ANNUAL RECORD

OF

SCIENCE AND INDUSTRY

FOR 1872.

EDITED BY

SPENCER F. BAIRD,

WITH THE ASSISTANCE OF EMINENT MEN OF SCIENCE.

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PREFACE.

The present volume is the second of a series in which it is proposed to present, year by year, the most important discoveries in the various branches of science, theoretical and applied—the selection of subjects being made, primarily, on the ground of their absolute importance, as marking the stages of scientific advancement; and, secondarily, as being of interest to the general reader. A general summary of progress for the year in the different departments, prefixed to the volume, is intended to give a connected sketch of what has actually been accomplished.

It will, of course, be readily understood that, in the compass of a single duodecimo volume, it is impossible to do more than touch very briefly upon what appear to be the more noteworthy subjects. As far as the specialist is concerned, he must necessarily have recourse, for full information, to the Journals or Year-Books devoted to his particular department, of which scarcely any branch of science is at present destitute.

As no person, however learned in any one direction, is competent to decide upon the relative importance of facts and discoveries in departments other than his own, the editor would be far from arrogating to himself even an average ability in this respect. He has, however, been so fortunate as to secure the collaboration of some of the most eminent men of science in this country; and among those to whom he has been indebted for the communication of original discoveries, abstracts of what has been done by others, or summaries of progress in their respective departments, he is permitted to mention the names of Professors Henry, Gill, Harkness, Abbé, Newcomb, and Hayden, of Washington; Professors Cope and Leidy, of Philadelphia; Professors Newberry, Joy, and Wm. A. Hammond, of New York; Professors G. F. Barker, Verrill, Marsh, and Dana, of New Haven; Professors Agassiz, Gray, and Watson, of Cambridge; Professor T. Sterry Hunt, of Boston; Professor Langley, of Pittsburg; Professor Himes, of Carlisle, Pa.; and Dr. Alfred W. Bennett, of London; while others prefer to remain unnamed for the present.

In addition to the large number of scientific serials enumerated at the end of the volume as received regularly by mail, expressly for service in preparing the *Record*, free access has been allowed to the unrivaled library of publications of learned societies belonging to the Smithsonian Institution, by permission of its Secretary.

The plan adopted in printing the *Record*, and the multiplicity of subjects sometimes contained in a single article, has prevented a satisfactory systematic arrangement. By means, however, of the analytical table of Contents, with cross references, and a copious alphabetical Index, it is hoped that any subject or name can readily be found.

SPENCER F. BAIRD.

SMITHSONIAN INSTITUTION, WASHINGTON, *April* 10, 1873.

TABLE OF CONTENTS.*

* In the arrangement of articles in the body of the work, it was found difficult to place them in systematic sequence. The effort has been made in the Table of Contents to rectify any misplacement of paragraphs, so as to bring together those most nearly related, and in proper order.

GENERAL SUMMARY

OF

SCIENTIFIC AND INDUSTRIAL PROGRESS DURING THE YEAR 1872.

The completion of another year imposes upon us the duty of presenting a summary of progress in the sciences, and of their practical applications to the needs and the tastes of mankind. To fulfill the task so as to meet all requirements, to criticise all announcements and discoveries in the various departments of learning, and to select for mention the most important in each, is a task that no one person can accomplish to the satisfaction of all, in the impossibility of thoroughly understanding throughout what points are really most noteworthy. The real value, too, of many discoveries is only appreciated after a considerable interval; and we are likely to overlook, in its apparent insignificance, the germ of some important development, and only realize its character long after the original announcement. If, therefore, some of our readers fail to agree with us as to the comparative value of the selections for a particular subject, both in the preliminary summary and in the body of the Record, we can only plead the fallibility of the human intellect in this, as in other instances, and express the hope that we have been more successful in other directions.

The most interesting revelations of *Astronomy* continue to be those of the spectroscope. Among the great mass of observations with this instrument—which are found in nearly every journal in the world devoted to physical science—we may select those of Huggins and Young as examples of what has been done. Our readers may remember that some four years ago Mr. Huggins announced, as the result of spectroscopic observations of great delicacy and difficulty, that the star Sirius was receding from us at the rate of between thirty and forty miles per second. The evidence of this motion was furnished by a displacement of one of the hydrogen lines in the spectrum of the star; but the displacement was so slight, and so difficult of measurement, that Mr. Huggins could not speak with confidence of the velocity of the motion. In 1870 the Royal Society supplied him with a telescope of 18 inches' aperture, and of very short focus, to continue his observations, and the result of his further researches were communicated to that body last summer. Observations of Sirius with this more perfect apparatus confirmed the fact of the motion of Sirius, but reduced nearly to one half the first estimate. Observations were also made on a number of other stars of the first and second magnitudes, which were found to be approaching or receding from us with various degrees of velocity. The following are some of the velocities found by Mr. Huggins:

Sirius	is receding	20	miles per second.
Betelgeux	"	22	"
Rigel	"	15	"
Castor	"	25	"
Regulus	"	15	"

Arcturus	is approaching	55	miles per second.
α Lyræ	"	50	"
α Cygni	"	39	"
Pollux	"	49	"
α Ursæ Majoris	"	46 to 60	"

These observations of Mr. Huggins furnish an interesting confirmation of the motion of the solar system in the direction of the constellation Hercules.

In the department of solar physics there are no brilliant discoveries to report, the advances being rather in the direction of establishing a general system of solar meteorology than in that of new discoveries. The Italian Society of Spectroscopists, of which Secchi and Tacchini are active and prominent members, keeps up as regular a system of observations on the sun as the weather will permit; and we may very soon hope, through their efforts, to know as much about the laws of storms on the sun as we now do of storms on the earth.

The most important step in the direction of new discovery in this department is one made by Professor Young. A committee of the American Association for the Advancement of Science has for some time past been endeavoring to secure the building of an observatory at some elevated point on the

Rocky Mountains, where it was supposed that the position would be extremely favorable for astronomical observation. The selection of a coast survey station at Sherman offered the desired opportunity, and Professor Young was sent thither, with his 9½-inch telescope and the necessary spectroscopes, as member of a party of which Colonel R. D. Cutts of the survey was the chief. The result of getting rid of one fourth of the atmosphere—which is the great foe of solar spectroscopy—was that the number of bright lines in the spectrum of the chromosphere was increased to 273—more than double the number formerly known to exist. Among them have been detected those belonging to the vapor of a number of metals found on the earth, especially iron, magnesium, and titanium; and there are besides a great number not identified as pertaining to any terrestrial substance.

Nothing positive has been done toward clearing up the mystery which surrounds the constitution of comets, of the solar corona, of the zodiacal light, and of the aurora. But the theory which connects comets and meteors has received a most striking confirmation. On the evening of November 27 a great meteoric shower was seen, and the direction of the meteors was exactly that of the lost Biela's comet, the orbit of which the earth was passing at that very time. The coincidence was such as to leave no room for doubt that the shower arose from a cloud of meteoroids accompanying the comet in its orbit.

The feature of most general interest in *Meteorological Science* has been the assembling of the preliminary congresses at Bordeaux and at Leipsic. These meetings have had for their more especial object the preparation for the general International Congress to be held in 1873 in Vienna. The Leipsic Congress was attended by many men prominent in their respective countries, and the desire for uniformity in matters of measurements and reductions was so strongly expressed that we may expect no long time to elapse before important reformations are effected.

The year 1872 has seen the establishment of additional extended national systems of weather reports and storm signals—those, namely, of Canada, Denmark, New South Wales, and Sweden. Only through such national offices, and by help of the telegraph, does it seem possible to hope for satisfactory investigations of the general features of atmospheric movements. In the practical application of meteorological science to the forewarning of storms, the highest perfection has probably been attained by our own American system—the well-known Weather Bureau of the Army Signal Service. The tri-daily bulletins of this office include weather forecasts of all kinds, as well as storms, and are considered a daily necessity to a large class of our citizens.

The number of observers and stations has been constantly increasing, and several new ones have been quite recently started at points on the coast as well as in the interior. At the session of Congress for 1871–72 a resolution was adopted instructing the War Department to do what it could in the interest of agriculture, which has been responded to by dividing the United States into about seventy districts, with a central station in each, to which the weather probabilities are to be telegraphed as soon as made up in Washington, and from which they are to be distributed by the mails, when printed off, to all the post-offices within the district accessible before the close of the day. The postmasters, on the reception of these notices, are to post them in a conspicuous place, so that all who have a desire to know what the weather is to be, can ascertain the fact by visiting or sending to the office. A few of these stations are already organized, and the arrangement will be extended throughout the United States as soon as possible.

Still another development of the system consists in having stations on the sea-coast, with special reference to indicating the probabilities for the benefit of fishermen, to include information as to the occurrence of schools of fish along the coast, so as to concentrate attention to them.

The meteorological work of the Smithsonian Institution, and of the Medical Department of the Army, also to all light-houses and life-saving stations on the coast, has also been kept up. Here the phenomena of the weather are entered upon blanks, and transmitted by mail each month. Although not available for forecasting the weather, as in the telegraphic system of the signal-office, these records are even better adapted to determining the general climatology of the country, in consequence of the much larger number of stations and the lengthened period of time over which they extend.

The Smithsonian Institution alone had over six hundred stations in active operation during 1872, representing every state and territory of the Union, as well as a large part of British America and Mexico.

Among the publications of the year none will rank higher in importance than the "Discussions of the Rain-fall Observations" in the United States published by the Smithsonian Institution. This laborious work has been so thoroughly accomplished by Mr. Schott that it must for perhaps a generation to come be our standard authority. The promised volumes on temperature and barometric pressure, and the new discussion of the winds, will complete that great undertaking which the Smithsonian Institution has, with the very limited means at its disposal, so persistently and successfully carried forward. As a foretaste of what may be hoped for when these works are completed, we may instance the interesting study of the temperature in the neighborhood of the great lakes, as lately published by Professor Winchell.

Passing to the problem of physical meteorology, we notice the observation by Professor Young of coincidences between solar-spot outbursts and terrestrial magnetic disturbances, confirmatory of the oft-cited observation of Carrington in 1859. On the other hand, Meldrum and Lockyer have proclaimed the increase of Indian cyclones (and, therefore, of rain-fall) with the increase of solar spots. These are the first fruits of the attention awakened by the previous publications of Abbé, Smyth, and Stone on the solar-spot period in terrestrial temperature. Some paper published in the Toronto *Leader* in 1870 and 1871, by Mr. Elvins, appears to have first enunciated a connection between solar spots and rain-fall.

In the obscure field of *Electricity* much labor has been spent, and with fair results. The splendid aurora of February 4th gave rise to very extensive essays on this subject, from all of which it appears that, while the purely atmospheric origin of this phenomenon seems well established, its cosmical or solar origin is rendered extremely doubtful. The great work of Professor Lovering, containing, as it does, a critical and exhaustive catalogue of all recorded auroras, has appeared during the year, and must long mark an epoch in the literature of this subject.

The eruption of Vesuvius, ending in April, 1872, afforded

Professor Palmieri opportunity for making more interesting observations on the electric condition of the volcanic smoke, confirming the results of his previous labors as to the origin of the electricity displayed in thunder-storms, etc. The English translation of Palmieri's work has afforded Mallet opportunity to prefix, by way of introduction, a masterly summary of the present state of seismology.

The long-vexed question of the cause of the scintillation of the stars has received almost a complete elucidation at the hands of Respighi—its dependence upon the changes of density in the upper strata of air seems to be completely established by him.

In *Theoretical Chemistry* the past year has witnessed very few changes of importance. The science seems at last to have reached a stage of comparative equilibrium. Kekulé, however, in a noteworthy paper, has given us his views upon the meaning of the term "atomicity," or "equivalence," when applied to atoms. He supposes a kind of intramolecular motion among these atoms, and divides atoms into monatomic, diatomic, etc., according to the number of contacts made in a given time. In water, for example—HOH—the oxygen atom strikes against both hydrogen atoms in the same time that each hydrogen atom strikes one blow; or, in other words, oxygen makes two vibrations while hydrogen makes one. He applies this conception to his theory of the benzol nucleus of the aromatic series, and ingeniously explains away some objections which had been raised against it. Another thing deserving mention here is Professor Cannizzaro's Faraday lecture before the Chemical Society of London upon "The Theoretic Teaching of Chemistry." Accepting fully the theory of atoms and molecules, and believing that "this theory affords the clearest, shortest, most exact, and most accessible summary of all that relates to the origin, meaning, value, and use of empirical formulæ and of equations," he naturally concludes that "it ought to be introduced into the teaching of chemistry at an early stage." "I do not hesitate to assert," he says, "that the theory of atoms and molecules ought to play, in the teaching of chemistry, a part analogous to that of the theory of vibrations in the teaching of optics." He affirms that "the solid base, the corner-stone of the modern theory of molecules and atoms, is the theory of

Avogadro, Ampère, König, and Clausius on the constitution of perfect gases." He would "found upon this theory," therefore, "the demonstration of the limits of the divisibility of elementary bodies; that is to say, the existence of elementary atoms." With his own students, Cannizzaro starts with proclaiming the invariability of the material mass in chemical changes, pointing out "that the only constant property of matter is its ponderability." He then passes to the Daltonian theory, establishes the correctness of the atomic weights by the Gay-Lussacian law of combining volumes, and easily demonstrates the molecular condition of simple matter. He thus places the fundamental notions of atoms and molecules upon a solid basis, freed from every thing not necessarily connected with them. Then it is that the instructor is in "a position to attack the difficulties encountered in the applications of these notions to particular cases." The assistance of specific heat, of isomorphism, and of chemical analogy in fixing the size of molecules, and the true meaning and value of the theory of atomicity, may then be taught, the student being made to recognize the dynamic as well as the ponderable phenomena of chemical change.

The researches of Berthollet, of Thomson, and of Favre in *Thermo-chemistry* during 1872 are most promising. While it can not be doubted that the dynamic equation of a given reaction would be fully as valuable as the chemical equation of the same reaction, the dynamics of chemical changes have only just begun to be studied. If, for example, the amount of heat given off by the union of each of two bases with one given acid be known, and the heat in the case of the union of these bases with a second given acid be also known, then it is evident that any double decomposition occurring upon the mixture of these salts must be accompanied by a thermal disturbance proportional to the difference given in the two cases. Hence the fact and direction of chemical decomposition may be solved dynamically, *à priori*. It is by methods of this sort that Berthollet has established the previously received assumption that it is the most powerful base in every case which unites with the strongest acid. Thus, if zinc acetate and sodium sulphate be mixed in solution, there is no exchange; but if zinc sulphate and sodium acetate be mixed, the production of heat proves that an exchange takes place.

Much light, it is to be expected, will be thrown upon chemical constitution and chemical changes by accurate determinations of the heat produced or absorbed in these changes.

In *General Chemistry* the ozone question has received much attention. A. W. Wright has devised a most efficient form of ozonizing tube for use with the Holtz machine, and M. Houzeau, also, an excellent ozonizing tube for use with the induction coil. By means of this apparatus of Houzeau's, it is possible to obtain from 60 to 120—and once even 188—milligrams of ozone in a litre of oxygen; more than quadruple the amount given by previous methods. This ozonized oxygen is exceedingly active, oxidizing alcohol to aldehyde and acetic acid almost instantly, forming, at the same time, hydrogen peroxide. Great care is needed in experimenting with it, since, when breathed, it causes serious irritation of the lungs, often with bloody expectoration. The deodorizing power of pure ozone is estimated to be forty times that of chlorine. Houzeau estimates that the air of the country, two metres from the ground, contains $\frac{1}{450000}$ of its weight of ozone. Carius has observed that a litre of water dissolves four or five cubic centimetres of ozone. He states that the ozonized water sold in Berlin contains about four centimetres of ozone in a litre. The oxidizing power of ozonized air is well illustrated by an observation of Professor Wright. He noticed that the sulphur of the vulcanite casing of his induction coil became converted, when the coil was in action, into sulphuric acid, which even accumulated in drops upon this casing. The commercial preparation of chlorine by Deacon's process having been proved a success, the inventor has made a most elaborate scientific investigation of it, the experiments extending over four years, and being made with the greatest care. This process, as is well known, consists in passing a mixture of hydrochloric acid gas and oxygen over copper sulphate, or other copper salt, heated to 700° or 750° Fahr. The copper salt is obtained in the best condition by soaking pieces of brick in it and then drying them. The action of the copper salt being of the kind called catalytic, an action of presence simply, the precise character of that action it became of importance to ascertain. Deacon finds that the amount of hydrogen chloride decomposed, other things being equal, depends upon the number of times the molecules of the mixed gases are passed through the sphere of action of the copper salt. With tubes of the same diameter, the opportunity of action is the same at all velocities; if the diameters differ, the number of these opportunities is the same when the velocity is inversely as the square of the diameter of the tube. The percentage of hydrochloric acid gas decomposed varies with the square root of the proportionate volume of oxygen to hydrogen chloride. The cupric chloride formed bears no definite proportion to the chlorine evolved. Since molecules not in contact with the copper salt are included in the field of action, hydrogen chloride must be decomposed also as a result of the forces engaged. M. Merget has made some remarkable observations upon the volatility of mercury, and has made a curious application of it. He finds that this metal gives off vapor continually, even when frozen solid; that this vapor may be condensed upon the surfaces of certain solids; that it passes readily through porous bodies like wood or porcelain; and that it readily reduces salts of the noble metals. If an ordinary silver negative, therefore, be exposed to the action of mercury vapor, this vapor will be condensed upon the metallic portions of this negative; and now, if this negative be laid upon a piece of sensitized paper, the mercury condensed upon the negative reduces the silver in the paper, producing, entirely without light, a *fac simile* in reverse of the original, which may be fixed and toned in the usual way of treating photographic prints. Davenport has investigated some points in the manufacture of malleable iron. He shows that the silicon, the phosphorus, and the manganese are not affected by the annealing process; that the sulphur is not diminished by it, and may be increased; and that the carbon may be reduced to a mere trace. In the centre of a thick casting there is a dark core, which contains uncombined or graphitic carbon.

The field of *Organic Chemistry* has been marked by great activity the past year; though much more has been done in working out old methods than in originating new theories. Young and Thorpe have succeeded in breaking up or "cracking" paraffin, converting it into liquid products. These consist of a mixture of hydrocarbons of the marsh-gas and the olefine series, thus proving paraffin to belong to the former series, which are known thus to break up. Wurtz and Vogt have clearly traced the successive stages in the formation of chloral, and have shown that its hydrate is really the glycol of ethylidene. O'Sullivan has examined the conditions under which dextrine is produced from starch, and has prepared it pure for the first time. He acted upon the starch both by diastase and by acids. He has also shown that the prolonged action of malt upon starch really does produce the sugar called maltose by Dubrunfaut. It has a specific rotatory power of +150°, and reduces only two thirds as much copper oxide as dextrose, into which it is converted by the action of acids. It has the composition of a simple sugar. Musculus—using an ingenious method of dehydratation by means of alcohol—has succeeded in abstracting a molecule of water from one of dextrose, and in producing a substance closely resembling dextrin, though it has a less rotatory power. When we remember that the removal of one molecule of water from two molecules of a simple sugar like dextrose produces a compound sugar like cane sugar—a synthesis of vast importance, which is yet unaccomplished — any steps taken in this direction deserve notice. Kekulé's remarkable theory of the constitution of the aromatic series of organic bodies, has received important verification in the discoveries of the year. He, himself, has added to the idea of position contained in it, and Hübner has fully confirmed the supposition that the six atoms of carbon in the nucleus are of equal value. As a direct outgrowth of this theory, Graebe and Liebermann produced alizarin from anthracene. And now Emmerling and Engler have succeeded in the synthesis of indigotin, the coloring matter of indigo. Though by the process of these chemists the yield is inconsiderable, yet their solution of the true constitution of indigo-blue will undoubtedly soon lead to other and, commercially, more valuable syntheses. The coloring matter of cochineal, also, has received attention. Liebermann and Van Dorp have succeeded in reducing ruficoccin—a coloring matter obtained from carmine by the action of sulphuric acid—by the agency of zinc-dust. They thus obtained a crystallized hydrocarbon melting at 183° to 188° C., and yielding a quinone on oxidation. Though this hydrocarbon has some resemblance to anthracene, it differs from it in composition and properties. As soon as it can be identified, the synthesis of the colored derivatives of cochineal may be looked for. The most striking results which have been obtained during the year in reference to coloring matters, however, are those developed by the researches of Baeyer. It has long been known that by the action of oxalic and sulphuric acids upon phenol (carbolic acid) a red coloring matter known as corallin is produced. Baeyer finds that this is a general reaction, and that whenever dibasic organic acids act upon any of the phenols, a coloring matter is produced. By the action of phthalic acid upon pyrocatechin, for example, a brilliant coloring matter is obtained, which, being remarkably fluorescent, he calls fluorescein. Using some others of the polyatomic phenols, he has succeeded in preparing in this way coloring matters which very closely resemble the natural coloring matters of dye-stuffs, such as Brazil-wood and logwood, though they are not identical with these. The road seems open, however, to the synthesis of these natural coloring matters in the near future. The constitution of the glucosides has received the attention of chemists. Many new ones have been discovered, the constitution of old ones has been established, and some of them, as æsculin, have been synthetically produced. Tannin has been removed by Hugo Schiff from the glucosides, since he has repeated and confirmed Vogt's synthesis of it from gallic acid by the action of arsenic acid. He regards it as digallic acid, as it is formed by the condensation of two molecules of gallic acid. This chemist, by the introduction of ammonia residues into butyric aldehyde, has succeeded in producing the vegetable alkaloid *conine*, the active principle of *Conium maculatum*. This is the first synthesis of a true natural alkaloid; and the certainty with which it was done is another proof, if any were wanting, of the fact that its synthesis is easy after the constitution of a substance is understood. Hence we may confidently look for a speedy synthesis of morphine, quinine, strychnine, and all the other vegetable alkaloids. The remarkable results, obtained first by Drs. Crum-Brown and Fraser of Edinburgh, of the action of the methyl derivatives of these alkaloids, have been increased by others the past year, particularly on the Continent. When the constitution of these alkaloids shall be understood, and their syntheses be effected, it seems clear that it will be possible to form, by replacement, a series of derivatives which in itself will form an almost complete *materia medica.* The action of phenol as an antiseptic is due, without doubt, to its destructive action upon the organisms which always accompany putrefaction. Plugge has examined the relative value of phenol for this purpose, and finds that from 1 to $1\frac{1}{2}$ per cent. suffices to kill all the vegetable and animal organisms in a highly putrid liquid. The alcoholic fermentation was arrested by 4 per cent., the butyric by $\frac{1}{230}$ of its weight of phenol. He believes phenol takes rank far above ferrous sulphate, chloride of lime, chlorine, permanganates, mineral acids, or even quinine. In its physiological action, phenol is similar to strychnine. Its vapor even is active. The best antidote to poisoning by it is, according to Husemann, sugar-lime, made by agitating a solution of 16 parts of sugar in 40 of water, with 5 parts of slaked lime, filtering and evaporating at 100°. Chalk is less efficacious, and oils are of no use.

In *Physiological Chemistry* much excellent work has been done. Bert has investigated most carefully the influence of pressure-changes on life. When animals die under a pressure of only 18 centimetres of mercury, he finds that this effect is due entirely to a want of oxygen; under a pressure of from 1 to 2 atmospheres, from a want of oxygen and the presence of carbon dioxide; of 2 to 6 atmospheres, from the presence of carbon dioxide alone; of 6 to 15 atmospheres, from the presence of carbon dioxide and an excess of oxygen; and of 15 to 25 atmospheres, from the excess of oxygen alone. Mammalia will die when the oxygen in their arterial blood will not balance a pressure of $3\frac{1}{2}$ per cent. of this gas in the atmosphere, or when the carbon dioxide in their venous blood is sufficient to balance 28 to 30 per cent. of it in the air. Inasmuch as the pressure of oxygen depends, first, on its percentage, and, second, on its pressure, the latter may be reduced to 6 centimetres with safety, if the amount of oxygen be increased; or may be raised to 23 atmospheres if properly diluted with nitrogen. Bert thinks aeronauts might go higher if they would take oxygen to inhale, and divers go deeper, without danger, if they would add nitrogen to their air. Aubert has investigated the caffeine question again. By an improved method of extraction, he shows that raw Java beans contain 0.709 to 0.849 per cent. of caffeine. By much roasting a loss of caffeine by sublimation is sustained; but a decoction made from strongly roasted coffee by percolation contains more caffeine than when made from the slightly roasted bean, since the roasting makes it easier to extract. Prepared as usual, by pouring 6 to 10 times its weight of boiling water over ground coffee 3 or 4 times, nearly the whole of the caffeine is extracted. In such a cup of coffee, prepared from $16\frac{2}{3}$ grammes of dry coffee, there is from 0.10 to 0.12 gramme of caffeine; the same amount is found in a cup of tea prepared from 5 or 6 grammes Pekoe tea. Caffeine acts directly on the spinal cord, and causes tetanus; in frogs, injected subcutaneously, in doses of 0.005 gramme; in rabbits, injected into the jugular vein, 0.12 gramme; and for cats and dogs, 0.2 gramme. It quickens the heart's action, and reduces the pressure of the blood. Zuntz shows that carbonic oxide, when in the blood, is not separated all at once, but is evolved at intervals. He believes, therefore, that in poisoning by this gas, artificial respiration should be kept up for a long time, in hope of resuscitating the victim. Romensky has observed that trichlorhydrin is an anæsthetic when taken by the stomach. Owing to its irritating action on the stomach, however, it can not be used in this way. Schultzen and Nencki have made some experiments which prove that the products which albumin gives when decomposed by alkalies—namely, glycocin, leucin, and tyrosin—are excreted as urea when ingested into the organism—the latter less readily than the others. This suggests that a similar metamorphosis of albumin goes on normally in the body. The liver-sugar question has received its share of attention. Dock has proved that the liver can form glycogen (liver-starch) from ingested cane-sugar, even in a few hours. Puncture of the floor of the fourth ventricle causes sugar to be excreted, but no glycogen is formed in the liver. The same effect is produced by curara injections. Hence it might seem that diabetes was due to the direct excretion of the ingested sugar, owing to its non-conversion into glycogen. But as curara causes the excretion of sugar when none has been ingested, Dock thinks the muscles themselves must have the power of retaining sugar or glycogen. Wanklyn has found that the ratio of the ammonia evolved from an animal fluid by evaporation, with potassium hydrate at 150° C., is, to that obtained by subsequently boiling the same portion with permanganate, a definite one for each animal fluid tested. He can thus discriminate between a spot of milk and one of white of egg upon a cambric handkerchief.

In *Agricultural Chemistry* a vast store of material has been accumulated. Pfeffer has apparently settled the vexed question which of the colors of the spectrum was most active in the decomposition of carbon dioxide in the leaves of plants. He exposed the leaves in a tank of water to a spectrum 230 millimeters long, and measured the action by counting the bubbles evolved in a given time. He ascertained that the maximum decomposition takes place at the maximum of light-intensity near D toward E. Calling the decomposition in the yellow 100, that in the red was 25.4, in the orange 65, in the green 37.2, in the blue 22.1, in the indigo 13.5, and in the violet 7.1. The curve of these members closely agrees with Kerordt's curve of the intensity of light. These results entirely confirm those of Draper published many years ago. An important experiment in practical agriculture has been carried on for two years and more at the Massachusetts Agricultural College, under the direction of Dr. C. A. Goessmann, Director of the chemical departments. This experiment is the cultivation of the best European varieties of the sugar-beet upon the experimental farm, and their subsequent analysis in the laboratory, in order to settle the question of the profitable manufacture of beet-root sugar in the Northern States. The best variety for different climates and soils, the best methods of cultivation, the time of harvesting, and the most suitable methods of extracting the sugar—all these are questions which Dr. Goessmann seems likely to solve in a manner at once satisfactory and profitable.

In *Mineralogy* we have the usual announcements of new species, and new determinations of the chemical composition and crystallographic peculiarities of the old ones. The nature and character of the immense meteorites found in Greenland several years ago by the Swedish expedition continue to invoke the attention of scientific men; and numerous memoirs have been published upon the nature of the iron and the other constituents, the amount of occluded gases and their peculiarities.

In economical mineralogy a most important announcement has been that of the existence of tin, in immense quantity, in Queen's Land, and extending over so large an area, and in such richness of percentage of the metal, as to promise a very large addition to the resources of the world as regards this substance. The alleged discovery of tin ore on the shores of Lake Superior is now pronounced to be entirely false.

The increased demand for mica has resulted in the development of new mines in North Carolina; and in connection with this have been found large deposits of corundum, sometimes in immense masses. Owing to various causes, partly the anticipation of a future scarcity, and partly to combinations of capitalists, the price of coal has gone up to a rather high figure in England, which is involving important changes in manufactures and their export, as far as Great Britain is concerned, in consequence of the increased price of iron and most other articles. This has naturally redounded to the benefit of the manufacturing interest of the United States.

In American *Geology*, much new light has been thrown upon the history of the Palæozoic strata, which make up so large a part of the rocks east of the Rocky Mountains. The question as to the age of the copper-bearing strata of Lake Superior has long been one in dispute; for while Hall, Whitney, Logan, and many others had claimed them to belong to the lower part of the palæozoic series, there were not wanting those who asserted their mesozoic age. This was grounded on the lithological resemblances between these bedded amygdaloidal traps, as they were called, with rocks belonging to that period in Europe and in eastern North America. Now, although certain crystalline strata of aqueous origin may, and doubtless do show such characteristics that their geological age and sequence may be determined from their general mineralogical composition, this can scarcely be looked for in rocks which, like the copper-bearing traps of the Keweenaw series, are eruptive in their origin. The late researches of Brooks and Pumpelly seem to show conclusively that the copper-bearing traps of Keweenaw are a very ancient series, and lie unconformably beneath the nearly horizontal sandstones of the vicinity, which occupy a position beneath the Trenton limestone of the New York series. This limestone, with its characteristic fossils, is, in fact, found in many places resting upon these sandstones, which, in their turn, inclose in conglomerate-beds fragments of the older copper-bearing amygdaloids.

The age of the series of dark-colored sandstones and argillites, which carry the silver-lodes of Thunder Bay and its vicinity, has been noticed by Dr. Sterry Hunt in a very recent paper, where it is shown that these strata, to which he gives the name of the Animikie group, are overlaid in slight unconformity by the red and white sandstones and marls of the region, which have been hitherto regarded as the same with those just described as overlying the Keweenaw group. This latter is however wanting in the silver region, where the Animikie group rests directly upon the old crystalline schists of the Huronian, into which also the silver-lodes pass. It would thus seem to be a formation unknown to the south and east of the Thunder Bay region, whose real age and relations can only be fixed by further study.

The study of the palæozoic rocks in Ohio by Professor Newberry shows clearly that the great movement which gave rise to the so-called Cincinnati axis, along which the Trenton limestone is exposed between the Silurian, Devonian, and Carboniferous rocks found on either side, was not, as has been conjectured by some, simultaneous with the movements which have folded these later strata in Pennsylvania, but much earlier. This is shown by the fact that at the base of the Medina sandstone occur beds of a conglomerate made up of the ruins of the older formations, and, moreover, by the fact that the Medina and its overlying formations thin out as they approach, on either side, this central axis, which must thus have been dry land from the time of the Medina formation. This agrees with what we might expect from the phenomena seen along the eastern border of the palæozoic basin, where it is clear, as Hall has shown, that at the same period —namely, between the time of the Hudson River group and the Medina sandstone—a great stratigraphical and paleontological break took place, uplifting the rocks of the Trenton, Utica, and Hudson River groups (which together make up the Cincinnati group of the West). One of the consequences of this movement is shown in the formation of local deposits of conglomerate—the Oneida and Shawangunk grits—at the base of the Medina; and, as a further result, it is seen that the latter, together with the Clinton, Niagara, and Salina groups, all thin out to the eastward, in which direction they were limited by the barrier of dry land composed of the rocks of the Cincinnati group. The Clinton, Niagara, and Salina formation, as Hunt has shown from their chemical composition, were all deposited in an inland basin cut off from the open sea, and consist of magnesian limestones, with salt and gypsum beds. This order of things was terminated by a great movement of depression, as a result of which the free ocean waters flowed over the former eastern barrier, so that the limestones of the Lower Helderberg period are resting unconformably on the different members of the Cincinnati group along the valleys of the Hudson and the St. Lawrence, and even among the ancient crystalline rocks of the Appalachian region in New England and the British provinces. This depression was the beginning of a new order of things, whose continuation is seen in the Corniferous limestone and the Hamilton shales, the rocks of the Erie division of the New York system—the so-called Devonian, to which Dawson has proposed to give the more appropriate name of Erian. The flora of this period, brought to light by Hall in New York and Newberry in Ohio, has been carefully studied by Dawson, and gives us a most important chapter in palæophytology.

The great geological revolution which marks the break between the rocks of the second and third faunas in Ohio and in New York is, as Hunt has shown, but a repetition of a similar process which took place at a still earlier period, and gave rise to the break between the strata of the first and second faunas along the eastern part of the great palæozoic basin. The Potsdam, and Calciferous, and Chazy formations of northern New York and Canada are the thinned-out representatives of the great series of strata designated the Taconic by Emmons, the Quebec group by Logan, and the Primal and Auroral by Rogers, and include the first palæozoic fauna. The Calciferous sandrock was evidently formed under conditions similar to the Niagara and Salina formations, and is, like these, a magnesian limestone with gypsums and brine-springs. The succeeding Chazy limestone is a local formation marking a passage to the new order of things, when, by a great change of level, the open ocean of the Trenton period invaded the region, and, extending far beyond the old sea-limits, spread its limestones not only over the Chazy, Calciferous, and Potsdam (which in some parts of New York it overlies unconformably), but over the surrounding more ancient crystalline rocks, and extended far over these to the northward of Lake Ontario and up the valley of the Saguenay. As regards the relations of these formations of the first and second faunas in the valleys of Lake Champlain and the St. Lawrence, they were supposed by Logan to be due to movements which succeeded the deposition of the latter; but according to Hunt we must admit that the principal movements were anterior, and that the rocks of the second fauna rest unconformably on those of the first.

Further contributions to our knowledge of the fauna of these older rocks, as seen in the valleys just named, have been made by Billings and by Ford. Hunt has lately pointed out that we can not, with correctness, apply the name of Silurian to these rocks, which correspond to the Middle and Lower Cambrian of Sedgwick, and to the first palæozoic fauna of Barrande. He therefore proposes to retain for these the name of Cambrian, in which the Quebec group, and the Potsdam and Calciferous, and perhaps the Chazy of the New York series, are to be included. The rocks of the second fauna—the Cincinnati group, which represent what was originally the debated ground between Sedgwick and Murchison—he proposes to call Siluro-Cambrian, reserving, with Sedgwick and Rogers, the name of Silurian for the rocks of the third fauna only. In this he is but returning to the old distinctions established by Hall and Rogers in their comparisons of American and British rocks, in conformity with the results of Sedgwick, Salter, and others, which were, without good reason, set aside by Murchison and his followers. The whole subject will be found in Hunt's recently published "Essay on the History of Cambrian and Silurian." In it he has moreover given a concise notice of the Cambrian fauna of our eastern sea-coast as seen in Massachusetts, New Brunswick, and Newfoundland; and he agrees with Hartt, Dawson, and Selwyn in referring to this horizon the gold-bearing rocks of Nova Scotia. In this connection he has discussed again the age of the crystalline rocks of New England, and, in opposition to the former generally received view, maintains that these are all pre-Cambrian, and assigns the Green Mountains to the

Huronian series. Hitchcock, who is carrying on a geological survey of New Hampshire, also adopts this view as the only one consonant with the facts there observed. It may be remarked that the notion of the conversion of great masses of palæozoic, mesozoic, and even cænozoic rocks into series of crystalline schists, which so long found favor both in Europe and in America, is now found to be a hypothesis based on very slender grounds, and that the late researches in the Alps by Favre and others show that it must be abandoned there in its stronghold, as well as in Great Britain and New England.

In the study of the magnesian limestones of the Permian age in Great Britain, Professor Ramsay has reached the conclusion that they were deposited in a great inland sea cut off from the ocean, and that their formation marked a period of evaporation, showing a climatic condition of great dryness. The same conclusion he shows, holds good in the case of other European formations of magnesian limestone. He is thus, he tells us, led to adopt the view put forth in 1859 by Hunt, that dolomites or magnesian limestones necessarily require for their formation isolated evaporating basins, from which, by special chemical reactions, which he has studied, the magnesian carbonate is deposited. This view, as the latter has shown, corresponds to the physical and paleontological history of our great magnesian limestone regions in the palæozoic area of North America.

Great progress has been made in the investigation of the fauna of the more recent geological formations in the western portions of the Continent, but the discussion of these belongs rather to paleontology.

In *Geological Dynamics*, Mallet has made an important contribution in establishing, by experiment, the amount of heat developed in the crushing of the strata which must attend the great movements producing corrugation in the earth's crust. This source of heat had already been pointed out by Vose, but the researches of Mallet give to it a quantitative value. He endeavors to show that the amount of heat thus generated as a result of the contraction of the envelop around a cooling nucleus is more than sufficient to account for that manifested in volcanic phenomena. Mallet adopts the view, now generally received, of a solid rather than a liquid nucleus to the globe; and Leconte has just rehearsed the many arguments in favor of this view, adopting the conclusions long since formulated on this subject by Hunt, who for the past fourteen years has maintained this theory, and endeavored, in accordance with it, to explain all volcanic and plutonic phenomena, on the supposition that they have their seat in the lower regions of the stratified and water-impregnated deposits of stratified rocks, and not in unstratified regions below. The great question of the origin of mountains, which has been discussed recently by Dana and by Whitney, is resumed by Leconte, who puts forth a new explanation, according to which the elevation is due to lateral pressure producing a vertical extension of the compressed sediments. Hunt, however, has shown that such a process of lateral compression is but an accident in mountain elevation, and insists upon the view which regards mountains as but the results of erosion of strata raised by continental movements, as originally maintained by Montlosier, by Lesley, and by Hall, the latter of whom long since ably expounded the view, and illustrated it by reference to our American rocks. The cause of continental oscillations is still obscure; but it is clear that it is to upward movements of this kind, and to the partial erosion of the areas thus uplifted, that mountains are due, and that the nearly horizontally stratified Catskills of New York have not had a different origin from the far older and almost vertically bedded Highlands of the Hudson.

The continued researches throughout the year of Professor Hayden in the Yellowstone region, of Lieutenant Wheeler in Arizona and Nevada, of Professor Powell in the Colorado, of Mr. Clarence King and his party in various parts of the West, and of numerous other specialists, including also the various state geological surveys, have greatly added to the information at our command, resulting not only in an improved knowledge of the stratification, structure, and geographical distribution of the rocks in general, but also of the animal and vegetable remains included in their beds. An important discovery by Professor Powell is that of the occurrence of a system of gigantic faults in the Colorado region, where the slip of the strata in places amounts to 2000 feet.

Most remarkable discoveries have been made by Professor

Marsh, Professor Cope, and Dr. Leidy in the Rocky Mountains in the way of fossil forms of mammals, reptiles, and birds, which will be referred to hereafter.

Important additions to our knowledge of the Bermudas and the West Indies are also indicated, especially in reference to very remarkable changes of level within a comparatively recent period. The evidence of a continued change of level in various parts of the earth's surface has been multiplied during the year, the facts observed relating to Spitzbergen, Greenland, Sweden, Patagonia, and the Andes. Professor Agassiz himself, when in the Straits of Magellan, found shells living in brackish ponds elevated some 50 or 100 feet above the level of the sea, precisely identical with species having living representatives in the waters below them. The interval of time has been so short since the occurrence which caused the elevation took place, as not to involve the dying out of the animals thus cut off from the ocean by the upheaval.

To Professor Agassiz we also owe the announcement of important indications in reference to the glacial condition of South America, especially in the vicinity of Montevideo and Chile. Striking glacial phenomena, too, have been brought to light in regard to Algeria and elsewhere in the Old World. The discovery of glaciers by Mr. Clarence King and others in the high mountains of Washington Territory, Oregon, and Northern California was announced during the year 1871; and they have also been detected, in 1872, by Mr. Muir in the Merced Mountains, not far from the Yosemite region.

The announcements of discoveries in the field of *Geography*, as usual, are quite full, as compared with many other branches of science, numerous explorations, both by sea and land, prosecuted by nearly all the civilized nations of Europe and America, having been prosecuted, with scarcely any intermission, from the beginning of the year to its end. We have nothing, so far, from the expedition of Captain Hall, which left the United States in 1871 for the North Pole, by way of Greenland and Smith's Sound. This, however, is not a subject of particular solicitude, as, except by very good fortune, the first news was not to be expected till the summer of 1873. The proposed expedition of Mr. Octave Pavé toward the North Pole appears not to have been actually undertaken, although the newspapers for a time were filled with alleged discoveries made by him in Wrangell's Land.

We are lacking in details of most of the great European expeditions in the line of North Polar research during the year 1872; one of the most important of these—that sent out by the Swedish government under Professor Nordenskjold—was prematurely inclosed in the ice, and exposed to much danger, particularly from the lack of food.

From the Austrian expedition of Payer and Weyprecht a few notices have been received, but nothing of great importance. Russia, it is said, has sent out a preliminary exploring party to Northern Siberia, in anticipation of a larger expedition during the coming year, which will be provided with every means of research, and accompanied by some eminent men of science. The detailed history of the celebrated voyage of the *Hansa* and *Germania* is in course of preparation, and a first part actually published, embracing the remarkable adventures of the *Hansa*, ending in her destruction, and the survival of the crew on a block of ice over an eight hundred miles' journey.

Efforts have been made in Great Britain to induce the government to send out a polar expedition by way of Smith's Sound; but, so far, the response has not been such as to satisfy the scientific men of that country.

The Antarctic regions are even still less known than the Arctic; but inquiry has lately been again directed to them by the efforts of Dr. Neumeyer to fit out an Austrian expedition to that part of the world. It is probable that the movements in connection with the observations of the transit of Venus in 1874 will also invite further attention to this region, as some of the best stations for observation are well toward the South Pole.

A great deal has been done in the way of deep-sea explorations, as well by the United States as by her sister governments in Europe. The American Hydrographic Office has fitted out two vessels for exploration in the Pacific Ocean, providing them with the necessary apparatus to cover all branches of the inquiry during the voyage. One of the most important of the efforts of this kind has been brought to a close by the safe arrival of the *Hassler*, after a lengthened voyage begun from Boston in December, 1871, and ended at San Francisco in the summer of 1872. This vessel, as already stated, was fitted out by the Coast Survey, with a view of hydrographic work on the California coast; and the occasion was embraced by Professor Agassiz, with experienced assistants, to make observations and collections throughout the voyage. Owing to various causes beyond the control of the expedition, less was done in the way of deep-sea research than was hoped for by them; but the collection of natural history specimens was continued unintermittingly, with the result of enlarging the Cambridge Museum by the addition of the contents of several hundred barrels of alcoholic specimens and other objects.

Extensive explorations were also carried on during the year in the Bay of Fundy, by the parties connected with the United States Commission of Fish and Fisheries, as also in conjunction with the Coast Survey, by the same parties, in the vicinity of George's Banks. Reports have already been published in Silliman's Journal and elsewhere of this work, which is believed to be scarcely inferior in importance to that of any of the more modern explorations of a similar character.

Great Britain has distinguished herself by the special equipment of a large steamer, the *Challenger*, for deep-sea work, this vessel having already started for a three years' cruise, to include the Bay of Biscay, the Madeiran seas, the coast of the United States, various parts of the South Atlantic and of the Pacific Ocean. It is commanded by Captain Nares, of the British navy; but the scientific work is under the direction of Professor Wyville Thompson, one of the most eminent of British naturalists.

