

## Editor's Scientific Record.

### SUMMARY OF SCIENTIFIC PROGRESS.

OUR last summary of scientific progress brought the subject up to the beginning of January, and we now proceed to give a brief mention of the more interesting discoveries and announcements made since that time.

In the section of *Astronomy* (with which we begin, as heretofore), the most prominent feature has been the observation and the discussion of the great auroral display of February 4, which in many respects is to be considered as one of the most striking on record. Although visible simultaneously in both the northern and southern hemispheres and in the intermediate regions, and seen at nearly the same time in Europe and America, it yet appears not to have presented itself to observers in the high north; at least, no statement to that effect has so far been indicated. The results of numerous spectroscopic observations have been already published, and the number is increasing. Determinations have also been made in regard to the height of this aurora and of auroras generally; and the conclusion seems to be very general that it is a phenomenon which either occurs entirely outside of the earth's atmosphere or only enters it to a slight extent. An elaborate paper on this subject, by Heis and Flögel, in the Austrian *Journal of Meteorology*, discusses the subject at great length. The spectrum of the zodiacal light has also been reported upon. Richard A. Proctor takes the ground that the once popular idea that meteorites consist of matter ejected from the sun is not so far out of the way; and finds occasion to believe that, under certain circumstances, the formation of protuberances on the celestial luminary may be followed by the discharge of matter, which passes beyond the sphere of the sun's attraction, either in the form of solid bodies or of gases, undergoing subsequent condensation. The temperature of the sun has also been critically discussed in the Academy of Sciences of Paris, where M. Vicaire lately maintained that its heat must be less than  $5500^{\circ}\text{F.}$ , instead of some hundreds of thousands or even millions, as claimed for it by Zöllner and Secchi.

In *Meteorology* and *Terrestrial Physics* we have the important work of Mr. Ley on the laws of the winds, in which he presents certain views as to the variations of the barometer under different circumstances, which he claims to have been thoroughly substantiated by observations which are based on Ballot's law—familiar to every meteorologist.

Dr. Friedmann, in a paper on the meteorological peculiarities of different parts of the country, indicates the changes which occur in proceeding round the globe in the temperate latitudes from the Pacific Ocean westward. The system of telegraphic signals of the weather, for the guidance of business men, mariners, and for other practical purposes, already adopted in many parts of Europe and the United States, has lately been commenced by the government of New South Wales. Mr. Croll, in continuation of his controversy with Dr. Carpenter as to the cause of ocean currents, again expresses very forcibly his belief that such currents are in all cases caused by the winds.

*Chemistry* has been enriched by the labors of an active band of workers, mainly in the organic and technical departments, and important applications of general principles have been made to meet the wants of mankind. An interesting fact is stated by Merget—that iridium and certain other metals are so sensitive to the vapor of mercury that a new and important photographic process will doubtless in time be based upon this discovery. It also furnishes a means for testing the amount of mercurial vapor in workshops much superior to any at our command. This is based upon the discovery that mercurial vapor is extremely volatile, and its emanations extend to a great distance in a very short time.

Various new organic compounds are announced—among them a new fossil resin, known as rosthornite; a new hydrocarbon, named abietine, obtained from the Sabine pine in California; a new red coloring matter, from the wattles of the grouse, called tetronerythrin; a new anthracene derivative, called carbazol, as also carbazoline; melolonthine, obtained from the cockchafer, etc. Dehermaine points out the sources of nitrogen in plants and in the soil; and the existence of milk-sugar in certain vegetable juices is indicated.

In *Mineralogy* we have the announcement of two new mineral substances—monzonite and ilsemannite.

In *Geology* we have fresh statements in regard to the rapid rising of the earth on the coast of Sweden, this, from certain facts adduced, appearing to date from the beginning of the present century. The continual changes in the position of the magnetic pole are ascribed by some authors to the alteration of the level of the land and water throughout the globe, more especially in the northern hemisphere. Mr. Howorth endeavoring to show that this rising toward the pole is very general, so much so as to have produced, within the historical period, a very appreciable influence upon the navigability of certain waters.

*Geographical Science* has an extensive record of progress both in the direction of facts already established and the announcements of preparation for the future.

Dr. Petermann takes the ground that the land of Ophir of the Scriptures is that portion of South Africa lately explored by Carl Mauch, and that the gold was derived from mines in the immediate vicinity. Dr. Beke contests this assertion, and places the situation of Ophir much farther to the north. He does not think it necessary that Ophir should have been a gold-producing country, but simply one to which it was carried, and thence shipped to other regions.

Dr. Schweinfurth, after laborious explorations in Africa, has returned to Germany, where he is engaged in completing the record of his adventures. Attention is called by Dr. Petermann to the modification required of previous ideas as to the shape and extent of Spitzbergen—the result of the investigations of the past summer.

Nothing new has been learned in regard to the history of Dr. Livingstone, although a well-appointed British expedition has been fitted out, and is probably far on its way to the region where Livingstone was last heard from.

The Palestine Exploration Society of New York has issued a circular asking for assistance to prosecute original investigations in the same field where the British society has won so much renown. We have advices from Mr. William H. Dall to the 5th of November of his explorations in the Aleutian Islands, announcing some interesting results both as to the physical condition of the seas and their inhabitants. Reports of the movements of Professor Marsh during the past summer in the regions of the Rocky Mountains and westward, of Professor Powell in Colorado, Professor Hayden in Montana and Idaho, of Lieutenant Wheeler in Arizona and Nevada, and Professor Cope in Kansas, have all been made public, indicating important additions to our knowledge of the paleontology and physical condition of these regions.

