surgeon or nurse can easily remove and replace the tube without pain or discomfort to the patient. He thinks country practitioners do not perform tracheotomy early or often enough; it is an operation which any country practitioner with a cool head and some surgical experience can perform.

Two Cases of Dislocation of the Ulnar Nerve.—These two cases were treated at St. Thomas's Hospital, London. The first was a woman aged twenty-eight, and the accident was caused by a fall on the elbow. There was pain in the inside of the elbow extending to the fingers whenever she flexed her arm, caused by the ulnar nerve slipping over the internal condyle when the elbow was near a right angle. There was no local tenderness, loss of power or sensation, or wasting of the muscles. The nerve was exposed by a semi-circular incision and the nerve sheath slit to the longer margin of the triceps tendon, and lastly attached the edge of the muscle to the periosteum covering the internal condyle, thus embedding the nerve. The arm was then fixed in the extended position. The day after there was numbness, and, later, absence of sensation in the fifth finger. The wound healed by first intention, and sensation gradually returned. On discharge from hospital there was no pain on flexion, and the function of the nerve was completely restored.

The second case was a man aged thirty, a book-keeper, with much writing to do, and for the last two years he found his arm getting weaker, preventing him from holding a pen for any length of time. He noticed that something slipped forwards on the inner side of the elbow. There was no dislocation of injury. The patient was operated on by Sir Wm. Macfarlane. The nerve was exposed and fixed by two lagaroon tendon loops passed through the inner margin of the triceps tendon and somewhat loosely round the nerve. The arm was extended. There was no loss of sensation, and on discharge from hospital the nerve was quite fixed in its normal position, and the patient could write fairly well.—Lancet Hospital Mirror.

THE REMOVAL OF GALL-STONES BY ETHER SOLUTION.—Dr. J. W. Walker had removed several gall-stones from the same patient by cholescytotomy when a fistula still remaining, severe abdominal pain came on, caused by another stone trying to pass along the cystic duct. The stone was no jaundice. The stone could be felt by a probe passed through the fistula into the duct, and appeared to be about the size of a split pea. He endeavored to extract it with forceps, but failed to do so. He then washed out the gall-bladder with a warm borax solution, and having drawn one droclin of a mixture of equal parts of ether and glycerine into a small glass tube attached to a syringe, passed the tube directly on to the stone, which he could distinctly feel, and injected on to it the ether glycerine, drop by drop. This gave rise to a burning sensation for some time, and the patient felt very exhausted during the remainder of the day, but the pain gradually lessened, and on the second day later he carefully examined the stone and found the duct with a probe, but could not feel any stone, and the patient has been absolutely free from pain since.

He believes that the stone which gave rise to this last attack must have passed on towards the gall-bladder at some period prior to the operation, as he very carefully washed out that viscus with borax and ether, but the time and place of its exit he could not determine. The author questions whether the pain of dissolving stones in situ has been before attempted by injecting ether on to them, as in this case; if the wound had closed, it could not easily have been undertaken. He injected the other very slowly, and there was sufficient space by the side of the glass tube for any vapor to escape; no bad symptoms followed the injection.—Lancet.
Goat Vaccine.—M. Ervieux, in a lengthy paper on goat vaccine, read before the Académie de Médecine, comes to the following conclusions: A goat inoculated with cow or human lymph functions lymph much exactly similar to that of the cow; vaccination direct from the cow succeeds as well as from the cow, if the lymph is used quite fresh. Vaccination with goat lymph, after it has been used to vaccinate a human subject, gives the same results as cow lymph. In consequence of the discussion at the Académie de Médecine concerning goat lymph, M. Bertin and Picq asked that their experiments be published, and that the vaccine be opened. Its contents may be summed up as follows: Tuberculosis may be transmitted to the human subject by cow lymph; goats, which are refractory to tuberculosis, should be substituted for cows; the latter may be tuberculous and yet be apparently in perfect health. M. Bertin and Picq are continuing their experiments in that direction, and appear to have discovered a mode of transmission of tuberculosis by either virus or vaccine.—N. Y. Med. Times.

The Treatment of Epithelioma by Magnesium Sulphate.—Dr. E. E. Graves reports eight cases of epithelioma treated in this manner. He uses three-tenths of a grain of sulphate of magnesium to one pint of water, a teaspoonful of the solution taken four times a day. After the parts have been cleansed, a little dry borax acid or a small amount of carbonate of ammonia was used. No other local treatment was given. In most of the cases when the disease was first observed by the patient, it was manifested as a hard scale on the surface of the skin, or as a button-like eminence on the face, which had been there for many months and perhaps years. Some slight itching or stinging sensation might cause the patient to remove the scale for several times, and it might become a little thicker and harder each time, when finally on being removed there would be found a moist ulcerating surface which soon became deeper and broader. The edges became indurated and elevated, and we finally had a growth of a nodular character, which by commensurate increase on its circumference kept a little in advance of the destruction which was going on in the center. There may have been a mistake in the diagnosis of all these cases; but it is a fact that whereas we had grown to the length of augmenting an elevated character with round or oval bases, whose summits were elevated and dark in color, with a discharge of an ichorous character, and those growths increasing perceptibly from one week to another, both in depth and in circumference, and pain of a prickling character, we now have a surface which is natural and healthy in appearance, and nothing to show that it was ever diseased in the least. Boston Med. and Surg. Jour.