The Russian corvette, *Witjas*, has also been distinguished for valuable work in the Pacific Ocean, especially in the vicinity of New Guinea.

The work of the German steamer, the *Pommerania*, in the Baltic and adjacent waters, under the direction of Dr. Meyer and Professor Möbius, has been prosecuted with vigor, resulting in the discovery of important facts in reference to the natural history and physical condition of the seas off the German coast.

In the way of land explorations in America, we may mention those in Greenland under the direction of Mr. Edward

Whymper, if it be proper to include that country in the New World. Important facts have been brought to light by this gentleman in regard to the great glacial sheet covering the land, the altitudes of various peaks, the natural history, recent and fossil, and the ethnology of the country.

Alaska has also been explored by Mr. Wm. H. Dall, in connection with his labors on the United States Coast Survey, while engaged in making surveys of the shores and harbors of the Aleutian Islands. He has used the leisure at any time at his command in gathering a very rich collection in natural history and ethnology. Other explorations have also been made, by Mr. Henry W. Elliot, in the adjacent group of the Fur-Seal Islands.

We have already referred to the geological work prosecuted in the Rocky Mountains by different parties; and the same expeditions have been equally noteworthy in their relationship to geographical science. A large unknown or previously unexplored region has been plotted down and brought within the scope of our geographical knowledge, so that the *terra incognita* of the great West is rapidly diminishing. The renewed explorations anticipated for the coming year will tend to relieve us still more from the opprobrium of ignorance in regard to our own country.

The survey of the boundary between the United States and British America, west of Lake Superior, was prosecuted till the close of the season, after which the parties went into winter quarters. It is expected that in the coming season they will carry the line of demarkation many miles to the West.

The labors of the United States government in reference to the establishment of practicable routes for ship canals in Central America have been continued industriously during the year, Nicaragua, Tehuantepec, and the Isthmus of Darien all receiving due attention. Although no very practicable route has been discovered, or, at least, none pre-eminently superior to all the rest, it is hoped that the labors of the coming season will tend to narrow the choice to be made, and to concentrate attention upon that which will prove to be most available under the circumstances.

Professor Hartt during the past year returned to Brazil for the third or fourth time, to prosecute investigations in certain regions that appeared to him eminently worthy of attention. The most important results obtained by him have reference to the earlier inhabitants of the country, for whose history he collected a large amount of material. A noteworthy fact in South American geography has been the ascent of Mount Cotopaxi by a German savant (Dr. Reiss), who was enabled to make the effort under specially favorable circumstances.

As regards Asia, considerable attention has been drawn to expeditions from both the United States and Great Britain, each of which has sent out agents in the form of Palestine Exploration Societies, the special region to be investigated by each being amicably determined. It is hoped that before long some important information may be secured that will repay all the labor and outlay in this service.

Dr. Schleimann announces interesting discoveries at what he considers the seat of ancient Troy, as developed in the penetration through various strata, and which contain remains extending from the most modern time down to that of the inhabitants of the country in the time of Priam.

The most popularly appreciated geographical fact of the year is in connection with Africa—consisting in the penetration into its wilds by Mr. Stanley, the agent of the New York *Herald*, in a successful effort to discover the long-lost Dr. Livingstone. The results of this expedition have been to give Mr. Stanley a deserved reputation, which he shares with the *Herald*, on account of which the enterprise was conducted, and which was induced to contribute so large a sum of money toward this apparently irrelevant object. The stimulus caused by Mr. Stanley's success has led to the departure of an expedition under Sir Bartle Frere, having for its object the suppression of the East African slave-trade; and the dispatch of an expedition with similar objects, on the part of Egypt, under General Purdy; also, in the fitting out of two expeditions for the investigation of Western Africa by way of the Congo—one of them under British auspices, Lieutenant Grandy in command, already in the field; and the other, German, being in an advanced stage of preparation for starting. Other notes in regard to African discovery are furnished by Dr. Schweinfurth, Gerhard Rohlfs, Mr. Edward Blyden, Sir Samuel Baker, Carl Mauch, and others.

This latter gentleman has attracted very great attention on account of his supposed discovery of the ancient land of Ophir, a region showing traces of extensive and ancient excavations, evidently made in the search for gold.

Natural History, as usual, claims a large share of attention, in view of its importance as a study, and the increasing facilities that are furnished by civilized nations for acquiring the necessary training for successful work in its prosecution. Although the new facts brought to light during the year in regard to the existence of species, their relationships to each other and to external circumstances, their anatomy, physiology, and development, are very numerous, it is difficult to select what may be considered of greatest importance. We may, however, mention as extremely interesting the discovery of certain remarkable fossil vertebrates in the Rocky Mountains, to which reference will be made hereafter. An important aid to zoological research, especially among marine animals, consists in the establishment of aquaria, in which they can be examined to advantage and at leisure, in the exercise of all their various functions. Beginning several years ago on a small scale, they have, more lately, been constructed of considerable magnitude in different parts of the world. The most extensive of these is now in operation at Brighton, England, and far surpasses all others in dimensions and scope. This, but recently erected, is now in working order, and already important facts have been ascertained in regard to fishes and certain crustaceans that have heretofore eluded detection. Another aquarium of note is that at Berlin; while others to be erected at Manchester and at Vienna promise to become very conspicuous. The zoological station started by Dr. Dohrn at Naples is another important establishment of a similar character. This is intended to embrace aquaria on a large scale and in great numbers, arranged in a building thoroughly fitted for research, situated on the Bay of Naples, and with the accompaniment of all the necessary collecting apparatus. Here, scientific men of any nationality can prosecute their studies, at the least possible cost and under every possible advantage. The expenses are to be borne in part by the fees received for the admission of the general public to view the aquaria. This institution promises to assume an international character, and the governments and institutions of all parts of the world are invited to take shares, which will entitle them to nominate incumbents for working tables in the establishment, and by whom every facility can be claimed as a right in virtue of the endowment.

A fact of much interest in the line of embryology has been detected in the very young sturgeon. This animal, as is well known, when mature, is destitute of teeth, and secures its food by means of suction. It was, therefore, with no little surprise that some gentlemen engaged in breeding a small species of sturgeon, the sterlet, eminent for the excellence of its flesh, found that the young, for some time after emerging from the egg, had the mouth armed with well-marked teeth, by means of which they were enabled to secure their prey. These disappeared, however, in a short time, leaving a form much like that of the adult fish.

An important fact has been brought out by Professor Panceri in regard to the luminosity of marine animals, and the conditions under which this peculiarity is exercised made intelligible; the separation by Dr. Phipson of this same phosphorescent material, under the name of noctilucine, has also tended to give precision to our views of the general subject of phosphorescence.

The investigation of the faunas of various parts of the globe has been prosecuted to a considerable extent. Among these, perhaps the most interesting and important results obtained are those from the labors of Grandidier in Madagascar, and of the Abbé David in Thibet. Both these gentlemen have brought to light many forms of vertebrate animals, having marked peculiarities, which have excited the attention of zoologists.

The special classes of vertebrates have received, perhaps, even more than the usual share of attention in respect to, at least, systematic work.

The *Mammals* have been re-examined, with reference to their mutual relations, by Gill and A. Milne-Edwards—the former adopting, with Huxley and other late therologists, the sub-classes Monodelphs, Didelphs, and Ornithodelphs, and dividing the first into two primary sub-divisions characterized by cerebral characters (see *Record*, p. 238); the latter isolating man as the type of a distinct sub-class, and then separating successively, from the higher mammals, the Ichthyomorphs, the Implacentals, and the Edentates, and dividing the remainder according to the structure of their feet, whether unguiculate or ungulate. Recent species have been described as new, or further illustrated, especially by Edwards, Elliott, Flower, Gray, Krefft, Macallister, and Murie. Edwards, especially, has added to our knowledge by the description of new forms, and has made known numerous interesting species of Thibet (see *Record*, p. 318). As has been the case for some years past, the cetaceans have received more attention than any other order. Among extinct mammals, the discoveries have been of far more than ordinary interest and importance. Many new types have been discovered by Professors Cope, Leidy, and Marsh (see p. 305), in the western portions of the United States, and especially in the State of Kansas and Wyoming Territory: chief of these are (1) the forms which have been referred to the order of Primates by Marsh and Cope (see p. 326), and supposed to be related to the lemurs; (2) several forms related to Proboscidians (see p. 307, 337); (3) bats obtained from the eocene of Wyoming; (4) a remarkable type referred by Cope to the order Edentata, and named *Pseudotomus* by him; (5) various remains discovered by Cope and Marsh, indicating, apparently, genera representing a previously unknown family related to the opossums. These various types have been indicated or described chiefly in the Proceedings of the Academy of Natural Sciences of Philadelphia, the Proceedings of the American Philosophical Society, and the American Journal of Science and Art (Silliman's). A work inferior in value to no other publication of the year, on the Vertebrates, is a list of the families of Mammals, with diagnostic tables of all the families and sub-families of Educabilia, and lists of genera, by Professor Gill, published by the Smithsonian Institution.

Among the mammalia, the species most interesting to all is, of course, man himself; and although comparatively few years have elapsed since systematic investigations were commenced into his condition in what has been aptly termed the prehistoric period, or the times anterior to authentic records, the amount of tangible knowledge accumulated has already become very great, and the study appears year by year to bring forth richer fruit. Several new lacustrian villages in Switzerland have been discovered, some of them furnishing remains of very great interest; and the detection of a Viking boat, many centuries old, in Norway, has excited much attention among the Scandinavians. A prehistoric corpse, clothed in grave wrappings, and in a remarkable state of preservation, was discovered in a peat-bog in Holstein, and has furnished the means not only of determining the cranial peculiarities of the people, but of the actual nature of the dress of that period.

In America, interesting remains have been brought to light in various mounds of the West, and especially in Alaska, through the untiring efforts of Mr. William H. Dall, of the Coast Survey. Dr. Leidy records also the occurrence of flint implements of very great antiquity in Wyoming Territory. The discovery of a well-preserved skeleton of post-tertiary formation in Hungary, and of skeletons of undoubted antiquity, perhaps even of the reindeer period, at Laugerie-Basse, in France, and near Mentone (Baoussé-Roussé), in Italy, have also attracted great attention.

A paper by Dr. Schmidt, of Essen, upon prehistoric man, takes the ground that man is of greater antiquity in America than in any other part of the world, the remains of his bony frame-work, as also of the implements fashioned by his hand, occurring in this country apparently in undoubted connection with the pliocene period, while the earliest known in Europe belong to the post-pliocene. It must be always remembered, however, that such evidence is only the expression of actual discovery, and that, judging from analogy, man must have originated in the Old World.

In the remaining mammalia, the quadrumana have been illustrated by the discovery of a new species of monkey in Thibet, and by a fossil species in Italy, and a fossil lemuroid in Wyoming, Professor Marsh being the fortunate discoverer of the latter object.

A new species of mastodon, from New Mexico, has been characterized by Professor Leidy, probably superior in size to the better known *Mastodon americanus;* and remains of the mammoth, both European and American, have been detected during the year.

The birth of a young hippopotamus and of a young rhinoceros in London, has excited much attention in view of the great rarity of such an occurrence in menageries.

Several new species of cetacea of the west coast have been described by Captain Scammon and Mr. Dall; and the work of Captain Scammon upon this group, now in a state of preparation, it is expected, will throw a great deal of light upon the species themselves, and the modes of capture of the more important kinds, such as the whale, the porpoise, grampus, etc.

The discoveries among the extinct cetaceans have been numerous and of unusual interest. Cope, Flower, and Gervais have described certain extinct forms, but it is especially to Van Benéden and Du Bus, of Belgium, and to Brandt, of St. Petersburg, that we are indebted for more or less insight into new types.

By far the most interesting discoveries among the mammalia are the fossil forms brought to light during the past summer by Professors Cope, Marsh, and Leidy. Among these may be mentioned a proboscidian of gigantic size, and provided with four horns, each possibly incased in a horny sheath, as in the hollow-horned ruminants. It is understood that these gentlemen are busily engaged in preparing elaborate memoirs upon these and other interesting forms, and that they will soon be published to the knowledge of the world at large.

Among the animals of uncertain position, or even of existence, is the gigantic marine animal popularly termed a "sea-serpent;" and of this we have had the usual number of announcements during the year. One of these accounts refers to its occurrence in a Highland loch during the past summer. Most of the statements concur, as usual, in describing the animal as serpent-like in shape, with a so-called mane along the back of the neck, and capable of erecting its head above the surface of the water, and with the body thrown into vertical coils that appeared at intervals like humps, or like balls along a string. What the true character of this animal may be, it is impossible to say; or how far the appearance of a serpent may have been simulated by a string of floating sea-weed, a school of porpoises, or other manifestation, all of which have been proposed as solutions of the problem.

The *Birds* have not received any specially noteworthy additions. American species have been further considered by

Allen (see p. 321) and Ridgway, with respect to certain coincidences of physical characters and geographical range previously indicated in part by Baird. New works have been published or commenced by Coues (see p. 310) and Maynard (see p. 320). Morse has contributed an important monograph on the condition of the carpus and tarsus in embryonic birds, and has discovered four bones in each (see p. 336). The anatomy of several forms has been examined by Murie. The important work on the fossil birds of France by A. Milne-Edwards (see p. 250), replete also with information respecting recent forms, and data for the amelioration of the system, has been completed. The fossil birds of this country have been the object of study by Marsh, and a very remarkable form (*Ichthyornis*) has been announced by him, which, in his opinion, constitutes a new sub-class (*Odontornithes*). In this, the vertebræ are bi-concave, and the tail was probably lengthened like that of the *Archæopteryx.* Another noteworthy feature is seen in the skull, which, although possessing the cranial characteristics of normal birds, is provided with armed jaws with conical teeth, as in the pterodactyl. Another species of fossil birds of the same or an allied genus is also announced by Professor Marsh, together with some that are less peculiar, and more nearly related to more recent types.

Papers upon the fossil birds of France and of the Mascarene Islands have been published; and the researches of Dr. Hector in New Zealand have revealed a new fossil from that country, which is supposed to have been one of the Rapacious group, of very large size, and fitted, perhaps, for pursuing the gigantic moa and its congeners.

Numerous publications upon birds of various parts of the world, of greater or less extent, have been published during the year, among them a valuable memoir upon the North American species by Dr. Coues. Several monographs of groups have also been presented to the public, and the average progress has been made generally in this fascinating branch of natural history.

Among the *Reptiles*, important work has been done by Gray for the chelonians, and by Fayrer for the poisonous serpents (*Thanatophidia*) of India. A memoir by Leydig on the reptiles of Germany is also of value. The most interesting fossil type has been made known by Cope, as *Protostega gigas*, a type of marine turtles referred to the family *Sphargididæ*, but distinguished by remarkable characters. Another interesting form is *Agathaumas sylvestris*, a genus of the order *Dinosauria*, and supposed by its discoverer, Cope, to determine the cretaceous age of the Wyoming formation, in which it was found. Researches on the *Pythonomorpha*, certain gigantic fossil serpents (see p. 256, 258), and the discovery of the remains of pterodactyls by Marsh and Cope in the cretaceous formation of Kansas, deserve to be signalized (see p. 244, 338).

The *Fishes* have been the subjects of study from an anatomical stand-point, and with a view to the improvement of their classification by Cope, Dareste, and Gill, although at first sight appearing to differ radically from each other, the differences of their several systems are not really as great as they seem to be. The anatomy of some interesting forms has been examined by Günther and Gegenbaur, the former having made known the structure and relations of *Ceratodus* in a very full monograph, and the latter having illustrated the craniology of the sharks. A valuable memoir has been published by Putnam on the *Hypsæidæ*, a family of which the blind fish of the Mammoth Cave is the type. Several interesting fossil forms found in the cretaceous and tertiary formations of the United States have been described by Cope (see p. 258, 368), and some interesting carboniferous types in England by Hancock and Attley.

The announcement made by Professor Agassiz in regard to the habit of the *Chironectes* (a pelagic fish) of building an artificial nest of sea-weed, in which the eggs are intertwined and allowed to float in the open ocean, has also attracted much attention.

Gill has reopened the question of the homologies of the scapular arch, agreeing with Gegenbaur and Parker in respect to the constituents of the scapular series as a whole, but interpreting entirely otherwise the several elements of which it is composed.

The much-vexed question as to the mode of generation of eels has been elucidated by the publication of a work by an Italian author, who takes the ground that the animal is really a hermaphrodite, and that during the winter season both sets of sexual organs are brought to their functional activity, and that the eggs are developed and impregnated in the same individual. This is a remarkable fact, if it be true, and will doubtless be critically inquired into.

The *Insects* have received a fair share of attention during the year, especially in the United States, where two very important descriptive works have been published; namely, one by Mr. Edwards on the North American Butterflies, and that by Mr. Glover on the *Orthoptera*, the latter forming the beginning of a series of illustrated monographs of our more conspicuous insects in general. Mr. G. R. Crotch, an accomplished English entomologist, has commenced the publication in the United States of a catalogue of North American *Coleoptera.*

A curious variety of insect is described by Dr. Le Conte as *Platypsylla castoris*, which, although in his opinion belonging to the *Coleoptera*, is yet so modified in form as to render it extremely difficult of assignment to its proper position. The ravages of the *Phylloxera*, or grape-vine louse, in various parts of Europe, especially in France, continue to excite the gravest apprehension; and it is feared that the result will be the entire destruction of the vineyards in that part of the world, excepting where the roots can be covered during winter with water, so as to kill the terrestrial form of the animal.

According to Professor A. Milne-Edwards, the king-crab (*Limulus*) is neither a crustacean nor an arachnid, but constitutes a distinct class of animals, which Professor Edwards proposes to call the *Merostomata.*

A paper by Professor Smith, upon the embryology and early stages of the American *Lobster*, has added to our knowledge of the peculiarities of this species, the work having been prosecuted by him in the summer of 1871 on the New England coast, and the result published during the past year.

The inquiry as to whether *Trilobites* are in the possession of legs or not has also been continued, Professor Dana and Professor Verrill insisting that they must have been destitute of these appendages, in view of certain peculiarities of their structure.

Perhaps the most important fact in reference to the *Annelids* is the demonstration that the form known as *Tornaria* is the embryo form of the singular worm called *Balanoglossus*, it having previously been supposed to be the embryo of an Echinoderm, which it very much resembles. A special interest attaches to this discovery, as it will by many be regarded as confirming the opinion originally promulgated by Huxley that the Echinoderms and Scolecids form together a peculiar natural group ("sub-kingdom Annuloida") of the animal kingdom; the evidence, however, is not yet regarded as conclusive by those who have heretofore advocated an opposite view, the resemblance being claimed to be superficial, and not based on true homological similarity.

A valuable paper has been published on the embryology of the *Gordius,* or hair-worm, in which the obscurity in regard to the successive transformations of this animal has been measurably cleared up. The announcement made a year or two ago by Professor Wyman that the cerebral cavity of the water-turkey (*Plotus*) is always inhabited by a mass of entozoa worms belonging to the genus *Filaria* is confirmed by him in later communications.

The *Mollusks* have received the customary share of attention from students and describers of new species, but nothing of special interest seems to have been published. We may, however, allude to the researches of Morse on the embryology of the Brachiopods (see p. 271). Among the fossil forms, not the least interesting made known are two species obtained from the carboniferous rocks of Illinois by Bradley, and referred by him to the Pulmonates, under the names *Pupa Vermilionensis* and *Anomphalus Meekii;* the last, originally referred to the *Rotellidæ* by Meek, has been transferred to the *Helicidæ* by Bradley. If these forms have been correctly identified, the addition is important, as only two species have been previously described from the Nova Scotian carboniferous; it is right to add that the discovery has not yet been verified by other naturalists, and is open to suspicion in connection with the type of *Anomphalus.*

The question lately raised by Professor Morse as to the systematic position of the *Brachiopods* has also continued to be discussed, this gentleman maintaining that they are in reality worms, while nearly all other writers insist on keeping them among the mollusks.

An important work on the American east coast Mollusks is announced as about to be commenced by Mr. Tryon, of Philadelphia, to embrace colored figures of all the species.

The *Radiates* have had several unusually important works devoted to their illustration, the first part of Alexander Agassiz's long-looked-for work on the Echinoids having appeared, Allmann's great work on the Gymnoblastic Hydroids having been completed, and a work by Dana on the Corals and Coral Formations, and one by Kölliker on the *Alcyonaria*, having been published.

The *Protozoa*, as represented by the Sponges, have been the objects of study by Bowerbank, Carter, H. J. Clark, Gray, and Kent; and one group especially has been finely illustrated in an excellent monograph published by Häckel. The *Foraminifera* have been the subject of articles by Parker and Jones, and the *Vorticellæ* have been further elucidated by Greef.

In *Botany*, the most important work that has appeared in this country is the "Genera Lichenum" of Professor E. Tuckerman. Dr. Gray, besides his address at Dubuque upon the origin of the North American flora, has published, in the Proceedings of the American Academy, notes on several genera of *Labiatæ*, and an enumeration of an interesting collection of Oregon plants made by Elihu Hall. Leo Lesquereux has given a report on Fossil Botany, supplementary to the Fifth Annual Report of the United States Geological Survey of the Territories. The report, also, of C. H. Peck to the Regents of the New York State University is a valuable contribution to cryptogamic botany.

In England, the first volume of a "Flora of British India," by J. D. Hooker, has appeared, and the second volume of Bentham and Hooker's "Genera Plantarum" is in course of publication. M. A. Cooke, whose recent work on Fungi is now the best authority on that subject for American species, has undertaken a monthly journal, the "*Grevillea*," devoted to cryptogamic botany. On the Continent, Decaisne has completed an extended monograph of the genus *Pyrus;* Boissier has issued a second volume of his "Flora Orientalis," a work which is to be a Flora for all Western Asia, from Greece and Egypt to the borders of India; Baillon's "Histoire des Plantes" has been continued, as also the "Flora Brasiliensis," edited by Professor Eichler since Martius's death. Pritzel has nearly completed a revised edition of the "Thesaurus Literaturæ Botanicæ;" Dr. Pfeiffer has commenced a

"Nomenclator Botanicus," to contain the synonomy of all grades of plants higher than the specific; Dr. A. Engler has published a monograph of the genus *Saxifraga;* Regel, a revision of *Cratægus* and other genera; and Maximowicz has continued his investigation of Japanese species and their relations to allied American ones. In the botanical journals there have been more or less extended revisions, as of some liliaceous genera, by J. G. Baker; of the *Caryophyllaceæ*, by Rohrbach (posthumous); of *Marsilia* and *Pilutaria*, by A. Braun; and of the *Cyperaceæ*, by Böckeler; and also contributions to morphology and biology by Hegelmaier, Brongniart, Cohn, and others. In physiological botany, however, the most important production has been an able morphological treatise by Strasburger upon the *Coniferæ* and *Gnetaceæ.*

As an instance of the use of paleontological botany, and its application to a more perfect understanding of the relation of surviving plants, we may refer to the address of Asa Gray, delivered as retiring president of the American Association for the Advancement of Science. In that discourse he traced the history of the genus *Sequoia*, embracing the giant trees of California, back to the tertiary period; and the data thus obtained necessarily led to the inference that the species in question were the last survivors of a group abundantly represented in previous ages, but whose representatives have successively disappeared, till the straggling and rather rare species now living stand out in bold relief against the predominant flora of our own times.

Botany has suffered in the deaths of Hugo von Mohl; Professor A. S. Oersted, of Copenhagen; Dr. F. Welwitsch, the African explorer and botanist; and, in this country, Rev. M. A. Curtis.

In the field, collections have been made to some extent by W. H. Dall, in Alaska; E. Hall, in Texas; C. C. Parry, in Colorado; Dr. Hayden, in Montana; and by Lieutenant Wheeler in Arizona. Many new American phenogamous species have been published, besides numerous species of Fungi by C. H. Peck and M. A. Cooke, in the publications mentioned, and in the London Journal of Botany.

Among fossil plants, many new and interesting species from the tertiary, cretaceous, and carboniferous beds of the Western territories have been made known by Lesquereux.

They were obtained by the collectors connected with the United States Geological Survey of Territories, of which Dr. Hayden is the chief. We may also mention, in connection with fossil plants, the "Introduction to the Study of Paleontological Botany," lately published by Balfour.

The next subject that claims our attention is that of *Agriculture and Rural Economy*, a department in which a restless activity has been manifested; as usual, evinced by the publication of numerous essays and communications to the agricultural and scientific journals. Much of this is, of course, mere repetition of facts already well known, or the crude views that carry their own refutation on their face. Real advance has, however, been embodied in the memoirs of agricultural societies, and particularly in the reports of the experimental stations in Germany and elsewhere.

An important aid in the future progress of agriculture will, it is hoped, result from the action of Mr. Lawes, the eminent agricultural chemist of England, who has given half a million of dollars for the endowment of an experimental farm, providing also for a corps of investigators, whose labors will be duly presented to the world.

Various agricultural societies in the United States have been diligently engaged in carrying on their work; and, by means of annual fairs and experiments, have done much toward introducing improved machinery and methods into various parts of the country.

The Department of Agriculture of the United States continues its useful labors in the dissemination of valuable information through its monthly and annual reports, and in the distribution of seed and roots of useful plants. It also continues to exercise, to the acceptance of the public, the function of reporter upon the state of agricultural products during their season, so as to give timely notice of the probabilities of a harvest.

The subject of manures, both animal, vegetable, and mineral, as heretofore, occupies special attention (the rapid exhaustion of the soils consequent upon wasteful modes of culture making such restoratives and stimulants absolutely necessary); so that the exhaustion of the guano of South America will probably be met by the manufacture of artificial substitutes. Many of these consist of fish mixed with sea-weeds and the mineral phosphates from South Carolina and elsewhere.

The subject of the diseases of animals and plants is, of course, an important one to the agriculturist, and the threatened destruction of the vine in Europe, and especially in France, by the ravages of the *Phylloxera vastatrix*, or grapevine louse, has caused the gravest apprehension. This insect is believed to be originally a native of America, and to have been transferred to Europe, where, as in its native home, it exhibits itself in two forms, one living among the roots of the vine, and the other on the stems and leaves. Numerous remedies have been proposed, but apparently with little success—the only practical one being flooding the roots during the winter with water, whenever this is practicable, so as to destroy the animal.

The silk-worm disease, at one time so prevalent in Europe, is now, according to Guérin-Méneville, in process of disappearance — so much so that partially diseased eggs have been known to produce perfectly healthy worms, a fact of much moment to silk-culturists.

Among the diseases of domestic animals, the most prevalent during the past year was the so-called epizootic, which appeared, for the most part, to be confined to horses, and which, beginning in Canada in September, rapidly spread southward and westward, until the whole country was involved. At the present time it appears to be raging in Arizona and Montana, where, as elsewhere, it has produced the greatest inconvenience.

Other diseases have been, perhaps, less common in this country; although we have the customary announcements in the papers of hog and chicken cholera, of pleuro-pneumonia among cattle, etc.

The potato has experienced one of its great seasons of epidemic in Europe—in Great Britain, especially, where the crop gathered has formed but a very small percentage of the expected harvest.

Having thus briefly considered the subject of Agriculture, or the questions connected with the culture of the soil and the rearing of terrestrial animals, we proceed to the consideration of a kindred department, or, indeed, a subdivision of the same general science, which has not inaptly been termed

Aquiculture, or that which relates to the capture, protection, management, increase, and marketing of the products of the water, both fresh and salt, namely, *Pisciculture and the Fisheries.* Agriculture itself is scarcely superior in importance to Aquiculture as a question of economy—whether we consider the extent of its products, its bearing upon the health and vigor of the nation, or the very large yield from a small investment, which, in most cases, is less that of capital than of labor and skill.

The increasing interest in this department is sufficient warrant for devoting some portion of our space to its elucidation. The rivalries and jealousies between American fishermen and those of the British Provinces in North America, which at one time threatened to bring on serious collisions, have been measurably removed by the establishment of a treaty, which only requires a few formalities on the part of the United States and of Canada to go into effect. These have been, in fact, for the most part supplied; and on the 1st of July next the provisions of the treaty will be in actual force. Under these the American fishermen will have a right in British waters equal to those of the natives of the provinces, while the latter, on the other hand, will enjoy free fishing on the coast of the United States nearly as far south as Cape May. Indeed, although the treaty does not actually become operative until July, it is understood that no obstacle will be interposed by the Dominion authorities to American fishermen entering British waters at any time during the present season.

The special fisheries on the American coast during the year have been of average excellence. The catch of mackerel was inferior to that of other species, however, partly in consequence of the scarcity of the fish, and partly because the surplus from 1871 was so great as to render the market inactive. It is expected that, with the removal by treaty of any restrictions, the favorite fishing-grounds of the Gulf of St. Lawrence and elsewhere will be occupied by large numbers of Americans; and it is to be hoped that the catch may be proportionally great.

The American *Herring fishery* has been more productive than usual, the waters of the Bay of Fundy having been perfectly alive with this fish during the fall and winter, so much so that they were sold as low as one dollar per hogshead at the weirs. A new trade—that in frozen herring—in Passamaquoddy Bay, and in the vicinity of Eastport, was prosecuted during the winter with much vigor, fish to the value of over $100,000 being taken and marketed. These fish are taken in winter in gill-nets, and soon become frozen by exposure to the air, and are carried in that condition to the principal ports to the westward and sold as fresh fish.

The *Menhaden fishery* continued to produce abundantly, millions having been captured, and converted into oil and guano.

The *Cod fisheries*, both on the Atlantic and Pacific, have been productive, and have given occupation to a large number of persons.

The *Salmon fisheries* of Maine, the only state on our Atlantic coast where they are caught in abundance, were quite satisfactory during the past season, and it is hoped that the measures now being taken for the increase of the supply will soon result in a great addition to the number. The fisheries of the Columbia River and on the Sacramento have also been prosecuted with diligence, and immense numbers have been preserved for domestic use and for exportation.

The *Shad fisheries* were less productive than usual in most of the states. In those only where artificial means of increasing the young had been taken were they captured in abundance. Their numbers were so great in Connecticut River, where this work has been carried on most vigorously, as to render the fish a drug in the market, ready sale not being found at eight or ten dollars per hundred.

The *Hair-seal fisheries* on the coast of Newfoundland were quite profitable, and those of the *Fur-seals* on the islands of St. Paul, St. George, and Alaska were fully up to the limit of the capture allowed by law. Owing to the judicious measures adopted by the United States government, seconded by the Alaska Commercial Company, who have leased the islands from the United States, these animals are increasing so rapidly that it is probable that an extension of the limit of capture and destruction will have to be made to keep them within reasonable bounds.

The *Whale fishery* in America continued to decrease, as it has done for many years past, the number of vessels employed diminishing year by year—the sea-port towns of New England, which were formerly supported by this trade, now showing the most evident indications of a falling-off in the business.

In view of their great value to a nation, as an article of food and trade, the great decrease in the numbers of fish in many parts of the world has, as is well known, invoked the attention of governments, as well as of private associations, toward restoring the supply, this being capable of accomplishment in two ways: first, by protection of the fish during the critical season of spawning or migration, and by removing the obstructions to their passage up the rivers, or elsewhere, to their spawning-grounds; and, secondly, by their artificial propagation, securing the eggs and hatching these out, and then rearing the young fish to a certain condition of maturity, or else turning them at once into the water. The utility of the second method depends, in a considerable measure, upon the fact that when fish spawn naturally, the eggs, in large part, are improperly fertilized, and, consequently, do not come to maturity, or else they are covered too deeply by mud or gravel, or are devoured by the inhabitants of the waters; and when the young actually succeed in escaping from the egg, they are equally liable to attack and destruction. But in the case of artificial hatching this result is measurably avoided, the impregnation of the egg being accomplished much more completely, and the eggs and young protected, during the critical period, from their enemies.

While, therefore, it is estimated that only five per cent. of the spawn naturally deposited by a fish in the water ever pass beyond the stage of helpless infancy, in the case of artificial propagation the total loss up to the same stage should not exceed five per cent.; thus giving ninety-five per cent. of the whole stock, instead of five per cent. The theory and practice of fish-culture rests largely upon this consideration, as also upon the fact that fish almost invariably return to the spot where they first saw the light to lay their own eggs, this making it possible, while introducing certain of the anadromous fish into a stream, to calculate upon completely stocking it after a few years.

To carry out this desirable object of increasing the fish supply, an appropriation was made by Congress to enable the

United States Fish Commissioner to take steps for stocking such of the fresh waters of the United States as were national in their character, and common to. several states; and, availing himself of the advice and counsel of practical fish-culturists, and of the fish commissioners of several of the states, his first operations were commenced in regard to the introduction of shad and salmon. The services of Mr. Seth Green were obtained for transferring young shad to the Alleghany River, and the Mississippi at St. Paul, while Mr. William Clift, also an eminent fish-culturist, took charge of their transportation to the waters of White River at Indianapolis, and to those of the Platte at Denver. It is expected that this branch of the work will be continued during the year 1873.

As regards salmon, the Commissioner dispatched an assistant to California for the purpose of obtaining eggs of the Sacramento species, and co-operated with the Fish Commissioners of the New England States in the support of the establishment of Mr. Atkins at Bucksport, Maine. He also engaged a large number of eggs from the salmon-breeding establishment at Freiburg on the Rhine, to which were added a large supply presented by the German government from the state establishment at Hüningen. A considerable number of Sacramento eggs was received, and the young hatched out at the establishment of Dr. J. H. Slack, of Bloomsbury, N. J., and placed in the Susquehanna River. The eggs from Bucksport were placed in charge of the State Commissioners, for introduction, when hatched, into the waters of their respective states. Such of the German eggs as survived the unexpectedly severe experience of their journey have been introduced into the Delaware.

The Commissioner has also continued during the year the inquiries ordered by law into the condition of the food-fishes, begun in 1871, carrying them on upon the coasts of Maine and New Brunswick, special reference being had to the herring, cod, and mackerel.

His Report upon explorations made in 1871, as presented to Congress, is in press, and contains much valuable information.

The Commissioners of fisheries of the several states have also been industriously engaged in carrying out their work, nearly all the New England and Middle States, excepting

Delaware and Maryland, having officers of this character; as likewise Alabama and California. Very gratifying results have followed their labors; for the details of which, however, we have not at present the space, and must refer our readers to the pages of the *Record* for fuller information.

The year 1872 has shown the usual amount of activity in the way of prosecuting great *Engineering* enterprises, although we have nothing to record equal in importance to the completion of the Suez Canal. This continues to be a success, and is gradually realizing, in reference to its effect upon the world's commerce, if not as a pecuniary investment, the anticipations of its projectors. The example of this work has stimulated similar efforts elsewhere; and measures have already been taken looking toward the construction of canals between the Rhine and the Weser, between the Black Sea and the Caspian, etc. The idea has also been broached of a ship-canal across the peninsula of Florida. The effort in favor of a canal across Cape Cod, to connect Buzzard's Bay with Cape Cod Bay, does not appear to have made definite progress.

Renewed investigations have been conducted by the United States Government in reference to surveys for canals connecting the Atlantic and Pacific oceans by way of the Isthmus of Darien, Nicaragua, and Tehuantepec. How soon any one of these works will be actually constructed it is, of course, at present impossible to predict.

In the United States, the most important engineering fact of the year is the perforation of the Hoosac Mountain (a railway tunnel), which was successfully accomplished on the 28th of December. Some time must necessarily elapse before the completion of this work, so as to admit the passage of trains—an event which will mark an era in the history of railroad enterprise in New England.

A tunnel has also been proposed under the East River, another under the Niagara; and others are in contemplation in different parts of the United States, as also one under the Gut of Canso, which divides Cape Breton from Nova Scotia.

The great suspension bridge across the East River, connecting New York and Brooklyn, is in an advanced stage of construction, moving steadily onward to completion.

The engineering operations, under the direction of the

United States Government, for the removal of obstructions at Hell Gate, are also well advanced, the work under the bed of the river being already honey-combed by the removal of immense quantities of solid material; and at the proper time all these submarine galleries will be charged with immense masses of explosive material, the discharge of which it is expected will shatter the remaining rock walls, and reduce them to a level that will carry the whole below the reach of any passing vessel in any state of the tide.

Official reports as to the present stock of workable coal in Great Britain has had the effect of creating a panic, which, aided by combinations of a few capitalists controlling the coal-interest, has increased the price of that necessary of life very materially, so much so as to involve in peril the future of the manufactures of Great Britain. So far from exporting coal hereafter, it is expected that large quantities will be imported from the United States and elsewhere, this change in the state of affairs necessarily resulting in favor of the American manufacturers and manufactures produced; and both the iron and coal trades have already experienced its stiffening influence.

Improvements continue to be made on railroads, looking toward the safety and security of life; the introduction of new forms of breaks and of platforms, as well as the more extended use of the telegraph in running the trains, all tending to this end.

The introduction of mechanical methods of puddling in iron forges has, it is said, more than realized the expectations of the inventors. The methods of Danks and Dormoy are especially recommended. The increased economy and efficiency consequent upon the use of these inventions is of special moment at the present time in connection with the enhanced cost of manufacturing, resulting from the rise of the price of coal just referred to.

The use of new explosive materials in engineering continues to increase, the employment of the old-fashioned gunpowder having been in a great measure superseded in certain connections. Nitro-glycerine, Dynamite, Dualin, Giant-powder, Fulminatine, Lithofracteur, etc., are terms applied to the various preparations, each of which is claimed by its inventor to be superior to all others, or, at any rate, safer and more applicable in certain connections. Gun-cotton, however, still continues to hold its own as an explosive; and the recent discovery that a combination with 20 per cent. of its weight of water does not materially affect its explosive power when set off with a fulminate, while it protects it against accidental ignition, will probably give to it the preference, in many cases, over its rivals.

Our limitations of space will not permit us to go into detail in reference to *Technology*, although the chemical branch of the subject has been referred to under the head of Chemistry.

For information in this department, the special journals in America, more particularly *The Scientific American* and *The American Artisan*, may be consulted with great profit. A few points, however, may be touched upon as being of general interest.

In the department of the liberal arts, progress continues to be made in the application of photography for purposes of illustration, numerous new processes having been announced, and improvements in the older ones. At the present time, the favorite methods of auto-type printing are those of Albert, as modified by Edwards of London, and that of Mr. Woodbury. Both of these have lately been applied successfully in illustrating natural history objects, and in the same work, that by Mr. Alexander Agassiz upon the Echini. The extreme volatility of metallic mercury as ascertained by Merget, has already been used by him in the production of pictures, and seems likely to receive an extended application hereafter.

The usual number of new dyes has been introduced during the year, many of them anilines, and others of a different composition.

The subject of pyro-plating, or the coating of one metal by another by first depositing a layer of the latter by electricity or otherwise, and then burning it in by the application of heat, has received much attention during the year, and has been applied very successfully to the plating of knives and other objects exposed to a great amount of friction.

Economy in the manufacture of paper has been advanced by improved methods of converting wood into pulp, this supplying a basis for printing papers especially, at a much less cost than those from linen or even cotton.

There are few subjects more interesting to the general public than those relating to questions of *Health and Disease*, and consequently we have given considerable space in the *Record* to matters connected with new remedies and the best methods of maintaining the health of the household, the city, and the nation. As usual, the *Materia Medica* has been enlarged by the introduction of various new remedies; and the old ones have become better understood, some that formerly occupied a prominent position in the favor of the Faculty having fallen into disrepute. Chloral hydrate continues to retain its place as a valuable remedy, sometimes single, and sometimes combined in the form of a crotonate, sulphohydrate, etc. Its use has been warmly recommended in cases of cholera.

Alcohol, which, in the form of spirituous liquors of one kind or another, has long been used as a remedy, has been recently denounced as unworthy of its reputation by a large number of the most eminent physicians in London, who, in the form of a protest, have taken strong ground against it, as in most cases actually doing more harm than good, and, at any rate, as imparting a thirst for intoxicating drinks, which is likely to do, on the whole, more injury than its benefits as a remedial agent can recompense.

The employment of carbolic acid has also increased very greatly, not simply as an antiseptic in preventing the spread of disease, or destroying any active lingering germs, as small-pox, cholera, etc., and an application to diseased surfaces, but also as a remedy in the way of an internal application. A hypodermic injection of this substance is considered by Dr. Declat as a most valuable antagonist to malarial and febrile diseases, and as producing a change for the better, in certain cases, in a much less time and more efficiently than any other remedy known.

A mixture of chloroform and morphine as an anæsthetic continues to be highly recommended by some, the combination producing a given effect with less evil results than a sufficient quantity of either substance taken separately.

Xylol, one of the coal-tar derivatives, has been warmly urged by the physicians of Berlin and elsewhere as more or less a specific in cases of small-pox. Its trial, however, in this country does not appear to have confirmed that opinion.

Apomorphia, which was brought forward some time ago by Dr. Richardson as an anæsthetic, has been declared of little or no value in that connection; while the assertion of Dr. Liebreich as to an antagonism between chloral hydrate and strychnine, such that either is a perfect remedy for the other, has been disproved, in a measure, by experiments in France.

Bromide of potassium continues to be manufactured by the ton for medicinal purposes; although, according to Dr. William A. Hammond, of New York, it may be replaced in many cases, to great advantage, by bromide of calcium, which is less stable in its nature, and more readily gives up its bromine (the essential remedial element) on being taken into the stomach.

Professor Polli, an eminent Italian physician, continues to urge the use of various sulphites in cases of malarial disease.

A great many communications have been published during the year in reference to the precise nature of the action upon the system of different substances, such as tobacco, quinine, coffee, delphinium, guarauna, etc., some of them being of much practical importance.

The use of nitrite of amyl as a remedy for epilepsy and *angina pectoris*, etc., has been warmly recommended. The discussion as to whether the various beef extracts, beef tea, etc., are actually nutritious or not, has been continued during the year, and a tendency is manifesting itself to consider them rather as stimulants than as articles of food.

Various parts of the world have been scourged by the ravages of the small-pox, which has been an epidemic during the year in many parts of the United States, and involving many deaths. The disease, however, appears to have run its course in many localities, as in Philadelphia, where it caused great mortality in 1871, but which has been measurably free from it during the past year. The subject of protection against that exceedingly distressing malady known as sea-sickness has occupied the public mind to a considerable extent, and several vessels are being constructed, and will be soon ready for use, intended to prevent its inconveniences. Among others, Mr. Bessemer is preparing a steamer for the route between England and France, in which the cabin is arranged to swing freely inside of the vessel, so that, in whatever position the latter may be, the floor of the cabin will, to a great extent at least, remain horizontal. The same result, on quite a different plan, is aimed at by a Continental engineer.

A suggestive and important paper by Dr. Liebreich bears upon the cause of the very prevalent tendency toward imperfection of vision in the present generation, this, in his opinion, being the result of the experiences of the school-room, in having the windows improperly situated, so as to involve the introduction of light from too many directions at one time, or from an improper quarter. He recommends that such apartments be so arranged that the light shall always come from one side only, and from over the left shoulder, so that when the pen is held in the hand the shadow shall not interfere at all with drawing or writing.

No question is more important in reference to daily life than that of sewage, and great attention has been given to it in various parts of the world. An interesting contribution to the history of this subject is announced in connection with experiments in Calcutta, where, as the result of an improved system of drainage and sewage, the great mortality hitherto prevalent in that city has been reduced in a very great degree, and it is hoped it may be still further prevented.