Professor Hartt has returned from Brazil with interesting results from his researches there, both in Ethnology and Zoology. In the line of deep-sea work we have a report, by Professor Draper, of the results of the cruise of the New York school-ship *Mercury*, extending from Sierra Leone to Trinidad, and giving some important facts as to ocean temperature and currents. The expedition of Professor Agassiz on the Coast Survey vessel *Hassler* has been heard of at various points up to Montevideo, with indications of important discoveries in regard to the zoology of the deep waters of the ocean. It is announced that the British government vessel, the *Challenger*, is now preparing to start in the summer for the deep water of the Pacific Ocean, to be accompanied by Professor Wyville Thompson and a corps on a three years' cruise.

The Coast Survey steamer *Bibb* has completed a line of soundings between Cape San Antonio, in Cuba, and Yucatan. Professor Stimpson, who accompanied the vessel, reports a very great scarcity of animal life along all the deep waters of the intervening channel, where a temperature of  $39\frac{1}{2}^{\circ}$  F. was met with.

In *Anthropology* we have the discovery of the remains of man in the post-tertiary of Hungary, and of two new lacustrine villages in Switzerland; the one, belonging to the bronze age, on Lake Leman; the other, to the stone period, on Lake Bienne.

The subject of *Zoology* in general, as might be expected, has numerous papers belonging to its records; some of high scientific interest, others of a more popular cast. An important paper has appeared from Professor Van Benéden on the subject of parasites and commensals of fishes on the coast of Belgium. Professor Agassiz announces, as one of the results of his expedition, that *Chironectes*, a small pelagic fish, weaves together with its hand-like pectorals a floating nest of sea-weeds, in which the eggs are deposited and hatched out in the open sea. Professor Cope brings to light numerous new forms of extinct animals, among them various fossil fishes and reptiles. Professor Marsh announces a new species of *Hadrosaurus*, and a pterodactyl; Professor Leidy, a new synthetic type of mammals, which he calls *Trogosus*. Professor Morse communicates papers on the embryology of *Terebratulina* and of the ascidians; and also upon the carpal and tarsal joints of birds, in which he shows the existence of several bones not previously recognized. Profess-

or Van Benéden maintains that *Limulus*, or the king-crab, is not a crustacean, but an arachnid; while the controversy between Professor Dana and Mr. Henry Woodward as to whether the trilobites had legs or not has been kept up by these gentlemen.

In *Physiology* we have papers intended to show that fibrine is formed from albumen; and that it is to glycogen in muscular tissue that its power of continued action is mainly due, this ceasing as the glycogen becomes exhausted.

The occurrence of a parasitic thread-like algæ in a species of phenogamous plants is one of the most interesting announcements in *Botany*.

Under the head of *Agricultural and Rural Economy* we have the suggestion that the *Phylloxera*, or new grape-vine louse, can only be exterminated by inundating the vines in the winter season with water, as is done with the cranberry crop. Perhaps a still more important announcement, if correct, is to the effect that if a branch of a tree or vine be bent so as to occupy an inclination below the horizontal, the vigor of vegetation therein will be increased to an enormous degree.

A Russian treatise upon the rinderpest tends to show that, under certain circumstances, this disease may be treated very successfully by inoculation. Typhus in cattle, it is also said, may be cured or measurably ameliorated by the hypodermic injection of carbolic acid and another substance, kept secret. A process devised by Dr. Louvel for keeping grain free from the attack of insects in large vessels subjected to a partial vacuum is also said to be a success in its practical application.

In *Fish-Culture* we record the appointment of Fish Commissioners by the State of Alabama, and the application of the American Fish-Culturists' Association to Congress for aid in supplying the fresh-water streams and the lakes of our country with such fish as are best adapted to them.

In *Domestic Economy* we have the renewed assurance that the best temperature for boiling all kinds of vegetables and meats is  $200^{\circ}$ , a great economy of fuel and improved cookery being the result. It is also now maintained, contrary to the previous opinion, that meat extracts are not nutritious, but that their only useful function is that of a stimulant, under circumstances when nothing else will answer so well. The origin of many fires has been traced to the rapid combination of oxygen with rusty iron which has been secluded from the air for a time and then suddenly brought in contact with it.

Much progress has been made, as might have been expected, in *Technology*, especially in the art of dyeing; many new colors, such as Campobello yellow, a new aniline black and a white, aurantine, indigoline, etc., having been reported. The use of caseine, derived from cheese, in cotton printing, as a substitute for albumen, is said to be increasing. A method has been discovered of welding copper as thoroughly as iron; and it has been announced that the manufacture of iron was carried on upon a large scale in India as early as the third and fourth century, huge columns equal in size and weight to the shaft of a sea-going steamer having been lately discovered. Various patents have been taken

out for the improvement of nickel plating; and this art may be considered as having attained to a high degree of perfection. A new fulminating explosive named fulminatine has been published. The application of non-conducting substances for preventing the escape of heat has been extended to preventing its entrance, by a lining applied to the interior of iron buildings in India, which is said to be so efficient for this purpose as to make a difference of eight or ten degrees in the temperature of an edifice. A new process for manufacturing red-lead furnishes a largely increased yield, and of a much superior quality. The utilization of suint, or the secretion found in the wool of sheep, and composed mainly of potash, is now carried on very largely in France, the value of the product being much greater than the expense of making this substance marketable.

*Therapeutics* and *Hygiene* are illustrated by papers on the propagation of disease by flies, by Professor Leidy; the cure of cholera by hypodermic injection; the existence of micrococci in measles and scarlet fever; the use of xylol as a cure for small-pox; the efficiency of bromide of potassium as a treatment for epilepsy; the advantages of combining the inhalation of chloroform with the hypodermic injection of morphia as an anæsthetic; the suggestion by Vaughan that malaria is caused by the exhalation of vegetable oils, etc.