[British Medical Journal.]

Ether or Chloroform? Dr. Julliard, after narrating a case in which death occurred during etherization, gives twenty cases of death by chloroform, seventeen of those being published for the first time. Of the twenty, no fewer than fifteen occurred before the operation was commenced. They were all men, and the operation was carried on with a view to ascertain the cause of death. The report is as follows: (1) that anyone who is accustomed to chloroform or by ether's risks his life; and (2) that the risk is five times less with ether than with chloroform. If, then, ether is less dangerous, why is it not preferred? This leads Dr. Julliard to discuss the objections to ether, and his fairness is indicated by his careful consideration of no fewer than eighteen objections:

1. Ether is disagreeable. This is a matter of taste, and is hardly worthy of consideration, in view of the risk.
2. Ether is difficult to administer, requiring complicated apparatus. Dr. Julliard gives it with a very simple mask containing gauze and flannel, and covered with macintosh cloth.
3. Ether is less active than chloroform, and the anaesthetic effect is more slowly produced. True; but the little delay is more than compensated by the additional safety.
4. Ether does not produce a sufficiently deep sleep. Disputed; objection not consistent with experience, if a sufficient dose be given.
5. Stronger preliminary excitement with ether. Excitation occurs in about the same number of cases with both anesthetics. Dr. Julliard finds that a preliminary subcutaneous injection of morphine in most cases prevents excitement.
6. Vomiting is more common after ether. Statistics show that this occurs in one in nine cases after ether, and that the proportion is about the same after chloroform.
7. Ether is insusceptible. True; and therefore it should not be used where the thermocoagulation is to be employed in operations on the head. As a matter of prudence, chloroform is to be then preferred.
8. Ether causes coughing during the operation. True; but this may be diminished by breathing at first through the nose a vapor not too concentrated, and by a subcutaneous injection of morphine.
9. Ether salivates. An exceptional phenomenon, occurring in one in twenty cases, and disappearing during deep anesthesia. Where it is necessary to grapple against, a subcutaneous injection of morphine and atropine is efficacious.
10. Ether excites bronchial secretions. This occurs rarely, and the tendency is much diminished by the subcutaneous injection of morphine and by breathing diluted vapor. It occurs chiefly at the beginning of the administration, and disappears in deep anesthesia.
11. Ether causes cyanosis. This occurs in nervous and alcoholic subjects. When observed, stop the administration, and recommence when the cyanosis has passed off. Cyanosis only occurs in cases in which any anesthetic is more than usually dangerous.
12. Ether asphyxiates. This accident may occur in one of two ways: (a) by an arrest of the respiratory mechanism; or (b) by tracheo-bronchial hypersecretion. It is not common. Stoppage of administration and artificial respiration are the proper procedures.
13. Vapor of ether disagreeable to other patients, nurses, etc. This is largely avoided by using a proper mask.
14. Ether causes severe muscular tremors. These occur rarely in the limbs, more chiefly in alcohols, usually in the lower limbs, cases during deep anesthesia, and it may pass off on strong flection of the great toe. It is very rarely seen after subcutaneous injection of morphine.
15. Ether is eliminated more slowly. It is true that patients recover more quickly from ether than from chloroform, but occasionally cases have been known to occasion the recovery not complete for several hours. These cases are very rare, and have no disagreeable conclusion. The rule is rapid recovery.
16. Ether lowers the temperature more than chloroform. This is also true, but the difference is so small as to be of no account.
17. Ether causes nephritis, pulmonary congestion, bronchitis, even pneumonia. Not admitted.
creosote solution. To this add the cocaine solution and mix.

Some of the salicylic acid corn cures are simply a salicylic acid cerate, made by mixing one part of salicylic acid with eight parts of simple cerate. After being made up to one foot long. The salicylic acid is one composed of forty parts of resin cerate, forty parts of galbanum plaster, fifteen parts of verdigris, five parts of turpentine (the oleoresin), and three parts of creosote.

There is also in the market a corn plaster which is ordinary adhesive plaster with about fifteen per cent of salicylic acid and a small percentage of benzoin.

Still another corn plaster is made of salicylic acid one part, Burgundy pitch one part, and yellow wax one part.

A caustic corn salve is made by mixing a hot saturated solution of caustic soda or potash with twice its bulk of glycerin of starch.