The Licurnur system of sewage, from which so much was hoped, does not appear to answer its purpose. This method consists in the gathering into an air-tight chamber, by atmospheric pressure, the contents of a certain number of privies, and their removal in air-tight vessels. The impossibility of cleaning the pipes which serve for the transfer of this material gives rise to a very offensive odor, and it seems, in reality, that the very evil is produced which it is intended to remedy. An ingenious method of dealing with the question is that of Captain Scott, mentioned on page 577.

As already stated, carbolic acid continues to occupy a conspicuous place as an antiseptic and disinfectant. Other substances recommended for the same purpose are chromic acid, chloralum, protoxide of hydrogen, iodine, etc.

Among the noteworthy institutions connected with the subject of health, we may mention the "Brown Institution," recently organized in London under a bequest made some years ago. This provides for an establishment, officered by competent veterinary surgeons, before whom may be brought all such domestic animals as are diseased, and whose owners are unable to call to their aid the services of the regular veterinary profession. As a further means of usefulness, the officers are expected to make physiological experiments in regard to questions connected with the health and disease of animals. The institution is under the direction of Dr. Burdon Sanderson, by whom some important memoirs have already been published.

Reports of Boards of Health in this country and Europe show continual activity on their part, and among the most prominent in the United States we may mention the Massachusetts State Board, which, by the publication of a number of memoirs every year, spreads much needed information before the people. A movement has also been made toward the establishment of a National Board of Health for the United States, to take into consideration questions that concern the whole nation.

Having thus considered in more or less detail the various branches treated of in the *Record*, it only remains to bestow a small share of attention upon such movements and operations as do not seem to be included in any of these; and in this connection we may refer to some points in the history of learned institutions both at home and abroad. The disastrous experience of the Chicago Academy of Sciences, in which a large and valuable library and museum were entirely destroyed by fire in 1871, we mentioned in the *Record* for 1871. We are happy to announce that a new building has been erected, and that the institution is likely to occupy a still more prominent place than before. The death, however, of Dr. Stimpson, its director, during the past year, has been a serious calamity, not only to the Academy, but to American science in general.

The National Academy of Science, organized during the war, for the purpose of securing to the government the aid and counsel of scientific men in all branches of its work, has held two meetings during the year; one, the regular session at Washington in April, the other at Cambridge in November. The first meeting was entirely for business, devoted mainly to the adoption of new rules and the election of new members; at the second, a number of interesting papers were presented by Professors Agassiz, Verrill, Mayer, and others.

The American Association for the Advancement of Science held its annual meeting at Dubuque, with the usual variety of communications. The Academy of Natural Sciences of Philadelphia has at last actually commenced the erection of the new building for which it has been collecting funds for so many years past, and it is hoped that before long, by the transfer to the new quarters, it will secure the accommodations which its rapidly increasing library and museum have been denied in the edifice at the corner of Broad and Sansom streets.

The other societies of the country have continued in their useful work of aiding the investigations of specialists in different branches of science, and have published the usual number of memoirs and proceedings. Similar progress has also been made by learned institutions abroad, to the list of which large numbers have been added, so that at the present time there is scarcely any town of a few thousand inhabitants in Europe that does not possess a society devoted to science in general or to some of its specialties. Of the Old World institutions of this character, we are informed that the Smithsonian Institution has over two thousand on its list of correspondents.

The losses in the ranks of science by the death of its votaries during the year, will be found detailed, as far as we have been enabled to ascertain them, in the department of Necrology; and it is with great regret that we have to report that this embraces some of the first names in physical and natural science, and that the number is considerably greater than that recorded in 1871.

Having thus completed, in however imperfect and partial a manner, our summary of what appeared to us to represent the principal stages of progress in the various branches of science throughout the year, we have only to refer for details to the pages of the volume, and to the systematic and alphabetical indexes accompanying it, by means of which any particular subject or fact can be reached, so far as any record has been made in regard to it.

ANNUAL RECORD

OF

SCIENCE AND INDUSTRY.

1872.

A. MATHEMATICS AND ASTRONOMY.

ON THE TRUE TEMPERATURE OF THE SUN.

At a recent meeting of the French Academy Mons. 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° Fahr., by Father Secchi; the lowest from 2662° to 3201° Fahr., by Pouillet; and other physicists have given varying estimates, generally under 200,000° Fahr. 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° Fahr.—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° Fahr.

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 locomotive 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° Fahr. 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 2½ 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.—6 *B.*

FAYE'S VIEW OF THE PHYSICAL CONDITION OF THE SUN.

The *Mechanics' Magazine* gives a summary of an interesting paper by Mr. Faye upon the physical condition of the sun, deduced from the observation of the solar spots made by Carrington. This is expressed in the following propositions:

1. That Zöllner's theory, which views the sun as a solid body covered with a layer of incandescent liquid, is entirely improbable, and, indeed, impossible. 2. The speed of rotation of any point whatever on the sun's surface is always expressed by one and the same formula. 3. There do not exist on the sun's surface any sensible currents which are at all analogous to the "trade winds." 4. The absolute absence of currents is only explicable by the presence every where of ascending

currents of great intensity, proceeding from the sun's centre to its surface. 5. The existence of such currents is an imperative proof that the body of the sun must be in a gaseous state, and is an immense sphere of aeriform matter of an enormous temperature, but which is continually cooling by the action of the ascending currents. 6. The sun is absolutely spherical.—3 *A*, *Nov.* 25, 1871, 413.

SOCIETY OF ITALIAN SPECTROSCOPISTS.

A very vigorous society has been formed in Italy, under the name of the Society of Italian Spectroscopists, whose special object is to collate and compare observations made simultaneously at the different Italian observatories on the spots, protuberances, and faculæ of the sun, especially with the spectroscope, so as to arrive at a more accurate knowledge of the scientific value of these phenomena. The society has already published three numbers of its memoirs, containing most valuable papers and records of observations by Secchi, Respighi, Tacchini, and other eminent Italian astronomers and physicists.

SECCHI ON SOLAR PROTUBERANCES.

The Italian astronomer Père Secchi has published in the *Atti dell' Accademia Pontificia de Nuovi Lincei* his papers "Sulle Protuberanze Solari e le Facole" and "Sulla Distribuzione delle Protuberanze intorno al Disco Solare," in which the conclusions arrived at are thus summed up: 1. The southern hemisphere of the sun is at present richer in protuberances than the northern hemisphere. 2. In general terms, the protuberances are numerous in those regions where the faculæ are numerous. 3. The protuberances are highest in the regions where they are the most numerous.

SUPPOSED PLANET INTERIOR TO MERCURY.

Mr. Denning, secretary of the Observing Astronomical Society of Bristol, invites the attention of observers of total eclipses of the sun to the fact that there probably exists a hitherto unknown planet, which revolves in an orbit interior to that of Mercury, and remarks that such a body, if it does exist, can be well detected during the progress of a total solar eclipse, if the region of sky in the neighborhood of the sun be carefully examined. He calls especial attention to the fact that during the eclipse of August, 1869, a bright object was seen in close proximity to the sun, and that it is not improbable that it is the planet which Lescarbault witnessed in transit March 26, 1859. He therefore urges observers to make a rigorous scrutiny of all objects visible in the neighborhood of the sun at the time of totality, so that this body may be rediscovered, if possible.—3 *A*, *November* 11, 1871, 381.

THE SOLAR ECLIPSE OF DECEMBER, 1870.

Preliminary reports of the observations of the recent total eclipse in India have been received from most of the stations, from which we judge that little has been added to the discoveries made by the American observers of the last two eclipses. The following extracts of letters from Janssen and Lockyer include all of importance yet communicated. Mr. Janssen says:

"The magnificent corona observed at Schooler showed itself in such a way that it seems to me impossible to admit such causes as diffraction or reflection from the moon, or simple illumination of our atmosphere. The spectrum of the corona, as seen in my telescope, was not continuous, as heretofore found, but remarkably complex. I found in it the brilliant rays of hydrogen gas, which forms the principal element of the protuberances and the chromosphere, but much more feeble; the brilliant green ray remarked during the eclipses of 1869 and 1870, and some others more feeble; some dark rays of the ordinary solar spectrum, especially that of sodium (D): these rays were much more difficult to see."

From these observations Janssen concludes that:

"Besides the cosmical matter independent of the sun which must exist around this body, the observations indicate the existence of an excessively rare matter, mainly of hydrogen, extending far beyond the chromosphere and protuberances, and fed in the same way with these by matter projected out with great violence, as we see every day. The rareness of this atmosphere at a short distance from the chromosphere must be excessive, so that its existence is not inconsistent with the observed passage of some comets near the sun."

Mr. Lockyer saw the same bright lines in the corona that

Janssen did, but the green line was much fainter than he had expected. He glanced at the corona through a six-inch telescope. Its structure was exquisite and strongly developed. "I at once exclaimed, 'Like Orion!' Thousands of interlacing filaments, varying in intensity, were visible; in fact, I saw an extension of the prominence structure in cooler material. This died out some 5′ or 6′ from the sun, and then there was nothing."

Both Mr. Lockyer and Professor Respighi, of Rome, observed the corona and chromosphere through a telescope without a slit, as proposed by Professor Young. Thus four images, one corresponding to each of the principal lines, were distinctly seen, and the effect is described as very beautiful, though nothing especially new was brought out.

Several observers tried to reproduce Professor Young's observation of the reversal of all the lines of the spectrum at the moment when the sun was just covered, but Major Tennant, so far as we have yet heard, was the only one who succeeded.

SECCHI ON SOLAR PROTUBERANCES AND SPOTS.

Professor Secchi, the well-known astronomer, who has devoted a great deal of his time for some years past to the study of the sun and its phenomena, communicates to the Academy of Sciences a summary of his observations for the year 1871. As general conclusions he remarks, first, that during the period mentioned the law has been confirmed that the maximum of solar protuberances corresponds, in the region of the spots, to a feeble minimum in relation to the equator. The maximum in reference to the polar zones is scarcely sensible. Second, in the field in question a habitual absence of polar prominences was observed, these being only replaced by very sensible elevations of the chromosphere. Third, with reference to protuberances, the height of which attains or surpasses five units, or forty seconds, these were found to be very rare near the poles. Fourth, this absence of polar protuberances is in harmony with the appearance of the granulations, and of more brilliant bands, circumscribing the polar zones of the sun, which are now very difficult to recognize, while during the past year they were very visible. Fifth, the intensity and number of the faculæ have also diminished. Sixth, in dividing the protuberances into three classes, according to their direction in relation to the poles, the following figures may be given:

Indifferent	398
Directed toward the poles	342
Directed toward the equator	67
Total	807

6 *B*, *May* 20, 1872, 1315.

YELLOW BRIGHT LINE OF THE SOLAR PROTUBERANCE SPECTRUM.

Professor D'Arrest, of Copenhagen, calls attention to the circumstance that, although the origin of the yellow bright line D^3 of the solar protuberance spectrum is entirely unknown, still that line is never seen except in company with the lines C and F, or, in other words, $H\alpha$ and $H\beta$. From a consideration of this fact, and bearing in mind that D^3 is situated between $H\alpha$ and $H\beta$, while $H\gamma$ is situated between $H\beta$ and $H\delta$, he has been led to the discovery that, in respect to the number of vibrations made by the light wave in a given time, D^3 is related to $H\alpha$ and $H\beta$ in the same manner that the logarithm of $H\gamma$ is related to the logarithms of $H\beta$ and $H\delta$.

In the case of nebulæ giving a spectrum consisting of three bright lines, the same relation holds between the middle line and the two outside ones; but in the case of comets, many of which also give a spectrum consisting of three bright lines, the relation does not hold.—*Astronomische Nachrichten.*

REPORT OF THE U. S. NAVAL OBSERVATORY ON THE ECLIPSE OF DECEMBER, 1870.

The long-expected report of the United States Naval Observatory upon the total solar eclipse of December 22, 1870, has just been published, as prepared under the direction of Admiral Sands, the superintendent. As is known to most of our readers, this eclipse was not visible in the United States; but several professors from the Observatory were sent abroad to assist in the investigation of the phenomena in Europe. Of these, Professor Simon Newcomb was stationed at Gibraltar, and Professors Asaph Hall, William Harkness, and J. R. Eastman at Syracuse, in Sicily. The foreign savants associated with these gentlemen bore honorable testimony to their zeal and ability; and, indeed, the honors of the occasion were fairly shared with their European brethren by the officers of the observatory and their American companions. The present report is accompanied by two plates, exhibiting the appearance of the sun during the eclipse. The general typography of the work does the fullest credit to the national printing-office, from which it emanated.

FUTURE ECLIPSES OF THE SUN.

Mr. Robert T. Paine communicates to *Silliman's Journal* a list of eclipses visible in the United States during the remainder of this century. The first central eclipse will be that of September 29, 1875, which will be annular in part of the State of New York and in four of the New England States. The duration of the ring on the central line will be three minutes thirty-nine seconds. At Boston it will be only two minutes twenty-nine seconds. The belt of country over which the annular eclipse will extend will be 110 miles wide. Within it are situated the observatories of Hamilton College, Albany, Harvard University, Amherst College, and Dartmouth College. The first total eclipse will be that of July 29, 1878, when the shadow of the moon will pass over British Columbia, Montana, Colorado, Texas, and Cuba. At Denver, Colorado, the eclipse will be total nearly three minutes.

MOVEMENT OF STARS IN SPACE.

General Dufour, of Switzerland, in the course of a recent investigation, attempts to show that in the case of the movement of two stars around a point supposed fixed, this point must be in motion. He also concludes that the curve is plane, and that the stars remain in the same plane during their translation; and the inference is that these stars have both received one impulse and a parallel movement; also that the movement of the apsides proves that the centre of gravity of the system is displaced, not according to a straight line, but a curved one.—*Mem. Soc. Phys. de Genève*, XXI., 1870, 344.

IS THERE A RESISTING MEDIUM IN SPACE?

Professor Asaph Hall, at a late meeting of the Philosophical Society of Washington, presented a communication (since published in *Silliman's Journal*) on the astronomical proof of a resisting medium in space. In this he referred to the opportunities offered by the return of Encke's comet, during the present year, for determining the accuracy of Professor Encke's views as to the causes of the successive retardation of the periods of this comet. It may be known to some of our readers that in comparing the observations of 1810 upon this comet with those of 1786, 1795, and 1805, the periodic times were found to be diminished by an appreciable fraction of a day; this being due, as supposed, to the existence of a resisting medium in space, assuming the fact of retardation to be established. Professor Hall now thinks it likely that an error may have been made by Encke in his computations, especially as corrections in the calculation respecting Faye's comet, supposed to be subjected to a similar retardation, as the observations lately made by Professor Möller prove, are satisfied within the limits of their probable error by a strict adherence to the law of gravitation, and without any extraordinary hypothesis. At the present time, then, it is only the Encke comet of which the movements are in doubt. Indeed, as far as the motions of comets have been determined, the evidence, according to Professor Hall, is against the theory of a resisting medium in space; and he sums up the whole case by saying that thus far observations of the planets lead to the conclusion that their motions are in strict accordance with the law of gravitation, and that it is quite possible that Encke's comet, when its movements are properly understood, will be found to be no exception to these conclusions.—4 *D*, *December*, 1871, 408.

SPECTROSCOPICAL PHENOMENA OF ARGUS.

Not long since, Lesueur, in applying the spectroscope to the great telescope at Melbourne, ascertained the existence of light lines in the spectrum of Argus, one of which was probably identical with C, and the other with F, and the third with a light nitrogen line, while a yellow line near D remains to be determined more positively. The presence of hydrogen can thus scarcely be doubted, while the occurrence of nitrogen, magnesium, and sodium is rendered at least probable.—7 *C*, 1871, 620.

MEMOIR BY LE VERRIER.

Professor Le Verrier has presented a memoir to the Academy of Sciences, Paris, upon the superior planets Jupiter, Saturn, Uranus, and Neptune, in which he demonstrates the extent of the motions experienced by each in consequence of the action of the other three. In the work in question he gives the perturbations of Jupiter by Uranus and by Neptune, and those of Saturn by Uranus and Neptune, to be followed by the notice of the perturbations of Uranus produced by Jupiter, Saturn, and Neptune, and another of the perturbations of Neptune caused by Jupiter, Saturn, and Uranus.—6 *B*, *May* 20, 1872, 1303.

INFLUENCE OF THE PLANETS ON SUN SPOTS.

Messrs. De La Rue, Stewart, and Loewy presented to the Royal Society of London the result of investigations made by them on planetary influences upon solar activity, and give as one of several conclusions reached that, in examining the tables for the planets Mercury and Venus, they find in them indications of a behavior of sun spots appearing to have reference to the position of these planets, and which seems to be of the same nature for both. This behavior may be characterized as follows: The average size of a spot would appear to attain its maximum on that side of the sun which is turned away from Venus or from Mercury, and to have its minimum in the neighborhood of Venus or of Mercury.—12 *A*, *March* 28, 1872, 425.

VOGEL ON THE SPECTRA OF THE PLANETS.

Herr Vogel, a director of the private observatory of Von Bülow, near Kiel, who has been making an elaborate series of experiments upon the spectra of various planets, has lately announced some of his results, as follows: The spectrum of Mercury was observed on the 14th of April last, and exhibited the lines C, D, E, b, and F, between which other faint lines were detected. The red part of the spectrum was remarkably intense, while the blue and violet were very faint. Venus was observed on the 14th of April, the 15th of June, and the 7th of August. The spectrum was throughout bright, clear, and beautiful, so that about thirty lines could be actually measured in it, agreeing exactly with the lines of the solar spectrum. The light of Vesuvius was sufficiently strong to be observed by day, and thus to permit a direct comparison of its lines with those of the spectrum of the sky. On the 15th of June and 7th of August, by means of a magnifying power of nine diameters, a variation of the position of the air lines with regard to those of the spectrum of Venus was readily detected; the lines in the latter spectrum appeared slightly displaced toward the violet, corresponding to the not inconsiderable velocity with which Venus, at the time of the observation, was moving toward our earth. The difference between the spectrum of Venus and that of the sun seems to be, essentially, that many of the lines appear stronger than in the solar spectrum. The sodium lines are remarkably distinct, and, under a high magnifying power, look broad and swollen, this being most striking with the one situated nearest the blue. This remarkable widening of the sodium lines can not have been produced by our atmosphere, since in April Mercury was much nearer the horizon than Venus, and yet showed the sodium lines very faint and delicate. It is therefore unquestionable that this variation is due to the atmosphere of Venus. The magnesium lines also appear to be more distinct than in the solar spectrum, and the spectrum differs from that of Mercury in showing the blue and violet very distinct, while the red is very faint.

Mars was observed on the 28th of February and the 8th of April. About twenty of the principal lines of the solar spectrum were observed in the spectrum of this planet. It differed from the solar spectrum in having a remarkably dark band in the red, with a wave length of 695.2 millionths of a millimeter.

The spectrum of Jupiter was found quite to resemble that of the solar spectrum, about thirty lines being determinable by measurement. Some dark lines visible in the red were ascribed to the very powerful absorption of the atmosphere of Jupiter, and are similar to the dark bands seen in the solar spectrum when the sun is near the horizon, and supposed to be produced by absorption in our atmosphere.

The spectrum of Uranus was the most remarkable of all, and was characterized by being traversed by peculiar absorption bands. The middle of a dark band corresponds very accurately with the F line of the solar spectrum; and the coincidence of this dark line in the spectrum of Uranus with the bright line $H\beta$ of a Geissler tube filled with hydrogen was established. The broad band, whose wave length is from 578 to 565 millionths of a millimeter, and also the broad but faint band beyond F, the middle of which has a wave length of 475 millionths of a millimeter, coincide quite accurately with absorption bands produced by our atmosphere, and observable when the sun is low. The possibility that there might exist in the atmosphere of Uranus some of the lower combinations of oxygen with nitrogen induced Dr. Vogel to determine more accurately the position of the absorption bands produced by such combinations; these, however, exhibited no satisfactory agreement with the bands in the spectrum of Uranus.—19 *C*, *December* 2, 1871, 387.

TRANSIT OF VENUS.

As the period of the transit of Venus in 1874 approaches, astronomers both at home and abroad are becoming more and more active in their preparations, and the American committee on this subject, it is understood, has already decided in considerable part upon the stations to be occupied. Of the result of their conclusions we hope to give an account before long to our readers. In Russia the committee, under Professor Struve, proposes the establishment of a chain of observers, at positions one hundred miles apart, along the region comprised between Kamtschatka and the Black Sea. The German committee has decided on recommending the organization of four stations for heliometric observations of the planet during its transit, one of them in Japan or China, and the others probably at Mauritius, Kerguelen, and Auckland Islands; and three of these, with the addition of a fourth station in Persia between Mascate and Teheran, will be equipped for photographic observations also. The French, before the war, suggested that stations be established at St. Paul Islands, New Amsterdam, Yokohama, Tahiti, Noumea, Mascate, and Suez. How far this programme will be carried out under the changed circumstances of that country remains to be seen. The British preparations are said to be very far advanced, owing to the interest taken in the matter by the astronomer royal. The stations proposed by England are six in number

—Woahoo, Kerguelen, and Rodriguez Islands, Auckland, New Zealand, and Alexandria.—12 *A*, *January* 4, 1872, 177.

RUSSIAN PREPARATIONS FOR THE TRANSIT OF VENUS.

In a letter from General Otto Struve, director of the Pulkowa Observatory, and astronomer royal of Russia, to Professor Newcomb, of the Washington Observatory, detailing the Russian preparations for observing the forthcoming transit of Venus, he remarks that the inquiries into the meteorological conditions of the stations selected have given, on the whole, very satisfactory results, particularly for the station on the coast of the Pacific Ocean and in Eastern Siberia (eighty-five per cent. of clear sky for December). In two only of the stations chosen, Taschkent and Astrabad, these conditions are not satisfactory. For this reason the observers designed for Taschkent will probably go to a place about one hundred miles west of that town; and, instead of Astrabad, it is proposed to take either the island of Aschuradeh, in the Caspian Sea, or, if possible, to cross the Elburz Mountains, and establish observers at Schahrech, in Persia (with nearly absolute certainty of clear sky).

The total number of Russian stations will be twenty-four, each of them provided with *only one* instrument for the transit observation. These instruments are, three four-inch heliometers, three photo-heliographs, four six-inch equatorials, and four four-inch equatorials, provided with filar micrometers and spectroscopic apparatus, and ten four-inch telescopes, designed merely for contact observations. Each station will also be furnished with clocks, chronometers, and the instruments necessary for exact determination of time. The principal instruments have already been ordered. Most of them will be ready for use in the course of the present or beginning of next year. For these instruments the observers are also in a great part already selected; they will all visit Pulkowa for a certain time in 1873 to exercise themselves in the observations.

The geographical positions of the stations will not be determined by the transit observers, but all stations on which the transit has been successfully observed will be carefully determined afterward by special expeditions of the general staff or the navy. For this purpose a principal line of telegraphic longitudes will probably be laid next year through all Siberia to Nicolajevsk, with which line the other stations of that part of Russia can be easily joined either by telegraphic or chronometric operations.

With regard to photographic observations, Professor Struve states that two observers, one at Vilna, and Dr. Vogel at Bothkamp, in Holstein, have been perfectly successful in taking instantaneous observations with dry plates.

NATURE OF THE AURORA.

Messrs. Heis and Flögel have lately published the result of an elaborate series of investigations into the subject of the aurora, and especially as to its altitude and its position in space, and they sum up their conclusions in the following propositions: 1. The aurora is a luminous phenomenon in regions which are either entirely outside of our atmosphere, or so situated that only the lowest portion enters into the outermost strata of the atmosphere. The observed altitude of the aurora varies from time to time, but the basal portion has been determined to be at least forty miles in height, which, of course, would preclude the idea of a direct association of this phenomenon with clouds, or of the possibility of its interposition between a distant mountain and the observer, as has been asserted. 2. The largest portion of an aurora is a luminous ocean of white light, which probably has its centre in the magnetic pole, and thence may extend more or less toward the south. Its exact magnitude can only be determined by corresponding observations in high northern and more southern latitudes at a great distance apart. The depth of this luminous stratum, or the distance between its upper and lower borders, has not yet been ascertained. 3. This universal luminous ocean is bounded by a fringe, extending in the direction of a magnetic parallel circle, which develops over a more or less extended space the phenomena of rays, and which seem to be exclusively limited to it; the observer north of the fringe seeing rays to the south of him, and the northern sky exhibiting only a general white light. It is probable that this border or fringe may have a width reaching 400 miles. 4. The fringe in general, shortly before a period of radiation, is thrown out in the form of concentric waves of light from the universal luminous ocean; the non-luminous space remaining behind this light is the well-known dark segment. 5. The radiating margin usually divides into a number of secondary areas which we may call the fields of radiation. 6. The fields of radiation appear to move with great velocity to the westward, in the direction of the magnetic parallel circle. 7. The fields of radiation send out upward masses of bright light arranged in columnar form—the rays proper—which take the direction of the magnetic dip. All the luminous emissions of a radiating character in other directions are not to be considered as genuine rays. 8. The height of the base of the rays is various, some observations making it from 80 to 140 miles, and the greatest height not exceeding 160 miles. 9. The height of the summit of the rays in extended auroras reaches 280 miles, sometimes 400, the maximum being 600. 10. The rays always have white light below, and pass at the summit into red.—19 *C*, *February* 10, 1872, 41.

THE AURORA OF FEBRUARY 4, 1872.

The scientific journals at home and abroad have had much to say of the extent and magnificence of the auroral display of February 4, 1872. This is generally asserted to have been one of the most magnificent exhibitions of the kind seen in Europe for the past twenty or thirty years; and there is perhaps none recorded over as wide an extent, and as critically investigated by so many scientific observers. It is quite probable, indeed, that the comparison of the phenomena observed, after the data are all accessible, will add greatly to our knowledge of the true nature of this celestial apparition.

One marked feature of the exhibition was the fact that it seemed not to have been noticed in the extreme north of Europe, where auroras are very abundant, but was observed to the best advantage in countries where those displays are very rarely seen.—12 *A*, *February* 22, 1872, 322.

SPECTRUM OF THE AURORA.

The recent brilliant displays of the aurora have afforded opportunity for a number of observations with the spectroscope, which may help to unravel the mystery which surrounds this phenomenon. We may begin this brief review of recent observations by calling to mind the researches of

Angström, made several years since, he being the pioneer in this field. He announced that the light of the aurora was almost monochromatic, showing in the spectroscope only a single bright line in the yellow-green. This conclusion was, however, contradicted by Professor Winlock, who found a number of other lines, especially when the aurora was bright.

We have lately received a very fine list of spectroscopic observations made by Dr. Vogel at the observatory of Bothkamp. He finds that the fainter auroras show only Angström's line, of which the wave length is 557, the measures being very exact. On the other hand, when the auroras became brighter, a number of other lines showed themselves. At one time, in the brightest part of the aurora, he succeeded in measuring five different lines in the green of the spectrum, as well as a somewhat diffuse line or band in the blue. In the red part the spectrum showed seven or eight bright lines. The following lines are well determined, four measures being made on each:

Wave length.	
463–469.	A bright band; brighter in the centre.
500.3.	Tolerably bright line.
518.9.	Sometimes quite bright.
513.3.	A quite bright line.
538.2.	An extremely faint line.
556.9.	The brightest line in the spectrum (Angström's).
629.7.	Bright streaks.

From researches on the spectra of the gases forming the atmosphere, and their comparison with the spectrum of the aurora, Dr. Vogel considers it very probable that the spectrum of the aurora is only that of atmospheric air, modified by temperature and pressure.

The auroral lines have also been observed by Professor Barker, of Yale College. Directing his spectroscope toward a brilliant streamer, he saw five bright lines, of which the wave lengths were about 623, 562, 517, 502, and 482. All except the first and last are probably coincident with the corresponding ones in the preceding list of Dr. Vogel.

The brilliant aurora of February 4 last afforded a fine opportunity for spectroscopic observation, of which a large number of amateur observers in Great Britain took advantage. The only satisfactory measurements seem to have been made by Professor C. Piazzi Smyth, Astronomer Royal for

Scotland. He saw Angström's line very constantly, and also a red line of wave length 635. He notes as very curious that the blood-red, lurid red, and tragedy red of the painters appeared very markedly to the naked eye, and yet were not seen at all in the spectroscope, either as a new ingredient or an altered place of the red line. Excessively faint greenish and bluish lines appeared at wave lengths 490, 510, and 530, but 8-10ths of the light in the spectroscope came from Angström's line, and most of the remainder from the red line 635.

M. Cornu, of Paris, makes nearly the same remark with Professor Smyth, that, notwithstanding the aurora was of a brilliant red to the naked eye, when the light was analyzed by the spectroscope the green line was far brighter than the red line. He undertook to compare the lines with those of hydrogen, but before his apparatus could be got ready the display had vanished.

Mr. Prozmowski saw, besides these lines, two other bands in the blue and violet, near F and G. These were seen in the white parts of the aurora; they disappeared or became very faint in the parts having an intense red tint.

Great difficulty is found in identifying these lines with any produced by artificial means. Angström considered that for this reason the theory that the aurora was simply electricity moving through rarefied air would have to be given up. But other physicists are not disposed to go so far as this until more careful experiments are made on the influence of the temperature and pressure of gases upon their spectra. It was once supposed that the Angström line in the aurora was identical with that seen in the solar corona, and on this supposed identity was founded a theory that the corona is a solar aurora. But it is now known that the two lines are entirely different, the wave length of the coronal line being 530, while that of the auroral line is 557.

DETERMINATION OF HEIGHT OF AURORAS.

Dr. J. G. Galle, director of the observatory at Breslau, celebrated as being the first to recognize the planet Neptune in the telescope, has lately given a new method of determining the height of the aurora. It is founded upon the hypothesis that the rays which form the auroral crown are parallel to the magnetic pole. The deviation from apparent parallelism he considers due to parallax, and thus calculates the distance of the rays. From a number of observations made by himself and Dr. Reimann he finds that the direction of the rays in the aurora of February 4 deviated from the magnetic zenith by from 3° 6′ to 10° 2′. He thus finds for the different rays heights varying from 150 to 280 miles.

PROOF OF THE GREAT DISTANCE OF THE AURORA FROM THE EARTH.

Mr. R. A. Proctor calls attention to what he considers a strange circumstance connected with the remarkable aurora of February 4 of this year. He remarks that if it be the fact, as stated, that the magnetic perturbations were experienced at the same time in America and Europe, while the chief luminous phenomena commenced six hours later in the former, it would go to show that the region of auroral manifestations is exterior to the earth, since the aspect of the sidereal heavens is the same in the evening hours in Europe and in corresponding latitudes in North America. It would seem, in fact, as if the great auroral light phenomena were witnessed in Europe and America when those regions of the earth were severally turned toward a certain region of extra-terrestrial space.—3 *A*, *March* 9, 1872, 205.

SECCHI ON THE AURORA OF FEBRUARY 4, 1872.

Father Secchi, of Rome, has published his observations of the aurora of February 4. At first the aurora had the appearance of a broad, nebulous, phosphorescent band, which moved parallel to itself in the direction of the meridian. After passing the equator its aspect changed. The whole heavens, except a small portion in the south, shone with a purple light, which changed to a yellowish-green on the northern side. The magnetic needle was greatly agitated, changing by more than a degree. The spectrum of the crown was very vivid. Angström's ray (5560) was visible in every part of the heavens. In the spectrum of the bright red column a red ray was also seen, perhaps C. In the bright parts of the arch large numbers of bright lines were seen. He remarks also that, in general, the aurora is followed by a decided and extensive change of weather, and seems to be connected with great movements of the atmosphere.

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 eight 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.

SPECTRUM OF THE ZODIACAL LIGHT.

This subject is intimately connected with that of the spectrum of the aurora, because Angström announced that the zodiacal light and the aurora both gave the same monochromatic spectrum. But Liais, the Brazilian astronomer, has lately been studying the zodiacal light under the very favorable sky of Rio Janeiro, and comes to a different conclusion. He finds that this does not differ from ordinary sunlight, but gives a continuous spectrum. It is, however, too faint to see any dark lines. This result is confirmed by Rev. T.W. Webb, of England, who has recently been observing the zodiacal light with a spectroscope which shows the auroral line very distinctly. He sees nothing like the green auroral line in the zodiacal spectrum.

SCHIAPARELLI ON THE NATURE OF METEORS.

The gold medal of the Royal Astronomical Society of London has recently been presented to Signor Schiaparelli for his remarkable discoveries in meteoric astronomy. His study of this subject received a great impulse from his observations of the meteors which fell on the nights of August 9, 10, and 11, 1866, and he was then confirmed in the opinion, expressed three years before, that a great number of the meteors which usually fall at that season are distinguished by their starting from one point in the heavens, which is called their radiant point. From the spasmodic manner in which they fall, he inferred that their distribution in space must be very unequal; and from the fact that there are many radiant points, and that the meteors coming from any one radiant always present the same color and appearance, he concluded that there must be many rings of them revolving around the sun, and that they become visible when the earth crosses their orbits.

He then proceeded to inquire how such a mass of cosmical matter could have accumulated in the solar system. This system seems to consist of two classes of bodies. First, the planets, all of which move in the same direction, and in nearly circular orbits, situated in almost the same plane, these characteristics applying also to the satellites, with the exception of those of Uranus. Second, cometary bodies, which are under no law as to the planes of their orbits or the direction of their motions. These orbits are extremely elongated, and extend far into stellar space, which seems to indicate that they did not originally form part of our system, but are wandering nebulæ picked up by the sun. Reflecting on this view of the case, Signor Schiaparelli was led to the hypothesis that large portions of the celestial spaces are probably occupied by small particles of matter, forming cosmical clouds, whose motions may be similar to those of the stars. He then showed that if such a cloud were to come within the attractive influence of the sun, under favorable circumstances, it would become a permanent member of the solar system, and would gradually be drawn into the form of a cylinder, which would continually lengthen till its two ends should meet, and it would be thus converted into a stream of particles flowing around the sun in an elliptical orbit. There are many of these streams in the solar system, but the particles composing them are so widely separated that their orbits may cross each other without interruption. When the earth encounters one of these streams, such of the particles as happen to pass through our atmosphere take fire from the friction generated by their own motion, and become visible as meteors, or *falling stars*, for such, in truth, they are, as they come from the stellar regions. They have the same relations to comets that asteroids have to planets; in both cases their small size is compensated for by their greater number.

It is almost certain that falling stars, meteors, and aerolites differ in size only, and not in composition. Hence we presume that they are an example of the materials of the universe; and as they contain no elements foreign to those of the earth, we may infer the similarity of composition in the whole universe—a fact already suggested by the revelations of the spectroscope.

Finally, to put beyond all question the intimate relation existing between comets and meteorites, Signor Schiaparelli has discovered that the orbit of the August meteors is identical with that of comet II., 1862, and that the orbit of the November meteors is identical with that of comet I., 1866, thus rendering it very probable that these comets were only highly condensed portions of the meteoric rings. Signor Schiaparelli concludes his last memoir with the following remarkable words: "Must we regard these falling stars as swarms of small comets, or rather as the product of the dissolution of so many great comets? I dare make no reply to such a question."—*Monthly Notices R. Astron. Soc.*, 1, 1872, XXXII., 194.

PROFESSOR PLANTAMOUR'S COMET.

The papers have lately contained a sensational item in reference to an alleged communication from Professor Plantamour, of Geneva, to the effect that, according to his calculations, the earth, on the 12th of August, would come in collision with a very large comet, which in volume far surpasses all that have hitherto appeared. Its approach is to be rendered sensible by an extraordinary degree of heat, and a catastrophe is not to be avoided except by the deviation of the rapidly approaching comet, produced by the attraction of some other heavenly body within the scope of whose influence it may come. Our readers, however, need not be alarmed by the prospect, as the fact is simply that about the 10th to the 12th of August the earth will cross the meteoric stream which was so conspicuous in 1866, and which has some interesting relations to the orbit of the comet of 1862. It is not, however, impossible that an unusually brilliant display of meteors may be seen at this time, together with some extraordinary auroral phenomena, and we presume that astronomers and physicists will be prepared to take advantage of the opportunity thus offered for spectroscopic and other research.—15 *A, February* 17, 1872, 213; and 3 *A, February* 17, 1872, 137.

ZÖLLNER ON THE NATURE OF COMETS.

The *American Journal of Science* for June contains an abstract of a work recently published by Professor Zöllner upon the "Nature of Comets," in which, starting from the well-known fact that water, mercury, and many other substances, even in the solid state, give off vapor of a certain amount, though of very low tension, and inferring from the characteristic odors of the metals that they also, even at very low temperatures, are constantly giving off vapor, though of an amount too small to be recognized by any of the tests yet employed in science, it follows that a mass of matter in space will ultimately surround itself with its own vapor, and the tension of the latter will depend upon the mass of the body —that is, upon its gravitative energy—and the temperature. If the mass of the body is so small that its attractive force is insufficient to give the enveloping vapor its maximum tension for the existing temperature, the evolution of vapor will be continuous until the whole mass is converted into it.

Then comes the question whether a mass of gas or vapor under these circumstances would be in a condition of stable equilibrium. The analytical discussion of this point leads to the conclusion that in empty and unlimited space a finite mass of gas is in a condition of unstable equilibrium, and must become dissipated by continual expansion and consequent decrease of density. A necessary consequence of this result is that the celestial spaces, at least within the limits of the stellar universe, must be filled with matter in the form of gas, pre-eminently that of the terrestrial atmosphere.—4 *D, June*, 1872, 476.

SOLAR ORIGIN OF METEORITES.

Mr. Richard A. Proctor, in the *Mechanics' Magazine*, seems quite inclined to favor the hypothesis that many, if not all, meteorites are derived from the discharge of matter from the sun, and states that, however strange and startling this idea may be at first sight, it can not be condemned as illusory. He suggests that the solar prominences may result from the shooting forth of liquid or solid masses or streams of matter, and that what we know as meteorites may have been propelled from beneath the surface of the sun.

Mr. Runyard follows in the same vein, and thinks that, even if meteorites are not composed of ejected masses, they may be formed by the aggregation of metallic vapors emitted from the sun or other stars.—3 *A, Feb.* 17, 1872, 136.

FALL OF AEROLITES IN HUNGARY.

On the 9th of June, 1866, a remarkable fall of aerolites took place in the County Unghvär, in Hungary, which was witnessed by a large number of persons. A violent detonation was first heard, like the discharge of cannon, making the glass rattle; this was followed by several more feeble sounds, accompanied by a noise like that of a heavy wagon rolling along the pavements. Attention having been attracted by the noise, a small cloud was seen in the distant heavens, which moved rapidly, having about ten times the apparent magnitude of the sun, and which emitted rays of smoke. Persons at a considerable distance off saw a red, incandescent, pear-shaped body, surrounded by a blue light, and which approached the earth at an angle of thirty to thirty-five degrees with great velocity, leaving behind it a train of vapor.

One of the observers affirmed that this red body continually emitted incandescent particles, and separated into two parts in its course, and that the two globes of fire fell separately upon the earth. The phenomenon is said to have lasted four or five minutes, while the smoke emitted by the bolid remained visible for ten minutes afterward. Some persons even professed that they perceived a decided smell of burning sulphur; and one of those who picked up a fragment a little time after its fall said that it was not free from the odor for three days after.

The number of stones that fell on this occasion was quite considerable, two of them being much larger than others, one weighing nearly 600 pounds, and the other about 80 pounds. At least a thousand fragments were picked up, being scattered over a surface of about 6600 feet in length by 2500 in width. The largest mass penetrated the earth to a depth of eleven feet, and the smaller to that of about two feet.—1 *E*, 1872, XII., 11, 146.

DIFFERENCE IN LONGITUDE BETWEEN CAMBRIDGE AND SAN FRANCISCO.

As the result of a series of observations, carefully conducted by Mr. Deane, of the Coast Survey, and his associates, it has recently been established that the difference in longitude between Cambridge and San Francisco amounts to 3 hours, 25 minutes, 7 seconds, and a small fraction.—4 *D*, *December* 1871, 448.

MASKELYNE ON METEORITES.

Mr. Maskelyne, the chief of the mineralogical department of the British Museum, in a recent lecture before the Royal Institution, gave an account of the present state of our knowledge of meteorites. According to the lecturer, the maximum height at which these have been observed is 120 miles, and their velocity from 18 to 34 miles a second, this resulting in great heat, intense light, and violent explosive force. The heat, he thinks, is due to the retardation of the velocity by passing from a rarer medium to our denser atmosphere. He considered meteorites as belonging to three classes—siderites (principally iron), siderolites (iron and stone), and aerolites (mostly stone).

The components of meteorites embrace about one third of the known elements. Mr. Maskelyne considers meteorites as probably cosmical in their origin; their velocity, however, he thinks incompatible with a lunar or sublunar origin, while their chemical constitution differs from that of the sun, as far as at present known.—22 *A*, *May* 18, 1872, 478.

THE DISCOVERERS OF ASTEROIDS.

Mr. Richard A. Proctor calls attention to certain peculiarities connected with the discovery of the 120 asteroids now known to astronomers, and states that it is very remarkable that the spring and autumn seem especially favorable for their detection. Of the entire number no less than forty-five were discovered in April and September. The average rate of discovery has been rather more than four times as great in April and September as in the midwinter and summer months. Mr. Proctor can understand the poverty of discovery in the midsummer months as due to the shortness of the nights and the amount of twilight, and suggests that the cold drives the observer from the telescope in the winter, so as to materially affect the discoveries. Of the asteroids yet known, Luther, of Bilk, in Germany, has discovered 20; Goldschmidt, of France, 14; Professor Peters, of Hamilton College, New York, 13; Professor Hind, of England, and Professor Watson, of Ann Arbor, 10 each; 67 being divided among five observers. Twenty astronomers share the honor of discovering the remaining 53.—3 *A*, *April* 20, 1872, 332.

LUNAR PHOTOGRAPHS.

Very perfect photographs of the moon have been lately obtained at the Melbourne Observatory, the original negatives being three inches in diameter, and capable of enlargement to any desired dimensions.—12 *A*, *July* 18, 1872, 228.

RECENT ADVANCES IN ASTRONOMY.

In his address before the Mathematical and Physical Section of the Brighton meeting of the British Association, Mr. De La Rue considers the most important advancement in astronomical knowledge to be connected with the observations of Dr. Huggins upon the proper motions of the stars, and the questions associated with the phenomena of the comets. He also refers, as very noteworthy, to the relationships established between the solar spots and the planetary configuration, terrestrial magnetism and auroral phenomena. He remarks that the connection between the amount of heat proceeding from the sun and the prevalence of spots has been established by the researches of Piazzi Smyth, Stone, and Abbé, and that from the researches of Mr. Meldrum there appears to be a periodicity of cyclones in the Indian Ocean corresponding to the sun-spot periodicity. The periodic changes of Jupiter's appearance seem also to be related to the changes of the sun-spots, all tending to show the importance of a critical study of this feature of the sun's disk. For this reason Mr. De La Rue urges very strongly the multiplication of photographic and spectroscopic observations of the sun, and anticipates, as the result, a much more thorough appreciation of the relationships between the great luminary and its attendant satellites.—12 *A*, *August* 15, 1872, 316.

SITE FOR AN ASTRONOMICAL STATION.

According to the San Francisco *Bulletin*, Professor Davidson, who, it is said, has been making examinations in California for the purpose of determining a suitable site for an astronomical station, has fixed upon a point situated about half a mile from Summit station, which is 7042 feet above the sea level, and the highest point on the Central Pacific Railroad. Castle Peak, seven miles from the summit, was also examined, but its atmosphere was found to be quite hazy, and the ascent to it too difficult to render it a desirable place for permanent occupation.—*San Francisco Bulletin*, *August* 30, 1872.