In various discussions upon the subject of antiseptics carbolic acid seems to be in less favor, such substances as chromic acid and sulphate of copper being assigned to a decidedly superior position. Carbolic acid, however, in combination with potash or soda, as a carbolate, still seems to meet with much approval.

Our *Necrology* embraces the names of Mr. Charles Kessler, of Reading; Mr. L. Vortisch, of Germany; Dr. William Baird, of the British Museum; Dr. G. E. Day, Dr. Sartorius, of Mexico; Mr. Robert Patterson, of Belfast, Dr. Granville and Dr. Goldstucker, of London; Dr. A. J. Spring, of Liege; Rev. Canon Mosley; Dr. Blythe; Professor S. F. B. Morse; and others.

#### MEAT EXTRACTS NOT NUTRITIOUS.

The increasing skepticism of physiologists in regard to the nutritive value of the various meat extracts, so much advertised at the present day, has been rather fortified by the publication of an elaborate paper of Müller, of Paris, upon the subject of the physiological character of meat extracts in general. In this, starting out with the proposition, first, that meat extracts do not have any nutritive value, and second, that they sometimes have a certain action which is to be attributed only to their mineral principles, and especially to the salts of potash, he proceeds to examine the various preparations, whether bouillons or extracts, and then inquires into the action of the nitrogenous principles contained in these preparations, and finally devotes a third part to a discussion of the action of the potash salts.

We have not the space to give the details of his elaborate researches under these three heads, but present the following summary of his conclusions upon the subject: First, that meat extracts are aliments neither directly, since they contain no albuminoid matters, nor indirectly,

since their nitrogenous principles do not arrest disassimilation. Second, in feeble doses they may be useful by the stimulating action of the salts of potash, which favor digestion and circulation. Third, in stronger doses, instead of being useful, they may have an injurious influence; administered at the end of long sickness, when the economy of the system is exhausted by prolonged abstinence, the salts of potash may have an injurious effect, manifest in proportion as the system has lost all its chloride of sodium. Far from favoring nutrition, they interfere with it by the direct action of these potash salts upon the globule which produces the least absorption of oxygen, and by the predominance in the serum of salts which only dissolve carbopie acid physically, and do not permit the exhalation of the normal quantity of this gas, and consequently the introduction of oxygen. Fourth, the physician should always bear in mind that to give these extracts alone is to maintain the patient in a condition of inanition.

#### SELF-REGISTERING EARTHQUAKE INDICATOR.

Erkmann has laid before the Natural History Society of Prussian Rhineland and Westphalia a plan of a self-registering apparatus for recording earthquakes, which, although somewhat complicated, is said to be not without its merits. The principal objects of this apparatus are, first, to record the exact hour and minute in which an earthquake has taken place at any given point; second, to determine the number and duration of the oscillations of the pendulum, and the relative force of the earthquake; third, from the difference of time at different stations, to determine the velocity of the propagation of the wave; fourth, to ascertain the duration of the earthquake, as also its beginning and ending, and whether acting by shocks in waves or radii; fifth, to indicate the shocks that without its agency would be inappreciable, and thus determine the absolute frequency of this phenomenon.

#### DRY EARTH THE BEST DISINFECTANT.

In the course of a recent discussion before the Lyceum of Natural History upon the subject of disinfectants, in which Dr. Endemann, Professor Joy, and others participated, it was stated that, of all disinfectants, dry earth was the most satisfactory. Dr. Endemann had tried all the disinfectants sold in the market, by composting blood, decayed meat, and vegetable garbage with them in boxes, and leaving them for six months in the best condition for a fair test. At the expiration of the time the only sample that remained absolutely sweet and inodorous was the one made up of dry earth and peat. As the result of numerous experiments conducted by himself, Professor Joy stated that he fully concurred in the statement of Dr. Endemann.

#### GALACTINE.

In a paper published in the Transactions of the Physical Society of Geneva, M. Morin remarks that Mulder has shown that there are three nitrogenous substances in the animal organism belonging to the proteine group, to which this serves as the base—namely, fibrine, albumen, and caseine; the first solid, and the two others liquid, but capable of being transformed into solids.

According to Mulder, also, there are two nitrogenous substances in the animal organism in another group (that of gelatine)—namely, chondrine, contained in the tendons, and gelatine, found in bone, or formed by the action of heat and water upon the membranes.

Morin proceeds then to show that there is still a third substance occurring in most of the elements of the animal organism, sometimes as a constituent element, and at others as a morbid product, such as in abnormal urines. He has found this in the liquid of the cotyledons of the fetus of the cow at different periods of development, in the hen's egg in different stages of incubation, in the blood, in the liquids of the digestive tube, etc., and, in fact, so frequently that it becomes necessary to recognize it as an element of the organism. This he formerly called *gelatiniform matter*, since it resembles gelatine, but is distinct from it by well-marked characteristics. The same substance was subsequently termed *albuminose* by Mialhe. Morin now proposes the name *galactine* as the better term, and states that when fresh, or just precipitated, it appears in the form of a gelatinous or viscous mass, becoming solid by desiccation, but not brittle, and remaining capable of being kneaded between the fingers. Its characteristic peculiarities lie in being soluble in water, insoluble in alcohol, either hot or cold, in being transformed into gelatine by the prolonged action of water or heat, and of being precipitated like gelatine by a solution of tannin; but with this difference, that the precipitate formed by the gelatine is insoluble in warm water, while that produced by galactine is dissolved at a temperature of 140° F., and reforms in cooling. As already stated, this substance has been found in the blood, in the gastric juice, in the liquor of the cotyledons of the fetus, and in the egg, where it is deposited as a germinating or an initial force, destined to start the final development. It also occurs sometimes in abundance in liquids produced by disease, in which case it is rejected like albumen, as if the organs had lost the faculty of assimilating it. It also occurs in the juice of certain plants employed as food for cattle, and it is not at all impossible that its occurrence in the animal economy may be the result of its extraction from plants, or, at least, not always produced by the process of digestion. In nutritive qualities galactine probably ranks with albumen, fibrine, and caseine.