A solution for the cure of corns has been made by dissolving thirty grains of tannic acid in one ounce of a mixture of equal parts of thurite of iodine, acetic acid, and glycerine.

This list could be continued for some time, but the above formulas will enable the energetic druggist to satisfy his customers and aid in filling his money drawers.

THE LICORICE PLANT.

In a report on the trade of Bussorah, Consul Cheney-Vrench says:—

"The great rivers of the Tigris and Euphrates, in the part where the licorice root is found, flow through flat, treeless plains of uncultivated and nearly uninhabited land, capable with irrigation of producing any grain. For three months of the year hot winds blow, and the temperature reaches 104°. For six months the climate is moderate and salubrious, and for three months bleak and wintry, the thermometer going down to 30° at night.

The licorice plant is a small shrub, with light foliage, growing to about three feet high invariably where its root can reach the water. It grows without any cultivation. No lands are leased for the purpose, and all the production is made to its being collected. It is found in abundance from Ctesiphon, twenty miles from Baghdad, down to Kutul-ulna, 178 miles, the latter place being halfway between the ports of Bussorah and Baghdad. It grows on red earth soil, and also on light, almost sandy soil, where the wood is best, provided it has plenty of water and the ground is not more than fifty yards from the actual river or stream. The tree from which it is obtained is called Mesacs, Zerdeli& Essaioy, and it is well known that the business is a prosperous one. The plant is dug up by Arab labor, which is, generally speaking, plentiful, and the men can be brought by boat to where the plant is growing. The laborers need supervision. They are paid according to the quantity dug. After being dug up and cured, grows again better afterward. The time of collecting it is, generally speaking, during the winter, but it is possible all the year round.

The root when dug is full of water, and must be allowed to dry. This process takes the best part of a year, especially in hot weather. After it is dry, or during the process, it is sawn or cut into small pieces, six inches to one foot long. The good and sound pieces are kept, and the rotten bits removed for fire wood. A local tax of ten per cent. is claimed by the government, which may be taken in money or kind from roots cut from the Sultan's lands, and twenty per cent. from government lands. It is then shipped in river native boats for Bussorah, where there is a wool hydraulic press. It is afterward shipped in pressed bales to London, and again shipped from there to America, where it is used largely in the manufacture of tobacco. The trade is capable of expansion. The demand in America is great, and shipments are easily disposed of."  

AN EARLY PROOF OF THE VALUE OF VACCINATION.

A correspondent of the British Medical Journal sends us the following extract from a French newspaper of October 3, 1804: "Six black children, the first who had ever been vaccinated at the Island of Réunion, and from whom five thousand people were vaccinated, were shipped on board the vessel Jenne Caroline, bound for one of the Seychelles Islands, to perform quarantine for small-pox. The six children were three months on board the ship, eating, drinking and sleeping with the sick; during the time of quarantine they were inoculated with the virus taken from the pussules of the diseased passengers, by large incisions made on both arms. From the report made at the time and communicated to the Central Society of Vaccine by the Minister of the Home Department, it was found that, although these six children had slept under the same blankets, and in contact with the pussules of the sick, eating and drinking out of the same vessels, and having been inoculated with pus from the patients who ultimately died of the disease, they were all preserved from the contagion, and were, during the whole time, in perfect health. The proof and counter-proof is one of the most severe tests ever performed, and ought to have a marked place in the history of vaccination. The fact of six children having lived in perfect health on board a small ship infected with small-pox, having on board twenty blacks with confluent small-pox—six of whom died—twenty to twenty-five others with dry crusts all over the body, with seven deaths before their arrival at the quarantine station, all packed in a small space between deck, is perhaps the most crucial test ever witnessed of preservation by vaccination."

MEDICAL MISCELLANY.

A CHRISTIAN scientist asks a patient whether he had ever tried faith-cure for rheumatism. "Yes, I am trying it now. I've got in my pocket the left hind-foot of a rabbit that was killed in the dark of the moon, and I'm inclined if I don't think its helping me." 

The Other Man Layed on.—Minister: "Who is the deceased?"

Attendant: "Oh, he was a faith healer. He used to go about the country haying on of hands, but one day he laid hands on the wrong man; there was a reaction, and the result was fatal to the healer."

COLOR-BLINDNESS.—The Lanacet publishes a curious case of color-blindness. The patient was an engineer-driver in Russia, about forty years of age, whose sight was perfect until 1885. Then he began to suffer from violent headaches, due to over-exertion and insufficient sleep, which were followed by a loss of all power to distinguish colors. Everything appeared to him to be red, and he was obliged to throw up his position. The surgeon who examined him could find no disease, but found his sight, focus, and sensation of light normal. In May, 1890, the man again submitted himself for examination, declaring that his sense of color had been restored. This proved to be the fact. The Lanacet thinks that "this case seems to show that sensation of color is perfectly independent of the physiological function."