NEW REFLECTING TELESCOPE AT EDINBURGH.

During the last year an appropriation of $11,500 was made by the British government for the purpose of supplying a new equatorial telescope to the Royal Observatory at Edinburgh, and the instrument is now being built by Mr. Howard Grubb, of Dublin. It is to be a reflector of a somewhat novel character, as, with an aperture of two feet, the focal length will be only ten feet, the diameter being larger in proportion than that of any telescope heretofore constructed. The lens is to be of glass, coated with pure silver, instead of being polished metal. The instrument is intended to be employed especially for photographic and spectroscopic purposes, and will be mounted so as to be perfectly free from any tremor. The whole apparatus will be completed and in operation by December.—22 *A*, *September* 7, 1872, 230.

GREAT TELESCOPE FOR WASHINGTON AND LEE COLLEGE.

Mr. Leander J. M'Cormick, of Chicago, has ordered of Messrs. Alvan Clark & Co. a telescope of 26-inch aperture, the exact duplicate of the one now being constructed for the United States government. It is stated that Mr. M'Cormick's order having been given first, his instrument will be first completed, and that, when ready for use, it will be presented to the Washington and Lee College, of Lexington, Virginia. Mr. M'Cormick also proposes, in addition to this telescope, to present a transit and other instruments required for the furnishing of a first-class astronomical observatory.

These two instruments will then be the largest in the world; the next in size being one in London, 22 inches, one in Chicago, 18½ inches; and one of 15 inches at Cambridge.

REPORT OF U. S. ASTRONOMICAL OBSERVATORY FOR 1869.

A very well printed report of the astronomical and meteorological observations made at the United States Naval Observatory during the year 1869, under the direction of the superintendent, Admiral F. B. Sands, has been published at the Congressional printing-office. This volume, forming a stately quarto of over nine hundred pages, is prefaced by a detailed account of the transit circle, the meridian transit instrument, the mural circle, and the equatorial of the observatory, and followed by a statement of observations made with these instruments.

The volume also contains the meteorological observations for 1869, the positions of the sun, moon, and planets during that year, as made with different instruments, etc. The report of the total eclipse of December 22, 1870, which has already appeared as a separate memoir, is included in this volume, as also an appendix embracing the zones of stars observed with the mural circle in the years 1846, 1847, 1848, and 1849.

The observatory is now in excellent condition, and includes in its working force some of the best astronomers and mathematicians of the country; among them Professors Newcomb, Hall, Harkness, Eastman, etc. The completion of the gigantic telescope now in process of construction by Alvan Clark will constitute an important addition to the means of research, and be doubtless turned to good advantage.

KIRKWOOD ON COMETS AND METEORS.

Professor Daniel Kirkwood, in a communication to *Nature* relative to the late paper of Schiaparelli upon comets, calls attention to an article published by himself in the Danville *Quarterly Review* for July, 1861, in which the following propositions were maintained:

1. That meteors and meteoric rings "are the *débris* of ancient but now disintegrated comets, whose matter has become distributed around their orbits."

2. That the separation of Biela's comet, as it approached the sun in December, 1845, was but one in a series of similar processes, which would probably continue until the individual fragments would become invisible.

3. That certain luminous meteors have entered the solar system from the interstellar spaces.

4. That the orbits of some meteors and periodic comets have been transformed into ellipses by planetary perturbation.

5. That numerous facts—some observed in ancient and some in modern times—have been decidedly indicative of cometary disintegration.

In reference to these propositions Professor Kirkwood remarks that, though stated as theory in 1861, they have since been confirmed as undoubted facts.—12 *A*, *June* 20, 1872, 148.

DRIFTING OF THE STARS.

The views of Mr. Proctor in regard to the movements of certain stars in systems of families have lately received a remarkable confirmation in the observations of Dr. Huggins, who for some time past has been prosecuting spectroscopic inquiries into the proper motion of the stars in the direction of the line of sight. With the instrument formerly used by him he was unable to determine that Sirius was receding at the rate of twenty miles per second; but now, by means of a telescope of fifteen inches aperture, specially adapted to gather as much light as possible, and placed at his service by the Royal Society of London, he has determined the facts in regard to various groups. Among these are five stars, β, γ, δ, ϵ, and ζ, of Ursa Major (or the Great Bear), as also Alcor, close by ζ, and the telescopic companion of ζ, which Mr. Proctor three years ago maintained to be moving in a common direction, and which, more recently, he predicted would prove to be either receding or approaching together, whenever Dr. Huggins was enabled to test the question spectroscopically.

Dr. Huggins now finds that all these five stars are receding at the rate of about thirty miles per second; while the star ζ, which Mr. Proctor had indicated as not belonging to the set, is found to have a spectrum differing in character from that common to them, and, though receding, has a different rate. Arcturus, on the other hand, is moving toward us at a probable rate of seventy miles per second. Other stars have been determined as moving with corresponding velocities.—5 *A*, *July*, 1872, 307; *also Littell's Living Age*, *July* 27, 1872.

ASTRONOMICAL WORK AT SHERMAN STATION.

Professors Young and Emerson, of Dartmouth College, have lately published an account of their astronomical operations at Sherman, the highest point of the Pacific Railroad (an elevation of 8300 feet), in connection with a party of the United States Coast Survey. One object of the expedition was to determine the difference in the astronomical appearances at that elevation as compared with those of lower levels. It was found that the Dartmouth telescope, with an aperture of 9.4 inches, would show every thing that could be seen in New England with a 12-inch objective. The views of Saturn and the moon, as well as of double stars, clusters, and nebulæ, were exceedingly beautiful.

As might have been expected, Professor Young's labors were largely connected with spectroscopic observations, and these were successful in a very high degree. The solar prominences and chromosphere were seen far more clearly than ever before, and Secchi's "layer of continuous spectrum at the sun's limb" was repeatedly verified. There were observed in the spectrum of the chromosphere 165 new, bright lines, making the total number known 268. Of the 103 previously recorded, all but 30 had been catalogued at Dartmouth.

The most interesting observation of all, however, was the discovery of the permanent reversal of the H lines of the spectrum of the chromosphere, and the fact that the same lines are reversed on the surface of the sun itself over quite a large region surrounding every spot. It is thought improbable that these observations can be verified by instruments near the sea-level.—*College Courant, October* 5, 1872, 153.

PROCTOR ON PHYSICAL OBSERVATORIES.

Mr. Richard A. Proctor, in an article on National Observatories for the Study of the Physics of Astronomy, refers to the communication of Colonel Strange, made to the British Association last year, urging the propriety on the part of the government of establishing observatories for the study of the aspect and changes of aspect of the sun, moon, and planets, on the ground that the establishments already in operation confine themselves too much to determining the position and motions, real or apparent, of the celestial bodies.

Colonel Strange, in urging his project, calls attention to the great uncertainty that has hitherto prevailed in regard to climatological laws, and promises that, if observatories are established especially for the purpose, there is a strong probability that the systematic study of the sun will throw useful light upon climatological conditions. To this Mr. Proctor rejoins that, while all weather changes may be traced to the sun's influence, the idea that we shall ever be able, by studying the spots, the faculæ, the prominences, or the chromatosphere of the sun, to interpret the phenomena of the weather, appears demonstrably incorrect. While the sun's diurnal course accounts for the seasonal changes, we yet know that the weather of any single day is almost wholly independent of the general character due to the season. A season may be exceptionally cold or hot in one portion of the earth, while in another precisely the opposite characteristics will prevail, although subjected to the same solar conditions.

Even if the direct action of the sun were more obviously recognizable in its general effects, yet, inasmuch as, in the length and breadth of England—a mere speck on the earth's surface—the greatest variety of weather is commonly experienced, it is surely hopeless to attempt to predict the conditions which will prevail in any one country where the solar relations exhibit such and such a character; and short of this no prediction would be of the least use to man. Even if there is the slightest prospect of our being able to do so much as this, of what practical use would it be to know that a storm will rage on a certain day, if it is as likely to occur in Russia as in the United States, or in India as in China?

Mr. Proctor also takes occasion to rebuke those who have sneered at the labor bestowed by meteorologists in tabulating and reducing a regular series of observations upon the weather, and remarks that, even though we may not, at present, have the means of interpreting meteorological relations, we must know what these relations actually are; or, in other words, we must have those long arrays of tabulated figures—thermometric, barometric, wind-recording, etc.—if we are to understand the cause or causes of changes in the direction of the wind, in the prevalence of cloud, in temperature, barometric pressure, etc. Although but little has hitherto come of these records, compared with the labor bestowed upon them, and though we may be under the impression that little ever will be the result, yet, if ever the great mysteries of meteorology are solved, these tables will have fulfilled their purpose. To cease to make them, he thinks, is to admit that these mysteries are inscrutable.—18 *A*, *June* 14, 1872, 317.

UNUSUAL AMOUNT OF MAGNESIUM IN THE FLAME OF THE SUN.

Professor Tacchini, one of the members of the new society of Italian spectroscopists, in a communication to the Paris Academy, remarks that since the 6th of May he has found magnesium to be unusually abundant in certain regions of the sun, some of these being very extended, comprising arcs of from 12° to 168°, whereas preceding observations gave no arcs larger than 66°. Continuing his observations to the 18th of June, he was able to recognize the presence of magnesium round the entire limb — that is to say, the chromatosphere was completely invaded by the vapor of this metal; and, although the flames of the chromatosphere were very marked and very brilliant, there was a decided absence of protuberances. The more marked and brilliant the flames were, the brighter and wider appeared the magnesium lines. Very brilliant and characteristic flames were observed at 288°. A bright facula, as anticipated by Tacchini, was found strictly on the limb of the sun. The granulations were very distinct, and the number of small faculæ was in exact agreement with the presence of magnesium. On several occasions the variation of the width of the lines accorded perfectly with the variation of the luminous intensity of the chromatospheric flames observed at the place of the line C.

At the latest dates a great abundance of magnesium still continued, although not around the whole limb; and the observations proved, not that local eruptions took place, but rather complete expulsions—that is to say, a mixture of certain metallic vapors with the chromatosphere, extending over the entire surface of the sun, which consequently would appear to be still in a gaseous state.

Several persons had remarked to Tacchini that the light of the sun did not appear to present its ordinary aspect, and the observations made at the Italian observatory seemed to verify this statement, the change probably being due to the presence of magnesium in unusual amount. — 3 *A*, *July* 20, 1872, 27.

RESULTS OF THE BRITISH ECLIPSE EXPEDITION.

The Eclipse Committee of the British Association reported at the last meeting that, in response to the request of the association, the government had given £2000 to aid in the work. The Melbourne expedition failed from bad weather, but the Indian expedition was successful. The observers selected various stations in Southern India, along the line of totality, and at one place only was the eclipse obscured by clouds. It was demonstrated that hydrogen exists at 8′ or 10′ at least above the sun. It was also proved that there was strong radial polarization of the corona. Some photographs were taken, chiefly at the expense of Lord Lindsay, and these proved the corona to be higher than seen by the spectroscope.—15 *A, Proc. Brit. Assoc., August* 24, 1872, 237.

ENGLISH ECLIPSE EXPEDITION.

Comment is made by the English scientific journals upon the omission of any official announcement on the part of the English eclipse expedition of December last of the results of the facts observed, and a comparison with the conduct of private expeditions is made, quite unfavorable to the former. A writer in the *Popular Science Review*, referring to this subject, applauds Col. Tennant for the promptness with which he communicated the results to the Royal Astronomical Society, and exhibited the photographs obtained at Dodabetta. These, when compared with the photographs made by Lord Lindsay's photographer, proved, in the opinion of the writer, in the most conclusive manner the solar nature of the corona. —5 *A, July* 4, 1872, 303.

PROFESSOR YOUNG'S LECTURE ON THE SUN.

An excellent compendium of our present knowledge of the sun and the phenomena of its atmosphere, from the pen of Professor Young, has just been published by Chatfield & Co., of New Haven. This author, it is well known, has himself occupied a very prominent part in the history of more recent discoveries in regard to the sun, and the article referred to is the substance of a lecture delivered at New Haven during the past winter. This has, however, been materially modified, so as to bring the subject up to the present state of our knowledge, as rendered necessary by the rapid progress made in the science of solar physics.

"ANNALS OF THE DUDLEY OBSERVATORY."

The second volume of the "Annals of the Dudley Observatory," edited by its director, G. W. Hough, has just made its appearance, and consists of a report of the meteorological observations made at the observatory from 1862 to 1871. Its value is enhanced by its embracing the hourly records of the barometer (automatically printed) for a continuous period of five years, made by means of a very efficient apparatus invented by the director, and now used in numerous places, among others, in the office of the Signal Service at Washington. An appendix to the report contains miscellaneous communications upon the galvanic battery, the total eclipse of the sun of August 2, 1869, and the meteoric showers of 1867, etc.; and the whole book must be considered a very valuable contribution to physical science.

NAMING NEW ASTEROIDS.

Professor Peters has named the two planets lately discovered by him (Nos. 122 and 123) Gerda and Brunhilda, and communicates to the *American Journal of Science* the elements of their orbits. The orbit of Gerda is remarkable for having both the inclination and eccentricity very small—a coincidence not found in any other known asteroids except in the case of Clytia. The planet No. 124 is now known as Alceste, and at the time of Dr. Peters's communication had the appearance of a star of a little less than the eleventh magnitude.—4 *D*, *November*, 1872, 400.

CHANGE OF SPOTS IN LUNAR CRATERS.

Mr. Birt reports as to the result of observations upon the spots on the floor of the crater Plato, on the moon's surface, that decided changes have taken place since the investigation was first undertaken, and gives an account of the observations on the streaks and colors of the floor. The changes in the direction and luminosity of the streaks detected were of such a character that they could not be referred to changes of illumination, but depended upon some agency connected with the condition of the moon itself. The color of the floor was found to vary as the sun ascended in the lunar heavens, being darkest with the greatest solar altitude. It is thought probable, if farther observations upon the spots can be made, that streaks and changes of an interesting character will be discovered.—15 *A*, *Proc. Brit. Assoc.*, *August* 24, 1872, 237.

THE RINGS OF SATURN.

The rings of Saturn have always been an enigma to astronomers. La Place showed that if they were solid, and of the same thickness throughout, they would soon fall down on the planet and be destroyed. He therefore supposed them of irregular density. Not many years ago Professor Peirce found that the same catastrophe would occur even in this case, and he and Bond have concluded that they are fluid. It soon became doubtful whether a fluid ring would be any more stable, and Professor Peirce hence conceived the idea that it was held up by the attractions of the satellites. Mr. Hirn, a French physicist, has lately presented a paper to the French Academy, in which he maintains that the ring is neither solid nor fluid, but is a swarm of small particles, which looks solid owing to the great distance at which we see it. The idea is not new, as it was developed mathematically more than ten years ago by Mr. J. C. Maxwell, of England; but Mr. Hirn adduces some new arguments to its support. One of these is that when the ring is seen on its dark side, which is presented to us on very rare occasions, it does not seem absolutely black, a little light shining through.

COINCIDENCE OF SOLAR OUTBURSTS AND MAGNETIC DISTURBANCE.

An interesting coincidence between solar outbursts and magnetic storms, if not a relation of cause and effect, is suggested by Professor Airy in a communication to *Nature*. In this, referring to an announcement by Father Secchi of a remarkable outburst from the sun's limb, which lasted nearly four hours, as witnessed by him on the 7th of July, he remarks that a magnetic storm commenced the same day, its influence upon all the instruments being unusually sudden and perceptible. The disturbance diminished gradually to the evening of the second day, and was accompanied during a part of the time by an aurora. If a connection really existed between the two phenomena, the transmission of the influence from the sun to the earth must have occupied two hours and twenty minutes, or a longer time if Father Secchi did not see the actual beginning of the outburst.—12 *A*, *August* 22, 1872, 328.

BRIGHT LINES IN THE SOLAR CHROMOSPHERE.

Professor C. A. Young has published a preliminary report to Professor Peirce, superintendent of the Coast Survey, describing the bright lines he found in the spectrum of the chromosphere during his observations at Sherman, Wyoming Territory, the most elevated point on the Pacific Railway. Professor Young was sent to this point at the instance of several men of science, who wished to have some trials made as to its suitableness for a permanent astronomical observatory. He seems to have devoted himself mainly to his favorite branch, solar spectroscopy, in which he was eminently successful. He gives a list of no less than 273 lines which he has determined satisfactorily, hardly a tenth part of which were ever seen by any other observer. He conceives that the dark lines always seen in the spectrum have their origin at the base of the chromosphere, and that, with proper instrumental power and favorable atmospheric conditions, they might all be seen reversed to bright lines at any time. The variations of brightness were very considerable and sudden when the chromosphere was much disturbed. Sometimes one set of lines would be particularly bright, and at other times another. In addition to the elements formerly known to exist in the solar atmosphere, the following seem to be pretty positively indicated—namely, sulphur, cerium, and strontium, while zinc, erbium and ytrium, lanthanum and didymium, are indicated with a less degree of probability.

REPORT ON ENCKE'S COMET.

The Washington Observatory has lately published a report, by Professors Hall and Harkness, of observations on Encke's comet during its recent return. It was first seen at Washington on the 11th of October last, and continued to be observed on favorable nights until the 7th of December. The observations on the movements and relations of the comet are detailed by Professor Hall, while the spectroscopic investigations were conducted by Professor Harkness. The results of the latter are summed up in the following propositions:

1. Encke's comet gives a carbon spectrum.

2. From November 18 to December 2 the wave length of the brightest part of the second band of the comet's spectrum was continually increasing.

3. No polarization was detected in the light of the comet.

4. The mass of Encke's comet is certainly not less than that of an asteroid.

5. The density of the supposed resisting medium in space, as computed from the reserved retardation of Encke's comet, is such that it would support a column of mercury somewhere between $\frac{220}{1017}$ and $\frac{285}{1020}$ of an inch high.

6. There is some probability that the electric currents which give rise to auroras are propagated in a medium which pervades all space, and that the spectrum of the aurora is in reality the spectrum of that medium.

7. It is not improbable that the tails of all *large* comets will be found to give spectra similar to that of the aurora, although additional lines may be present.

SMALL PLANETS DISCOVERED IN 1872.

During the year 1872 eleven additions were made to the number of small planets known to revolve between Mars and Jupiter, making the entire number now known 128. Their numbers, discoverers, and dates of discovery are as follows:

(118), *Peitho*, by Luther, at Bilk, March 15.
(119), by Watson, at Ann Arbor, April 3.
(120), *Lachesis*, by Borelli, at Marseilles, April 10.
(121), by Watson, at Ann Arbor, May 12.
(122), *Gerda*, by Peters, at Clinton, July 31.
(123), *Brunhilda*, by Peters, at Clinton, July 31.
(124), *Alceste*, by Peters, at Clinton, August 23.
(125), by Prosper-Henry, at Paris, Sept. 11.
(126), by Paul-Henry, at Paris, Nov. 5.
(127), by Prosper-Henry, at Paris, Nov. 5.
(128), by Watson, at Ann Arbor, Nov. 28.

The numbers 126 and 127 are remarkable as being found on the same evening so near together that they were in the same field of view of the telescope.

CABLE ANNOUNCEMENTS OF ASTRONOMICAL DISCOVERIES.

Astronomers have been for some time interested in devising some method by which the discoveries of new planets or comets in one hemisphere could be reported to the other with the least possible delay, communication by mail being so slow, comparatively, that the object materially changes its place before the fellow-workers on the opposite side of the Atlantic Ocean can direct their attention to it. The difficulty is still greater when the bodies in question are faint, since they are necessarily discovered in nights free from the light of the moon; but before the news can be transmitted across the water (requiring an interval of about two weeks) the moon will so illuminate the sky as to prevent observers from looking immediately for them, and for this reason the first notice of a planet is frequently its last, the most careful search failing to detect it again in consequence of the impossibility of determining a second or third position.

These considerations have naturally invoked attention to the Atlantic cable as a means for exchanging discoveries; but the great expense of dispatches by it, and the poverty of astronomers, has prevented their making use of this means of communication to any great extent. For some time past Professor Henry, of the Smithsonian Institution, has been in correspondence with the authorities of the cable for the purpose of inducing them to transmit such communications free, and at last has had the pleasure of receiving from Mr. Cyrus W. Field the announcement that this boon has been granted. The precise details of the arrangement to be made are not yet fully established, but it is probable that, in case of important discoveries in America, the fact will be communicated by telegraph to the Smithsonian Institution, which will at once forward it to the observatories in Paris, London, Berlin, and Vienna, which, in turn, will supply the information to their associates. These same institutions will be the recipients, by telegraph, of the first announcements in Europe, to be transmitted to the Smithsonian Institution as before, and the information sent from Washington, either by the medium of the Associated Press, or by direct telegraphic dispatch. The Western Union Telegraph Company has also granted the free use of its wires for the same purpose, in co-operation with the Cable Company.

The directors of these telegraphs deserve great credit for their enlightened liberality, and for thus aiding in the scientific work of the day, and it is to be hoped that the European inland lines will not be behind in their co-operation, so as to make it an absolutely free interchange from one country to the other. The number of such dispatches traveling in either direction annually can not be very great (hardly more than one or two a month), as during 1872 there were only ten new asteroids discovered, and a proportional number of telescopic comets. It is probable that the information in regard to the discovery of comets in America will be sent more directly to the Vienna Academy of Sciences, as that body has a standing offer of reward for all such announcements made under certain specific conditions.

SPECTRUM OF NEPTUNE.

Mr. H. C. Vogel, of the observatory at Bothcamp, has spectroscopically examined the light of Neptune, the most extreme of the known members of our solar system, and found the spectrum of this planet identical with that of Uranus. Eight lines of absorption have been measured, and they coincided with those of Uranus. Red could not be perceived. This result differs somewhat from that of M. Secchi, who only considers the spectra of the two planets as very similar.—19 *C*, XXVIII., 1872, 223.

THE LOST COMET.

Just one hundred years ago a new comet was discovered by Montaigne. It was so faint and difficult of observation that no time could be fixed for its return. In 1826 a comet was found by Von Biela, and, on computing the orbit, it proved to be identical with that of 1772. Further investigation showed that it was also observed in 1805, but was not then recognized as the same. It was, therefore, a periodic comet, and the period of its revolution was found to be six years and eight months. It has since been known as Biela's comet, from its discoverer of 1826. The next two returns were not favorable for its observation, so that it was not again satisfactorily detected till 1845. It was seen in November and December of that year by a number of observers, who noticed nothing unusual; but in January it was found to have suffered an accident such as was never before known to happen to a heavenly body, and of which no explanation has ever been given. It was split in two, and for some months was observed as two comets. In 1852 it appeared again, and now the two comets were nearly two million miles apart. They disappeared from view about the end of September, and have never been seen since, although they must have returned in 1859, and again in 1866 and 1872. The return of 1866 was quite favorable, but, although the most powerful telescopes searched for it, all was in vain. The comet had vanished from the heavens.

The earth crossed the orbit of this comet about the end of November. Professor Newton was thus led to infer that, though lost to sight, the fragments of the comet would be seen about that time striking the atmosphere as shooting-stars. This prediction was fully verified by the event. On the evening of November 27, between the hours of six and eight, a remarkable shower of meteors was observed, the astronomers of the Naval Observatory counting several hundred. And further, the direction of their motion corresponded, as nearly as could be judged, to that of the lost comet. In consequence, the Washington astronomers entertain no serious doubt that the meteoric shower was really caused by the earth's meeting the débris of the comet.

COINCIDENCE OF SOLAR OUTBURSTS AND MAGNETIC DISTURBANCE.

An interesting coincidence between solar outbursts and magnetic storms, if not a relation of cause and effect, is suggested by Professor Airy in a communication to *Nature*. In this, referring to an announcement by Father Secchi of a remarkable outburst from the sun's limb, which lasted nearly four hours, as witnessed by him on the 7th of July, he remarks that a magnetic storm commenced the same day, its influence upon all the instruments being unusually sudden and perceptible. The disturbance diminished gradually to the evening of the second day, and was accompanied during a part of the time by an aurora. If a connection really existed between the two phenomena, the transmission of the influence from the sun to the earth must have occupied two hours and twenty minutes, or a longer time if Father Secchi did not see the actual beginning of the outburst.—12 *A*, *August* 22, 1872, 328.

TRANSIT OF VENUS IN 1874.

Our government is making active preparations to observe the transit of Venus in 1874 with a completeness which will leave nothing to be desired. At the last session of Congress a scientific commission was organized to provide the necessary instruments, and it has been determined to occupy eight or ten stations. The stations will be mostly on the islands and coasts of the Pacific Ocean, from New Zealand on the south to the Aleutian Islands on the north, and from the Sandwich Islands on the east to China on the west. Telescopes and photographic apparatus for eight stations have been ordered from the firm of Alvan Clark & Sons, Cambridgeport, Massachusetts, and it is probable that nearly all the apparatus will be of American manufacture.

The commission has printed a pamphlet containing some important papers on the subject, and it is expected that this will be followed by others. The present pamphlet is mostly devoted to the question of photographing the transit. It contains a very full description of the apparatus used by Mr. L. M. Rutherford, of New York, whose photographs of the celestial bodies are the finest ever taken. The longest paper is by Professor Newcomb, one of the commission, who gives a detailed description of the method by which the commission actually proposes to take the photographs. Professor Newcomb finds objections which he deems fatal to nearly all the plans of photographing that have been proposed in Europe, and therefore proposes that adopted by Professor Winlock, of the observatory of Harvard College. In this plan the telescope is forty feet long, and is fixed in a horizontal position, the object end pointing north. A short distance from the object-glass is a plain mirror, which is set so as to throw the rays of the sun into the telescope. At the other end of the telescope an image of the sun four and a half inches in diameter is formed, and here the photographic plate is placed to receive and photograph this image. Immediately in front of the plate a plumb-line is to be hung, and thus be photographed on the plate, in order to get the direction of the vertical diameter of the sun.

Among the advantages claimed for this plan are: That the photograph can be taken in the dark room, and on a firm support (while, by the other plan, the photographer must take his sensitive plate to the eye-piece of the telescope, which has to be kept in motion); that the image on the plate is free from distortion; and, finally and chiefly, that it is the only plan by which the measures of inches, on the negative, can be reduced to minutes and seconds of an arc in the heavens with the necessary accuracy.

B. TERRESTRIAL PHYSICS AND METEOROLOGY.

RATIO OF BAROMETER DEPRESSION TO THE HEIGHT OF THE TIDES.

At a meeting of the Philosophical Society of Washington, Professor William Ferrel presented an account of some experiments in which he had been engaged at the request of the superintendent of the Coast Survey, for determining the influence of the barometric pressure upon the tides. Taking the observations made with the tide-gauge at Boston Harbor, he compared them, hour by hour, for a certain period, with the barometrical records of Harvard Observatory, and ascertained that, in general, a fall of the barometer of one inch was accompanied by an increased height of the tide of seven inches. The theoretical ratio should be one inch to about thirteen and a half; but the shallowness of Boston Harbor, and the numerous obstructions to the free flow of the water in and out of it, are assigned as the cause of the difference. Similar observations made at Liverpool showed that the tides varied ten inches in height with one inch of barometric fluctuation.—*Wm. Ferrel, Prof. Washington Phil. Soc.*

CROLL ON CARPENTER'S THEORY OF OCEAN CURRENTS.

In a third part of his memoir on ocean currents, lately published in the *London, Edinburg, and Dublin Philosophical Magazine*, Mr. James Croll examines critically the theory of a general oceanic circulation, put forth by Dr. Carpenter in a paper read before the Royal Geographical Society. After showing that no additional power is obtained from a vertical descent of the polar waters through the action of cold (the "primum mobile" of Dr. Carpenter) above that which is derived from the full slope, of less than eighteen feet, due to difference of temperature between the equatorial and polar regions of the sea, Mr. Croll endeavors to prove that the "primum mobile" has in reality no existence, and that, since the energy derived from the whole slope comprehends all that can possibly be obtained from gravity, there is not, in this, sufficient power to produce the circulation which Dr.

Carpenter assumes. Further, he maintains that if difference of specific gravity fail in accounting for the circulation of the ocean in general, it fails in a more decided manner to explain the Gibraltar current, because it is only the stratum of water which rests above the level of the shallowest part of the strait on each side that can exercise any influence in disturbing equilibrium, and since the observed difference of density between the Mediterranean and Atlantic within these limits does not give a difference of level sufficient to cause movement.—13 *A*, *Nov.* 1, 1871, 500.

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 $\frac{1}{500}$ of a grain. —12 *A*, *Jan.* 11, 1872, 202.

TEMPERATURES IN SOUTH AMERICA.

A correspondent of the New York *Tribune*, writing from the *Hassler*, refers to the great uniformity of the temperature at sea on the west coast of South America; thus, on reaching Callao, on the 28th of May, although the sun was shining brightly and the wind was from the equator, the thermometer stood steadily at 66° for a number of days in succession. For the seven weeks preceding the arrival of the *Hassler* at Callao there had been very little difference in the temperature either of the sea or air, as observed on the vessel.

On the 6th of April, in latitude 43°, in San Pedro Channel, the thermometer stood at noon at 69° F.; on the 24th of May, at Callao, latitude 12°, at 66°. This, in the words of the writer, would be like leaving Portsmouth, New Hampshire, on the 6th of October, in seasonable weather, and reaching Barbadoes or Greytown on the 24th of November, and finding it colder than it was in New Hampshire.

DEEP-SEA TEMPERATURES IN THE ATLANTIC NEAR THE EQUATOR.

Mr. N. Von Maclay, who, as our readers have been informed, is in charge of a Russian scientific exploration of the Atlantic and Pacific Oceans, reports to the Academy of Sciences of St. Petersburg that on the passage of the *Witjas* from the Cape de Verd Islands to Rio he made an experiment, on the 3d of February, for the purpose of determining the temperature of the sea at a depth of one thousand fathoms in the region of calms, about 3° north latitude and 24° west longitude. The temperature of the water at this depth was about 38.30°

F., that of the surface water being 81.68° F. It is interesting to compare this with the temperature obtained during the past winter by the Coast Survey steamer *Bibb*, at about the same depth, in the deep water between Cuba and Yucatan, in the latter case the temperature amounting to about 39.50° F. —*Bull. Acad. St. Petersburg*, 1871, 346.

SOUNDINGS BETWEEN CUBA AND YUCATAN.

The greatest depth between the west end of Cuba and the coast of Yucatan found by the Coast Survey Steamer *Bibb* is 1164 fathoms, as reported to Professor Peirce by Captain Robert Platt, commanding the surveying vessel. The lowest temperature observed is 39.5° F. at the bottom; surface, 81°; strongest current, two knots; direction, north. Dr. Stimpson reports the bottom from Cape San Antonio to Yucatan very barren of animal life. A few rare shells were found.—*Prof. Hilgard.*

SELF-REGISTERING EARTHQUAKE INDICATOR.

Erkmann has laid before the Natural History Society of Prussian Rhineland and Westphalia a plan of 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.—3 *C*, 1871, 1150.

STORM-SIGNALS IN NEW SOUTH WALES.

The government of New South Wales, following the lead of Europe and the United States, has introduced the system of telegraphing the anticipations of the weather, and has established certain stations on the coast for indicating the nature of any expected storm by means of signal masts; these signal masts support two yards, crossing each other at right angles in the direction of the cardinal points of the compass. A violent squall is to be represented by a conspicuous diamond-shaped signal; a heavy sea by a drum; a gale with clear weather is indicated by a diamond-shaped signal over a drum; and one with thick weather and rain, with the same signal under a drum. The direction in which the wind is blowing is indicated by the particular yard-arm between which and the mast-head the geometrical signal is suspended. Gales that are general over a large portion of the coast are indicated, without the mast-head flags, by the geometrical figures.—*Newspaper.*

BRITISH AND AMERICAN STORM WARNINGS.

A motion was made in the British Parliament, just before its recent adjournment, for the appointment of a committee to report upon the practical effect of the storm warnings issued by the British Meteorological Office, specifying how many had been verified by the result, and how many the contrary. The return has, we believe, not yet been made, although the general subject has been discussed at considerable length in the London journals. It is well known that under the administration of the government meteorological system of storm warnings, under Admiral Fitzroy, the attempt was made to indicate the probable approach of gales and storms, with the general direction from which the storm was to be expected. These were announced during the daytime by two large bodies in the shape of a drum and a cone variously adjusted, and at night by means of lights. After Admiral Fitzroy's death, and the reorganization of the system, but one drum was used, and that only raised to show that a serious atmospheric disturbance existed somewhere on or near the British coast; this is exhibited for thirty-six hours after the telegraphic message directing it to be hoisted, and is merely intended to give an intimation to seamen to be on the lookout for approaching bad weather.

At the present time there are seventy-four drum signals in England and Wales, thirty-two in Scotland, twelve in Ireland, three in the Isle of Man, and two in Jersey.

A similar system has quite recently been adopted by the

Signal Service branch of the War Department of the United States, under General Myer, as is well known to most of our readers. The day signal here consists of a flag instead of a drum, and is likewise intended only to indicate the probable approach of a storm, blowing at the rate of at least thirty miles per hour. The short time during which this system has been in operation has been sufficient to prove its value, and, during the late severe gales all over the country, much loss of life and property has been prevented by proper attention to the intimations given.

For a considerable time the Signal Office has given telegraphic announcements of the probabilities of the weather, and we learn from an abstract of the report of the chief signal officer, General Myer, that sixty-five per cent. of these prognostications have been verified by the result; and, as the theory of atmospheric disturbances is better understood, the percentage of verifications will continually increase.—3 *A*, *Nov.* 11, 1871, 368.

BRITISH WEATHER MAP.

The Meteorological Office of Great Britain proposes to issue lithographic charts illustrative of the daily weather report. These will be forwarded from the office of the printer between 1 and 2 o'clock P.M. each day, and sent to any part of the kingdom, upon payment of five shillings per quarter. In addition to the returns from forty stations, charts of the British Isles and a portion of the Continent are given, showing the movements of the barometer and thermometer, the conditions of the wind and sea, and the quantity of cloud and rain. The rapid dissemination of this information can not fail to be of great value to Great Britain, as is shown by the success which has attended a similar enterprise of the American Signal Service, of which we are so justly proud, and which has been in operation for a considerable time, embracing much more minuteness of detail than is proposed for the English maps.—15 *A*, *March* 16, 1872, 339.

LAWS OF THE WINDS IN EUROPE.

A work has recently been published by Mr. W. Clement Ley upon the laws of the winds in Western Europe, containing some important generalizations which may be of interest to our readers, agreeing, as they do, in the most essential points, with the results of inquiries by the United States Signal Service. The author, after referring to the great amount of statistical matter upon the subject of meteorology, and the great number of persons interested, locally or otherwise, in such inquiries, thinks that it may be considered as a matter of surprise that so few have attempted the investigation of the greater problems of meteorology, but suggests that this is caused, in part, by the abstruse character of the inquiries involved, and the almost interminable complexity of the conditions which influence the motions of the atmosphere. Indeed, so many are the difficulties in which the subject is involved, that it requires a certain degree of scientific enthusiasm to believe that they are not insurmountable.

One of the most important generalizations in regard to the motion of the winds, according to Mr. Ley, is that known as Ballot's Law, which connects the direction of every surface wind with the distribution of surrounding pressures; and he thinks that the general fact that the winds blow in directions nearly parallel to the isobarics (or lines of equal atmospheric pressure, as shown by the barometer), having the highest pressure on the right and the lowest on the left, in the northern hemisphere, and the contrary in the southern, no longer needs demonstration, being now an accepted law. It is only recently, however, that its bearing upon some of the earlier conceptions of the science has received attention.

Among the general propositions which Mr. Ley presents to his readers, and some of which he thinks he can prove, and others of which require more or less further investigation, are the following:

I. Baric areas, or the atmospheric spaces inclosed in isobaric lines, tend, as a general rule, in temperate latitudes, to circular or oval forms. These forms are most nearly approached in the areas of lowest pressure, while irregular figures are common in those of high pressure.

II. Baric areas are naturally divided into two classes, viz.: A, those whose currents revolve directly (or *with watch-hands*) in the northern hemisphere, and the contrary in the southern ("anti-cyclonic"); and B, those whose currents revolve in a *retrograde* direction (or *against watch-hands*) in the northern hemisphere, and the contrary in the southern ("cyclonic"). All areas of higher pressure than that of the surrounding regions are invariably of the former class; all areas of lower pressure than that of the surrounding regions are invariably of the latter.

III. Areas of depression tend to move in extra-tropical latitudes with a more or less eastward progression. Areas of high pressure, when of small extent, commonly follow the progression of neighboring depressions; when of large dimensions, progress with much less rapidity, and are frequently erratic, and sometimes for a prolonged period stationary.

IV. The direction of progression commonly varies in Western Europe between north-northeast and south-southeast, and is primarily dependent on the general antecedent distribution of surrounding temperatures, every depression area tending to advance at an inclination of about 45° toward the lower mean isothermals. This progression is, however, frequently interfered with, for,

V. Mountainous districts, as well as certain coast lines, exercise (1) an attractive and (2) a detentive influence upon depressions.

VI. Extensive areas of very high pressure check, divert, or accelerate the motion of depressions, every depression progressing with greatest facility in the direction in which it has the highest general pressures, on the *right* of its course in the northern hemisphere, and the contrary in the southern.

VII. Depression areas are dependent, both for their original development and subsequent expansion, on precipitation, which is also the medium through which the forces described in propositions IV. and V. operate. Heavy and extensive precipitation invariably precedes their first formation, and accompanies their expansion, and its cessation immediately precedes their collapse or dissipation.

VIII. This influence of precipitation, as a disturbing or motive power in the lower regions of the atmosphere, commonly varies inversely as the general temperature of the atmosphere.

IX. The upper currents of the atmosphere, while tending in a general way to move with the highest pressures on the right of their course, but depending in this respect on the more extensive pressure systems, and being comparatively unaffected by very limited baric areas, yet deviate considerably from Ballot's Law; for,

X. Upper currents manifest, in a large percentage of examples, a distinct centrifugal tendency over the areas of low pressure, and a centripetal over those of high.

XI. The axis of a progressive depression commonly inclines backward.

Several of these propositions are, however, according to Mr. Ley, ultimately dependent upon the following primary law, which, although obvious, requires to be clearly apprehended at the outset by the student of meteorology. "Every extensive centripetal motion in the atmosphere tends to become, through the influence of the earth's rotation, a helix, the currents of which are retrograde in the northern hemisphere and direct in the southern. Every extensive centrifugal motion tends to become helix, the currents of which are direct in the northern hemisphere and retrograde in the southern."

Also, first, that extensive precipitation occurring in a region of atmosphere previously approaching a condition of tranquillity is the primary factor of every system of baric depression, with its resulting atmospheric circulation, retrograde in the northern and direct in the southern hemispheres; second, that such an atmospheric circulation being established, the changes in their capacity for aqueous vapor which its currents undergo in consequence of the unequal distribution of solar heat tend to propagate the depression in an eastward direction.

To the subject of "upper currents" a special chapter is devoted, and the difficulties of making observations upon them is referred to. The special object of this inquiry is to ascertain whether there is any general relation between the motion of this upper stratum and the conditions and disturbances of atmospheric pressure at the surface of the earth; and if so, what that relation is. As a partial answer to these inquiries, resulting from the discussion of numerous observations, the author remarks that the relation between the number of instances in which the upper currents incline from low to high pressures, and that in which they incline from high to low, is as 393 to 92 (or about four to one).

We thus arrive at the important general law connecting the direction of the higher currents with the distribution of atmospheric pressure at the earth's surface, that the higher currents of the atmosphere, while moving commonly with the highest pressures, in a general way, on the right of their course, yet manifest a distinct centrifugal tendency over the areas of low pressure, and a centripetal over those of high.

The rapidity of the upper currents, on an average, Mr. Ley states to be about twice as great as that of those at the surface of the earth, since the latter rarely attain velocity greater than sixty to seventy miles per hour. The more distant clouds not uncommonly have a much greater velocity. The observations of the United States Signal Service furnish corroborative evidence in regard to this matter, since the velocities at the top of Mount Washington have repeatedly equaled the maximum mentioned, as recorded by an accurate anemometer.—*Ley's Laws of the Winds*, pt. i., 1872.

CLIMATIC CONDITIONS OF DIFFERENT REGIONS.

In a paper by Dr. Friedmann on the climatic peculiarities of the eastern coast of Asia, he states that when passing around the world from east to west the following climatological conditions will be found to present themselves in succession. First, on the east coast of Asia we have a decided continental climate—cold winter, warm summer, considerable difference between the temperature of day and night, and between the coldest and warmest months—the whole, however, tempered by the influence of the east wind. Second, in the interior of Asia we have the highest expression of a continental climate—very hot summers, with extreme cold in winter, the lowest winter temperature on the globe being in latitude of about 62 degrees. We have, then, a gradual equalization of this continental feature as we pass to the west, until we reach number three of his division, in Western Europe. Here the climate is purely maritime—mild winters, moderate summers, and but little difference between day and night, winter and summer. Fourth, the eastern coast of America—cold winters and hot summers characterize the climate; the southwest wind is cool, and extends over the continent. Fifth, the central portion of America—similar to the central portion of Asia, although with less extremes of heat and cold. Sixth, the west coast of America—climate maritime, similar to that of Western Europe, in consequence of the warm returning trade winds passing over the sea; warmer winters and cooler summers, in consequence of the cooling action of the sea and of the rather feeble equatorial current.—3 *C, Feb.* 8, 1872, 140.

COMPARATIVE CLIMATE OF HILL-TOPS AND VALLEYS.

As the result of a series of investigations upon the comparative temperature of hill-tops and valleys, made by Mr. Dines, we are informed that the air on the top of a hill is colder than in the valley in the daytime, and warmer at night. The daily range at the higher station is not so great as at the lower, the difference being about four and a half degrees. In cold weather it is found that the air on the top of a hill is never so cold as that in the valley. The rainfall, also, on the hill is forty per cent. greater than in the valley. These observations were prosecuted in a valley at Cobham and on a hill at Denbies, the difference in height being about six hundred feet.—15 *A, April* 27, 1872, 530.

UNUSUAL WEATHER IN THE ARCTIC OCEAN IN 1871.

The accounts furnished by the Boston *Advertiser* from the captains and crews of the vessels of the whaling fleet lately destroyed or ice-bound in the Arctic Ocean concur in describing the presence of peculiar meteorological phenomena during the past season. The prevailing summer wind on the northwest coast of Alaska is from the north, and this works the ice off from the land and disperses it, while the northwesterly winds close it up on the shore. As the ice moves off, the ships generally work up by the land, and in that situation find whales in plenty. By the end of the season, when northwesterly winds are prevalent, the ice has become so broken up and melted that it has ceased to be an element of danger, and the vessels are compelled to retire to the northward by heavy ice drifting along the coast from the north, and not from a threatened closing in upon the land. But this season the easterly winds were not so strong and constant as usual, and the ice that had gone off from shore returned in a heavy pack that it was impossible to get a ship through, or even to hold against at anchor. The heavy ice-fields are all composed of fresh-water berg-ice, not floe-ice of salt-water. The bergs are not of the immense proportions seen in Greenland seas, but are solid enough to be equally dangerous, many masses being so heavy as to ground in ten fathoms of water. —*Boston Advertiser*, *Nov.* 18, 1871.

PECULIARITIES OF THE WINTER OF 1871–1872 IN EUROPE.