#### ACTION OF STRYCHNINE ON VASO-MOTOR NERVES.

Dr. Sigmund Meyer has published the results of some experiments upon the action of strychnine on the vaso-motor nerve-centre, using for the purpose dogs and rabbits, and calling to his help the cymograph. In most of the experiments the poison was introduced into the venous circulation in the form of an aqueous solution of nitrite of strychnine. In a short time after the injection a very considerable increase of the pressure of arterial blood was appreciable. The decided increase of pressure in the aortic system occurred in animals breathing independently, as well as those poisoned with curare, in which artificial respiration had been produced. In the course of the experiment it was shown that the increase of pressure described is caused by a contraction of the smaller arteries consequent

upon a central excitation of the vaso-motor centre in the brain, and the increased elevation of the resistance to the current of the blood in the arterial system. The contraction of the arteries in question could easily be appreciated by direct inspection of the intestines. While the pressure of the blood was very high, the occurrence of the periodic variation discovered by Troube was frequently observed.

#### LIFE-BOAT.

Mr. N. J. Holmes, engineer of the Orkney and Shetland Islands Telegraph Company, writes to the *London Times* in regard to the subject of life-boats, and states that three valuable lives having recently been lost by the swamping and sinking of an open boat with stone ballast, he had recently built a life-boat thirty feet long by eighteen feet broad, which he had found to be unsinkable, and requiring no ballast, being in every respect a life-boat. This is the form of the safety-boat invented by Captain John Moody, built on the "ray" principle, drawing only seven inches of water, carrying no ballast, self-emptying, and "as stiff as a steeple" in a gale of wind, with a fifty-foot mast and ample sails. He has been employing her in very dangerous work, repairing the heavy shore end of the Great Northern Telegraph Company's cable in the North Sea, under circumstances when an ordinary boat must have capsized.

#### ORIGIN OF COAL.

According to Professor Würtz, the formation of coal depends entirely upon the action of the iron which was dissolved in the waters of the coal period. The combinations of iron with which coal is always accompanied are pyrites, iron spar, and hydrated oxide. These were doubtless derived from the strata interjected between the coal beds. In this case the oxygenated water appeared to act upon the metallic sulphurets which were contained in the crystalline slates, from the destruction of which these coal strata were derived. Coal, consequently, is the normal result of the eremacausis of organic substances in waters which contain sulphate of iron and free carbonic acid. An immense pressure upon the mass, while in a plastic condition, was also, without doubt, an additional element of importance.

#### RENDERING KEROSENE INEXPLOSIVE.

According to a French journal, if amyl-alcohol be added to petroleum or mineral oils, it renders them inexplosive, even when brought into contact with burning substances. This is the discovery of M. Hurtault, who has taken out a patent for it.

#### USE OF CASEINE IN COTTON PRINTING.

The use of caseine as a thickening material in cotton printing continues to increase in favor, the substance being applied by adding a very little cold water to the caseine, and about two to three per cent. of magnesia, giving a thick and gummy solution, which runs when exposed to heat, but not in the cold, the melted mass being soluble in alkaline liquids. When insoluble colors are printed with this solution they become fixed, in consequence of the running produced by steaming. The colors, however, will



not wash. If the caseine is treated with a larger quantity of magnesia, say from five to ten per cent., we do not have a solution, but a thick, semi-fluid, homogeneous paste, which can be stirred around in water without giving a true solution. In barytes water, however, this paste becomes a thin, gummy solution, which is well adapted, in certain cases, for thickening. This melts almost completely by heat, and the mass is insoluble in alkali. The solution can be kept for a long time without decomposition, but must be protected against the carbonic acid of the atmosphere, which will gradually cause the barytes to precipitate, and thus diminish the solubility of the magnesian combination.

#### YOUNG ON THE SPECTROSCOPE.

Number 109 of *Nature* contains an article, in detail, by Professor Young, of Dartmouth College, upon the construction, arrangement, and best proportion of the spectroscope with reference to its efficiency. These notes are reprinted from advanced sheets of the journal of the Franklin Institute, to which the article was originally communicated.

#### ARTIFICIAL MELLITIC ACID.

Professor Schulze, of Rostock, has devised a method of forming mellitic acid artificially by the direct oxidation of carbon by permanganic acid in an alkaline solution.

#### PIGMENTS AND DYES USED BY THE ANCIENTS.

From a memoir by M. Rousset upon the pigments and dyes used by the ancients it would appear that the variety was very considerable. Among the white colors, they were acquainted with white-lead; and for the blacks, various kinds of charcoal and soot were used. Animal skins were dyed black with nut-galls and sulphate of iron. Brown pigments they made by mixing together different kinds of ochre. Under the name of Alexandria blue the ancients—Egyptians, as well as Greeks and Romans—used a pigment containing oxide of copper, and also one containing cobalt. Fabrics were dyed blue by means of pastel-wood (*Isatis tinctoria*). Yellow pigments were principally derived from saffron and other native plants. Vermilion, red ochres, and minium were known from a remote antiquity, although the artificial preparation of vermillion was a secret possessed only by the Chinese. Kermes was used in Egypt in the time of Moses. Among green paints the ancients knew only certain green-colored compounds of copper with the acetate of that metal. The celebrated Tyrian purple was obtained from a mollusk known as the *Janthina prolongata*, a shell abundant in the Mediterranean and very common near Narbonne, where Tyrian purple dye-works were in operation at least six hundred years before Christ.

#### SEWAGE COMMITTEE OF BIRMINGHAM.

A committee was appointed by the town of Birmingham, England, to inquire into the best method of disposing of the sewage of that city, an injunction having been obtained restricting them from allowing it to be discharged into the small river Tame. They reported that they felt inclined to follow the example of other towns in

England, of precipitating the solid portion of the sewage and converting it into useful products, and to apply the remaining water to purposes of irrigation. On this subject they remark, as the result of their inquiries elsewhere, first, that land improves greatly under this irrigation; second, that, as a rule, no complaints are made of nuisance arising therefrom (in the few instances in which nuisance has arisen it has been the result of carelessness in conducting irrigation); third, the health of the district where irrigation is carried on is not injuriously affected; fourth, cattle thrive on the irrigated land, and no case of their being affected with entozoa has ever been heard of; fifth, no other manure has been found necessary for the crops, and the produce, both in quality and quantity, is very satisfactory; sixth, the water, after passing through the land, is purified in a satisfactory manner; and, in one case, cattle drink the effluent water.

#### MONZONITE, A NEW MINERAL.

Von Kobell describes a new mineral, called Monzonite, as occurring in Monte Monzoni, in the Fassa Valley.

#### KEENAN'S BOILER COATING.

Much value is assigned to a substance known as Keenan's Boiler Coating, as a means of preventing the radiation of heat from steam-boilers, and the saving, in consequence, of fuel as well as of time in bringing steam up to the proper degree of tension. The substance is a pulp composed of paper, oil, and certain chemicals, and is laid cold on boilers, steam-chests, steam-pipes, or any other article that is to be protected from the outer atmosphere, to the thickness of an inch and a quarter; on superheaters two inches are required. The boiler, however, must be kept warm during the coating process. When the pulp has properly set it receives three coats of paint, and can, if necessary, be grained and made to look ornamental.

The editor of the London *Mechanic's Magazine* has recently examined certain boilers coated with this substance, and found that with boilers in actual operation the exterior exhibited a gentle warmth just perceptible to the touch. He also was informed that it was the practice of the stokers to draw their fires at half past three in the afternoon and to close the dampers, the steam being then at about thirty-five. On resuming work in the morning, at five o'clock A.M., the gauges generally showed twenty-five pounds of steam, or a loss of only ten pounds during the night as the result of radiation.

#### FIRES CAUSED BY IRON RUST.

A possible cause of fires is suggested by Colonel Angus Croll by the following hypothesis: When oxide of iron is placed in contact with timber, excluded from the atmosphere, and aided by a slightly increased temperature, the oxide parts with its oxygen, and is converted into very finely divided particles of metallic iron, having such an affinity for oxygen that, when afterward exposed to the action of the atmosphere from any cause, oxygen is absorbed so rapidly that these particles become suddenly red-hot, and, if in sufficient quantity, will produce a temperature far beyond the ignitable point of dry timber. Wherever iron pipes are employed for the circu-

lation of any heated medium (whether hot water, hot air, or steam), and wherever these pipes are allowed to become rusty, and are also in close contact with timber, it is only necessary to suppose that under these circumstances the finely divided particles of metallic iron become exposed to the action of the atmosphere (and this may occur from the mere expansion or contraction of the pipes), in order to account for many of the fires which periodically take place at the commencement of the winter season.

#### ACTION OF LIGHT IN ELIMINATING OXYGEN FROM PLANTS.

In the course of some experiments recently prosecuted by Müller on the action of light of different degrees of refrangibility upon the elimination of oxygen from the green portions of plants, it was ascertained that the curve of intensity for the assimilating action of the different rays possesses several maxima, and that the highest intensity of the secretion of oxygen lies in the red of the spectrum, between the Fraunhofer lines B and C, or in that part of the spectrum the rays of which are most completely absorbed by both living and dead chlorophyl.

#### RIVOT METHOD OF EXTRACTING GOLD AND SILVER.

A new process of extracting gold and silver from their ores, devised by Rivot for treating the California ores, has been lately published, and is said to be applicable under certain circumstances in which the usual methods can not so readily be employed. The principal stages in this method of treatment are presented in the following summary:

1. Roasting of the pyrites in heaps, or in reverberatory furnaces, in such a manner as to almost completely oxidize the metallic sulphides, and to reduce the formation of sulphates to a minimum.
2. Pulverizing and mixing of the roasted pyrites with the ores.
3. Roasting of the mixed mass with superheated steam in a revolving furnace, with exclusion of air.
4. Amalgamation in vertical mills, which are capable of a great out-turn, and of working wet or dry, as may be desired, and which divide the mercury well, and effect a more speedy and complete amalgamation, owing to the pressure of the millstones.
5. Separation of the mercury from the residues.
6. Squeezing of the mercury through coarse linen bags or wooden cylinders.
7. Distillation of the amalgam in cast iron tubes provided with receivers cooled by water.
8. Smelting of the metals recovered by amalgamation in black-lead crucibles, and casting in iron moulds.

#### NEW GROUND FOR STEREOCHROMIC PICTURES.

A new painting ground for stereochromic pictures, invented by Schweiger, consists of carbonate of lime, cement, and quartz sand, mixed with a solution of *potash* water-glass, of which so much is added that the mass can be laid on with a brush, and in greater quantity the more porous the ground. The carbonate of lime may

be either chalk or marble powder. The quartz sand must be clean and well washed, and of even grain. The mass of carbonate of lime and quartz sand together should be three to four times the volume of the cement. This, besides possessing a good absorptive power and durability, is white, and in this respect is very superior to some kinds which otherwise have equally meritorious qualities.