The past winter has been a very remarkable one in England. The cold weather set in unusually early and severely with the commencement of November, and from that date to December 13, Mr. Glaisher's weekly tables of meteorological observations, taken at Greenwich, show the temperature to have been uniformly below the mean of the last fifty years, with the break of only a single day, the mean depression for the whole period being 6° 5′ Fahr. The coldest day was December 8, when the thermometer fell to 18° 6′ Fahr., and the temperature of the twenty-four hours was 19° 3′ below the mean. Throughout France the month of November was very severe, the mean temperature of the month having been lower only four times during the last century. According to statistics presented to the Academy of Science by M. Ch. Sainte-Claire Deville, the thermometer fell as low as 11° Fahr. at Montargis on December 3, while even at Marseilles the remarkably low temperature (for that locality) of 27° 5′ Fahr. is recorded on November 23. During the early part of December the frost continued still more severe in France and Italy, where much snow fell. At Rome and throughout France trees and shrubs which had survived many winters were entirely destroyed. M. Delaunay remarks that the cold advanced, as is usually the case, from northeast to southwest. The minimum temperatures were recorded at Groningen, in Holland, on December 7, 14° Fahr.; at Brussels, 9° 5′ Fahr. on the 8th, and at Paris, 6° Fahr. on the 9th. This extremely low temperature appears to have been confined to a very limited tract of country between Paris and Charleville. On the same day the temperature was above the freezing point in Scotland, within reach of the influence of the Gulf Stream, as far north as Nairn, and in the greater part of England, falling only at Greenwich as low as 28° Fahr. This severe frost was followed in England by a period of exceptionally mild weather of probably unprecedented length. For ninety-seven days, from December 13 to March 18, Mr. Glaisher's tables show that the temperature was above the average on eighty-nine, and below the average on only eight days, the mean excess for the whole period being 5° 1′ Fahr. During the whole of this period of more than three months the thermometer fell below the freezing point on four nights only, February being entirely free from frost. The warmest period was from March 1 to 8, when the maximum temperature ranged each day from 57° 1′ to 60° 8′.

On March 19 the temperature again fell below the mean, and continued so for nine days, till the 27th, accompanied in London and the neighborhood by heavy falls of snow. The minimum temperature for March was, on the 21st, 26° 2′, being the lowest recorded since December 9. There were nine frosty nights in March, against two in the whole of the two preceding months. For the week ending March 26, the mean temperature was 34° Fahr., or 16° lower than the mean for the week ending March 7. The severe frost of March 21, following such a long period of mild weather, has done an immense amount of damage to the fruit crops, the pears and cherries having suffered more severely. It is remarkable that, although the flowers were killed in the bud, the centre being turned perfectly black, they opened as if untouched, and presented a mass of bloom looking to the eye entirely uninjured. On the early vegetable the effects were no less disastrous. In the island of Jersey alone, whence large supplies are usually obtained for the London market, the damage to the potato crop is estimated at many thousands of pounds.—*A. W. Bennett.*

RELATION OF WEATHER TO COLLIERY EXPLOSIONS.

A careful collation of meteorological records for given localities, and the explosions from fire-damp in coal mines in Europe, has shown that there is a very close relationship between the two, and that alterations in the meteorological condition are proximately the cause of most colliery accidents. Out of 550 given explosions investigated, it is thought that 226 may be attributed to the state of the barometer, and 123 to that of the thermometer, while the remaining 161 were unaccounted for on meteorological grounds; thus seventy per cent. of the whole were directly related to meteorological influences. It is suggested that special care should be exercised in mines after a fall of the barometer, although the explosions in most cases do not occur until several days after the depression has reached its minimum. The greatest number of accidents are said to occur when a serious storm follows a long period of fair weather. Elevation of temperature, of course, greatly interferes with the natural ventilation of a colliery; and hence, if a warm day occur in a cold season when natural ventilation is relied upon, it is very likely to be followed by an explosion. For a like reason, the first hot days of spring are quite often marked by colliery accidents. —16 *A*, *July*, 1872, 385.

CYCLONES IN THE PACIFIC.

Mr. Whitmer, in referring to a paper by Mr. Murphy in *Nature* on the scarcity of cyclones in the Pacific, remarks that there is rarely a year without at least one cyclone passing through, or in the neighborhood of, one of the Feejee, Samoan, or Hervey group of islands. He states that the cyclone season extends over the greater part of the period during which the sun is south of the equator; consequently, when the trade-winds from the north reach farthest south, they are most prevalent about the middle, or a little later than the middle, of the season, rarely earlier than December or January. They are usually preceded for a few days by strong northerly winds; and if during such winds a sudden fall of the barometer occur, this is considered a sure indication of an approaching cyclone.—12 *A*, *June* 13, 1872, 121.

CHANGE OF TEMPERATURE IN THE NORTHERN HEMISPHERE.

Mr. Howorth has been engaged for some time on a series of papers discussing the changes that have taken place to the present time in regard to the distribution of land and water, and the consequent effect upon the climate. He finds that the result has been a great increase in the amount of cold in the far north, rendering regions such as those of East Greenland, once capable of supporting a considerable population, now entirely uninhabitable, and literally covered the year round with snow and ice. He says, however, that while the evidence is overpowering that the climate has been growing more severe in the highest latitudes, there is a great deal of evidence to show the cold has decreased elsewhere, and that, especially in view of the accounts given of the climate of Gaul and Germany in the Roman times, we can not but admit that there has been a great improvement since that date. Thus we are told of winters when the Danube and Rhine were frequently frozen over, and of the occurence of the reindeer and moose in localities far south of their present habitat. Ovid laments over the fearful severity of his place of exile on the coast of Thrace, and refers to the occurrence of white foxes there, and contemporaneous references corroborate his statements.

Mr. Howorth inquires whether, even within the prehistoric period, the circumpolar climate may not have been very temperate, when that of more southern latitudes was very severe. We know, in fact, that during the miocene period Greenland once possessed a climate not dissimilar to that of the Eastern United States, as shown in the occurrence of numerous species of trees of large size, some of them, like our cypress, etc., absolutely identical with our forest vegetation of the present day. Mr. Howorth also refers to the general impression among whalers that excessively severe winters in the more temperate latitudes are accompanied by an unusual degree of mildness in the more northern latitudes.

This we accept as an augury in favor of Captain Hall's exploration, since the winter of 1871–72 was one of the severest on record of late years; and should Mr. Howorth's suggestion be correct, the captain should have enjoyed an unusual freedom from snow and ice, permitting him to prosecute his researches to great advantage.—12 *A*, *June* 13, 1872, 121.

PALMIERI'S LAW RESPECTING ATMOSPHERIC ELECTRICITY.

Mr. George Forbes, in an article in *Nature* upon Professor Palmieri's observatory on Mount Vesuvius, to which constant reference has been made in the accounts of the recent eruption of that mountain, mentions a law in regard to atmospheric electricity that Professor Palmieri has reached, as the result of his observations for a quarter of a century in a country where meteorological changes are very regular and less capricious than in Great Britain. He enunciates this as follows: If within a distance of about fifty miles there is no shower of rain, hail, or snow, the electricity is always positive. The single exception is during the projection of ashes from the crater of Vesuvius.

During a shower he finds the following law to hold good universally: At the place of the shower there is a strong development of positive electricity; round this there is a zone of negative, and beyond this again, positive. The nature of the electricity observed depends upon the position of the observer with respect to the shower, and the phenomenon will change according to the direction in which the shower is moving. Sometimes negative electricity may be observed during a shower, but this is always due to a more powerful shower farther off. These conclusions have been supported by means of telegraphic communication with neighboring districts. It appears, then, that, except when the moisture of the air is being condensed, there is no unusual development of electricity.—12 *A*, *June* 20, 1872, 147.

VOLCANIC SAND IN CHILÉ.

The *Revista del Sur*, of Chilé, states that showers of sand occurred on the 3d of July, in Araucania, of sufficient extent to cover up all the planted fields of the Indians, and oblige them to take refuge on the north side of the mountain. This rain, supposed to have come from an eruption of Mount Llaima, distressed the Indians so much as to drive them into the neighborhood of the white settlements.—*Panama Star and Herald*, *September* 23, 1872, 2.

STEEL SOUNDING-LINES.

Sir William Thomson, in a communication read before the British Association, recommends the use of steel wire in deep-sea soundings. The great difficulty in such operations consists in the resistance of the water to the line, which is usually overcome in very deep soundings by employing extremely heavy weights. Beyond a depth of 300 fathoms the ordinary lead ceases to be available, and until very recently the difficulty of bringing up a long line and heavy weight from a considerable depth was so great that it had become the practice to leave the weight behind, simply bringing up a sample of the bottom. Farthermore, when there is great resistance to the line, the currents sometimes carry it away to a considerable distance, so that it is difficult to know when the bottom is actually reached. In view of these facts he has lately been experimenting in mid-ocean, at a depth of

2700 fathoms, with a line consisting of a steel wire of No. 22 gauge. This was 0.03 of an inch in diameter, weighed twelve pounds per statute mile, and broke with a weight of 252 pounds. To the end of the wire was attached a piece of hemp cord, which carried the weight, so that the wire did not touch the bottom at all. The wire was wrapped around a wheel. The danger of breakage was considered very slight, especially if by coating the wire with some non-oxidizable material its rusting be prevented.—18 *A*, *Aug.* 30, 1872, 606.

DEEP-SEA TEMPERATURES.

According to Dr. Carpenter, if we go deep enough in the open sea we shall always find the temperature as low as 32°; but in inclosed seas, such as the Mediterranean, the deeper and colder water, circulating from the poles, can not enter; therefore the lowest bottom temperature is determined by the lowest winter temperature of the surface. Scarcity of life in the Mediterranean he considers to be owing to a deficiency of oxygen in the water, due to its combining with a large quantity of organic matter brought down by the rivers and emptying into it. Thus, while in the Atlantic we usually find 20 per cent. of oxygen and 40 per cent. of carbonic acid, in the bottom waters of the Mediterranean there is often only 5 per cent. of oxygen and over 65 per cent. of carbonic acid. He considers the Red Sea and its neighborhood the hottest region on the earth, the temperature of the surface water rising to 85° or 90°, and the bottom temperature being about 71°, corresponding to the greatest winter cold. Outside of this sea, however, in the Arabian Gulf, the bottom temperature is 33°. Dr. Carpenter thinks that, as the lowest bottom temperature of the Red Sea is as high as 71°, living corals should occur there at greater depths than any where else in the world.—15 *A*, *August* 24, 1872, 240.

CURRENTS OF THE BLACK SEA.

Some time ago Dr. William B. Carpenter, on theoretical grounds, concluded that a strong *surface* current runs outward from the Black Sea through the Bosphorus, the Sea of Marmora, and the Dardanelles into the Ægean, this current being obviously the result of the elevation of the level of the Black Sea by the enormous volume of fresh water discharged into its basin by the Danube, the Dnieper, the Don, and other rivers. This inflow, being greatly in excess of the evaporation from the surface of the Black Sea, keeps down the salinity of its water to an average of about two fifths that of ordinary sea-water.

It is, therefore, evident that, as the outer current is continually carrying away a portion of its salt, the basin would in time become entirely filled with fresh water but for some return of salt water from the Ægean, and he maintained that this is supplied most probably by an under-current flowing inward. The truth of this prediction on the part of Dr. Carpenter was contested by Captain Spratt, on the ground of experiments made by him during the survey of these straits, this officer maintaining that, on the contrary, the water of the Dardanelles below twenty fathoms is motionless, and that the salt water finds its way back into the Euxine as a surface current when the rivers are low and the wind sets along the straits from the Ægean.

Quite recently the controversy has been decisively settled by experiments conducted by the surveying staff of the *Shearwater* with a large current drag. This was suspended in the deeper stratum of the Dardanelles from a boat, which was carried along by it in opposition to the surface current, which is said to have been even stronger than the steam-power of the launch of the *Shearwater*. This under-current was found to be flowing at twenty fathoms from the surface, precisely the depth assigned to it by Dr. Carpenter, as deduced from the discussion of Captain Spratt's own experiments.—15 *A, October* 26, 1872, 534.

CARBONIC ACID IN SEA-WATER.

Oscar Jacobsen, of Kiel, has made a communication to *Nature* in reference to the carbonic acid in sea-water, the determination of the amount of this gas being considered a matter of much importance in deep-sea researches. He states that the complete expulsion of oxygen and nitrogen from sea-water presents no difficulty, the comparative proportion of the two gases not being sensibly different in the first and last portions of the gas expelled. Carbonic acid is only partially driven off by boiling the sea-water for hours in a vacuum, and the proportion of acid found in the expelled gas justifies no conclusion as to the amount in the water. The portions of the sea-water gas first displaced are almost entirely free from carbonic acid, the later being richer.

The complete expulsion of carbonic acid from sea-water is attained by its distillation in a current of air free from carbonic acid; but even under this operation it is detached so slowly that only after the evaporation of a considerable amount of water does the carbonate of lime begin to separate. The distillation must be continued until only one fourth of the original quantity of water remains. The fact, therefore, that carbonic acid is present in sea-water, not as a dissolved gas in the same sense as oxygen and hydrogen, but in a peculiar condition of combination, Mr. Jacobsen considers of great importance, not only as respects animal and vegetable life, but also in reference to the geological relations of the sea. He is now prosecuting an inquiry as to which of the constituents of sea-water is due its power of close combination with carbonic acid, and what is the proportion of this acid to the salt.—12 *A*, *August* 8, 1872, 279.

CARBONIC ACID OF SEA-WATER.

Mr. Lant Carpenter, who has been investigating the amount of gaseous constituents in samples of deep sea-water obtained during the *Porcupine* expedition of 1869–70, remarks that the analyses show that both surface and bottom water contain more carbonic acid and less oxygen in the more southern than in the more northern latitudes. The examinations made embraced samples taken from localities extending from the Faroe Islands to Lisbon. Contrary to the general supposition, however, he reports that there is no greater quantity of dissolved gaseous constituents in the bottom than in the surface water, although he fully admits the power of pressure at great depths to retain gases in solution if once evolved there.—1 *A*, *August* 23, 1872, 88.

DISCUSSION OF DEEP-SEA TEMPERATURES.

Professor Mohn, of Christiania, discussing in Petermann's *Mittheilungen* the results of the deep-sea temperature observations in the waters between Greenland, North Europe, and Spitzbergen, remarks that the deep basin of the polar sea is filled from bottom to top with an enormous mass of cold water, which on the southeast is encompassed by the warm waters of the Gulf Stream, and penetrates below its current to the coast of Europe. The principal discharge of the polar ocean takes place into the lower strata of the Atlantic, through the deep channel between Greenland and Iceland; while the shallow sea between Iceland and the Faroes hinders any further outflow, which is only permitted through the narrow lower portion of the Faroe-Shetland channel. The banks around the British Islands (the shallow North Sea and the Norwegian banks) prevent any other outflow southward; and those between the Bear Islands and Norway answer the same purpose to the east. On the other hand, an immense mass of warm water extends from the deep abyss of the Atlantic northward over the shallow sea between Iceland and the Faroe Islands, as also above the Faroe-Shetland channel. Thence some part of the current passes the Norwegian coast and continues in two different arms, the narrower but deeper reaching to the north coast of Spitzbergen, while the second and broader arm expands over the entire sea of Nova Zembla.

The left bank and bottom of the Gulf Stream are formed by the ice-cold water of the Arctic Ocean; the right side, however, consists of the bottom of the North Sea and the banks connected with it, as also of the Norwegian coast to the Russian boundary. The Gulf Stream is warmest on the surface layer quite close to the coast of Norway (in the summer, of course), and from this point the strata exhibit a sensibly decreasing temperature with the increasing depth, until we reach the stratum of the freezing-point.

Deep-sea observations in several of the Norwegian fiords, which are protected by their outlying banks from the great Atlantic depths, show that their water comes from the Gulf Stream, and they appear to be filled with this water to the very bottom, even when this lies lower than the ice-cold bed of the Gulf Stream off the coast. Thus the West Fiord, at a depth of from 100 to 320 fathoms, showed a uniform temperature of 44.6° Fahr. in the summer of 1868, while outside of the Loffodens the observations of the *Norna* in July, 1871, at 35 fathoms, revealed a temperature of 44.6° Fahr., and at 215 fathoms of 39.2°. To the southwest of Lindesnes and Lister, in June to August, 1871, at 150 to 250 fathoms, the temperature registered 42.8° to 44.6°, while in the Faroe-Shetland channel, at the same depth, the temperature decreased from 42.8° to 38.8°.

Attention is called by the author to the temperature indications of the *Porcupine* expedition in July, 1869, where, in the deep depression of the Atlantic Ocean, outside the channel, while the temperature at the surface was 62.6° Fahr., at 2435 fathoms it was 36.5°, a decrease occurring abrubtly below the first 50 fathoms, through the loss of the influence of the sun's rays, and then, again, at 700 fathoms, the difference between 900 fathoms and the sea-bottom amounting only to 2.7°.

Southwest of Iceland, to the west of the Rockall Gulf, at a depth of 300 fathoms, where the sea-bottom branches off from the greatest depression of the Atlantic, a uniform temperature of 44.6° was noted, while at the same depth on the east side of the Rockall the temperature was 48.2°.

In the Faroe-Shetland channel, and to the northeast of Iceland, at a depth of 200 to 300 fathoms, water was met with of 32° Fahr., while in the neighboring portion of the Atlantic Ocean the temperature at the same depth was above 46.4°.

The general variation of the surface temperature amounts to 9° Fahr. or even more, but becomes less as we descend, the decline, however, not being every where in the same ratio. Deep-sea strata reach their maxima and minima a little later than the surface layer.—17 *C*, *October* 1872, 315.

DO GREAT FIRES PRODUCE RAINS?

Professor Lapham, in the *Journal of the Franklin Institute*, discusses the question whether the great fires in the Northwest, during the months of September, October, and November of 1871, especially that which destroyed the greater part of Chicago, had any decided effect upon the weather, either by creating or moving currents of air, or by causing the fall of rain. After a careful consideration of the facts connected with these fires, and the accompanying meteorological conditions, as shown by reliable records, he sees no reason to conclude that any of the rains that fell about the same time were due to the cause in question.

Referring, however, to Mr. Espy's hypothesis of the production of rain by artificial fires, he calls attention to the fact that Espy only claimed that fires would produce rain under favorable circumstances of a high dew-point and a calm atmosphere, both of which conditions were entirely wanting in Chicago at the time of the fire, the air being almost destitute of moisture, and the wind blowing a gale. To produce rain the air must ascend until it becomes cool enough to condense the moisture, which then falls in the form of rain. In the case of Chicago the air could not ascend very far, being driven off in nearly a horizontal direction by the great force of the wind. He presumes, therefore, that this instance neither confirms nor disproves the Espian theory, and that we may still believe the well-authenticated accounts of instances where rain has been produced by a large fire under favorable circumstances of very moist air and absence of wind.—*Jour. Frankl. Inst.*, *July*, 1872, 46.

USE OF STEEL WIRE FOR SOUNDINGS.

An important communication was made by Sir William Thomson to the British Association in regard to the substitution of steel wire for the ordinary sounding-lead in determining ocean depths. Usually, if the depths to be measured exceed two or three hundred fathoms, the ordinary sounding-lead becomes insufficient, and a much greater weight must be employed. As a general rule, for each thousand fathoms in depth it is necessary to attach one hundred-weight for the purpose in question; and consequently, for soundings of two or three thousand fathoms, the weight required becomes enormous. The difficulty in raising such a weight has led to the adoption of an arrangement, by which, on touching the bottom, the descending weight is detached and the line drawn up, leaving the weight at the bottom, and, of course, entirely lost. This necessarily involves great expense, and the carrying of so many weights adds seriously to the loading of the vessel.

The size of the cord (usually made of the best Italian hemp) adopted in the British Admiralty is three quarters of an inch in circumference, with a tenacity of half a ton. Steam-power is generally used for bringing back the cord; about thirty-five minutes being required to reach a depth of 2000 fathoms, and forty-five minutes for winding it up. The cord is allowed to run freely off a reel, and the time noted when it ceases to be paid out regularly. The proposition of Sir William

Thomson, to substitute steel wire for the cord, was at first quite unsatisfactory; but certain minor difficulties having been obviated, the application of the new material proves to be perfectly practicable. The wire is coiled around a wheel one fathom in circumference, constructed of tin, and carrying three miles of wire, No. 22 steel piano wire being found to be the best, as this has twice the sustaining power of ordinary iron wire. The difficulty of getting it of sufficient length was overcome by Richard Johnston, of Manchester, who was able to supply a homogeneous wire of three miles in length, weighing but thirteen and a half pounds to the mile. This is 0.03 of an inch in diameter, and bears a weight of 252 pounds, so that it will sustain twenty-one miles of its own weight in the water.

When the apparatus is arranged for use, a sounding-lead of thirty pounds, with a brass tube in it for taking up a specimen of the sea-bottom, is connected by means of thirty fathoms of sounding-line to the end of the steel wire in question, and at the point of union of the latter a lead weight of three pounds is attached. This weight being directly at the end of the steel wire, keeps it sufficiently stretched to prevent any danger of kinking. An adjustable friction brake is applied to the wheel, set to a pressure of about twenty pounds, so that whenever the thirty-pound weight touches the bottom the uncoiling of the wheel immediately ceases. The wire, then, does not touch the bottom, and is kept taut by its special lead.

With the increasing depth the pressure of the brake is increased proportionally, as it has been ascertained that for each eighty fathoms of wire an addition of a pound of force to the brake apparatus is required; and as each circumference of the wheel represents a fathom for each eighty revolutions, it is easy to calculate the force to be applied for a given number of revolutions. In all cases it is necessary that the wheel run out freely when held in the hand.

Sir William Thomson made experiments in the Bay of Biscay during the past summer, and found the apparatus to be perfectly satisfactory. Once, while expecting a depth of 1500 fathoms, the wire ran out 2500 fathoms without reaching bottom. Continuing to pay out the line, with a brake pressure of thirty-five pounds, greater and greater velocity was exhibited, until forty-five pounds were required to keep the equilibrium. Suddenly the revolutions ceased, and the lead was found to have reached bottom at the extraordinary depth of 2700 fathoms, or about 100 fathoms greater than the deepest hitherto indicated upon the charts.

PHYSICAL GEOGRAPHY OF THE RED SEA.

The Hydrographic Office has lately published a pamphlet on the physical geography of the Red Sea, translated from the German of Captain W. Kropp, of the Imperial Austrian navy. The article contains an account of the formation of the coast, the winds, the clouds, the amount of atmospheric precipitation, the temperature and pressure, the saltness and temperature of the sea, the currents, tides, depths, etc. The tables of temperature given well bear out the reputation of the Red Sea in regard to excessive heat, the maximum temperature ranging from 80° in November to nearly 105° in July; and the minimum in November and December being about 58°. This temperature in itself, although indicating one of the hottest regions on the globe, would not be unbearable were it not for the enormous amount of moisture in the atmosphere, which makes it a perpetual hot bath.

The Red Sea is an exception to the general rule that deep water approaches close to high and rocky shores, while a low and flat shore indicates shallow water. Although the sea is surrounded almost entirely by a flat sandy coast, the depth of the water up to the land is very considerable. The descent is gradual in a few localities, the bottom of the sea forming plateaus, with sudden and steep descents from one to the other in some cases.

CHANGE OF LEVEL IN THE NORTHERN SEAS.

According to *Notice*, No. 89, just published by the Hydrographic Office at Washington, the principal results of the explorations in the Northern seas about Nova Zembla during the past year prove that the waters are completely free from ice for five months in the year, during which period they are navigable along the northwest coast of the island as late as September, while the sea east of it was not only free from ice, but had a temperature of about 48° Fahr. in the month of September. The position and contour of Nova Zembla on the map has been considerably changed, as it has been shown to reach north to latitude 77°, and east to longitude 69°, and Cape Nassau lies twenty-two miles farther southwest than the position given to it hitherto.

A very interesting discovery is that of the Gulf Stream islands, in the exact place where the examinations of the Dutch expeditions in 1594 to 1597 located a sand-bank with eighteen fathoms of water over it, the depth of water between it and the coast being fifty to sixty fathoms. This would indicate that the sea-bottom in that region has risen more than 110 feet in three hundred years, a very remarkable fact. According to Mack, these islands are six miles from the coast, the north point being in latitude 76° 22′, longitude 63° 38′. They consist of sand and rock, being bare, with no trace of vegetation. Petrified shells are found on the firmer parts of the surface.—*Notice*, No. 89, *Hydrographic Office.*

DISCUSSION OF DEEP-SEA TEMPERATURES.

Professor Mohn, of Christiania, discussing in Petermann's *Mittheilungen* the results of the deep-sea temperature observations in the waters between Greenland, North Europe, and Spitzbergen, remarks that the deep basin of the polar sea is filled from bottom to top with an enormous mass of cold water, which on the southeast is encompassed by the warm waters of the Gulf Stream, and penetrates below its current to the coast of Europe. The principal discharge of the polar ocean takes place into the lower strata of the Atlantic, through the deep channel between Greenland and Iceland; while the shallow seas between Iceland and the Faroes hinders any further outflow, which is only permitted through the narrow lower portion of the Faroe-Shetland channel. The banks around the British Islands (the shallow North Sea and the Norwegian banks) prevent any other outflow southward; and those between the Bear Islands and Norway answer the same purpose to the east. On the other hand, an immense mass of warm water extends from the deep abyss of the Atlantic northward over the shallow sea between Iceland and the Faroe Islands, as also above the Faroe-Shetland channel. Thence some part of the current passes the Norwegian coast and continues in two different arms, the narrower but deeper reaching to the north coast of Spitzbergen, while the second and broader arm expands over the entire sea of Nova Zembla.

The left bank and bottom of the Gulf Stream are formed by the ice-cold water of the Arctic Ocean; the right side, however, consists of the bottom of the North Sea and the banks connected with it, as also of the Norwegian coast to the Russian boundary. The Gulf Stream is warmest on the surface layer quite close to the coast of Norway (in the summer, of course), and from this point the strata exhibit a sensibly-decreasing temperature with the increasing depth, until we reach the stratum of the freezing-point.

Deep-sea observations in several of the Norwegian fiords, which are protected by their out-lying banks from the great Atlantic depths, show that their water comes from the Gulf Stream, and they appear to be filled with this water to the very bottom, even when this lies lower than the ice-cold bed of the Gulf Stream off the coast. Thus the West Fiord, at a depth of from 100 to 320 fathoms, showed a uniform temperature of 44.6° Fahr. in the summer of 1868, while outside of the Loffodens the observations of the *Norna* in July, 1871, at 35 fathoms, revealed a temperature of 44.6° Fahr., and at 215 fathoms of 39.2°. To the southwest of Lindesnæs and Lister, in June to August, 1871, at 150 to 250 fathoms, the temperature registered 42.8° to 44.6°, while in the Faroe-Shetland channel, at the same depth, the temperature decreased from 42.8° to 33.8°.

Attention is called by the author to the temperature indications of the *Porcupine* expedition in July, 1869, where, in the deep depression of the Atlantic Ocean, outside the channel, while the temperature at the surface was 62.6° Fahr., at 2435 fathoms it was 36.5°, a decrease occurring abruptly below the first 50 fathoms, through the loss of the influence of the sun's rays, and then, again, at 700 fathoms, the difference between 900 fathoms and the sea-bottom amounting only to 2.7°.

Southwest of Iceland, to the west of the Rockall Gulf, at a depth of 300 fathoms, where the sea-bottom branches off from the greatest depression of the Atlantic, a uniform temperature of 44.6° was noted, while at the same depth on the east side of the Rockall the temperature was 48.2°.

In the Faroe-Shetland channel, and to the northeast of

Iceland, at a depth of 200 to 300 fathoms, water was met with of 32° Fahr., while in the neighboring portion of the Atlantic Ocean the temperature at the same depth was above 46.4°.

The general variation of the surface temperature amounts to 9° Fahr., or even more, but becomes less as we descend, the decline, however, not being every where in the same ratio. Deep-sea strata reach their maxima and minima a little later than the surface layer.—17 C, *October* 1872, 315.

UNVARYING COURSE OF CIRRUS CLOUDS.

It seems to be generally admitted that there are two cold poles (points of minimum temperature) in the northern hemisphere, one in Asia, and the other in North America, and that from these the trade-winds radiate, regulating, as they veer to one side or the other, the changes of the weather. To complete the statement, attention is called to the fact that it is extremely probable that the high cirrus clouds are unaffected by the variation in course, between northwest and southeast, which the trade-winds experience on the eastern borders of the two great continents, but preserve the normal direction imparted to them by the rotation of the earth—namely, that of the anti-trades—and, at a great elevation, continue undisturbed from west or west-southwest to east-northeast. Observations are not complete enough to establish the latter proposition, but numerous concordant statements render it so probable that it seems worthy of the attention of local and other observers.

In North America, where the axis around which the wind veers lies decidedly between northwest and southeast, as in Eastern Asia, the fact seems better substantiated than in Europe (can, indeed, be considered as fixed), and the inference is justifiable that the condition on the eastern coast of Asia is similar. Russell verifies by his own observations in Canada, in Washington, in the Southern States, and Cuba, the statement of Espy, that in the United States there is an unvarying upper current of air from the west. Blodgett asserts that at Philadelphia, at all seasons, a western current can, not unfrequently, be detected by cirrus clouds. In Northern Asia, even on the east coast, no exact information on this point has been supplied, on account of the neglect to notice particularly cirrus clouds. In interior Asia, a few definite observations can be given, and on the east coast of Siberia a few at least not contradictory ones, inasmuch as the existence of cirrus clouds has been noted with varying inferior winds, but without giving their direction. If it should be demonstrated, then, which the writer does not doubt, that the high cirrus clouds, the greatest elevation of which can be placed at 40,000 feet, on the east side of the two cold poles do not take part in the variation of the anti-trades from a west-southwest to southeast direction, but that these elevated masses of ice crystals and flakes continue unaffected in the normal direction imparted by the earth's rotation, the fact will be of the highest importance in giving a more correct exhibition of the total movement of the atmosphere, and lead to the conclusion that the whole depth of the atmosphere does not find the initial and final point of its motion in the region of the greatest cold, but that a very considerable and more elevated portion moves above this, having this point at the geographical pole of the earth. There would be in this a new proof that the whole atmosphere takes part in the circulation between the equator and the poles, and that the cause of the movement is not simply the difference of temperatures, but much more—the centrifugal force of the earth's rotation, in consequence of which there exists at the points of maximum velocity, during the night as well as the day, a continuous upward current, of aspiration, of the trade or polar current drawn to this region, and that this air, with the moisture contained, must again descend. This may only take place in the polar latitudes, toward which it moves, and which it finally reaches in its normal west-southwest direction, also by force of aspiration, as compensation for the air drawn from those regions.—3 *C*, *September* 30, 1872, 949.

METEOROLOGY OF THE FUTURE.

Mr. Lockyer contributes a very interesting article to *Nature*, under the title of the *The Meteorology of the Future*, in which he inquires into the possibility of anticipating the climatological conditions of the country for years before any given period. He remarks that the most feasible solution of the problem, ascertained from meteorological phenomena, is whether there is a general movement in regular cycles; and, from the observations of Mr. Meldrum and others, he is inclined to believe that there is such a cycle, and that it corresponds very closely to the eleven-year sun-spot period. The connection between these sun-spot periods and the most favorable vine-growing seasons has already been pointed out by various writers; and it is not improbable that by continuing the inquiry, as suggested by Mr. Lockyer, important results will be obtained that may place the science of meteorology on an entirely new basis.

In a communication to a later number of *Nature*, referring to the article in question, Mr. G. J. Symons, a very eminent authority, corroborates the suggestions of Mr. Lockyer by pointing out a very remarkable connection between the maximum sun-spot years and heavy rain-fall, as also between the minimum sun-spot years and a small amount of rain-fall. The results which Mr. Symons give extend in one instance over a period of one hundred and forty years, and are very striking, pointing to something more than a mere coincidence.—12 *A*, *December* 26, 143.

THE GREAT BAROMETRIC WAVE.

Considerable interest has been excited by the announcement that a great scientific discovery has been made by the meteorologist of the weather bureau of the Army Signal-office. The paragraphs that are going the rounds of the daily press are so evidently exaggerated that it may be well to record what we suppose to be the exact nature of the so-called discovery.

It will be remembered that in successive reports of the British Association for the Advancement of Science, Mr. Birt, of England, in the years 1844–50, developed the fact that about the middle of November the barometer reads quite high at the stations in Britain and on the neighboring coasts, and he maintained also that this "November wave," as he called it, is a feature of importance in the meteorology of that portion of the world. The word "wave" should not mislead the reader, for there is no evidence of the existence of waves of air like those of water, the term being used for convenience.

But during the past ten years the weather map of the

Bulletin International, issued daily at Paris, has, by extending the area of our observation, shown that these "waves" are simply circular or elliptical areas of high barometric pressure, around which the winds circulate in accordance with well-known laws. The great extent of our own country has of course given the signal-office superior advantages for studying the motions of these areas and the weather accompanying them. On a recent occasion a very extensive one moved over the country from Kansas to the Blue Ridge, and, being attended by very cold winds, was quite generally remarked upon, although differing in extent only from those that have been chronicled by the signal-office almost daily during the past two years. This "high area" (for so they are succinctly denominated in the daily weather reports) was accompanied, as usual, by "low areas," or "storm centres," which simultaneously passed rapidly eastward over the northern portions of the country, and the idea has been entertained by some that possibly the presence of the former may help to the earlier prediction of the latter. This hope has not yet been realized, nor does there seem any reasonable probability that we shall live to see the day when weather predictions will be ventured upon by careful meteorologists for longer periods in advance than have already been attempted by the compilers of the Signal-office "Probabilities."

The true result arrived at by the two years' experience of the signal-office seems to be the renewed confirmation of the experience of European meteorologists as to the perfect feasibility of predicting approaching storms, clear weather, winds, etc., in early enough season to be of the greatest benefit to all classes of industry. As regards the discovery of new laws, scientists are well aware that these must be of the nature of generalizations or inductions founded upon at least several years' experience.

C. GENERAL PHYSICS.

ADJUSTMENT OF SHIPS' COMPASSES.

Professor E. Dubois, of the naval school at Brest, has spent much time in studying the best means of obviating the dangers which arise to ships in consequence of the deviations of their compasses. With this view he has constructed a gyroscopic compass, revolving 8000 times per minute, mounted upon Cardan's triple suspension, and carrying a needle supported above a graduated circle. In accordance with a well-known property of the gyroscope, this circle maintains an invariable position, and indicates the precise number of degrees through which the vessel may be turned to starboard or port, thus furnishing the means of determining the true direction of her head at any time after it has once been obtained from observations on a headland. This instrument may therefore be used to determine all the deviations on the compass on board ship. Some experiments made with it on the corvette *Bougainville* in the roadstead of Brest are said to have been extremely satisfactory.—3 *B*, I., 1872, 3.

ELECTRIC APPARATUS FOR DEEP-SEA TEMPERATURES.

Professor Davidson, of the Coast Survey, has lately devised an apparatus for recording the temperature at different depths by means of an electro-thermal pile. He proposes to register the depth by breaking the circuit of an electric current passing through two insulated wires in the sounding-line at about every one hundred fathoms by means of the wheel-work of the Massey or similar apparatus. In the changes of temperature, an electro-thermal pile eighteen inches long, insulated, and surrounded by a non-conductor except at one end, is used in combination with a Thompson's reflecting galvanometer, not liable to derangement on shipboard. At every one hundred fathoms, when the chromograph registers the depth, the observer notices the readings of the galvanometer, which readings are reduced to Fahrenheit degrees.—*San Francisco Bulletin.*

DEVELOPMENT OF ELECTRICITY BY FRICTION.

It has been observed that the friction of certain granulated metals on the walls of a glass vessel containing bisulphide of carbon excites electricity. Silver, iron, aluminium, etc., produce the phenomenon, while platinum, copper, and zinc seem to be inactive. The mode of conducting the experiment is as follows: About half an ounce of granulated silver is put into a retort of thick white glass, containing an ounce of pure bisulphide of carbon; the vessel is then tightly closed and shaken for some time in the dark. Sparks soon become visible in the liquid, and after a while the entire mass becomes luminous. If water is poured upon the outside of the vessel the light immediately disappears, but it is again excited by shaking. The electricity in the glass is positive. Silver furnishes the best experiment.—19 *C*, XIV.

CAUSE OF THE VARIATION OF THE MAGNETIC POLE.

The precise cause of the variation of the magnetic pole of the earth has not been well established; but in the view of Dr. Menzzer this is owing to the continued variation of the level of the earth's surface mainly in the polar regions. He goes through a very elaborate mathematical investigation of the relation between the land areas of the north and the magnetic currents, and endeavors to show that with unchanging outlines this pole will be constant, but that with any variation it will necessarily be altered in its position. In the fact that the level of the land is continually altering, not only in the north, but elsewhere on the surface of the globe, very few portions being entirely free from change, he finds the explanation of the deflection of the needle first on one side and then on the other, these changes being not all in one direction, the elevation of the land in one place to some extent balancing its depression in another.—7 *C*, *Feb.*, 1872, 127.

NEW THEORY OF TERRESTRIAL MAGNETISM.

Professor Zöllner proposes a new theory in regard to the origin of terrestrial magnetism. He adopts the idea of drift currents upon the liquid surface of the sun, by means of which he tries to explain the movement of the sun spots. These drift currents originate, according to his conception, from the current of heat continually ascending from the interior, and from the rotation of the sun. Such currents, Professor Zöllner maintains, exist in all rotating cosmical bodies, even after the surface, cooled by radiation, has become rigid to a certain extent. This is the case with the earth, and the continuous regular currents of the interior liquid mass produce different effects upon the outer shell, mechanical, thermal, and also magnetical, the latter as a necessary consequence of the electricity originated by the currents. The professor further maintains that by this hypothesis the general phenomena of terrestrial magnetism may be satisfactorily explained, and that they are related to the currents of the inner liquid mass, and whatever affects these currents, as, for instance, volcanoes, reacts immediately upon the magnetism of the earth. Whenever a cosmical body becomes entirely solid, no induced magnetism can exist, etc.—19 *C*, XVI., 123.

CONCURRENT MAGNETIC OBSERVATIONS.

Mr. Diamilla-Müller, of Milan, invites the concurrence of physicists in making a series of simultaneous observations in terrestrial magnetism on the 15th of October, 1872. He remarks that the simultaneous observations of the 20th of August, 1870, have furnished a long and rich series of data in reference to the diurnal variation of the needle, taken as a whole, and over the entire surface of the earth. Among the most important results of this series is that the secular variation of the horizontal needle, on the surface of the globe, increases or diminishes in proportion to the value of the angle formed by the needle with the astronomical meridian, this variation being two minutes per annum near the line of zero, or in declination, and seven minutes where the declination is equal to fourteen degrees, such proportion being exhibited symmetrically on either side of the line of no declination.

The special object of the second series is to ascertain the absolute mean daily declination, for the purpose of determining the secular variation of the isogonal lines—in other words, the increase or diminution of the declination. They will also serve to assist in the construction of magnetic charts, as with their aid it will be possible to resolve many pending questions relative to the real position of certain isogonal lines, and to the proportional value of their secular displacement. The general object, as finally summed up by Mr. Müller, is to determine the absolute mean value of the magnetical declination on the 15th of October, 1872, upon the entire surface of the globe, with instruments and according to the tests employed up to this time by the different observatories. The magnetic stations which possess self-registering instruments should take the mean variation of the twenty-four hours reduced to an absolute value. Those who do not possess such instruments should determine directly the absolute magnetic declination at eight o'clock in the morning, and two and six in the afternoon. Directors of observatories are requested to transmit the results of their observations to Mr. Müller at Milan, with the assurance that they will be carefully collated, and the comparative results published in a special report.—1 *B*, *Nov.* 5, 1871, 79.

ACTION OF THE MAGNET ON ELECTRIC LIGHT.

Professor Houston calls attention, in the journal of the Franklin Institute, to the action of the magnet upon electrical light, first noticed by him in the course of an experiment upon the rotation of light by the magnet. In this he approached a compound bar magnet to the light, holding it with one end pointing directly to the arch, in a horizontal plane, equidistant between the carbon electrodes. When the nearest end of the magnet was four inches from the electrodes, the light was instantly extinguished.

The cause of this phenomenon, he thinks, is to be attributed to the tendency of the flame to rotate on the approach of the magnet. This might cause the extinguishing of the light in two ways: either by the irregularities on the surface of the carbon electrodes offering greater resistance to the passage of the current from some points than from others, or by the current being unable to pass through the greater distance of the arched path which is always assumed by the light on the approach of a magnet.

Another assumption, which is perhaps as probable as any, is that on the approach of the magnet there is a slight increase in the non-conducting power of the medium between the electrodes, produced by their polarization, and which, though always acting, can only manifest itself in a striking manner when the distance between the electrodes is near a maximum, and the tension of the current is exerted to its utmost in passing through the non-conducting medium. This assumption of the polarization of the medium between the electrodes, and its consequently diminished power of conducting the current, seems to be somewhat sustained by the fact that a powerful electro-magnet, in the form of a horseshoe, when approached, did not extinguish the light, although it produced rotation of the current; for we may conceive that the two poles, acting simultaneously on the medium, would each neutralize the effect of the other.—1 *D*, *May*, 1872, 299.

BOYDEN PREMIUM.

Uriah A. Boyden, of Boston, has deposited with the Franklin Institute, of Philadelphia, the sum of one thousand dollars, to be awarded as a premium to any resident of North America who shall determine by experiment whether all rays of light, and other physical rays, are or are not transmitted with the same velocity. The conditions of the premium limit the applicants to those living north of the southern boundary of Mexico, and including the West India Islands. Applications must be made before the 1st of January, 1873, at which time the judges, appointed by the Franklin Institute, shall examine the memoirs and decide whether any one is entitled to the premium.—1 *D*, *January*, 1872.

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.—19 *C*, *January* 20, 1872, 18.

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.—12 *A*, *November* 30, 1871, 85.

NOMENCLATURE OF OBJECTIVES.

Dr. Woodward, of the Army Medical Museum, in speaking of the nomenclature of achromatic objectives, and of the compound microscope, takes exception to the method of estimating their power by their real or supposed agreement, in the amount of magnifying, with single lenses of specified focal lengths. Thus, when we read of inch, half inch, and quarter inch objectives, we are expected to understand combinations agreeing in magnifying power with single convex lenses of the focal length named. After a critical discussion of the formula for expressing the relationship between the distances of the object and the lenses to each other, and their magnify-power, the doctor finds that in compound lenses, instead of having one value for all distances, as with the single lens, we may have as many different values for the principal focus as there are distances used. After a full consideration of all the circumstances, he concludes that the best interest of makers and purchasers of instruments would be consulted if the present nomenclature were abandoned altogether, and objectives named instead by their precise magnifying power without eye-pieces at some selected distance, this to be always explicitly stated.—4 *D*, *June*, 1872, 406.

THE REFRACTION OF LIGHT.

An elaborate series of observations has recently been made at the Royal Observatory, Greenwich, to settle the disputed question in optics whether the thickness of the object-glass has any influence on the position of a star seen through it, in consequence of a change in the aberration of the light. It is well known that the refraction which a ray of light undergoes on entering a medium depends on the angle of incidence, so that if it strike the refracting surface perpendicularly, it will suffer no refraction at all. It is also known that the stars appear displaced from their true position about twenty seconds whenever the earth in its motion round the sun moves in a direction nearly at right angles to that of the star. The true direction of the star is then twenty seconds from the apparent direction. The disputed question amounts to this: in order that a ray of light from a star may suffer no refraction on entering a lens, must the surface of the latter be perpendicular to the true or to the apparent direction of the star? This question Professor Airy has sought to answer by mounting a zenith telescope, of which the entire tube between the eye-piece and objective was filled with water, and observing the zenith distance of the star γ Draconis at different times of the year.