#### THE PRICKLY COMFREY AS A FODDER PLANT.

According to Voelcker, the prickly comfrey, a native of Caucasus, is at present cultivated in some parts of Ireland as food for dairy stock. The plant is perennial, is easily propagated by cuttings from the root, and yields a heavy crop. The ordinary produce is about thirty tons to the acre in several cuttings; but eighty-two tons have been reached. An analysis made of this substance showed that it would probably have the same feeding value as green mustard, turnip tops, or Italian rye-grass grown on irrigated land.

#### HYDRATE OF CHLORAL AS AN ANTISEPTIC.

When hydrate of chloral was first introduced into the *materia medica* its expense was so enormous as very materially to interfere with its applications. In consequence, however, of improved methods for its preparation, and the great extent to which this is now carried on, the cost is now very much less, and it is, therefore, possible to make use of it as a reducing agent of metals, as a preservative of objects of natural history, etc. For this latter purpose it would really seem to be of much value, as it is decidedly antiseptic in its character. In one experiment one-half of one per cent. of chloral added to some concentrated dried egg albumen kept it for a long time from putrefying. For such application the chloral hydrate must first be dissolved in water, and then the albumen added to the solution.

#### IMPROVEMENT IN THE MANUFACTURE OF SUGAR.

The Abbé Moigno, in a late number of *Les Mondes*, makes a mysterious announcement in regard to the sugar industry, in which he asks what his readers would think if he were to say that he expected soon to be able to reveal the details of a process by which the juice of the beet root, treated immediately after its extraction, first by lime, and then by a mysterious, sovereign agent, should furnish spontaneously, in the condition of very pure crystals, all the sugar which it contained; or what would be thought of the statement that a Frenchman had lately entered into his sugar-beet root establishment with freshly collected beets, and come out in a few minutes after, having the pulp in one hand, and in the other the crystallized sugar? He promises before long a satisfactory answer to these conundrums!

#### PHOSPHORESCENCE OF MARINE ANIMALS.

According to Professor Panceri, of Naples, the phosphorescence of marine animals is due in all cases to matter cast off from the animal, but still adherent to it; and he is of the opinion that the property is that of dead separated mat-

ter, and not of the living tissues. In all cases (excepting *Noctiluca*) he found that this matter was secreted by glands, possibly special for this purpose, but more probably the phosphorescence is a secondary property. Further, the secretion contains epithelial cells in a state of fatty degeneration, and it is these fatty cells, and the fat which they give rise to, which are phosphorescent. Hence the phosphorescence of marine animals is brought under the same category as the phosphorescence of decaying fish and bones, being due to the formation, in decomposition, of a phosphoric hydrocarbon, or phosphureted hydrogen itself. In *Pennatula* Professor Panceri has made phosphorescence the means of studying a more important physiological question, namely, the rate of transmission of an irritation. For when one extremity of a *Pennatula* is irritated, a stream of phosphorescent light runs along the whole length of the polyp colony, indicating thus, by its passage, the rate of the transmission of the irritation. A careful study was also made by Professor Panceri, by means of the spectro-scope, of the light of phosphorescence.

#### ANHYDROUS ALCOHOL

Chemists are well aware of the difficulty of rendering alcohol absolutely anhydrous, or entirely free from water. According to Erlenmeyer, if alcohol of 0.792 specific gravity be treated with an excess of burned lime for two days, and then distilled, absolutely pure alcohol can be obtained, provided that the first run be returned to the distilling apparatus. This is necessary, since that which comes over during the first half of the operation is not entirely free from water.

#### TEMPERATURE OF LAVAS.

According to the investigations of Dr. Fuchs, of Heidelberg, it would appear from a study of the chemical processes which take place in lavas at the moment of eruption, and by the observation of the broken crystals in the lava, that the melted masses some time before the eruption must have had a higher temperature than at the moment of eruption.

#### REACTIONS OF ALCOHOL

Mr. Hugo Tamm, in a brief abstract of certain experiments upon the action of permanganate of potash upon various substances, such as filter-paper, tartaric acid, coal gas, tallow, turpentine, benzole, alcohol, ammonia, etc., states that the two most interesting facts which he found were that alcohol boiled with an equal bulk of a solution of permanganate of potash was partially transformed into acetate of potash, and that in the same condition ammonia was converted into nitrate of potash.

#### THEORY OF DISINFECTING POWDERS.

A recent treatise upon carbolic acid and its compounds discussed the general theory of disinfecting powders, especially those containing carbolic acid, and ascribes the virtues of the latter in preventing putrefaction to their poisoning the germs in the air before they reach the mass, and filtering out the elements which dispose to putrefaction. This is perhaps due to another cause—their power to absorb water from a moist putrescible material. After showing the power of car-

bolic acid to prevent fermentation and putrefaction, the author of the treatise examines its position among other agents having like powers, and from the fact that its chemical constitution is similar to the bulk of the fermentescible mass, and consequently its action is not explainable on account of its chemical properties, he comes to the conclusion that the chemical constitution and the chemical properties of a body have no direct relation whatever with the power of that body to arrest fermentative or putrefactive change.

#### ANTIQUITY OF THE MANUFACTURE OF IRON.

The antiquity of the manufacture of iron on a large scale is shown in an article by Mr. Richard Mallet, upon the working of iron in India, where, according to this author, it had been carried on upon a scale so stupendous as to rival the production of the largest steam-hammer forges in Europe at the present day. Among other illustrations mentioned is that of a wrought iron pillar at the principal gate of the ancient mosque of the Kutub near Delhi, which is as large as the screw shaft of a first-class steamer. This is slightly spindle-shaped, and is surmounted by a capital of elaborate Indian design, carved by the chisel in the solid iron. The entire length is about sixty feet. Its diameter near the surface is sixteen inches; it contains about eighty cubic feet of metal, and weighs upward of seventeen tons. Near its middle is an inscription of six lines in Sanscrit, from which its age has been assigned to the third or fourth century of the Christian era.