The result was that the apparent position of the star fluctuated exactly as if there had been no water in the telescope, thus showing that the thickness of the object-glass was without influence on the amount of the aberration. Applied to the question we have suggested, this proves that to have no refraction the surface must be perpendicular to the apparent and not to the true direction of a star. The result is expected to throw some light on the various questions of the ethereal medium, and especially of its density in transparent bodies, and of its motion with such bodies.

TIME AND DURATION OF VISUAL IMPRESSIONS.

In an article by M. Baxt, of St. Petersburg, on the time requisite for a visual impression to arrive at the consciousness, and upon the duration of the period of consciousness caused by a visual impression of definite duration, he remarks that, from the experiments of Helmholtz and Exner, it has been shown that, if a number of ordinary letter-press letters be exhibited to the eye on a white ground, sometimes one, sometimes two or more of them, will be distinguished from the row according to the duration of the impression and that of the positive after image. He proceeded on the same principle as Helmholtz, and with apparatus similar to that employed by him, which consisted of two disks, that could be caused to revolve at known speed, but the posterior of which rotated twelve times quicker than the anterior. As the result of a series of experiments by means of this apparatus, it was shown, first, that the consciousness of a given excitation is only realized or perfected by degrees; second, that, under particular circumstances of his experiments, a period of one twentieth of a second must elapse between the occurrence of a relatively simple excitation of six or seven letters suddenly placed before and withdrawn from the eyes, and its reception or formation in the consciousness. In other experiments he found that the time required for the comprehension of a complex figure was much greater than that for a single figure; the proportion between an ellipse and a pentagon, for instance, being as 1 : 5. Researches on the time requisite for the production of consciousness, with various strengths of illumination, gave the result that this time was proportionate, within rather wide limits, to the degree of illumination; but if the illumination was excessively strong or weak, it increases.—13 *A*, *November* 1, 1871, 500.

ACTION OF GAS JET ON WATER.

It is said that if a thin thread of water is passed through the jet from a blow-pipe, it is but slightly warmed, the increase in temperature being but three degrees, although its heat is sufficient to melt almost any metal. When passed through an ordinary flame, the increase in temperature is considerably greater, possibly owing to the incandescent particles being carried away by the liquid in smoke. If the blowpipe jet is directed against a sheet of water, it is not pierced, nor does it produce any sensible heating effect. It is suggested that if, instead of the metallic curtains used in theatres, a sheet of running water were interposed, it would be a great improvement as a fire guard.—18 *A*, *March* 8, 1872, 631.

ICE EXPERIMENT.

A simple method of producing ice instantaneously consists in placing a little water in a small watch-glass or porcelain capsule laid upon wool or cotton. The water is then to be covered with a layer of sulphide of carbon, and a current of air directed upon it through a slender tube. The absorption of the heat of the water, in consequence of the rapid passage of the sulphide of carbon to a gaseous condition, is so great that a few seconds are sufficient to solidify the water. A lens of hemispherical and transparent ice is thus obtained, which can be preserved long enough to pass it from hand to hand.—3 *B*, *May* 9, 1872, 90.

POLARIZING ACTION OF TARTARIC ACID.

In the extensive series of organic substances, there are some that, as is well known, are endowed with the peculiar faculty of deflecting the plane of polarization of the luminous rays. This property was discovered by Biot, in 1815, in various liquids—among others, in spirits of turpentine—and the laws which most of these substances follow are, *first*, the rotation produced by the liquids in the plane of polarization is proportional to the length of the path which the luminous rays must traverse in the liquid; *second*, in the mixture of substances endowed with the rotatory power with those that are inactive, and which exercise no chemical action upon the former, rotation is in proportion to the quantity of the active substance; *third*, when several liquid columns are superposed in the path of the luminous rays, the total rotation is equal to the algebraic sum of the rotations peculiar to each of them; *fourth*, the angle of rotation corresponding to the different simple colors is very nearly in the inverse ratio to the square of the length of the luminous rays. Tartaric acid does not follow the law of Biot, constituting a special exception to the second and fourth law. This anomaly induced Krecke to take up the inquiry, the result of which he has lately published.

The special points that he desired to investigate were, whether the anomaly which tartaric acid exhibits at the ordinary temperature is seen also at a more elevated temperature; if the tartrates present the same anomalies as free tartaric acid; and if tartrates follow the law of simple relations. The results which he attained in the course of his inquiry he sums up as follows: For all the rays of the spectrum the specific rotatory power augments with the temperature, but in a quantity different for different solutions of the acid, and the peculiar irregularity presented by tartaric acid—namely, that the green rays are displaced more than the yellow or the violet—disappears with the augmentation of the temperature. It decreases also in proportion to the increase of the quantity of water, as had already been demonstrated by Biot. He also informs us that the tartrates, as far as examined, follow the laws of Biot; that the molecular rotatory power is very nearly the same in all the normal tartrates and alkaloids, but considerably more in tartar-emetic; and that the molecular rotatory power of the tartrates is threefold that of tartaric acid, thus following the laws of simple relations.—1 *E*, VII., 97.

INFLUENCE OF A DIAMAGNETIC BODY ON THE ELECTRIC CURRENT.

Professor Stephan has been engaged in investigating the phenomena exhibited when an electric current is opened or closed in the presence of a diamagnetic body, and has arrived at the following conclusions: *First*, the presence of a diamagnetic body at the moment of closing the circuit accelerates the ascending movement of the current, and the chemical action developed simultaneously within the pile is less than when the closing takes place in the absence of a diamagnetic body. *Second*, the heat developed at the moment of opening the current by the secondary current is less when the interruption takes place in the presence of a diamagnetic body. *Third*, when the current sets in motion a diamagnetic body, the action simultaneously supplied by the chemical force inside of the pile will be to the live force furnished by this body as two to one. This surplus of chemical action is manifested as soon as we open the current in the secondary circuit, reinforced by the absence of a diamagnetic body. The contrary takes place every time that a body of this nature is moved in a direction opposite to that of the electro-dynamic forces. *Fourth*, the energy of the needle increases or diminishes according as it is removed or approximated to a diamagnetic body. If this body is set in motion by a needle it furnishes a sum of live force equivalent to the action of the live forces acting in the needle.—3 *B*, *July* 18, 1872, 482.

TRANSMISSION OF SOUND IN WATER.

During the siege of Paris a series of experiments was made within the city with a view to determine the possibility of establishing a system of telegraphic communication, through the waters of the Seine, between the city and the country in the rear of the besieging lines. The result, however, was not at all satisfactory, although some interesting conclusions were placed on record. Among them were the following: 1. The range of sound in running water, even in the direction of the stream, is much less than in still water, as in a lake. 2. When the volume and depth of sound are greatly augmented, there is a very small increase, but in some cases even a decrease, of the distance at which the sound is audible. 3. It is probable that with equal volumes of sound in moving water the auditory distance will increase with the sharpness of the sound. It is suggested that powerful steam-whistles might be used with great effect, but no attempt has been made to test this question.—6 *D, October* 19, 1872, 241.

ELECTRICAL PYROMETER.

According to the *American Chemist*, an instrument has been invented which will measure with perfect accuracy the heat of the hottest furnace. It is based on the principle that the resistance of pure metals to the electric current increases with the temperature in a very simple ratio. A platinum wire, of known resistance, is coiled around a cylinder of fine clay, and covered with a tube of the same material. The test is a Daniell's battery, of two cells, and with a resistance measurer, and the instrument is placed in the furnace, the temperature of which is to be ascertained. It is then only necessary to read off the indications of temperature on the graduated resistance measure.—*Amer. Chemist, June*, 1872, 476.

MAGNETIC ACTION OF PETROLEUM.

According to Captain Fütterer, of the Memel bark *Orion* (a petroleum vessel plying between Philadelphia and Hamburg), during a return voyage with a cargo of the above substance on board, he observed an easterly deflection of the compass amounting to as much as 90°. He had been previously informed that such would be the fact, but had been inclined to doubt it. A cargo of railroad iron, brought over by him to Philadelphia from Hamburg, exercised no magnetic attraction.—3 *C, August* 19, 816.

IDENTIFICATION OF LIGHTS AT SEA.

Sir William Thomson, in a series of remarks upon the identification of lights at sea, urges the adoption of a system of indications corresponding to the Morse telegraphic alphabet, so that, by the varied combinations of short and long flashes, a particular number shall be signaled, corresponding to that of the light-house. The result will be that at whatever point the vessel first makes the coast of the country, the locality can be ascertained by noting the particular number flashed by the light.—15 *A*, *August* 31, 280.

WEATHER TELEGRAPHY.

A very important extension of the work of the Signal-office, as far as its system of weather telegraphy is concerned, is about to go into operation. The forecasts now published in all the daily papers in the United States, and which are eagerly scanned by those who are desirous of knowing what is in store for them in the way of weather, are, of course, only serviceable to those who live in the places of the publication of those papers, or can be reached by them with little delay through the mail. It is now proposed to call the post-offices of the country into requisition as intermediate agents for disseminating this intelligence, for which purpose the territory east of the Mississippi has been divided into districts of about two hundred miles in extent each way, and each having a point of distribution near its centre, to which the "probabilities" will be telegraphed from Washington, and from which two copies of the report are to be sent to all post-offices within the district which can be reached by mail as early as six o'clock P.M. each day.

It is well known that country post-offices are the centres of intelligence to rural districts, and, in order to afford the farmers in the community especially an opportunity of profiting by this information, postmasters receiving these dispatches are to place a copy as soon as furnished in a conspicuous situation, where the public can see and read it. The New York *Herald* of January 18 contains a chart, furnished by the Signal-office, illustrating the districts referred to, from which any one can ascertain the central office whence his own information will be disseminated.

D. CHEMISTRY AND METALLURGY.

NEW REDUCING AGENT.

If an aqueous solution of sulphurous acid be allowed to act upon fine zinc dust, the zinc is dissolved without the development of gas, the solution assuming for a time a decided yellow color. This liquid now possesses the peculiarity, in a very high degree, of rapidly decolorizing indigo, a fact well known to chemists. Schützenberger, who has lately been investigating this subject anew, ascertained that this decolorizing of the indigo is by no means the result of oxidation, but, on the contrary, is a reduction; and this power of reduction in the liquid is so extraordinarily great that it will reduce, with heat, the salts of copper, silver, and mercury to their metals. The liquid is not related to hydrosulphuric acid, and is exceedingly unstable in its free condition; but if a concentrated solution of bisulphite of soda be allowed to act upon the zinc filings, we shall obtain a soda salt of the new acid which has as great an affinity for oxygen as the free acid, and can therefore be kept for any length of time if completely excluded from the air.—6 *C*, *October* 5, 1871, XL., 399.

FRIABLE GOLD COIN.

In some instances after a piece of gold coin has been struck in a mint it becomes friable and crumbling. It has been ascertained that this property is due to the presence of a very small quantity (hardly a thousandth part) of certain metals, among which lead is the most injurious. By an improved process, however, this difficulty has lately been overcome. This consists in passing a current of gaseous chlorine over the melted metal, which is covered with borax in the ordinary way. A chloride of gold would not be formed at this high temperature, but, on the contrary, would be decomposed, while the other metals unite with the chlorine so as to quickly purify the mass. Any silver which may happen to be present is not lost, as it becomes dissolved in the borax, which serves as a cover for the molten gold.—3 *B*, *March* 7, 1872, 394.

IRON DEPOSITED BY ELECTRICITY.

The following conclusions have been reached in the course of investigations into the characteristics of iron deposited by electricity. First, iron and copper, when deposited, absorb a certain amount of gas, especially hydrogen; second, the volume of the gas absorbed by iron varies between widely extended limits, this, in the case of iron, being sometimes as much as 185 times its volume; third, absorption of gas takes place principally in the layers which are deposited first; fourth, when such iron is heated, the disengagement of the gas commences below the temperature of 212 degrees. At this temperature it is principally hydrogen that is separated. —3 *B*, *January*, 1872, 33.

METALLIC POTASSIUM.

Professor Dolbear obtains metallic potassium by a new process, which is likely to prove of much commercial value. He first forms sulphide of potassium by treating dissolved sticks of caustic potassa with sulphureted hydrogen, and subsequently evaporating until the mass is solid in cooling. This mass is then mixed with somewhat more than its bulk of iron filings, and subjected to distillation, the product being run off into petroleum.—3 *A*, *May* 4, 1872, 382.

NITRATE OF SILVER FROM SILVER ALLOY.

Mr. R. Palm, of Russia, has succeeded in obtaining pure nitrate of silver from the metal alloyed with copper by a very quick and simple process. He dissolves the alloy in nitric acid, evaporates to the consistency of thick oil (not to dryness), and then adds concentrated nitric acid. The silver salts precipitate in crystals, while the copper remains in solution. The crystals have to be repeatedly washed in concentrated nitric acid, and then they contain no trace of copper.—14 *C*, vol. 204.

IMPROVEMENT IN NICKEL PLATING.

An English patent, for the purpose of improving the adhesiveness of the nickel deposit upon iron or steel by the galvanic process, recommends the addition of a small quantity of an acetic, citric, or (best of all) tartaric salt of potash, soda, ammonia, or alumina, to the solution used in nickelizing. Of these salts, that will be most desirable the basis of which consists of the same alkaline earth as that of the double salt used in nickelizing. Thus, with a solution of a salt of nickel and ammonia, we should use a tartrate of ammonia, etc. In this case, with 20 quarts of the aqueous solution of the sulphate of nickel and ammonia, of 7° Baumé, we should add about one quart of an active solution of tartrate of ammonia, of about the same specific gravity.—6 *C*, *Feb.* 8, 1872, 58.

CAST-STEEL FROM THE IRON SAND OF NEW ZEALAND.

According to the London *Times*, iron sand, as found on the beaches in New Zealand, is used in the manufacture of steel. The process consists in mixing the sand with an equal quantity of clay and of the ordinary sea sand, containing a large percentage of shells, and then working this into bricks, which are hardened in a kiln, broken up into irregular pieces, and smelted in an ordinary cupola furnace. The result is a cast-steel from which some beautiful specimens of the finest cutlery have been manufactured.

These experiments were conducted by a mechanic in government employ, who was restricted to an expenditure of £100. With the apparatus he was able to construct with this sum, he succeeded in producing 500 pounds of steel in the manner described above.—5 *A*, *April* 20, 1872, 211.

ON BURNED IRON.

Various investigations have been prosecuted for the purpose of determining the precise causes under which is produced what is known as the burned condition of iron. Thus, if a bar of iron be allowed to cool in the air without being hammered, it becomes brittle; after having been raised to a white heat, and on breaking, it presents a laminated, crystalline appearance. The iron is then said to be burned, and is generally supposed to have absorbed oxygen. Recent experiments show, however, that a similar condition is produced whether the iron is heated in the air, in a neutral or a reducing atmosphere; and it is therefore inferred that the character is not due to the absorption of oxygen, but to a change in the molecular condition caused by heat.—20 *A*, *June* 20, 1872, 745.

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.—21 *A*, *Dec.*, 1871, 1219.

ESTIMATING SULPHUR IN COAL.

A method for the estimation of sulphur in coal or coke, introduced by Dr. Crace Calvert, has reference more particularly to the combination of sulphur with iron, as being the only combination affecting the commercial value of the fuel. The process consists in boiling the powdered coal in a solution of carbonate of soda, which decomposes any sulphate of lime, the carbonate of lime being removable by washing. In the residue is contained the combination of sulphur and iron, which can be estimated by any of the methods familiar to chemists.—15 *A*, *August* 12, 1871, 209.

PHENOMENA ASSOCIATED WITH A HYDROGEN FLAME.

In an article upon certain phenomena associated with a hydrogen flame, communicated to *Nature* by Mr. William F. Barrett, the results of a series of experiments are summed up as follows: 1. That the combustion of hydrogen exhibits some physical peculiarities, and produces phosphorescence on many substances with which it comes in contact. 2. That the blueness so often seen in a hydrogen flame is due to the presence of sulphur, derived either from the vulcanized rubber tubing, or from atmospheric dust, or from the decomposition of the sulphuric acid spray from the generator. 3. That a flame of hydrogen forms an exceedingly delicate reagent for the detection of sulphur or phosphorus, and possibly also of tin. 4. That many sulphates, and also carbonic acid, are apparently decomposed by a hydrogen flame. 5. That a hydrogen flame is, further, a test for the presence of some gases, notably carbonic acid. 6. That these results are capable of practical application.—12 *A*, *April* 18, 1872, 484.

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.—1 *A*, *January* 19, 1872, 26.

CLASSIFICATION OF ODORS.

Dr. Ludwig, of Jena, presented to the convention of pharmaceutists, lately assembled at that city, a classification of odors, which he proposed for the purpose of fixing the ideas of persons engaged in chemical investigations. Of these he enumerated twenty-two kinds, some of them with subdivisions, as follows:

1. The *garlic* odor, as manifested by combination of arsenic and phosphorus. The colorless vapor of arsenious acid does not exhibit this characteristic; but if this be thrown on de-

oxidizing bodies, such as burning coals, it will be immediately indicated. Numerous plants are mentioned, besides garlic, as possessing this same odor. 2. The odor of *burning antimony.* This, according to most authors, is to be compared to nitric acid. 3. The *tin* odor. This is perceived when tin is rubbed with the naked hand. It is generally known as the metallic odor. 4. The odor of the *radish.* This is exhaled when selenium is oxidized by combustion, so as to form selenic acid, the fiftieth part of a grain of the former being sufficient to fill a room with the odor. 5. The odor of the *horse-radish*, or mustard, found in numerous bodies. 6. Of *sulphur* and *sulphurous acid.* 7. Of *rotten fish*, found in phosphureted hydrogen. 8. Of *ozone*, or that which is diffused by an electric machine when set in operation. 9. Of *nitrous acid.* 10. Of *chlorine* and *chlorinous* bodies. 11. Of *osmic acid.* 12. Of *bromine.* 13. Of *iodine.* 14. Of *hydrocyanic acid*, or *bitter almond.* 15. Of the *acids*, such as—*a*, the purely acid; *b*, the pungently acid; *c*, sulphurous acid; *d*, nitric and nitrous acid; and *e*, carbonic acid. 16. The *alkaline* odor, such as ammonia. These are divided into—*a*, pure ammoniacal; *b*, impure ammoniacal; *c*, herring or fish-like (as methylamine); *d*, the hemlock odor; *e*, the tobacco odor; and *f*, narcotic odor. 17. The odor of *tar* and *smoke*, as in creosote, carbolic acid, benzole, etc. 18. Of *petroleum* and *mineral oils.* 19. Of *volatile oil*, or *aromatic oil.* 20. Of the *purely ethereal oils*, such as the acetic, or the odor of wine, the apple, pear, etc. 21. Of *alcohol*, pure and fusel-like. 22. The *musky* odor.—2 *C*, CXLVII., 225.

SPONTANEOUS COMBUSTION OF CHARGED SILK.

In consequence of the frequent occurrence of cases of spontaneous combustion in "charged silks," the German railroads have refused to receive them for transportation. Charged silks are goods which have been treated with grease or oil, for the purpose of increasing their weight and their consequent apparent value, this being done mainly in France and Belgium.—5 *C*, XIII., 104.

ANHYDROUS ALCOHOL.

The best process for obtaining alcohol absolutely free from water is said by Erlenmeyer to consist in boiling with quick-lime, in a vessel fitted with an inverted condenser, for about an hour, and then distilling. If the spirit contain more than five per cent. of water, it is necessary to repeat the treatment with lime two or three times. After distillation the whole product obtained will be anhydrous. With weak spirit not more than half the space occupied with spirit must be filled with lime at first, as otherwise the vessel might be broken by its slaking.—21 *A*, *Feb.*, 1872, 133.

CHEMICAL INVENTIONS IN THE LONDON EXPOSITION OF 1871.

A report has been made by Professor Abel upon the scientific inventions and discoveries having a relation to chemistry, illustrated in the London exposition of 1871, among which he mentions the colors obtained by the distillation of coal, enumerating the various substances that have been discovered in such rapid succession, so much to the advantage of dyers. Taking up aniline first, he remarks that the discovery of aniline violet and mauve by Perkins, in 1856, was eclipsed by that of aniline red, or Magenta, which soon after became the centre of a numerous series of brilliant colors. The first aniline blue was obtained by Nicholson in 1862–63, and a second blue, known as Nicholson, or solid blue, was obtained in 1863. From naphthalin has been obtained a beautiful color known as Magdala; while another derivative of coal has yielded the true coloring matter of madder, alizarine. Other products of coal referred to by Professor Abel are carbolic acid, which itself furnishes various colors, as picric acid, rosolic acid, aurine, etc.

Other specimens presented at the exposition consisted of paraffine and ozokerite, the latter being a natural mineral substance, and replacing paraffine and stearine for illuminating purposes. Lubricating oils in considerable variety were also exhibited, as well as oil and paper made from cotton seeds, the manipulation of which promises valuable economical results. Wood paper and the method of its preparation were also shown, together with gun-cotton in its different forms. The selenitic mortar of Colonel Scott, which has already been referred to in our pages, is one of many of the other substances treated of in Professor Abel's communication.

He remarks in reference to thallium—a metal discovered by Crooks in 1871, as the result of spectral analysis—that, if procurable in sufficient quantity, it promises to be of great value for the production of colors; as many beautiful specimens of yellow and orange-red, which are chromates of thallium, and green, also a chromate, and a dark brown, which is a sulphuret of the metal, were exhibited by Messrs. Winsor and Newton, the eminent colorists, of London.—4 *B*, *Sept.*, 1871, 675; *do. Oct.*, 1871, 745.

ACTION OF LIGHT ON OLIVE-OIL.

Olive-oil, in its natural state, contains in solution a yellowish substance, which, when the oil is treated with acids or with caustic soda, gives rise to the well known greenish coloration. By exposure to sunshine this coloring matter is essentially altered, the oil being thereby decolorized, and no longer exhibiting a greenish color when treated with the reagents above mentioned. Moreover, other changes take place at the same time in the constituents of the oil, the olein in particular being greatly altered, and acquiring the fundamental property of *elaidin*, namely, that of not solidifying in contact with nitrate of mercury mixed with nitrous products; at the same time free acids are formed, and the oil acquires a rancid taste and odor.—21 *A*, *Dec.*, 1871, 1192.

CHEMICAL INTENSITY OF TOTAL DAYLIGHT.

Messrs. Roscoe and Thorpe, in a paper upon the chemical intensity of total daylight, as observed at Catania during the eclipse of 1870, remark that, for the purpose of determining the variation in chemical intensity caused by the alteration in the sun's altitude, observations were made on the three previous days, and that the results obtained confirmed the conclusions formerly arrived at, "that the relation between the total chemical intensity and sun's altitude is represented by a straight line." It was difficult to estimate the chemical intensity of the feebly diffused light during totality, owing to the obscuration of the sun's disk, and to the greater part of the heavens being covered by clouds. Not the slightest action could be detected after an exposure of the sensitive paper for ninety-five seconds. It was estimated that the chemically active light present was certainly not more than 0.003 of the unit adopted, probably much less.

From the observations made during the partial phase the law was deduced "that the diminution of the total chemical intensity of the sun's disk during an eclipse is directly proportional to the magnitude of the obscuration."—21 *A*, *Dec.*, 1871, 1141.

GLYCOL-STRYCHNINE.

The detection of a new base from strychnine, to be named glycol-strychnine, has lately been announced.—1 *A*, *Dec.* 1, 1871, 263.

SEPARATION OF PURE NITROGEN.

Pure nitrogen, it is reported, can be prepared by means of bi-chromate of ammonia, which, when heated in a retort, is transformed into gaseous nitrogen, water, and green chrome oxide.—15 *C*, XXI., 1871, 376.

CUPRO-AMMONIUM.

If shreds of copper are introduced into a bottle half full of ammonia solution, the metal will be dissolved, with the production of what is called cupro-ammonium, and with the accompaniment of a deep blue color. This substance has the remarkable property of dissolving various substances, as silk, lignine or cellulose, paper, etc., with great rapidity. It has been proposed to apply this agent in the preparation of solutions which can be converted to important industrial uses, such as readily suggest themselves in connection with this power of dissolving the substances in question. Paper, linen, wood, etc., can be readily united almost indissolubly by means of this substance; and it is said that, when thus adherent, the copper which they hold may be extracted by a weak acid, leaving the material pure and white, but without disturbing the adhesion already established. It is not known in what particular chemical combination the two substances unite, or what is the precise character of their union. The name given, cupro-ammonium, is to be considered as of no chemical significance.—6 *D*, *April* 20, 1872, 256.

ACTION OF NITRIC ACID ON METALS.

Some time ago it was announced that tin is not affected by nitric acid of 1.42 specific gravity as long as it is in contact with platinum, while without the latter metal the chemical action is very energetic. It is now stated that the same result is obtained with platinum and cadmium when treated with nitric acid of 1.47 specific gravity. The acid acts very energetically upon the cadmium by itself, but if the latter is brought in contact with a sufficient quantity of platinum, both the acid and the platinum remained unchanged. For these experiments the cadmium may be wrapped around with platinum wire or platinum foil. If the acid be reduced with water, the decomposition of the cadmium commences at a certain point of dilution.—18 *C, Nov.* 8, 1871, 709.

COMPOUND NATURE OF CATHARTINE.

A substance obtained some years ago from senna, and named cathartine, under the supposition that it contained the active principle of the plant, has lately been ascertained by Bougoin to consist of three distinct substances—chrysophanic acid, dextro-rotary glucose, and chrysophanine.—21 *A, Feb.*, 1872, 152.

CARBAZOL AND CARBAZOLINE.

In the process of purifying crude anthracene, a solid hydrocarbon has been discovered which is considered new, and is named carbazol. This substance crystallizes, is insoluble in water, but soluble by the aid of heat in ether, alcohol, and benzol; fuses at 460° Fahr., boils at 640° Fahr., and is not decomposed at red heat, nor affected at that temperature by the contact of zinc dust and soda lime. It is soluble without decomposition in strong sulphuric acid; is not decomposed by fusing caustic potassa, but is attacked violently by oxidizing substances. When heated for some hours in a sealed tube, along with a mixture of amorphous, phosphorus, and hydriodic acid, another substance, called carbazoline, is obtained, which is solid, readily soluble in alcohol, ether, and benzol, and yields with acid salts that are easily dissolved in water. —1 *A, Feb.* 2, 1872, 57.

ABIETINE, A NEW HYDROCARBON.

Dr. William Wenzell has announced to the California Pharmaceutical Society the discovery of a new hydrocarbon, which he calls abietine. This is the product of distillation of the resinous exudations of the *Pinus sabiniana*, or the well-known Sabine pine of the Sierra Nevada and the Coast Range; also called nut pine and Digger pine. Mr. Wenzell finds that abietine possesses qualities which distinguish it from spirits of turpentine and other similar hydrocarbons. It is remarkable for its low specific gravity, and its low boiling-point as compared with that of spirits of turpentine. It is a powerful solvent for the fixed and volatile oils, with the exception of castor-oil, which it does not affect at all. It dissolves balsam of copaiba freely, and in all proportions. When burned in an alcohol lamp, with a flame not too large, a brilliant white light is obtained without smoke. Its vapor is powerfully anæsthetic when inhaled, and has been used with success as an insecticide when sprinkled in places frequented by moths. *Scientific American, March* 9, 1872, 97.

CHINAMINE, A NEW CINCHONA ALKALOID.

Hesse announces to the Chemical Society of Berlin the discovery of a new cinchona alkaloid, which he calls chinamine. This is obtained from the *Cinchona succirubra*, as grown in British India, and as associated with chinidine, quinine, and other substances. The special therapeutic qualities of this substance have not yet been determined, although the chemical characters are detailed at considerable length.—1 *A, April* 19, 1872, 191.

COMBINATION OF ALDEHYDES AND PHENOLS TO FORM COLORS.

It was ascertained some time ago by Bayer that all of the so-called phenols furnish coloring matters when combined with polybasic organic acids. As the number of these phenols is unlimited, as is also that of the polybasic acids, it is evident that an indefinite number of new unions can be effected by the combination of the two series. More recently this field, already so extended, has been still further widened in another direction.

It was originally found, as the result of the first investigation, that the oil of bitter almonds—the aldehyde of benzoic acid—was capable of combination with the phenols, but additional investigations have shown that all aldehydes combine with all phenols to form bodies belonging to the group of phenol dyes, if the necessary conditions are complied with.

Among the different dyes derived from aldehydes, upon which Bayer reported to the German Chemical Society in January last, one excited a special interest, as its production appeared to be one step further toward the synthesis of natural coloring matters. The first series of experiments led up to bodies which, in their chemical relations, as apparently in their constitution, stood very near to the dyes of logwood and Brazil-wood. This time it is the pigment of green plants, or chlorophyl, which Bayer approaches in his synthetic experiments. Furfurol, the aldehyde of mucic acid, and reforcine, or pyrogallic acid, furnish a substance having the reaction of chlorophyl. If, therefore, we can not actually speak of the synthesis of the latter, because what has been hitherto termed chlorophyl is scarcely a pure chemical body, but rather a mixture of green pigment with protoplasm, we may still hope to arrive at the green coloring matter of plants along the path pointed out by Bayer, and consequently be able to clear up its hitherto unknown chemical constitution.—19 *C, March* 9, 1872, 77.

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.—13 *A, December* 1, 1871, 540.

ON CHLOROPHYL AND ITS DERIVATIVES.

Gerland and Rouwenhoff, in a paper upon chlorophyl and some of its derivatives, sum up their inquiries in the following propositions: 1. Not alone in chlorophyl, but also in such derivatives as show, like it, the obscure, dark absorption band I, this band is composed, for a certain degree of concentration, of two parts, separated by an interval which is but little superior in brightness. 2. Once modified, chlorophyl experiences no further changes. 3. Solid chlorophyl, whether contained in the tissue of leaves or precipitated from a solution, shows the same absorption bands as chlorophyl in solution. 4. The phylloxanthine of Frémy seems to be simply modified chlorophyl; his phyllocyanine is a derivative of chlorophyl produced under the influence of an acid. 5. The green and yellow matters of Filhol should be regarded as the principal constituent of chlorophyl, which owes its color to a mixture of these two substances. 6. Dead leaves of a brown color contain, with very little of chlorophyl remaining unaffected, a great excess of the yellow matter of Filhol.—1 *E*, part vi., 1871, 114.

RED COLOR OF APHIS.

Mr. Sorby has lately described a red coloring matter found in some species of *Aphis* (or plant louse), named by him *Aphideine.* This resembles cochineal in some of its characters, but in others the red coloring matter of the blood of vertebrate animals, though entirely distinct from either. It can exist in an oxidized and in a deoxidized state, and thus may perhaps serve to convey loosely combined oxygen from the respiratory organs to other parts of the body. One of its most remarkable peculiarities is that it rapidly passes into a series of fluorescent products, giving remarkable spectra, which, unlike the original substance, are not dissolved in water, but are soluble in bisulphide of carbon, and thus are like the coloring matters of wax and oils, which they also resemble in their general consistence, when left dry on evaporation. This change is so rapid that it occurs in the course of a few minutes, when the living insects are crushed and exposed to the air; and special care was therefore required to prove that none of these fluorescent substances exist during life, and that the fatty matter then found is similar to that met with in other insects.—13 *A*, *October* 15, 1871, 481.

CRYSTALLIZED INDIGOTINE,

it is reported, may be made by solution in hot phenol, which takes up the indigotine and redeposits most of it on cooling in a crystalline form, retaining enough to color the acid deep blue. To prevent a solidification of the phenol during refrigeration, alcohol, camphor, or benzine may be added. Five hundred grains of phenol will serve for the preparation of two grains of pure indigotine.—21 *A*, *March*, 1872, 250.

INDOPHAN, A NEW COLORING MATERIAL

similar to indigo, is obtained as an accessory product when dinitronaphthal is acted upon by potassium cyanide, being converted thereby into naphthyl-purpuric acid. When pure it is of a violet color, and has a beautiful green metallic lustre.—21 *A*, *March*, 1872, 251.

CARBAZOL, A NEW ANTHRACENE DERIVATIVE.

A new substance, called carbazol, has been discovered in the process of purifying crude anthracene. This possesses various peculiarities, and is convertible by heat into carbazoline, which is presented in the form of large white needles, soluble in ether, alcohol, and benzole. It sublimes in needles, evaporates with steam, and with acids forms salts which are extremely soluble in water.—18 *C*, *March*, 1872, 150.

SYNTHESIS OF ORCINE.

Messrs. Vogt and Henninger announce to the Academy of Sciences in Paris that they have succeeded in forming synthetically the substance known as orcine, the basis of the coloring matter of lichens. Numerous attempts have previously been made in vain to produce this body. The artificial orcine appears to have all the properties of the original, and its mode of formation shows that it is a diphenol or toluene.—6 *B*, *April* 22, 1872, 1107.

MELOLONTHINE.

A chemical examination of the common cockchafer or May-bug (*Melolontha vulgaris*) has shown the presence of a new crystalline substance named melolonthine by its discoverer. As prepared, this is a beautiful, lustrous, crystalline body, tasteless and odorless. It is soluble with difficulty in cold, but most readily in hot water, and quite insoluble in alcohol and ether. The aqueous solution has no action on vegetable colors. Thirty pounds of the insect furnish twenty-two grains of melolonthine.—21 *A*, *Dec.*, 1871, 1192.

TETRONERYTHRIN, A NEW ANIMAL COLOR.

As is well known, grouse, pheasants, ptarmigans, and other gallinacea have a red patch or wattle above the eye, this being so conspicuous in some species as to resemble a piece of red flannel. This has lately been subjected to a careful analysis by Dr. Wurm, who ascertained that it contains a new organic coloring material, which he calls *Tetronerythrin*, or grouse red. It seems to lie in the deeper strata of the epidermis, like the coloring matter of the human skin, and to be partly dissolved in the deep layers of the cells, and partly to occur in granules. It appears, however, to have nothing in common with the coloring matter of the blood. The fact has been well known to hunters that if a white cloth be rubbed over this red process the color will come off.—19 *C, Jan.* 20, 1872, 24.

TETRONERYTHRIN IN TROUT, ETC.

The red coloring matter first detected in the red comb of the grouse and ptarmigan, and known as tetronerythrin, has also been found in the reddish spots of the trout and the crab, and in the *Phialopsis rubra.* This coloring matter is soluble in chloroform, and is unchanged by caustic potash, while concentrated sulphuric acid turns it indigo blue, then black. It is also soluble in bisulphide of carbon and ether. It appears to be different from the coloring matter of blood.—21 *A, June*, 1872, 511.

CARBONIC ACID OF THE ATMOSPHERE.

A course of experiments upon the amount of carbonic acid in the atmosphere has been prosecuted at Rostock, for several years past, by Professor Schultz, who communicated the results of his inquiries at the last meeting of the Society of German Naturalists and Physicists. The percentage found by him appears to be much less than that hitherto indicated by most observers; the quantity detected amounting to only about 2.9 of the acid in 10,000 volumes of the air. Variations according to the time of day and year, noticed by other observers, were not found in the Rostock experiments. On the other hand, however, meteorological phenomena appeared to exercise an undoubted influence. Thus a snowfall was frequently connected with a constantly increased percentage, while rain produced a precisely opposite effect. These influences are not constant; indeed, with snow there was sometimes found a less degree of acid, and with rain a greater. The direction of the wind, however, exercised a constantly appreciable influence. With atmospheric currents from the northeast the carbonic acid was increased, while with a southwest wind it was diminished. This fact led Professor Schultz to the impression that the sea was a constant absorbent of carbonic acid from the atmosphere, and that the average percentage was kept up by volcanic exhalations, animal respiration, processes of decomposition and combustion, and other causes developed on the land. Professor Schultz is now engaged in endeavoring to learn to what the absorptive power of sea-water is due, and has already ascertained that sea-water, when boiled, absorbs scarcely one fourth part as much carbonic acid as sea-water which has lost its carbonic acid by the action of hydrogen.—19 *C*, *Nov.* 4, 1871, 359.

MILK-SUGAR FROM VEGETABLE JUICES.

According to Dr. Bouchardat, a specimen of sugar obtained from the *Achras sapota* of the West Indies, on being treated with boiling alcohol at 90 per cent., was found to leave a residuum, which, on further investigation, proved to consist almost entirely of milk-sugar, this substance forming 45 per cent. of the original mass.—16 *A*, *Jan.*, 1872, 116.

CONVERSION OF CANE-SUGAR INTO GLUCOSE BY LIGHT.

The common impression that a solution of cane-sugar, kept at the ordinary temperature, and protected against the action of ferments, will preserve its taste and chemical proportion for an indefinite period of time, according to Riault, is a mistake, as he has observed in many cases that a solution of sugar-cane, without undergoing any ferment, will ultimately become altered, and be transformed more or less completely into grape-sugar. After considerable experiment, he has satisfied himself that this action is due to the influence of light, and that even when cane-sugar is found to be apparently adulterated with glucose, the inquiry should be instituted as to whether this was not the result of exposure to light rather than of intentional adulteration.—1 *B*, *Dec.*, 1871, 175.

FAT FOUND IN BEER YEAST.

In an article by Dr. Vogel, read before the Academy of Sciences in Munich, after referring to the fact that all cereals contain a larger or smaller quantity of fatty matter, which is an essential constituent of the grain, the author describes at length his experiments made for the purpose of extracting, by means of ether, the fat contained in beer yeast, an oil boiling at about 200° Centigrade, specific gravity equal to 0.901; decomposed when heated above 300° Centigrade, and yielding acrolein. The quantity of this oil found in one liter of the yeast amounts to from 0.2 to 0.3 grams. It appears that this oil is in most respects similar to the fatty matter found in barley.—1 *A*, *Dec.* 8, 1871, 276.

COMPOSITION OF THE ALBUMEN OF EGGS.

The albumen of the white of egg has lately been shown to consist of two distinct varieties, one having its maximum point of coagulation at 63°, the other at about 74°. In addition to these there is still another substance, one known as lactoprotein. According to Gautier, when albumen of egg is treated with water at 150°, it yields the following products, which pass through a dialysis, besides insoluble matters: 1. Substance having the properties of casein; 2. A substance analogous to hypoxanthine., 3. An albuminoid substance.—21 *A*, IX., *July*, 1871, 577.

CORN-COBS AS A SOURCE OF POTASH.

The availability of corn-cobs as a source of supply for potash has been suggested. Analysis has shown that these contain over 7½ parts in 1000 of carbonate of potash, or twice as much as the best kind of wood. In consideration of the average production of corn in the United States, it is estimated that nearly 52,000 tons of carbonate of potassa may be annually obtained from this source, to say nothing of a considerable quantity of chloride of potassium.

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° Fahr., 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.—*Mem. Soc. Phys. de Genève*, XXXI, 1871, 237.

CHANGE OF VOLUME IN SOLUTIONS.

Mr. Bolson has presented to the Academy of Sciences of Paris the results of a series of experiments upon the change of volume accompanying solution, and has arrived at the following general conclusions:

1. In every case there is a diminution in volume when an anhydrous salt is dissolved in water—that is, the volume of the solution is less than the sum of the volume of the water and salt. Of all salts tried, ammonium chloride gives the least contraction.

2. The first portions of the anhydrous salt correspond to the maximum of contraction. As the strength of the solution increases, the contraction diminishes, until, with very soluble salts, when the solution is nearly saturated, the contraction is almost insensible.

3. Viewed with regard to their energy of contraction, the substances experimented on may be ranged in the following order, beginning with the greatest contraction: (*a.*) With respect to the *non-metallic radicals*—carbonates, sulphates, chlorides, nitrates, iodides; (*b.*) With respect to the *metals*—iron, zinc, copper, magnesium, strontium, barium, calcium, sodium, lead, potassium, ammonium.

4. Hydrated salts give far less contraction than the corresponding anhydrous salts; the contraction is smaller as the number of molecules of water of crystallization becomes greater.

5. Salts which crystallize in the anhydrous state are those in which the co-efficient of contraction is smallest.—21 A, *March*, 1872, 217.

MENSBRUGGHE'S LAW IN PHYSICS.

Professor Van der Mensbrugghe, of the University of Ghent, has announced as a law in physics that each time a liquid of strong superficial tension, and containing gas in solution, is brought into contact with a liquid of feeble tension, there is a more or less decided disengagement of the gas dissolved in the liquid.

The accuracy of this proposition the author proposes to establish hereafter in a special memoir, and announces it at present simply to secure priority of presentation. One illustration presented by him is to the effect that if a drop of alcohol or of ether be introduced into distilled water half filling a small vial of one or one and a half inches in diameter, and the liquid agitated, a lively effervescence will be observed after the agitation. This experiment was made long since by Duprez, but without any explanation. It is impossible to attribute the effervescence to the air introduced by the agitation, since the alcohol and ether alone, or water alone, give no marked result in this respect. The experiment succeeds equally with benzine, sulphide of carbon, creosote, turpentine, olive-oil, lavender, etc. It is only necessary to shake the distilled water, after having introduced a glass rod containing a slight quantity of any fatty body whatever, in order to perceive a distinct disengagement of small bubbles of gas.—*Bull. Acad. Royale de Belgique*, 1872, III., 223.

VALSON'S LAW.

According to *Les Mondes*, Professor Valson, of Montpellier, has discovered an important physical law, expressed in the following terms: For all normal solutions—that is to say, containing each one equivalent of nitrous salt, estimated in grams, and dissolved in a fixed quantity of water equal to one liter—the product of the density by the capillary height remains sensibly constant.—3 *B*, *Jan.* 18, 1872, 91.

SENSIBILITY OF IRIDIUM, ETC., TO MERCURIAL VAPOR.

Professor Merget, in a communication to the Academy of Sciences of Paris, states that when solutions of iridium, platinum, and other metals in nitro-muriatic acid are brought into relations with metallic mercury, their sensibility is so great that if a paper be impregnated with such a solution and exposed to the vapor of mercury, in however small a quantity, it becomes colored black, forming, as it were, an actual indelible ink. From his experiments the author infers that mercury evaporates with a velocity of 180 meters per second, and reaches to a height of 1700 meters. A practical test of these experiments of Professor Merget shows that by means of iridium paper so prepared, the presence of mercury can be ascertained in the atmosphere of all workshops where this metal is employed, especially in looking-glass manufactories. It also shows that the clothes, hair, etc., of a workman who has spent an hour in such an establishment become entirely impregnated with mercury, and that it is only necessary to bring his hand near paper prepared with iridium in order to have it instantly outlined in black. It is not at all impossible, according to Professor Dumas, that this discovery may be the initiation of a method by which the reproduction of objects in nature and art may be accomplished in a degree of perfection far exceeding any thing known at present, both in point of rapidity and economy, not excepting photography. Specimens actually exhibited to the Academy of Sciences in the new art of mercuro-typy are very encouraging in their promise.—3 *B*, *December* 14, 1871, 599.

DETECTION OF ALCOHOL IN WATER.

According to M. Berthelot, the existence of alcohol in presence of a large quantity of water may be determined by means of chloride of benzoyl. This substance is decomposed very slowly by cold or lukewarm water; but if the water contain alcohol, benzoic ether is immediately formed: the ether is found with the excess of the chloride of benzoyl. Its presence can be made manifest by heating a drop of the chloride of benzoyl, which dissolves the acid chloride almost immediately without acting at first on the ether. Even with a thousandth part of alcohol the smell of benzoic ether is very apparent.—21 *A*, *November*, 1871, 1093.

DETECTION OF SULPHURIC ACID IN VINEGAR.