#### ON THE TRUE TEMPERATURE OF THE SUN.

At a recent meeting of the French Academy M. E. Vicaire called attention to the state of our knowledge in regard to the temperature of the sun. The highest estimate of this temperature is about 18,000,000° F., by Father Secchi; the lowest from 2662° to 3201° F., by Pouillet; and other physicists have given varying estimates, generally under 200,000° F. Perhaps the most surprising feature connected with these estimates is that the two extreme results—viz., those of Secchi and Pouillet—have both been derived from observations on radiation made by means of apparatus which is essentially identical in principle. M. Vicaire showed that the difference in these results has arisen, not from any thing in the observations themselves, but from the fact that Father Secchi has made his reductions by means of an erroneous formula. Correcting this error, he finds for the temperature of the sun, from Father Secchi's observations, 2548° F.—a result almost identical with that of Pouillet; and he finally arrives at the conclusion that the temperature of the solar surface is entirely comparable with that of terrestrial flames, and is certainly less than 5500° F.

In the discussion which followed the reading of M. Vicaire's paper the president of the Academy called attention to Sir William Thomson's very remarkable essay on the age of the sun's heat (*Macmillan's Magazine*, March, 1862), in which it is shown that the sun's radiation amounts to about 7000 horse-power for each square foot of its surface, and that coal burning at the rate of half a pound per second produces almost the same result. But Rankine has estimated that in the furnace of an ordinary loco-

motive coal is consumed at the rate of one pound per square foot of grate surface in from 30 to 90 seconds. Hence the force expended in radiation from a square foot of the sun's surface is only from 15 to 45 times greater than that developed from an equal surface of coal burning in the furnace of a locomotive; and as the increase of radiation is much more rapid than that of temperature, it would require an increase of temperature of less than 1000° F. to make the radiation from the coals the same as that from an equal area of the sun's surface.

Sainte-Claire Deville and Edmond Becquerel entirely concurred in the views expressed by M. Vicaire. M. Fizeau remarked that these conclusions were in perfect harmony with photometrical experiments, which show that the intensity of the Drummond-light is 56 times less than that of the electric light, which latter is only  $2\frac{1}{2}$  times less intense than sunlight itself. It therefore follows that the two last-named sources of light are in all respects comparable, and we must admit that their temperatures can not differ so excessively as is indicated by many of the recent estimates of the heat of the solar surface.

#### ILSEMANNITE, A NEW MINERAL.

A mineral which has been termed Ilsemaninite has lately been described as new by Höfer, and as occurring in some heavy spar from Bleiberg. From its chemical composition it is believed to be a product of the decomposition of wulfenite.

#### CROLL ON OCEAN CIRCULATION.

Mr. Croll, in further discussion of the subject upon which he and Dr. William P. Carpenter are at variance—namely, that of "ocean currents"—remarks, in *Nature*, that the true way of considering the matter is to regard the currents as merely one grand system of circulation, produced, not by the trade-winds alone, but by the combined action of all the winds capable of producing this action; and the effect upon the currents depends upon two circumstances—namely, the direction of the prevailing winds and the conformation of the sea and land. From this it results that the general system of winds may sometimes produce a current directly opposite to the prevailing wind blowing over the current.

Taking into the account the result of the conformation of the sea and land, Mr. Croll thinks, and he expects to show, that all the principal currents of the globe, the Gibraltar current not excepted, are moving in the exact direction in which they ought to move, assuming the winds to be the sole impelling cause. The influence of the rotation of the earth he considers greatly overestimated, such rotation exercising no influence in generating motion on the earth's surface; but if the body be already in motion, the rotation will deflect it to the right in the northern hemisphere, and to the left in the southern.

Difference of specific gravity, as resulting from difference of temperature between the equatorial and polar regions, might, if sufficiently great, produce some such interchange of equatorial and polar water as Dr. Carpenter supposes; but this difference of temperature, in Mr. Croll's opinion, could not produce currents like the equatorial current and Gulf Stream in a wide expanse of water. Taking Dr. Carpenter's own data as to the difference of temperature between

the waters at the equator and the poles, and also his estimate of the rate at which the temperature of the equatorial water decreases from the surface downward, he thinks he has proved, in a paper published in the *Philosophical Magazine* for October last, that the amount of force which gravity exerts on, say, a pound of water, tending to make it move from the equator to the poles, supposing the pound of water to be placed under the most favorable circumstances possible, is only  $\frac{1}{300}$  of a grain.

#### ROSTHORNITE, A NEW FOSSIL RESIN.

A new fossil resin, named rosthornite, is described by Höfer as occurring in the coal of the Sonneberg, in Carinthia. This has a fatty lustre, a brown color with garnet-red gloss, wine-yellow by transmitted light, and a light brown to orange-yellow streak. When heated in the air it gives off white vapors having an aromatic odor, and burns with a smoky flame without leaving any residue. In chemical composition this mineral approaches most nearly to enosmite, and still more to the fossil resin of Girona, in New Granada. This substance can not be properly assigned to any of the groups already established among the fossil resins, but seems rather to conform to the type of a solid resin, rich in carbon but poor in oxygen.

#### EXTENSION OF THE AURORA OF FEBRUARY 4, 1872, TO THE SOUTHERN HEMISPHERE.

Students of cosmical physics have been much interested in learning whether the great aurora of February 4 was visible in the southern hemisphere, as in the northern. Letters received by the French Academy from St. Denis (Bourbon Island), latitude 21° S., longitude 55° E., decide this question in the affirmative. One writer says that during the night of February 4, 1872, "a brilliant aurora was seen here. It commenced at half past 8 o'clock P.M., or about five o'clock Paris time. The heaven was then tinged with a purple shade, which gradually increased and extended from the south toward the southeast and southwest. It looked like the eruption of an immense volcano. In the south the coloration extended up to the zenith. Between ten and eleven o'clock the aurora attained its greatest brilliancy and extent. It then shone so brightly that I could distinctly see the lines of my hand and the features of the by-standers. At midnight the aurora was a brick-red color. At three o'clock it became pale again, and the color gradually changed to a golden-yellow, like that of sunrise."

Comparing this account with that of the observations in Europe, it is found that the principal phases of the phenomenon were seen almost simultaneously in both hemispheres. But Mr. Janssen, the celebrated eclipse observer, who was in India on this night, saw nothing unusual, which raises the question whether the auroras seen in the two hemispheres were actually joined at the equator, and not entirely separate. Mr. Janssen's testimony, however, being only negative, this can not be settled until the reports of other observers near the equator have been received. Indeed, we learn that the aurora was very brilliant at Alexandria, in Egypt, which renders it probable that it was continuous from the northern to the southern hemisphere.



## Editor's Historical Record.

### UNITED STATES.

OUR Record closes April 24.—The most important measures adopted by Congress during the month are the Soldiers' Homesteads bill and the Senate bill for the reduction of taxation.

In the Senate, March 28, the House bill to repeal duties on tea and coffee was amended by the addition of the entire Tariff bill of the Finance Committee slightly modified, those modifications being the excepting from that bill the clauses reducing present duty on rice and on silk manufactures. To this was added an amendment abolishing all internal tax, except on spirituous and malt liquors and tobacco. The attempt to include the income tax in the exceptions was defeated by 21 to 19. The abolition of internal taxes was agreed to by 28 to 11. The bill passed at last by a vote of 35 to 4. The repeal of the income tax provided for in the bill is to take effect immediately on the enactment of the bill, although the repeal of the other internal revenue taxes named therein is fixed from and after the 1st of July next.

A resolution was adopted in the House, April 2 (yeas 153, nays 9), declaring the Senate amendment to the House bill repealing the duties on tea and coffee unconstitutional.

In the House, April 1, a bill was passed repealing all laws giving portions of fines and penalties to informers in internal revenue cases.

The Soldiers' Homesteads bill, having been passed by both Houses of Congress, was signed by the President April 4. It is entitled "An act to enable honorably discharged soldiers and sailors, their widows and orphan children, to acquire homesteads on the public lands." Its main provision is that soldiers or sailors who have served ninety days may enter one hundred and sixty acres of public land, and have the time of their service in the army or navy deducted from the time required of other citizens to perfect the title; or if they have been discharged by reason of wounds received in the service, the whole time for which they enlisted is to be deducted. Soldiers' widows and minor children, through a guardian, can also have the benefit of this act.

In the Senate, April 10, Mr. Patterson, of New Hampshire, presented the petition of the Governor and prominent citizens of New Hampshire, asking the United States to set apart the proceeds of sales of public lands to each State in the proportion of 30,000 acres for each Senator and Representative, to be applied to the establishment of State universities for the higher education of women.

In the Senate, April 4, a bill was reported from the Committee on Commerce to promote the ship-building and commercial interests of the United States. It provides for the payment of a drawback equal to the duties paid on timber, metals, and all other articles which may be imported and used in the construction or equipment of vessels of all kinds built in the United States and employed exclusively in trade with foreign countries; and in case American material is used in the construction of such vessels, the Secretary of the Treasury is to pay a bounty equivalent to the duties imposed on similar material or articles

of foreign manufacture when imported. The bill further provides that American vessels which have been registered in foreign countries since January 1, 1861, may, within two years from the enactment of the bill, be registered as American vessels under such regulations as the Secretary of the Treasury may prescribe; that foreign-built iron ships, of not less than 2000 tons, when owned by United States citizens, may, within three years, be registered in the country for foreign trade; that all ship stores and coal to be used in American vessels on voyages from the United States to foreign countries may be taken from bond and disposed of for such purposes duty free; and that all vessels hereinbefore mentioned may be taken by the government for the naval service in time of danger after due inspection and appraisement, the regulations for which are minutely provided in the bill.

In the House, March 25, a bill was passed authorizing the Secretary of the Navy to contract for a statue of the late Admiral Farragut, to be erected in Washington, at a cost of not more than \$20,000.

In the House, April 5, a bill was passed authorizing the appointment of shipping commissioners by the judges of the several circuit courts of the United States, to superintend the shipping and discharge of seamen engaged in merchant ships belonging to the United States, and for the protection of seamen. This bill provides for one commissioner to be appointed by the judge of the circuit court in circuits where there is a seaport, whose duties are well defined in the bill. It provides for the manner of contracts, for remuneration, engagements, and discharges between seamen and masters of ships, and is intended to insure protection to a hitherto oppressed and neglected class.

In the House, April 15, the River and Harbor Improvement bill, appropriating about \$5,000,000—including \$225,000 for Hell Gate—was passed; as was also a bill for the appointment of a commission to inquire into the depredations on the Mexican frontier.

An influential delegation from Texas waited on President Grant, March 28, to request government protection from the Mexican raiders on the Texas frontier. Of late great depredations have been committed, and Mexican troops have not hesitated to arrest American citizens, and hold them, while droves of cattle were conveyed to the Mexican shore of the Rio Grande. Cattle valued at from \$6,000,000 to \$10,000,000 have been stolen from Texas by Mexicans during the last six years. The President promised to bring the question before the cabinet.

In replying to a memorial signed by a number of prominent men, President Grant announced, late in March, that he had appointed Brevet Major-General Andrew A. Humphreys, Professor Benjamin Peirce, and Captain Daniel Ammen commissioners to examine and consider all plans and proposals for an interoceanic ship-canal across the Isthmus, and to report thereupon.

An order was issued by the President, April 15, approving the recommendations of the Ad-