The following process for detecting the 500th part of free sulphuric acid in vinegar, it is stated, is sufficiently accurate for all practical purposes. A fluid ounce of the vinegar to be examined is, by evaporation upon a water bath, reduced to about half a drachm, or the consistency of a thin extract; when quite cold half a fluid ounce of strong alcohol is to be thoroughly incorporated; the free sulphuric acid will be taken up by the alcohol to the exclusion of any sulphates; the alcoholic liquid solution should stand for several hours and then be filtered; add to the filtrate one fluid ounce of pure distilled water, and evaporate off the alcohol by the application of a gentle heat; the remaining liquid is again left standing for several hours and again filtered; to the filtrate, previously acidulated with a few drops of hydrochloric acid, a solution of chloride of barium is added, which, if sulphuric acid be present, will yield a white precipitate.—16 *A*, *July*, 1872, 411.

GUAIACUM AS A TEST FOR BLOOD-STAINS.

The frequent occurrence of the necessity of identifying blood-stains in medical legal cases has brought out the fact that there is one good test, which answers the purpose sufficiently, although, unfortunately, it does not enable us to distinguish human blood from that of other animals; the constituent, hæmatine, upon which the reaction is based, being identical in all blood, even in that of the common earth-worm, as is proved by the spectroscopic appearances. To apply the test, a drop of blood is placed on a white surface of porcelain, and a drop of simple tincture of guaiacum added. If then a drop of the solution of peroxide of hydrogen be added, a blue color will be developed. If the stain of blood be dry, moisten with glycerine, apply the tests, and press it with a piece of white blotting paper; this will absorb the color. This action depends on the oxidation of guaiacum in the presence of the hæmatine.—1 *A*, *January* 19, 1872, 26.

CHEMICAL COMPOSITION OF GASES IN THE SWIMMING BLADDERS OF FISHES.

According to Schultze, the gases contained in the swimming bladders of certain cyprinoid fishes consist of oxygen, carbonic acid, and nitrogen in different proportions, the amount of oxygen never exceeding that in the atmospheric air, and carbonic acid being always present. He concludes from his experiments that in such fishes the swimming bladder contains the ordinary gases found in the expired air of the lungs and gills.—21 *A*, *March*, 1872, 254.

DISCRIMINATION OF BARLEY FROM WHEAT STARCH.

The following method of discriminating barley starch from that of rye or wheat has been announced: The flour is placed on a glass slide and moistened with water, a covering of glass is laid upon it, and a single drop of oil of vitriol added. If now viewed with a magnifying power of 200 the starch grains of wheat and rye are seen to dissolve in a uniform manner, but the grains of barley starch, after losing their external coat, break up into a number of polyhedrons before their solution is completed.—21 *A*, *April*, 1872, 320.

NATURE OF CHLORAL HYDRATE.

According to Meyer and Dulk, chloral hydrate is in reality ethylene-glycol, chloral alcoholate being the ethylic ether of the same substance.—21 *A*, *March*, 1872, 246.

DIRECT OXIDATION OF CARBON.

An important announcement was made not long ago by Professor Schulze, at the meeting of the Chemical Section of the German Association for the Advancement of Science, at Rostock, in reference to the direct oxidation of carbon by means of permanganate of potash in an alkaline solution. In addition to oxalic acid and other products not determined, Professor Schulze obtained an acid to which he has given the name of anthraconic acid, and which he found to closely resemble mellitic acid in its properties. The experiment was repeated with carbon of different varieties, all of them, however, yielding analogous results.

A subsequent investigation proved that the new body was identical with mellitic acid. By treating it with caustic soda, benzole was produced, which was converted into nitro-benzole in the usual manner, and from this aniline was manufactured. This may justly be considered one of the most important of recent chemical discoveries.—16 *A*, 1872.

EFFECT OF VARIATION OF PRESSURE UPON THE EVOLUTION OF GASES IN FERMENTATION.

According to Mr. Brown, nitrogen, hydrogen, or hydrocarbon, and sometimes nitric oxide, together with carbonic anhydride, are evolved during the alcoholic fermentation of grape-juice or of malt-wort. He shows that the proportion of gases unabsorbed by potassium hydrate is largely increased when the operation is carried on under diminished pressure. At the ordinary pressure by far the larger proportion of these gases is nitrogen, but under diminished pressure the hydrogen preponderates very decidedly. Nitrogen, however, does not occur when the solutions contain no albuminoids, even if ammonium salts are present in considerable quantity. The increase of the proportion of hydrogen, resulting from diminution of the pressure, is accompanied by the formation of a comparatively large amount of acetic acid and aldehyde, so that it would seem that water is decomposed during the alcoholic fermentation, and that this result is facilitated by the diminution of the pressure. The presence of nitric oxide in the evolved gases was found to be due to the reduction of nitrates originally present in the solutions.—5 *A*, *July*, 1872, 315.

BLUE COLOR FROM BOLETUS.

In the course of some recent experiments Dr. Phipson has ascertained that a certain blue color, produced by the action of hypochlorite of lime on the alcoholic solution of a yellowish coloring matter of *Boletus luridus*, etc. (species of fungi), may be reproduced almost exactly from phenol, which renders it probable that the vegetable blue in question belongs to the phenyl group—1 *A*, *June* 28, 1872, 301.

SOLUBILITY OF SALTS AND GASES IN WATER.

M. Tommasi communicates to *Les Mondes* the following laws in reference to the solubility of salts and of simple gases in water, which he thinks he has established, but for which he desires additional verification. These are as follows: First, for salts belonging to the same chemical formula (as sulphates, bromides, etc.) the coefficients of solubility are in direct ratio to their specific heat; one exception only, so far, has been met with, namely, chloride of manganese. Second, for simple gases the case is just the reverse from that of salts, namely, that their solubility in water is in inverse ratio to their specific heat.—3 *B*, *June* 13, 1872, 266.

SOLIDIFICATION OF SOLUTIONS IN COUNTRY AIR.

According to Tomlinson, supersaturated saline solutions, which would instantly solidify if exposed to the air of a room, may be kept for many hours in the open air of the country without crystallization, even newly sprouted leaves not acting as nuclei.—21 *A*, *March*, 1872, 218.

CHEMICAL COMPOSITION OF CLEAN AND FOUL SALMON.

Every one conversant with the fish is aware of the great difference in taste and value between what are called the clean and foul salmon, and Professor Christison has endeavored to determine the precise nature of the difference by means of chemical analysis. The most prominent indication was the occurrence of a large percentage of oil in the clean salmon, and a deficiency in that of the poorer qualities. As a mean of the examinations made by Professor Christison, he states that in clean salmon there are 18.53 per cent. of oil, 19.70 per cent. nitrogenous matter, 0.88 per cent. saline matter, and of water 60.89 per cent.; while in foul salmon the amount of oil was only 1.25 per cent., and of water 80.88 per cent., the saline and nitrogenous matter not being materially different, although the latter was somewhat diminished.—2 *A*, *April* 13, 1872, 257.

TESTING ANIMAL FLUIDS.

According to Mr. J. A. Wanklyn, the differential action of potassic hydrate and potassium permanganate may serve as a method to distinguish between various animal fluids. When these are evaporated down with excess of potassa solution, and then maintained for some time at 150°, a certain proportion of ammonia is evolved; and if the residue be now boiled with an alkaline solution of potassium permanganate, a further definite quantity of ammonia is given off, the relative amount of ammonia evolved by these two additions being constant for the same animal fluid. The author has examined by this method urine, milk, blood, white of egg, and gelatine, the latter of which gives but a mere trace of ammonia by treatment with caustic potash. It would be possible by this process to distinguish between a spot of milk and one of white of egg on a cambric handkerchief.—1 *A*, *June* 14, 1872, 284.

PURPUROPHYL, A DERIVATIVE OF CHLOROPHYL.

If we boil chlorophyl with potash lye for a quarter of an hour we shall have a mixture of a green color, which may be filtered, and hydrochloric acid added. As soon as the potash is neutralized a precipitate is produced; and on adding more acid the liquid becomes of a bright grass-green color; and when again neutralized with carbonate of lime a green precipitate is formed, constituting a new substance, which has been called *purpurophyl*. This, when washed with water and covered with alcohol, assumes a fine purple tint, and is turned green by ammonia.—3 *A*, *June* 29, 1872, 560.

ALCOHOLIC PRODUCTS OF DISTILLATION.

Messieurs Pierre and Puchot have been prosecuting some researches into the alcoholic products of distillation, and find that these consist, first, of aldehyde; second, of ethylic acetate; third, of propylic alcohol; fourth, of butylic alcohol; fifth, of amylic alcohol; and sixth, of essential oils.

For the purpose of determining the existence of these various products as chemical substances, and formed at the expense of sugar during fermentation, the authors above named have submitted them to numerous chemical tests, and have also sought for the means of depriving vinous alcohol, properly speaking, of these various substances, for the practical purposes of purification, as it is to the presence of one or other of them that the defective taste of certain forms of spirits is attributed.

Among the indirect results reached in their inquiries, the authors maintain that it is incorrect to say, when two non-miscible liquids are boiled together, that the atmospheric pressure is equal to the sum of the elastic forces of the vapors of the two liquids, estimated separately at the temperature at which the mixture boils; but that, *first*, when two non-miscible liquids are boiled together, one of them being water, the boiling-point of the mixture is below that of the liquid that boils most readily; *second*, this boiling-point of the mixture continues absolutely constant as long as there remains an appreciable quantity of each of the two liquids; *third*, this constancy is independent of the relative proportions of the two liquids; *fourth*, the mixed vapors condensed during distillation have a direct relation to each other, independently of the relative proportions of the two liquids brought together in the distilling apparatus.—1 *B*, *June* 23, 1872, 209.

MINERAL WORKS AT STASSFURT.

Few more happy illustrations of the valuable practical applications of chemistry have ever been given than in the treatment of a substance, at first believed to be worthless, found at the village of Stassfurt, about twelve miles from Magdeburg, in Germany, in the course of borings for rock salt, which were first made in 1839, but were not brought to a successful result until after the supposed refuse substance, containing magnesic salts, was pierced. The entire deposit is upward of 1300 feet thick, and consists of four groups or regions. The lowest is the rock salt; the next is the polyhalite group, in which common salt predominates, but mixed with magnesium, calcium, and potassium. The third is called the kieserite region, consisting principally of an abnormal hydrated magnesic sulphate. The fourth, the Abraum salt, the most interesting of the whole, chiefly consists of a double chloride of potassium and magnesium, which occurs both of a white and red color, and contains traces of other salts, and includes several minerals, such as sylvin, kainite, tachydrite, stassfurtite, etc. From these various substances, principally from the Abraum salts, an immense variety of products is now obtained, the most important being potassic chloride. Besides this, there is a considerable quantity of chloride of magnesium and of bromine, of which latter substance about 30 tons are manufactured annually. Some of the other products are saltpetre and carbonate of soda, the latter being made in large quantities for use in soap-boiling and bleaching, as well as in glass and alum manufactories. A large proportion of the bleaching salts are used in the preparation of manures, made by adding them to phosphatic or other manures obtained elsewhere; of such manures more than 270,000 tons were produced in 1869.—13 *A*, *July* 15, 1872, 269.

COMBUSTIBILITY OF IRON.

An interesting experiment to demonstrate the combustibility of iron has lately been devised by Professor Magnus, of Berlin. He takes a straight bar-magnet of some power, and sprinkles iron filings on one of its poles. These filings arrange themselves in accordance with the lines of magnetic force, and however closely they may appear to be packed, of course no two of the metallic filaments are parallel, and consequently a certain portion of air is inclosed, as in a metallic sponge. The flame of a spirit-lamp or gas-burner readily ignites the finely-divided iron, and it continues to burn most brilliantly for a considerable time.

If the experimenter stands on a little elevation, and waves the magnet to and fro while burning, a most magnificent rain of fire is produced. The experiment was first exhibited in

Berlin before the Emperor of Germany and his court, and excited much admiration.—3 *A*, *August* 10, 1872, 96.

ACTION AT RED HEAT OF CHARCOAL AND IRON ON CARBONIC ACID.

Professor Dumas, in summing up the result of an investigation into the action exercised at a red heat by charcoal and iron upon carbonic acid, remarks that we may consider as established, first, that absolutely dry carbonic acid, in passing over charcoal entirely freed from hydrogen, is converted, at a dull, cherry-red heat, into oxide of carbon; second, that if the charcoal is in excess, the carbonic acid disappears entirely, replaced by perfectly pure oxide of carbon; third, that wood charcoal, heated most energetically, retains some hydrogen or water, which it loses only under the prolonged influence of chlorine at a red heat; fourth, that charcoal which has not undergone treatment by chlorine, being employed to convert the carbonic acid into oxide of carbon, always furnishes a gas, accompanied by some traces of hydrogen; fifth, that a slow current of dry carbonic acid is partly converted by iron, heated to a dull, cherry red, into oxide of carbon, a considerable proportion of the carbonic acid always remaining unaltered, or becoming regenerated.—6 *B*, *August* 26, 1872, 519.

PRODUCTION OF CERTAIN METALS IN 1866.

A few interesting facts in regard to the production of some of the less extensively used metals have come to light through the Paris Exposition of 1867. The yearly product of *arsenic* was 5210 centners (each 110 pounds nearly)—of which England produced 2230; Austria, 250; Prussia, 2450; Saxony, 280—or about 286 tons. The yearly production of *mercury* was 64,392 centners—of which California produced 36,000; Spain, 22,000; Peru, 3200; Germany and France, 2600; Italy, 592—or about 3541 tons. The yearly production of *antimony* was 8370 centners—of which England produced 4000; Austria, 1600; France, 1100; Northern Germany, 1300; Italy, 200; Spain, 170—or about 460 tons.

A singular point in the above statement is the large amount of arsenic that is consumed. It is well known that mercury is very largely used in mining operations, as well as for barometers, thermometers, voltaic batteries, and points; and we may easily account for any moderate consumption of antimony, from the fact that it enters largely into the composition of all type-metal. But arsenic is popularly supposed to be a comparatively rare metal, best known, in the form of white arsenic, as a deadly poison. It is, however, very extensively used in the arts, forming a prominent constituent of the finer kinds of paint, and employed extensively by glass-makers.

ON ALCOHOLIC FERMENTATION.

An exhaustive essay upon alcoholic fermentation, by Professor Dumas, in an August number of the *Comptes Rendus*, is summarized by the London *Chemical News* as follows: No chemical movement excited in a saccharine liquor can convert sugar into alcohol and carbonic acid. The simple fermentation of a saccharine liquor and yeast may be regulated like any other chemical reaction. The duration of the fermentation is exactly proportionate to the quantity of sugar contained in the liquid. Fermentation proceeds more slowly in the dark, and in *vacuo*. No oxidation takes place during the fermentation. Neutral gases do not modify the fermentation, inducing action of yeast. Sulphur is converted into sulphureted hydrogen by the fermentation. Acids, bases, and salts can exercise an accelerating or retarding, disturbing or destructive, action on fermentation; but the accelerating action is more rarely observed. Very dilute acids do not affect fermentation, but acids in larger quantity completely destroy it. The same applies to alkalies. Carbonated alkalies only impede fermentation when they are present in, or added to, the fermenting liquid in large quantity. Earthy carbonates do not interfere with fermentation. Neutral salts of potassa and of some other bases exert no influence upon the process. Silicate of potassa, borate of soda, soap, sulphites, hyposulphites, neutral tartrate of potassa, and acetate of potassa may be applied for the physiological analysis of ferment, and for studying its mode of action.—1 *A*, *August* 16, 1872, 209.

NOCTILUCINE.

A communication from Mr. Phipson appears in the *Comptes Rendus*, upon what he calls noctilucine, and which he claims to be a hitherto undistinguished organic substance, widely distributed in nature, and which constitutes the phosphorescent matter of animals, living or dead. This is not only the cause of the phosphorescence of dead fish and dead animal matter, but it is secreted by certain luminous worms (the scolopendra, etc), and probably by all animals which shine in the dark, and frequently by certain living plants (*Agaricus*, *Euphorbia*, etc.). It is also developed by the decomposition of vegetable matters, under certain conditions (fermentation of potatoes, etc.).

At the ordinary temperature noctilucine is an almost liquid, nitrogenized matter. It mixes with water, but does not dissolve in it, and appears to have a density little less than this liquid. It is white, and, whether extracted from a living or dead animal, is luminous, and possesses an odor resembling that of caprylic acid. It is insoluble in alcohol and ether, and is dissolved and easily decomposed by the mineral acids and alkalies. When fermented in contact with water, it disengages an odor of cheese. When fresh it is strongly phosphorescent, the production of light being due to its oxidation in contact with moist air. Indeed, it will shine as well in water as in air. It is a little more brilliant in oxygen gas; and it has been observed that it is always most lustrous when the wind blows from the southwest—that is to say, when there is most ozone in the air. As soon as the oxidation of all the matter is accomplished the production of light ceases. If the slightest quantity of air adheres to it, it shines for some moments in moist carbonic acid.

In phosphorescent animals noctilucine is supplied from a special organ—as the bile is secreted by the liver—and appears to be employed to produce light almost as soon as it is formed. It is also produced in certain conditions of temperature and moisture by dead animal matter of various kinds; but whatever its source, it always gives the same kind of light—that is to say, one that is almost monochromatic, giving a spectrum principally visible between the lines E and F, and possessing the same uniform chemical properties, as far as has been observed. It is secreted in a state of considerable purity by the *Scolopendra electrica*, and, by causing several of these myriapods to run about on a large capsule of glass, enough can be obtained to allow an examination of its principal properties.

From *Lampyrus* and the phosphorescence of dead fish it can always be obtained in a state of less purity. The secretion of this substance by the luminous animals higher in the scale, such as *Lampyrus* and others, is, without doubt, up to a certain point, under the influence of the nervous system, this permitting them to shine at will. In this case the secretion is arrested for the moment, but it is known that the eggs of *Lampyrus* shine for some time after they are laid, probably from containing a small quantity of noctilucine. In the animals lower in the scale there appears to be the existence of a special organ for the production of light; and where we find scarcely any traces of a nervous system the secretion of luminous matter is often subject to external circumstances.—6 *B*, *August* 26, 1872, 547.

SYNTHESIS OF AMMONIA.

According to Chartier, if a current of electricity without sparks be passed through a tube containing hydrogen and nitrogen, a notable quantity of ammonia will immediately be formed. Hydrogen, similarly electrized, will decompose fresh oxide of silver that has not become too old. In the course of this combination, effected at the ordinary temperature, the silver presents itself in small globules, which imprison the oxygen, which is subsequently disengaged with the formation of small lamellæ of silver.—3 *B*, *August* 22, 1872, 698.

CARBONIC ACID OF SEA-WATER.

Mr. Lant Carpenter, who has been investigating the amount of gaseous constituents in samples of deep sea-water obtained during the *Porcupine* expedition of 1869–70, remarks that the analyses show that both surface and bottom water contain more carbonic acid and less oxygen in the more southern than in the more northern latitudes. The examinations made embraced samples taken from localities extending from the Faroe Islands to Lisbon. Contrary to the general supposition, however, he reports that there is no greater quantity of dissolved gaseous constituents in the bottom than in the surface water, although he fully admits the power of pressure at great depths to retain gases in solution if once evolved there.—1 *A*, *August* 23, 1872, 88.

NATIVE SULPHURIC ACID IN TEXAS.

According to a communication presented to the British Association by Professor J. W. Mallet, of the University of Virginia, sulphuric acid occurs native in certain pools in the midst of the open prairie to the westward of the Nueces River, in Texas. These pools are strongly acid, owing to the presence of free sulphuric acid combined with various salts, especially of aluminum and iron sulphates. At the bottom of some of these lakes there is a deposit in which sulphur is largely present.

A kind of petroleum is sometimes found oozing from the soil to such an extent that sods taken up with the spade can be ignited, and produce a considerable amount of light. Professor Mallet was informed by Confederate officers serving west of the Mississippi during the late war that during the blockade of Southern ports the galvanic batteries of the telegraphic offices in Texas and Southern Louisiana were worked with this sulphuric acid.—1 *A*, *September* 27, 1872, 147.

REDUCING POWER OF NASCENT HYDROGEN.

Active reducing properties are generally attributed to hydrogen liberated from palladium, which may have absorbed it as the negative pole of an electrical circuit. Graham cites, as remarkable evidence of this, the conversion of ferri-cyanide of potassium into ferro-cyanide, and of sesqui-salts of iron into proto-salts. Professor Böttger states, however, as the result of his investigations, that palladium and some other metals, as thallium magnesium, and arsenic, possess of themselves such power, without previous absorption of hydrogen, when placed in solutions of certain salts, especially of ferri-cyanide of potassium and of sesqui-chloride of iron. He suggests, as an experiment corroborative of the above, the placing of a clean piece of palladium foil in one half per cent. solution of ferri-cyanide of potassium, and after the lapse of ten minutes testing the solution with a sesqui-salt of iron for ferro-cyanide.—15 *C*, 1872, 274.

E. MINERALOGY AND GEOLOGY.

RISING OF THE SURFACE OF THE EARTH NEAR THE NORTH POLE.

Mr. Howorth calls attention to certain changes in the surface of the globe, affecting the ancient ethnography, and endeavors to show that, at the present time, the area of upheaval in the northern hemisphere is confined to the land bordering the polar sea and to the polar sea itself; also that the upheaval is perfectly continuous all round the earth, and is greatest near the pole, gradually diminishing until it disappears about the 57th parallel, and leading to the conclusion that the focus of upheaval is the pole itself. This suggestion is supported by citations of various authors as to the difference in the distribution of land and water in the northern countries at an early period and at the present time, illustrations being drawn from various parts of Scandinavia, Spitzbergen, Northern Siberia, etc. In Spitzbergen and the polar sea of Siberia it is said that the water has shallowed so fast as to have excluded the right whale, which formerly was known to abound there; and the occurrence of skeletons of whales high up on the northern shores, of species of shells on considerable elevations similar to those of the adjacent waters, still retaining their color, and many other arguments, are brought forward to prove the probability of the suggestion.—12 *A*, *December* 28, 1871, 162.

NEW METEORITES FROM GREENLAND.

We informed our readers some months ago that among the special objects of one of the Swedish arctic expeditions was the acquisition of some immense masses of meteoric iron found in the southern part of Greenland. Telegraphic advices from Stockholm announced not long since the return of this expedition and the successful accomplishment of its mission, and we now learn by accounts in the foreign journals that numerous masses were obtained, the largest weighing about 41,000 pounds, with a maximum sectional area of 42 square feet. The second in size weighed about 20,000 pounds, and was presented to Denmark, upon whose territory it had been found. The masses are mostly of iron, and exhibit all the usual characteristics. They were found lying loose on the shore, but resting upon basaltic rocks, supposed to be of the miocene age, and in which they appear to have been imbedded, possibly by having fallen when the rock was still in a molten condition. Although these masses were found loose on the shore between high and low water mark, they are decomposing very rapidly since they have been transferred to Stockholm; so much so that it has been found almost impossible to preserve them—indeed, it has been actually proposed to immerse them in alcohol for this purpose. Mr. Maskelyne, of the British Museum, has suggested that this destruction is due to the absorption of chlorine, and advises the application of a varnish of shellac, dissolved in nearly absolute alcohol, and applied hot.—1 *A*, *November* 17, 1871, 239.

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.—21 *A*, *December*, 1871, 1174.

NEW MINERALS.

The discovery of several new minerals has lately been announced. Among them may be mentioned *Julianite*, a species somewhat resembling fahlerz, occurring in small groups of cubic crystals of a dark gray color, and containing $As_2Cu_3S_6$, part of the arsenic being replaced by antimony and iron, and part of the copper by silver. The ore was formerly found in the Friederike-Juliane Mine, at Rudelstadt, in Silesia. Another species is *Beyrichite*, from the Westerwald. This occurs in groups of maculed prisms, of a lead-gray color, with a faint metallic lustre. A native silicate, hitherto undescribed, has been called *Bismuthoferrite* by Frenzel. This occurs at Schneeberg, in Saxony. Other new species, described by Weisbach, are *Trögerite* and *Walpurgine.*—16 *A*, *April*, 1872, 261.

ILSEMANNITE, A NEW MINERAL.

A mineral which has been termed ilsemannite 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.—13 *A*, *January* 1, 1872, 15.

MONZONITE, A NEW MINERAL.

Von Kobell describes a new mineral, called monzonite, as occurring in Monte Monzoni, in the Fassa Valley.—21 *A*, *December*, 1871, 1178.

NEW MINERALS.

The discovery of two new mineral substances has been announced, under the names of *ceruleo-lactine* and *variscite.* The first-named occurs in Nassau, in a bed of brown iron ore, where it is found in threads and veins, and in cliffs in botryoidal and reniform masses. It consists of thirty-seven parts of phosphoric acid, thirty-nine of alumina, and twenty-three of water. The variscite occurs in Saxony in quartz in silicious shale, and is quite similar to ceruleo-lactine, and also consists of phosphoric acid, alumina, and water, with a few other ingredients.—21 *A*, *Nov.*, 1872, 1014.

CORUNDUM IN NORTH CAROLINA.

Professor Leidy, at a meeting of the Philadelphia Academy of Sciences, on the 6th of February, exhibited specimens of corundum from Macon County, North Carolina, which, he said, were especially interesting, as they consisted of fragments of large crystals of gray corundum, containing in the interior dark blue sapphire, and coated on the exterior with bright red ruby. One pyramid of a large crystal from the same locality recently brought to that city weighs 300 pounds.—12 *B*, *Feb.* 6, 1872.

DIAMONDS IN XANTHOPHYLLITE.

We have already referred to the discovery of diamonds in xanthophyllite, and the suggestion that this is the true matrix of the mineral. We are now informed that Von Helmersen has succeeded in isolating the diamonds in the form of fine powder by treating the xanthophyllite with acids. The greenish-gray less transparent varieties of xanthophyllite contain diamonds in greater abundance than the yellow transparent plates of that rock.—13 *A*, *Jan.* 1, 1872, 15.

METEORIC ORIGIN OF SOUTH AFRICAN DIAMONDS.

A French writer takes the ground that the diamonds of the Cape of Good Hope were originally components of aerolites which fell there, and were scattered over a great distance in a certain definite direction. This view is largely based upon the asserted fact that these objects occur on the summit of the highest mountains and in the plains, but very rarely, if ever, at great depths.—3 *B*, *Dec.* 14, 1871, 601.

BED OF GLAUBER'S SALT.

A deposit of Glauber's salt has lately been discovered in the Caucasus, not very far from Tiflis and Marienfeld. In sinking a shaft the experimenters first passed through one foot of marl, two and a half feet of gray moist clay, seven of dark gray bituminous saline clay, then penetrated a bed of pure Glauber's salt to a depth of five feet, with a probability that the thickness was much greater. In the same region there are various lakes filled with solutions of Glauber's salt, which furnish the apothecaries of that neighborhood with what they need of that substance, as it crystallizes in perfect purity along the edge of the water.—18 *C*, *Feb.* 21, 1872, 118.

MILLEPORA LIMESTONE.

Various triassic and tertiary limestones are composed of small organic bodies generally called millipores, and Gumbel has lately been investigating specimens from several localities and formations. He finds occasion to divide them into two great groups, one belonging to the dactylopores of the triassic age, the other to lithothamnium of the tertiary. The latter group is interesting from the fact that its recent representatives contain only 2 per cent. of organic matter, the remainder being inorganic, consisting chiefly of carbonates, which were most probably produced in the organism of the plant from the sulphate of lime and magnesia of the sea water. Enormous deposits of "millepora" limestone found in Europe were caused by the agency of this group. A feature of interest is the vast percentage of magnesia in some recent formations, in certain cases amounting to 17 per cent., and it is suggested that the formation of dolomitic limestone may be closely related to this form as the active agent.—13 *A*, *March* 1, 1872, 94.

BITUMINOUS SHALES IN AUSTRALIA AND INDIA.

An extensive bed of bituminous shales has been discovered eighty miles from Sydney, Australia, near to the western slope of the Blue Mountains, and a large establishment has been erected for the purpose of obtaining oil. The seam is horizontal, and from five and a half to six feet thick, in stratified sandstone. About one hundred tons of the slate are worked up weekly. The crude oil first obtained is subsequently converted into burning fluid, lubricating oil, etc. In that portion of India, also, adjoining the mountains of Persia, principally occupied by the cretaceous and tertiary strata, sufficient traces of petroleum have been found to make it important to make farther investigations. Petroleum has likewise already been obtained in the vicinity of Gunda.—18 *C*, 1871, 752.

MICROSCOPICAL COMPOSITION OF SLATE.

Zirkel has been studying the microscopic constitution of clay and roofing slate, and finds that these are not composed simply of elastic and dialitic mineral constituents, nor of the hardened and finely ground mud of pre-existing rocks, but that they embrace within their texture microscopical crystalline and crystallized constituents which vary in amount, and often play the principal part in the composition of the strata. —7 *C*, *Feb.*, 1872, 128.

ANALYSIS OF METEORIC SAND.

A meteoric sand which accompanied a heavy rain-storm in Sicily, on the 9th of March, 1872, has been reported upon by Silvestri, who states that the sand strained out from the water consisted of about seventy-five per cent. of a clayey substance, colored yellow by oxide of iron, eleven per cent. of carbonate of lime, and about fourteen per cent. of organic matter. In this the microscope revealed numerous vegetable fragments, such as hairs of plants, membrane, scales, seeds, etc., with various diatoms and living infusoria, while the water contained carbonate of lime, carbonate of magnesia, carbonate of iron, sulphate of lime, chloride of potassium, sulphate of soda, etc.—18 *C*, *June* 12, 1872, 377.

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.—9 *C*, *Nov.*, 1871, 86.

DISCOVERY OF COAL IN CHILE.

Late Chilian papers announce the discovery of important mines of coal in that country, especially along the Gulf of Aranco, near the mouth of the Carampangue River. According to an official report, one of these veins is five feet thick, and is estimated to contain four million tons of coal.—*Panama Star and Herald*, *April* 19, 1872, 3.

FRESH-WATER LAKES.

It is generally supposed that lakes and other bodies of water which receive the final drainage of streams, and are themselves without an outlet, are more or less salt—an instance of this being seen in the Great Salt Lake of North America, and in other bodies of water. It is said, however, that the waters of Lake Peten, in Yucatan, are fresh, though without an outlet, as are also those of Lake Araqua, in Venezuela, and the lakes near Damascus, into which the Abana and Pharpar respectively discharge.—12 *A*, *Jan.* 11, 1872, 203.

PHOSPHATE BEDS ON THE DNIESTER.

The immense deposits of mineral phosphates in South Carolina bid fair to be matched by those lately discovered on the banks of the Dniester, in Eastern Europe. From a report of an investigation by Schwackhöfer, ordered by the Austrian government, we learn that these phosphatic concretions differ from those hitherto observed in being almost entirely globular, with concentric radiated joints in their interior, and varying in diameter from half an inch to eight inches. When powdered, and heated in the dark, a bluish phosphorescent light is observed. The region in which the phosphorite balls occur is characterized by the existence of silurian and cretaceous strata, all intermediate formations being wanting. The silurian strata are principally represented by limestone and clay slate, and the latter is either coarsely granulated and compact, or in smooth, lustrous sheets. It is in the latter alone that the phosphatic balls occur, and, indeed, only where this slate is immediately covered by the chalk marl. From these considerations, it is inferred that the balls consisted originally of carbonate of lime, which have been transformed into phosphorite by the infiltration of phosphatic salts. The original material of these chalk concretions was doubtless supplied by the chalk marl overlying the slate in a manner familiar to geologists, and it may fairly be presumed that the phosphoric acid of the mineral is simply the product of leaching out of the phosphatic slate above referred to, since all the other constituents of the slate besides phosphoric acid are found in this mass. Herr Schwackhöfer imitated the mode of forming these balls by taking boys' marbles and keeping them for several days in a solution of phosphate of soda or of iron, and observed the transformation into phosphate of lime. An acid phosphate of lime is first produced, which is subsequently changed into the insoluble salt. In nature this process must have been a long time in progress, but the result was sure to be attained ultimately. As to quality, this phosphate promises to be of very decided value, showing a positive superiority over that of the Sombrero

Islands. It occurs in immense masses, and, in fact, is apparently almost inexhaustible.—19 *C, Nov.* 25, 1871, 382.

WAS THE NORTH POLE SITUATED IN THE DESERT OF SAHARA IN THE QUATERNARY PERIOD?

A correspondent of the *Association Scientifique de France* takes the ground that the phenomena of the quaternary period are inexplicable on the ordinary principles assumed by geologists, and that the only proper cause that can be assigned for them is a change in the position of the poles, the northern of which, during this period, according to the writer, was somewhere in the vicinity of the Desert of Sahara.—1 *B, November* 5, 1871.

UPHEAVAL OF THE SWEDISH COAST.

The rate of upheaval of the Swedish coast, a fact long known to geologists, is shown by a large block, ten feet high and fifteen feet broad, on the shore near Morup, which in September, 1816, was four feet above high-water mark, as is proved by an inscription to that effect. During the past summer this block was 120 feet from the shore, indicating a comparatively recent and rapid upheaval. The earliest records of this stone state that it was close to the water, but not in it, so that it would appear that the upheaval commenced in the present century.—13 *A, March* 1, 1872, 94.

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.—12 *A, February* 1, 1872, 276.

ACTION OF EMANATIONS FROM VESUVIUS ON VEGETATION.

Signor G. A. Pasquale has contributed to the *Accademia delle Scienze Fisiche e Matematiche* of Naples a paper in which he accounts for the destruction of the vegetation during the recent eruption of Vesuvius by the effects of the chloride of sodium which is deposited along with the ashes. The destruction of the tissues he states to be far too rapid to be attributable to the mechanical action of the ashes in closing the pores of the leaves; and there is no evidence of desiccation except in the immediate vicinity of the volcano, nor of the change of color in the leaves and flowers which would be the result of poisoning by acid fumes.—*Letter of Alfred Bennett.*

EARTHQUAKE IN CALIFORNIA.

On the 26th of March last an earthquake was experienced in California and adjacent Territories, which is said to have been the most severe since the American occupation of the country. In October, 1869, a very violent shock occurred, but the more recent one seems to have been of still greater magnitude. Although rather feeble at San Francisco, it became more and more severe toward the south, increasing in energy, and being quite severe at the height of several thousand feet up the Sierras. The area of disturbance was at least 500 miles long by 60 to 100 wide. The shock was the greatest in the valleys, and its line followed the Sierra. The California papers were filled with local accounts of the disturbance, consisting in the opening of fissures in the ground, the change of level of adjacent localities, the drying of some springs and the bursting forth of others, and various features usually attendant upon such startling phenomena. — *San Francisco Bulletin, March*, 1872.

CHILIAN GLACIERS.

The overland journey from Talcahuana to Santiago by Professor Agassiz, after leaving the *Hassler*, gave him an excellent opportunity of studying the glacial phenomena of the south temperate zone. His route was by stage-coach to Toma and Curico, the rest of his journey to Santiago being by railway, thus making a distance of several hundred miles through the entire country between the coast range and the Andes. A correspondent on the *Hassler* writes that the professor believes that the whole valley of southern and central Chile, between the coast range and the Andes, was once the bed of a glacier, or a part of a great glacial sheet moving northward, and that, after the general glacial action had ceased, large local glaciers descended from the Andes at certain points, leaving their moraines well marked as the record of their extent; but in no case in the grounds passed over in this journey did the local glaciers from the Andes appear to have extended across the valley and reach the coast range.—*Semi-weekly N. Y. Tribune, June* 25, 1872.

GLACIERS IN ALGERIA.

Mr. Charles Grad, a well-known scientific writer, an Alsatian by birth, but resident in Paris, has lately visited Algeria for the purpose of deciding upon its availability for colonization on the part of such of his compatriots as prefer to live under French rule abroad to remaining in their own country under German dominion. In addition to the special objects of his mission, he has been devoting much of his time to the determination of various scientific questions. He has published papers upon the magnetic declination of Algeria, and has also been inquiring into the glacial phenomena of the mountains of Northern Africa. Among other observations he discovered the existence of enormous moraines on the slopes of the mountains turning toward Sahara. He also expected to find traces of old glaciers in Djurdjura and the mountains of the great Kabylia. From daily observations in regard to the sea temperature at La Calle, Algiers, and Oran, and during a journey along the Algerian coast in December, he found the temperature on the high seas during the month to be from 56° to 59° F.—17 *C, June*, 1872, 229.

GLACIAL ACTION NEAR MONTEVIDEO.

A communication was presented to the National Academy of Sciences at its annual meeting on the 16th of April last, from Professor Agassiz, dated Montevideo, February 26. In this he expresses his gratification at finding evident traces of glacial action in the vicinity of Montevideo, as shown by the occurrence of phenomena which were quite satisfactory to his mind. He leaves the question undecided as to the origin of the erratic boulders found scattered over the surface, but hopes that his further investigations in the southern hemisphere will enable him to supply the necessary data.—*Proceedings of National Academy.*

YELLOWSTONE PARK.

A preliminary report upon the hot springs, geysers, and mud springs of the Yellowstone and Fire Hole Rivers has been presented by Dr. Hayden in the February and March numbers of the *American Journal of Science*, in which are reproduced quite a number of the illustrations prepared for his official report, which will probably appear before long.

The interest attaching to this wonderful region, first visited in 1870 by Governor Langford, Lieutenant Doane, and others, and then more thoroughly explored in 1871 by Dr. Hayden and General Barlow, has been intensified by the publication of a popular article on the subject in *Scribner's Monthly*. The prompt passage of a law by Congress, reserving this tract for a national park about sixty by fifty miles in extent, and embracing all the principal geysers, mud springs, etc., is a subject for congratulation, as, under the direction of the Secretary of the Interior, there is no doubt that such regulations will be established as will secure to the people of the country the right of free access to these wonders of nature, unrestricted by such charges and exactions as now render Niagara Falls a by-word and reproach.

SECOND REPORT OF THE GEOLOGICAL SURVEY OF INDIANA FOR 1870.

The second report of the Geological Survey of Indiana, made during the year 1870, under the direction of E. T. Cox, State Geologist, has just made its appearance, and, like its predecessor, appears to be a work of much scientific value. In addition to the series of reports upon the geology of the counties, it embraces a paper upon the Western coal measures and Indiana coal, and a paper upon palæozoic zoology, and closes with an extended manual of the botany of Jefferson County, Indiana, prepared by Professor A. H. Young, of Hanover College. In this the total number of indigenous species is given at 537, those introduced numbering 72.

REPORT OF THE GEOLOGICAL SURVEY OF OHIO FOR 1870.

The report of progress for 1870 of the Geological Survey of Ohio, under the direction of Professor J. S. Newberry, has just been published at Columbus, forming a volume of nearly six hundred pages, with a number of accompanying maps and sections. The volume contains, besides a report of progress of the survey for 1870, a sketch of the structure of the lower coal measures in Northwestern Ohio by Professor Newberry; the report of labors in the second geological district by Professor E. B. Andrews, and on the geology of Highland County by Professor Orton; the report of the Agricultural Survey of the State by Mr. J. H. Klippart; a report of the chemical department by Professor Wormley; sketches of the geology of several counties by Messrs. M. C. Read and E. Gilbert; a sketch of the present state of the iron manufacture in Great Britain by W. W. Potter; and a sketch of the present state of the steel industry by Henry Newton.

All of these subjects are treated with great care, and the whole volume bears ample testimony to the ability of the chief geologist and the industry of his assistants. This volume is intended as simply preliminary to the final report, which Professor Newberry hopes to have embodied in four volumes—two of them devoted to the geology and paleontology, one to the economical geology, and one to agriculture, botany, and zoology. The materials for these volumes are in an advanced stage of forwardness, and will embrace monographic treatises on the several subjects, which will be of the utmost benefit in ascertaining and developing the resources of the state.—*Report.*

REPORT OF PROFESSOR HAYDEN'S EXPLORATIONS.

The report of Professor Hayden of his geological explorations in Montana and the adjacent Territories during the past season has just been published at the office of the Congressional printer, the promptness with which the manuscript was furnished by the authors of the several papers and printed by the public printer being deserving of much commendation. The book itself is an octavo of five hundred pages, with geological sections, maps, diagrams, and two plates of new species of orthopterous insects.

Our readers will remember the interesting discoveries made by Professor Hayden in the geyser region of the Yellowstone Lake and Fire Hole River, resulting in the passage of a law by Congress setting apart a tract of land nearly sixty miles square as a public park forever for the benefit of the people of the United States.

The present report contains full details of the country, the location of the principal geysers and hot springs, and a plan of the reservation in question. As appendices to the report, we have a paper on the agricultural resources of the regions traversed by Professor Thomas, and letters by Mr. R. S. Elliott, well known for his labors in reference to tree-planting on the prairies, and other subjects. A division of the volume is devoted to the paleontology of the survey, and embraces papers on the fossil flora by Professor Lesquereaux; on the fossil vertebrates of the cretaceous strata of Kansas, and of the Wahsatch group, by Professor Cope; on the vertebrates of the tertiary formation of Wyoming by Professor Leidy; and on the invertebrate fossils by Professor Meek. Lists of recent insects, reptiles, fishes, plants, etc., are also included, as also a communication on meteorology by Mr. Beaman, one of the assistants of the survey. Many new species, both recent and fossil, are described in the report, and it is understood that fuller details will hereafter appear, properly illustrated, in the final report, which is now in the course of preparation.

REPORT OF MR. CLARENCE KING—VOL. V.

Among the many works published by the United States government, or at its expense, there are few that exceed in intrinsic value, as well as in beauty, the volumes hitherto printed belonging to the series of reports made by Mr. Clarence King, of his geological and other explorations of the region along the fortieth parallel of latitude. This expedition is still occupied in carrying out the work assigned to it by the Engineer Department of the army, while reports are now being made of such portions of the work as have been completed.

It is nearly a year since the volume upon the mining industry of the Sierra Nevada and other mineral regions of the West was published, as prepared mainly by Mr. J. D. Hague (one of Mr. King's assistants), but including articles by Mr. King himself, and other members of the corps. This was accompanied by a large atlas of plates, and contained full details of all the methods of metallurgical operations and manipulations, together with drawings of machinery, plans of mines, sketches of mining geology, etc. This book has been received with great favor every where, and has redounded greatly to the credit of the United States, first in authorizing the research, and then in publishing the results in so superior a style.

We now have to chronicle the appearance of another volume of the series, namely, the Botany, as prepared under the direction of Mr. Sereno Watson, the botanist of the expedition. This constitutes volume five of Mr. King's reports, and number eighteen of the professional papers of the Engineer Department of the army. The work embraces a report upon the geography, meteorology, and physics of the region explored as connected with the general botany of the country, catalogues of the known plants investigated, descriptions of new genera and species, and various appendices—these accompanied by forty plates of new or rare species.

Another volume of the series is now in press, and will include the zoological portion, as furnished by Mr. Robert Ridgway. This will probably appear in the course of a few months.

It is not many years since the works published by the national printing-office in Washington were a by-word and reproach on account of the carelessness of their execution and general inferiority to those of private establishments; and efforts were continually made, on the part of those who valued the dress in which their reports were to appear, to obtain the privilege of having their printing done under other auspices. With such examples, however, as this report of Mr. King, and others which have lately made their appearance, we may safely claim for our government establishment the ability to produce scientific works in a style, as regards presswork, paper, engraving, and binding, scarcely to be equaled, and not to be excelled.

PROGRESS OF THE GEOLOGICAL SURVEY OF CALIFORNIA.

The statement by Professor J. D. Whitney, of the present condition of the geological survey of California, lately presented to the governor of the state, gives a gratifying picture of the activity and success in accomplishing the objects for which the exploration was authorized. The state geologist remarks that less has been done than he had hoped, in consequence of the suspension of the appropriations by a preceding Legislature. Since the work was resumed, however, as the result of renewed appropriations by the Legislature of 1869, the survey has been carried on as rapidly as the nature of the service would allow.

Among the points particularly engaging the attention of the state geologist was the completion of the topographical map of California, it being readily understood that this must be a necessary preliminary to a geological map. The survey of Central California was considered especially interesting and important, embracing, as it does, that portion of the state from Owen's Lake on the south to Lassen's Peak on the north, or between 36° and 40° 30′ north and south, and 117° 30′ and 123° east and west, the whole area comprising about one third of the state, with probably ninety-five per cent. of the population residing in it.

Of the portion included within these limits, represented upon four maps, three are entirely drawn and partially engraved, while the fourth is two thirds drawn, with the field-work of the remaining third yet to be done. A preliminary map, however, of the whole of California, on a scale of eighteen miles to an inch, has been drawn, in compliance with the wish of the community, and will soon be ready for distribution.

Besides these, other works connected with the same subject are reported by the state geologist, being the new editions of the Yosemite Guide-book, and the publication of the first volume of the "Ornithology of California," which is characterized as a work exquisitely illustrated and admirably printed. The remaining volumes of the series of reports are so far completed as only to wait the continuance of appropriations to place them in hand and secure their early appearance.

Arrangements have also been made with Mr. Lesquereux to work up the fossil plants of California, and with Dr. Leidy and Professor Meek in regard to the fossils. Professor Brewer, of the survey, is well advanced in the work on the botany of California, which, when completed, will doubtless be used extensively as a text-book. It is much to be hoped that very liberal appropriations will be made for these important objects, since its chief and his assistants are known to be among the very best specialists in America, and their work has commanded the highest respect among naturalists at home and abroad. The reports themselves are models of perfection in regard to typography and general execution, and are not to be surpassed by the finest European works, whether published by governments or private parties. It may be stated as a well-known fact that much interest has been excited throughout the scientific circles of Europe by the character of the work done under the auspices of the state, and the utmost admiration expressed in regard to its liberality and enterprise, this example being commended to European governments as eminently worthy of their imitation.

SOUTH AMERICAN GLACIERS.

Professor Agassiz, in a letter dated July 29, and addressed to Professor Peirce, makes a second communication in reference to the geological structure of Southern South America, with special reference to the glacial phenomena heretofore indicated by him. He refers to the broad Chilian valley, which lies between the Andes and the coast range, and extends from the Gulf of Ancud to Santiago, and still farther north. This is a continuation, upon a high level, of the channels which, from the Straits of Magellan to Chilöe, separate the islands from the main-land, with the sole interruption of Tres Montes. This great valley, covering some 25° of latitude, he considers as a continuous glacier bottom, giving indications throughout its entire length of the great southern ice-sheet which has been moving northward in it. He found nothing to show that glaciers had descended from the Andes and crossed this valley so as to reach the shores of the Pacific.

Between Currillo and Santiago, however, passing the gorge of Tenon, he saw two distinct lateral moraines parallel to one another. These were chiefly composed of volcanic boulders resting upon the old drift, and indicated by their position the course of a large glacier that once poured down from the Andes of Tenon and crossed the main valley, without, however, extending beyond the eastern slope of the coast range. These moraines are so well marked that they are known throughout the country as the Cerillos of Tenon.

He finds it difficult, in his brief communication, to describe the successive retrograde steps of the great southern ice-field that, step by step, left to the north of it larger or smaller tracts of the valley free of ice, so that large glacial lakes could be formed, and, in fact, seem always to have existed, along the retreating edge of the great southern glacier. The natural consequence is that there are every where stratified terraces, without border barriers (these originally constituted by the ice that has vanished), resting at successively higher or lower levels as one moves north or south upon unstratified drift of older date, the northernmost of these terraces being the oldest, while those farther south belong to later steps in the waning of the ice-fields.—*New York Herald, Sept.* 6, 1872.

RECENT UPHEAVAL OF THE PATAGONIAN COAST.

In illustration of the recent upheaval of certain portions of the South American coast, Professor Agassiz, speaking in a letter to Professor Peirce of the geology of the Straits of Magellan, remarks that about a mile back from the shore, near Possession Bay, he found, at a height of nearly 150 feet above the sea-level, a salt pond, which, to his very great surprise, contained marine shells, some of them still living, of species common in the adjacent ocean waters. The most abundant were *Fusus*, *Mytilus*, *Buccinum*, *Patella*, etc., occurring in apparently the same numerical relation as in the waters of the bay.

The period at which this upheaval took place could not be determined; but it certainly could not be very remote, in view of the fact that so many specimens were still living. The pond appears to become nearly dry in the winter season, the small quantity of water remaining in it being intensely saline. —*New York Tribune, July* 2, 1872.

OCCURRENCE OF ASPHALTS.

Professor Newberry, in an article published in the *American Chemist* upon the asphalts, expresses the opinion that, without exception, they are more or less perfectly solidified products of the spontaneous evaporation of petroleum. In many instances the process of the formation of asphalt may be witnessed as it takes place in nature, and in oil stills varieties of asphalt are constantly produced. These are undistinguishable from the natural ones.

Among the most important of our asphaltic minerals are the Albertite and Grahamite—the first from New Brunswick, the second from West Virginia. Both occur in fissures opened across their bedding in strata of carboniferous age. There is little room for doubt that the fissures which contain the asphalt have afforded convenient reservoirs into which petroleum has flowed, and from which all the lighter parts have been removed by evaporation. Similar deposits, of less magnitude, are known in Colorado, Arkansas, Ohio, and Kentucky. In Southern California, Western Canada, and elsewhere, asphalt may still be seen passing through the process of formation from petroleum, and especially in Santa Barbara and San Luis Obispo, where the accumulations of asphalt are well known to geologists. It also occurs on the shores of the Gulf of Mexico; but it is in Trinidad, according to Dr. Newberry, that we must look for the greater part of the supply that is likely to be required for various purposes, especially those connected with road-making. The quantity appears to be inexhaustible, and the quality is the very best; and its accessibility to the sea-ports of the United States renders its transportation so cheap that it may be furnished, to the Atlantic cities especially, at much less cost than any of the asphalts from the interior.—*American Chemist, May*, 1872, 428.

PRECIOUS STONES IN ARIZONA.

Much interest has been excited of late in the minds of the public by the alleged discovery of vast numbers of diamonds and precious stones in Arizona, and numerous parties have started for the locality with the intention of availing themselves of the riches thus offered. Professor J. Lawrence Smith, one of our highest authorities on such subjects, informs us that the diamond, in all probability, if found at all, will be of but little commercial importance, but that he is quite prepared to hear of rubies, sapphires, and amethysts of more or less value. He, however, considers the corundum deposits of North Carolina to be quite as likely to furnish these gems, and possibly of superior quality.—*San Francisco Bulletin, August* 30, 1872.

TRIMORPHOUS CONDITION OF SILICA.

Professor Maskelyne, of the British Museum, announces the discovery of a new form of crystallized silica, detected by him in a meteorite found in 1861 at Breitenbach, in Bohemia. The best-known species of silica is common quartz, which crystallizes in the hexagonal system, and has a specific gravity of 2.6. Professor Rath, however, not long since detected a second species of silica, which he called Tridymite, having a specific gravity of only 2.3, crystallizing in the hexagonal system, but with different parameters from those of quartz. The discovery of Professor Maskelyne shows that silica is trimorphous, and for this third species he proposes the name of Asmanite. The specific gravity is very low, 2.245, in this resembling Tridymite, from which, however, it differs in being a biaxial mineral, and belonging to the orthorhombic or prismatic system. Its hardness is 5.5. Two analyses show that it consists essentially of silica, and contains but a small percentage of foreign matter. The Asmanite is associated in the Breitenbach meteorite with enstatite, chromite, triolite or meteoric pyrites, and nickeliferous iron.—16 *A*, *July*, 1872, 389.

IRON SAND ON THE PACIFIC COAST.

The discovery that the iron sand, so abundant on the shores of Australia and New Zealand, is capable of being smelted by a very simple and cheap process into iron of the best quality has stimulated search for similar deposits on the western coast of the United States; and at a meeting of the Academy of Sciences of San Francisco, Dr. Stout announced that he had found such a deposit within fifty miles of that city, and indulged in glowing anticipations of an important addition to the resources of the state, more valuable, perhaps, than her treasures of gold or quicksilver.

Similar iron sands are found at various points on the western coast, and are extremely abundant throughout the whole chain of the Aleutian Islands. It is, perhaps, from the volcanic character of the region, that Dr. Stout announced the novel hypothesis that this iron was probably formed by the discharge from volcanoes of vapor containing iron in suspension, and which, becoming condensed by electric action, fell again on the earth or into the water as iron sand, this being subsequently washed up and accumulated on the shores.

Dr. Gibbons did not feel inclined to accept this theory, and believed that it was produced by the wearing away by the action of the sea of the sea-side strata containing iron, comminuting it into fine powder. He anticipated one difficulty in regard to utilizing the iron ore, however rich, in many localities in the absence of fuel, and the great expense attendant either upon bringing this to the ore, or *vice versa*. If, however, the asphaltum deposits of the state could be used, as was stated in the course of the debate, then the difficulties would be less formidable.—*San Francisco Bulletin, July* 19, 1872.

COORONGITE, A NEW AUSTRALIAN MINERAL PRODUCT.

A substance strongly resembling caoutchouc has lately been brought from Australia under the name of coorongite, the name being derived from Coorong, the place where found. Mr. Dyer says that, according to the researches of Australian savants, it can not be considered to be of vegetable origin, but is rather a mineral hydro-carbon, analogous to petroleum. In what manner coorongite has been deposited upon the sand, in the peculiar form of moderately thick strata, is yet to be ascertained by further research.—19 *C*, XIII., *June*, 1872, 186.

ORIGIN OF MINERAL PHOSPHATES.

The question as to the origin of the phosphorus occurring in the beds of mineral phosphates found in South Carolina has been a subject of persistent inquiry, and a great variety of hypotheses have been given to account for its existence. In an article read before the London Geological Society upon phosphatic nodules in the cretaceous rock of Cambridgeshire, the opinion was expressed that the phosphate was probably separated by the animal matter (that constituting a nucleus to the nodule) from its solution in water which was charged with carbonic acid, this being a well-known solvent of the phosphate. In the discussion of the article, it was suggested that phosphoric acid is largely present in sea-water, and reference was made to the present seas of the Newfoundland Banks, where fish exist in enormous quantities, no doubt giving rise to a great deal of phosphatic matter, much of the phosphate attaching to decaying animal matter being derived from excrementitious deposits floating on the water.—12 *A*, *June* 13, 1872, 134.

MINERAL IRON IN GREENLAND.

Reference has already been made in the *Annual* for 1871 to the enormous meteorites recently obtained in Greenland by the Swedish government expedition, one of them weighing no less than 49,000 pounds. Not very far from the spot, on the shore at Ovisak, where this mass was found, a rock was observed differing from the basalt of the cliffs, and inclosing iron not only in granules and spherical masses, but as a vein of metal several inches wide and several feet in length. The metal has the appearance of gray cast-iron, has a bright metallic lustre, is very hard, and quite unalterable in air, and has a specific gravity of 5.82. The metal of the larger masses, when heated, has been observed to give off a large quantity of gas. It has been ascertained that this iron evolves more than 100 times its volume of a gas which burns with a pale, blue flame, and is carbonic oxide mixed with a little carbonic acid. Hence the iron is supposed to contain a considerable quantity of carbon and a compound of oxygen, and the mass itself, it is suggested, could at no time have been exposed to a high temperature.

The iron contains 11 per cent. of oxygen, and when dissolved in acid leaves a carbonaceous residue. The composition of the metal consists largely of iron, with some nickel, cobalt, sulphur, phosphorus, carbon, and oxygen. Mineralogically speaking, the mass is considered to be a very intimate mixture of magnetite, of which there would be 40 per cent., with metallic iron and its alloys of nickel and cobalt, as well as of some pure carbon in isolated particles. The view is entertained by many that these rocks are meteoric in their origin, and form part of the original mass that fell in the miocene period.—13 *A*, *June* 15, 1872, 233.

GEOLOGY OF THE WEST INDIES.

The *American Journal of Science* contains an abstract of a paper by P. T. Cleve, on the "Geology of the West India Islands," published in the Memoirs of the Swedish Academy of Sciences, and embodying some interesting facts and generalizations. According to this account, the oldest rocks of the West Indies do not contain fossils; and the precise determination of their age is, therefore, difficult, if not impossible. These rocks occur in Trinidad, where they have been named the Caribbean series, and extend farther to the west in the northern part of South America. They have not yet been detected on the other islands. The oldest fossiliferous rocks of the archipelago are of cretaceous age, and are observed in Trinidad, Jamaica, the Virgin Islands; possibly also in Porto Rico, San Domingo, and Cuba. The cretaceous formation of Trinidad appears to be older than that of Jamaica and the Virgin Islands, and is, perhaps, of the Neocomian period, while that of Jamaica is probably equivalent to the European hippurite line.

The fact that most of the rocks of the cretaceous formation in the West Indies are of an igneous nature would tend to show that they were heaped up in a period of great volcanic activity, and as the miocene formation in several places covers the highly disturbed cretaceous rocks in almost horizontal and undisturbed beds, it is inferred that prior to the miocene time cretaceous rocks were raised to a mountain chain, running from east to west, and parallel with the northern coast-line of South America.

Eocene beds occur in Jamaica, in Trinidad, and St. Bartholomew; probably also in St. Martin, Antigua, Guadaloupe, Barbadoes, etc. These may be considered as equivalent to the lower or middle eocene of Europe. They embrace to a great extent igneous or metamorphic rocks, proving the existence of volcanic agencies at that time.

The miocene formation consists mostly of limestone or marl, and is of enormous abundance, extending over large spaces in Cuba, San Domingo, Jamaica, Porto Rico, and some other islands. It is continued in the northern part of South America and in Panama. Its fossil fauna has a close resemblance to that of Europe, and shows a great affinity to the still living fauna of the Pacific and the East Indies. Some of these fossils have their representatives still living in the Caribbean Sea. The fauna of the miocene of the West Indies, however, shows but little relationship to that of North America. The geological evidences in the West Indies tend to prove that during the miocene period there was a connection between the waters of the Atlantic and Pacific oceans by means of a strait occupying the present position of the Isthmus of Panama, and also that there was probably a connection with Europe by means of an archipelago extending across the ocean.

From the thickness of the miocene strata of the West Indies, and their generally undisturbed position, we may infer that this formation represents a long period of calm, undisturbed by volcanic phenomena.

The pliocene beds of the West Indies are found in Trinidad and Barbadoes, and to the post-pliocene we may refer certain deposits in St. Kitt's and Guadaloupe.

From the general facts observed by Mr. Cleve, we may conclude that, of the two prevailing lines of elevation, the one running from west to east originated before the miocene period, and the other, from northwest to southeast, commencing with the Bahamas and running down to Trinidad, was found after this period. Two new minerals are described in the memoir, one Resanite, a hydrosilicate of copper and iron, and the other Bartholomite.—4 *D*, *September*, 1872, 234.

GEOLOGY OF THE BERMUDAS.

Mr. J. Matthew Jones communicates to *Nature* the result of some observations which he has lately made in the Bermudas, and from which he concludes that what is at present a group of islands was, in all probability, originally connected by land, and that a large area has now measurably disappeared by subsidence, leaving only certain higher points above the water. This, in his opinion, is fully proved by facts which appeared in the course of recent excavations made for the construction of the great Bermuda dock, where a depth of fifty-two feet below low-water mark was reached. At a depth of forty-six feet a layer of red earth was met with, two feet in thickness, containing remains of cedar-trees, and resting upon a bed of compact calcareous sandstone. This, of course, sustains Mr. Jones's view that the present bed of the ocean had been once elevated above the surface of the water. On an examination of the soundings in the vicinity of the group, he finds that an elevation of forty-eight feet will bring the entire space intervening between the present land and the Barrier Reef, now submerged, above the level of the water. If, therefore, it is shown that the Bermudas were forty-eight feet higher than now, it is highly probable that they may have been still higher; and Mr. Jones thinks that they extended as far as certain rocky ledges, thirty to thirty-five miles to the southwest.—4 *D*, *August* 1, 1872, *copied from* 12 *A*, *November*, 1872, 416.

POST-PLIOCENE GEOLOGY OF CANADA.

Dr. J. W. Dawson has recently published an exhaustive paper upon the post-pliocene geology of Canada, in which he enumerates all the species of animals and plants hitherto detected in that formation. His list embraces ten species of plants, one hundred and ninety of invertebrates, and five of vertebrates — two hundred and five in all. The whole of these, with three or four exceptions, are living northern or arctic species, the marine species belonging to moderate depths, reaching down to about two hundred fathoms. The assemblage is identical with that of the northern part of the Gulf of St. Lawrence and Labrador coast at present, and differs merely in the presence or absence of a few more southern forms, now occurring in the Gulf; especially in the southern part, where the fauna is of a New England type, whereas that of the post-pliocene may be characterized as Labradorian. As might have been anticipated from the relations of the modern marine fauna, the species of the Canadian post-pliocene are in great part identical with those of the Greenland seas and of Scandinavia, where, however, there are many species not found in our post-pliocene. The post-pliocene fauna of Canada is still more closely allied to that of the deposits of similar age in Britain and in Norway, change of climate having been much more extensive on the east than on the west side of the Atlantic, owing to the distribution of warm and cold currents, resulting from the present elevation of the land.

The amelioration of the climate seems to have kept pace with the gradual elevation of the land, which threw the cold ice-bearing arctic currents from its surface, and exposed a larger area of land to the action of solar heat, and also probably determined the flow of the waters of the Gulf Stream into the North Atlantic. By these causes the summer heat was increased, the winds, both from the land and sea, were raised in temperature, and the heavy northern ice was led out into the Atlantic, to be melted by the Gulf Stream, instead of being drifted to the southwest over the lower levels of the continent. Still the cold arctic currents entering by the Straits of Belleisle, and the accumulation of snow and ice in winter, are sufficient to enable the old arctic fauna to maintain itself on the north side of the Gulf of St. Lawrence, and to extend as far as the latitudes of Murray Bay and Gaspé. South of Gaspé we have the warmer New England fauna of Northumberland Strait. Some of the peculiarities of the post-pliocene fauna in comparison with that of the St. Lawrence River indicate a considerable influx of fresh water, derived possibly from melting ice and snow.—*Dawson's Notes*, 101, 102.

GLACIAL PERIOD OF THE NORTHERN HEMISPHERE.

Mr. James Geikie has lately published an elaborate article upon the successive changes of climate experienced in Great Britain, especially during the glacial epoch ; and among some of the more general conclusions at which he has arrived are the following:

1. That at some distant period (according to Mr. Croll's calculations, upward of 200,000 years ago), owing to the eccentricity of the earth's orbit being at a high value, and the winter of our hemisphere happening to fall in aphelion, a climate of intense severity covered Scotland, Ireland, and the major portion of England with a massive sheet of snow and ice. At the same time similar conditions characterized the mountains and northern regions of Europe and America.

2. That one result of this glacial action was the erosion of rock-basins.

3. That intense glacial conditions were interrupted by intervening periods characterized by mild and even genial climates, the changes of climate being directly due to the precession of the equinoxes, which during a period of extreme eccentricity would gradually cause the ice-cap to shift from one pole to the other.

4. That these interglacial climates are represented in Scotland by stratified deposits intercalated with the till, and containing, in places, mammalian and vegetable remains ; in England by beds in the boulder clay, and by some portions of the valley gravels and cave deposits, with paleolithic implements and bones of the extinct mammalia ; on the Continent by similar deposits ; in America by layers of peat, with buried trees and extinct mammalia.

5. That the climate of the earlier cold periods was more severe than in subsequent glacial periods of the same great cycle.

6. That when submergence, in consequence of subsidence of the land, was approaching its limits in the northern latitudes of Europe, a change of climate gradually supervened, and icebergs and ice-rafts set sail from the frozen islets that represented Scandinavia and Great Britain and Ireland.

In connection with the glaciation of the northern hemisphere, Mr. Geikie recognizes a *Preglacial Period*, a *Glacial Epoch*, and a *Postglacial Period*, followed directly by the *Recent Period.* The *Preglacial Period* is represented in England by the Norwich Crag, and is characterized by remains of the elephant and mastodon; but Mr. Geikie finds no evidence of the existence of man, as shown by the discovery of stone implements. The Glacial Epoch is divided into the *Great Cycle* of *Glacial* and *Interglacial Periods*, a *Last Interglacial Period*, and a *Last Glacial Period.* The first mentioned is characterized in Europe generally by the occurrence of traces of man in the form of paleolithic implements, and of remains of arctic and southern mammals.

In the second, or *Last Interglacial Period*, there are also river gravels and cave deposits, paleolithic implements, and extinct mammalia, or species no longer indigenous to Europe, These include the *Elephas antiquus*, the rhinoceros, etc.

In the *Last Glacial Period* we have also river and cave deposits, with arctic mammals—the arctic mammoth, the Siberian rhinoceros—and paleolithic implements. The *Postglacial Period* is marked by the existence of raised beaches, river and cave deposits, neolithic implements, and the passage from the stone to the bronze and iron period; and in Denmark by the occurrence of peat, and buried trees in part, and kjökken-möddings. The series is closed by the *Recent Period*, with its well-known characteristics.—*Reprint from Geological Magazine*, vols. viii and ix.

SYNGENITE, A NEW MINERAL.

A new mineral has been lately described by Professor Zepharovich, from the potash beds of the salt mines of Kalusz, in Galicia. This, which has been named Syngenite, occurs in cubes of sylvine, in colorless, pellucid crystals, somewhat resembling selenite. It is very closely allied to polyhalite.—13 *A*, *October* 15, 391.

F. GEOGRAPHY.

PAVY'S EXPLORATIONS.

Mr. Octave Pavy now announces his intention of starting very soon from San Francisco on that raft expedition to the pole about which so much has been heard for the last twelve months. He proposes to take with him Dr. Chesmore, who has had much experience in Alaska, Captain Mack, the seaman who crossed the Atlantic on the raft *Nonpareil*, and Watkins, a celebrated Rocky Mountain hunter. He carries with him a rubber raft built like the *Nonpareil*, which can be transported with ease on the land, and is capable of carrying a large weight on the water. The expedition will be taken to Petropaulovski from San Francisco, where dogs and fur clothing will be procured; and they will then endeavor to make Wrangel's Land direct, instead of going by way of Cape Yakan, as originally intended. From this island, if they reach it, they will launch their raft, and make their way to the coast of Greenland, touching at the pole on the way!

CAPTAIN LONG ON PAVY'S EXPLORATIONS.

Captain Thomas Long, so well known as the discoverer, in 1867, of Wrangel's Land, situated about seventy to one hundreds miles north of Cape Yakan, in Siberia, has written a letter in reference to the plan of exploration by Mr. Octave Pavy, to which we have already referred. While indorsing the idea presented by Mr. Pavy, he takes occasion to claim it as his own, having, as he states, urged this route as long ago as 1867, the time of his first discovery. He does not think that Mr. Pavy will be able to pass through the channels between Spitzbergen and Greenland, or between Nova Zembla and Spitzbergen, as those passages have always been found blocked with ice, and it would be impossible to winter in the ice in such a raft as he has constructed. He thinks it possible that the north pole may be reached from Wrangel's Land, but that it would be necessary for him to return for winter quarters; but to endeavor to return into the Atlantic with such a craft would be the height of folly. He believes that a vessel, properly fitted for the purpose, could make the passage from Behring's Strait to the Atlantic in one year from the time of passing Behring's Strait.—*San Francisco Bulletin, April* 5, 1872.

DR. RAY ON ARCTIC EXPLORATIONS.

Dr. John Ray, formerly well known for his labors in the way of arctic exploration, replies to the proposition of Mr. Markham to prosecute polar exploration by way of Smith Sound by taking the ground that a course along the west shore to the north of Spitzbergen is by far the best. He states that at Spitzbergen a vessel can always get as far as 80° north, and perhaps farther, while the farthest latitude attained by ships through Smith Sound is only 78° 40′. He thinks that by following the Spitzbergen route, and then taking sledges, the object aimed at can be reached with greater certainty than from any other direction. The amount of travel by sledges will not be over 1400 geographical miles, and this is not beyond the power of sledges to accomplish.—20 *A, December* 9, 1871, 727.

ALLEGED NEWS FROM THE POLARIS.

A remarkable story from Newfoundland is detailed in a letter to the New York *Times* of April 15, to the effect that a Danish brig just arrived, which had left Disco on the 1st of March, brought information that the *Polaris*, under Captain Hall, had been there for two days undergoing repairs and procuring a fresh supply of provisions. The account goes on to say that on the evening of February 8 the *Polaris* encountered extremely heavy weather, and while lying to, owing to the shallowness of the water, ran among ice snags, which caused a leak in the vessel, and made it necessary to proceed to Disco for repairs. Mysterious intimations were given of wonderful discoveries which had already been made by the *Polaris*, indicating the existence of a genial atmosphere and open seas in the extreme north. Plants indigenous to southern climes were detected in the ice, while a floating stick of wood proved to be northern birch. Throughout the whole of the month of February very little ice was seen, and the skies were literally alive with meteors of the most gorgeous description.

On Christmas day the ship was hemmed in by a heavy field of ice, but the weather was as pleasant as an Italian spring day. Such was the reluctance of Captain Hall to have the further discoveries which he is expecting to make shared by rival expeditions, that, according to the writer, he did not send word of his return to the Secretary of the Navy, which was certainly a very reprehensible omission. The entire story bears little evidence of credibility, and will at least require further confirmation before it can be accepted.—*New York Times, April* 15, 1872.

LATEST NEWS FROM CAPTAIN HALL.

The Secretary of the Navy has recently received, by way of Copenhagen, a letter from Capt. C. F. Hall, of the *Polaris*, written on the 24th of August, 1871, at Tossak, North Greenland, latitude 73° 21′, longitude 56° 5′ west. Although this is but a few days later than the dispatch brought home by the frigate *Congress* nearly a year ago, it renews the assurance of the harmony existing on board the vessel between the members of the expedition, and the perfect satisfaction of all with the equipment and preparations for the coming winter.

It is well known that no efforts were spared by the Navy Department to render this expedition the most perfect and complete in its equipment of any ever sent to the north, and the success of these endeavors must therefore be a source of great gratification to it. Governor Elberg, of the Upernavik district, accompanied the *Polaris* as far as Disco, and brought back the dispatches, which have thus been a year in their journey to Washington. Through his help Captain Hall obtained sixty strong, healthy young Esquimau dogs, and a large supply of food for them, together with a supply of reindeer furs, seal-skins, etc.

At Upernavik, Hans Christian, well known to the readers of Kane's narrative, joined them as hunter and dog-driver, and was accompanied by his wife and three children, who, with Joe and Hannah and their child, Captain Hall's faithful companions in previous years, made up quite a party. It will be remembered that Captain Hall met the returning Swedish expedition at Holsteinborg, and that its commander supplied him with charts and copies of such of his notes as promised to be of service to him. Partly in consequence of the suggestions of the commander, Baron Von Otter, and of other scientific men whom he met in Greenland, Captain Hall concluded to abandon the Jones's Sound route, and intended to cross Melville Bay to Cape Dudley Digges, and thence to steam directly to Smith's Sound, with a view of finding a passage on the west side of the sound from Cape Isabella to Kennedy Channel. Captain Hall speaks very favorably of the steaming qualities of the *Polaris*, her passage having been perfectly satisfactory from port to port. The entire steaming time from New York to Disco was twenty days seven hours and thirty minutes.—*Washington Daily Chronicle.*

PARTICULARS OF THE EXPEDITION OF PAYER AND WEYPRECHT.

In the December number of Petermann's *Mittheilungen* we have a detailed though preliminary report of Payer and Weyprecht of their polar expedition of the past summer. The first acclamation with which the announcement of the discoveries of these gentlemen was received has been somewhat tempered by the criticisms of Markham and others; but, while we are not able to admit that they have solved the general problem of a journey to the pole, we can hardly suppose that Dr. Petermann would have been so exultant without good grounds. The information of the report in question gives the diary of the journey from the beginning up to the 4th of October, when they reached Tromsö, on their return. Their highest point reached (on the 6th of September) was 78° 5′ north latitude, and 56° east longitude; and with the open sea expanding before them, their progress northward was only arrested by severe northerly winds, and the necessity of entering upon the homeward course, if they desired to avoid the possible danger of being blockaded by the ice and frozen in for the winter.

The earlier accounts of the expedition referred to the abundance of whales noticed; and in this report it is remarked that so many fin-backs were seen that for days and days together numbers of them were continually in sight. They recommended for the future that three well-manned expeditions be sent out; one to investigate Gillis's Land, and to proceed thence northeastwardly; second, a special polar expedition for the purpose of attaining the highest latitude at about 42° east longitude; and the third, from Nova Zembla eastward, to investigate the Siberian Polynia. All three expeditions should be fitted out for passing the winter, and have auxiliary steam-power. The latter is indispensable, as the favorable condition of these seas occurs so late in the season as to make it proper that the brief period available for action should be made use of with all possible energy.

The same number of the *Mittheilungen* contains the report of Lamont's cruise from May to August, and notices of the labor of Johannesen, Mack, Carlsen, and others, in the summer of 1871. Captain Mack reached the degree of 80 east longitude without finding any ice.—17 *A*, *December* 8, 457.

PUBLICATIONS OF THE U. S. HYDROGRAPHIC OFFICE.

In 1871 the important papers of Dr. Petermann upon the Gulf Stream, with their accompanying maps and charts, were translated into English and published by the United States Hydrographic Office, under the direction of Captain R. H. Wyman. Since then two supplements have been issued by the office, including additional information obtained by Dr. Petermann, the second one accompanied by a map of the northern region of Europe and Asia east of Greenland. This, which is on quite a large scale, gives us the results of the discoveries made up to the end of 1871, including the work done by Lamont, Mack, Johannesen, Payer and Weyprecht, Rosenthal, etc. The text of this supplement contains reports of the cruises of Smyth and Ulve, and of Captain Torkildsen, papers on the sea north of Spitzbergen, and on Gillis's Land and King Charles's Land, etc.

Petermann is of the opinion that, as far as the discoveries of land go, the results of Smyth and Ulve are more important than those of any cruise between Greenland and Siberia for many years past, as they show that the northeast line of Spitzbergen extends across 10½ degrees of longitude instead of the 7½ previously assigned, this extension including the southern coast as well as the northern. The easternmost point reached by this expedition was a little beyond the 28th degree of east longitude.—*2d Supplement Gulf Stream Memoirs.*

PROPOSED EXPLORATIONS NORTH OF SIBERIA.

In a lecture lately delivered by Herr Weyprecht before the Academy of Sciences of Vienna upon the expedition instituted by himself and Lieutenant Payer during the past summer, of which frequent mention has been made in our pages, he recommends the following as the plan of campaign for the coming season. As soon as the northern coast of Nova Zembla is free from ice, which may be looked for in the second half of August, a movement should be made as quickly as possible to the east, in order to reach New Siberia the same season, if possible. The greatest difficulty will be met near Cape Tscheljuskin, around which the ice is very apt to accumulate, and for the avoidance of which it may be necessary to go around toward the north. East of this the polynia will be found, through which New Siberia, perhaps, will be easily attainable.

If these islands can be reached the first year, it will be well to winter there, or upon any lands still farther to the north, and devote the next summer to explore the polynia, and in making a movement toward the north. If New Siberia can not be reached the first summer, then the first winter must be passed at Cape Tscheljuskin; if possible, to the eastward of it. In this event the second summer must be devoted to reaching New Siberia. The third summer, in this case, should be occupied in endeavoring to reach an American port through the polynia and Behring's Straits. A voyage of this kind may require two winters and three summers, and will have as its work an investigation of the broad unknown sea to the north of Siberia. The results of a successful exploration of this region will doubtless be of the most interesting character, and may do a great deal toward solving the remaining problems of arctic discovery.—17 *C*, *February*, 1872, 74.

ARCTIC EXPLORATIONS.

The general interest felt in arctic explorations is best seen from the many expeditions either actually at work or now being fitted out. Among the latter may be especially mentioned the Austrian, as likely to occupy the foremost rank. When Messrs. Weyprecht and Payer, in 1871, returned from their reconnoitring cruise with such important results, the desire to continue researches so successfully begun became universal. The most liberal contributions of money were immediately offered, and in a very short time the sum of $70,000 was collected. The emperor, the high officials of the government, the nobility, and private citizens all willingly gave aid to the enterprise. It was resolved to intrust Messrs. Weyprecht and Payer with the leadership—a confidence well deserved by the energy, integrity, and scientific accomplishments of these gentlemen. A screw steamer, schooner-rigged, of 220 tons, with an engine of ninety-five horse-power, has been built, an ample outfit for a three years' cruise prepared, and a crew selected with the utmost care. This will consist of two officers and sixteen sailors of the imperial navy, a physician, a machinist, and two chamois hunters from Switzerland.

The object of the expedition, according to Mr. Weyprecht's statement, will be to follow up the track in the unfrozen ocean, toward the east and north, met with in last summer's cruise, and to further explore the arctic sea north of Siberia. It is intended to winter at Tscheljuskin, the most northern cape of Asia, to continue the exploration of the central polar sea during the second summer, and to penetrate to Behring's Strait, and an Asiatic or American harbor, during the third.

Quite a different plan has been adopted by the Swedes. They will winter upon the most northerly of the seven islands of Spitzbergen (81.5° north latitude), and next spring proceed to the north pole upon sleighs drawn by reindeer, fifty of which are in training for the purpose. Mr. Nordenskiöld will direct the enterprise under the auspices of the Royal Swedish Academy. Mr. Weyprecht, however, considers this plan as chimerical in the extreme.

Two Norwegian expeditions, in steamers, will explore the Siberian ice-sea in the direction taken by the Austrian expedition. They are commanded by Captain J. Jensen, of the steamer *Cap Nor*, and by Captain Svend Foyn, the celebrated enterprising whaler.

According to Mr. Gustave Ambert, the French propose to dispatch an iron screw steamer from Havre to continue explorations in the path marked out by Messrs. Payer and Weyprecht in 1871.—17 *C, April*, 1872.

HEUGLIN'S EXPLORATIONS IN THE ARCTIC SEAS.

In a letter addressed by Von Heuglin to Middendorff, of the St. Petersburg Academy, we find the fullest details of the exploration instituted by that eminent traveler during the past summer in the Nova Zembla Seas. In this he remarks that the original plan included a visit to the mouths of the Obi and Yenisei, perhaps even extending to the island of New Siberia. This, however, was found to be impracticable on account of unseasonable weather, as it was not till the 6th of August that they reached the Straits of Matotschkin. Up to that time they had met with no ice; but after passing the straits to the east there was very much drift ice from the Sea of Kara, so as almost to bar their way. Finding that the northern coast of the island was entirely embargoed by ice, they turned to the south, and, in passing, visited the Straits of Kostin and the Nechwatowa, then Waigatsch, and finally arrived at the Straits of Jugorsky on the 1st of September. Here the expedition did not make any better progress than in the Straits of Matotschkin, and, fearing that they might be shut in by the ice for the winter, they returned to their starting-place.

Among the more important results of the voyage were numerous soundings and measurements of deep-sea temperatures, as also various geographical determinations, while large collections of specimens of natural history were brought together. Among these the most interesting was the discovery of two different species of lemming in Nova Zembla, and it was thought possible that in Southern Nova Zembla still a third species might be met with. The same animal was also found in Spitzbergen. Numerous birds were obtained in Nova Zembla and Waigatsch, among them the Mandt's guillemot. Of fishes, some species of cod, cottus, and salmon were obtained, and about one hundred species of plants.—*Mélanges Biologiques Acad. St. Petersburg, Oct.*, 1871.

ALTERATION OF THE MAP OF SPITZBERGEN.

As the result of the explorations during the past year in the neighborhood of Spitzbergen on the part of various travelers, Dr. Petermann presents, in a new map of that country, a very great change in its form, the eastern line of Northeast

Land being entirely altered, it proving to be twice as large as was once supposed, and various new islands having been discovered.—15 *A*, *March* 16, 1872, 338.

PROPOSED BRITISH ARCTIC EXPEDITION.

We learn by the report of the proceedings of the meeting of the Royal Geographical Society of London of April 22, that Great Britain does not feel inclined to allow the great powers of Europe and America to monopolize the problem of arctic exploration. A paper was read on the occasion referred to by Admiral Sherrard Osborne, in which he remarks that an area of over 1,000,000 square miles is still unexplored around the region of the north pole, and that the route by way of Smith's Sound is still the only one by which a distance farther than 80° north can be reached. The numerous expeditions on the part of the Germans and Swedes in the last few years have only shown, in Admiral Osborne's opinion, that the outpour of ice from the north, between Greenland and the east, is so great as to prevent a passage by that route. Land evidently lies to the north of Spitzbergen, and Nova Zembla has been circumnavigated. The experiences of Payer and Weyprecht during the last summer were thought to be very illusory, the advance made by them being comparatively unimportant.

The reasons for trying Smith's Sound again are three: first, the most advanced station toward the pole, 82°, has been reached in that way; second, explorations can easily be made from it toward the pole; third, it affords the largest guarantee for the safety of the people engaged in the expedition.

In these views Admiral Osborne was sustained by Sir George Back and other experienced explorers, who seemed to be unanimous in preferring the Smith's Sound route. As this is the channel selected by Captain Hall for his polar exploration, these remarks form a very gratifying indorsement of the propriety of the American enterprise.

Dr. Hooker, at the same meeting, referred to the botanical interest that would attach to the further researches into the arctic flora. The examination of fossil arctic plants has shown that at one time there were between fifty and sixty kinds of large trees growing in these regions; among them species of elm, oak, plane, pine, maple, etc. These flourished during the miocene period, when probably a different day and night existed from what we have at present. The flora now is extremely meagre, embracing only about 300 flowering plants, these being well-known species, inhabiting the whole circumpolar region, and extending southward along the Rocky Mountains. Sir Leopold M'Clintock thought that the interval since any arctic exploration had been prosecuted by Great Britain was so great that there were no officers now fitted to take the command, and urged the propriety of an expedition for the purpose of serving as a training-school in reference to the antarctic expedition for the observation of the transit of Venus in 1874. He thought that unless something of this kind were initiated very soon, it would be difficult to organize properly such an expedition as the last mentioned. He was therefore in favor of arctic expeditions any where, and especially in the direction of the north pole. Dr. Carpenter was especially interested in the proposed expedition in view of the probable results in regard to ocean currents and deep-sea temperatures.—19 *A*, *April* 27, 1872, 376.

EXPLORATIONS OF THE YACHT NORNA IN 1872.

In the extended list of expeditions for deep-sea exploration carried on during the summer of 1871, not the least interesting was that of the yacht *Norna*, owned by Mr. Marshall Hall, and placed by him in the service of men of science for the purpose of employment in their investigations. This enterprise on the part of Mr. Hall is, we learn, to be repeated by him during the coming summer; and he is said to be preparing an expedition to Morocco and Madeira, accompanied by a young naturalist of Dublin, Mr. Abraham, who has already obtained a considerable reputation as a zoologist. He proposes to prosecute inquiries into the natural history of the regions visited, and to inquire into the chemical and physical questions relating to the deep sea and its currents. *Nature*, in reporting these facts, adds that the great government expedition, to which we have referred as likely to visit foreign seas for the purpose of investigation, is in a favorable state of progress, and that Professor Wyville Thompson, with a corps of assistants, will probably sail in the autumn, so as to spend the antarctic summer season in the waters adjacent to Cape Horn.—12 *A*, *Feb*. 29, 1872, 344.

ASCENT OF MOUNT SEWARD.

The report of an ascent of Mount Seward, one of the Adirondack chain, and the barometric determination of its height, has recently been published by Mr. Verplanck Colvin, in the twenty-fourth annual report of the New York State Museum of Natural History. The report of Professor Emmons, of the geological survey of the state, made many years ago, estimates its height at 5100 feet above the tide; but as this was entirely conjectural, it was considered desirable to have the question decided by careful observations. The peak in question is on the most southern boundary of Franklin County, about latitude 44° 10′ and longitude 74°. It is in the neighborhood of Mount Marcy, the height of which has been determined at 5467 feet, and which is the crowning peak of the Adirondack series.

The ascent took place in October, 1870, and, after various adventures, the top was reached. The observations made with the barometer were carefully discussed by Professor Hough, of the Dudley Observatory, who found the height above the tide-water to be 4462 feet, this being considerably less than the original estimate. Mr. Colvin closes his report by some timely remarks upon the importance of preventing the farther destruction of the forests of the Adirondack wilderness. He calls to mind the fact that, year by year, the water supply of the principal rivers of New York, and her canals, experience notable diminution, and sees in this the result of the clearing of the slopes of the high mountains of Central New York, and looks forward to the time when, if this action is not checked, the Hudson will cease to be navigable more than half way to Albany, and other streams will suffer in proportion.

To any one who has been in the Adirondack wilderness the reasoning of Mr. Colvin is perfectly intelligible, as its whole hill-surface is seen to be an enormous sponge, the moss being in some places several feet in depth, which, protected by the forest vegetation above it, holds the water as it falls in the wet season, and gives it out gradually and equally in the dry. With the removal of the trees this moss dries up and disappears, leaving nothing but the bare rock which lies immediately subjacent; and in this case the falling rains would run off with great rapidity, forming tremendous torrents, producing devastation in their course, and leaving little or no water in the affluents of the great rivers. This condition of things, which is inevitable should the denudation of the surface continue, would probably be accompanied by a great alteration in the climatological peculiarities of New York and New England, such as hotter summers, colder winters, and a much less amount of rain throughout the summer season, involving droughts and their attendant evil consequences.—*24th Report New York State Cab.*

EXPLORATIONS OF LIEUTENANT WHEELER IN 1871.

Advices from Lieutenant G. M. Wheeler, United States Engineers, whose movements during the past year we have had frequent occasion to chronicle, announce his arrival at Tucson about the 4th of December, 1871, with the men and animals nearly exhausted. The trip from Prescott to Camp Apache had been very severe, on account of the snow and high winds on the Colorado plateau. During their exploration one party had been sent to the San Francisco Mountains, and made the ascent of the principal peak. These mountains consist of three prominences, grouping in the form of a crater, the northeastern rim being wanting. The principal peak was occupied as a topographical, barometrical, and photographic station. It is believed to be nearly one thousand feet higher than the peak usually ascended, and Lieutenant Wheeler was of the opinion that his party was the first to occupy its summit. This, however, was a mistake, as Dr. Edward Palmer, of the Smithsonian Institution, made the ascent in 1870, and obtained a number of new species of plants, reptiles, and insects.

EXPLORATIONS OF MAJOR POWELL IN 1871.

Major Powell has returned from the cañons of the Colorado, having left his party in the field in charge of Professor Thompson. Since the party started in April last it has passed through the cañons of Green River and the cañons of the Colorado to the mouth of the Paria, at the head of Marble Cañon. Here the major left his boats for the winter, and he expects to return as soon as there is a favorable stage of water, and embark for the second trip through the Grand Cañon.

On the way down the party explored the region to the west of the Green and Colorado, tracing the courses of the larger streams emptying into the two great rivers to their sources in the Wasatch Mountains and Sevier Plateau, and examined the geology of the great mesas and cliffs.

Early in the winter a base-line 47,000 feet in length was measured on a meridian running south from Kanab, and the party is now engaged in extending a system of triangles along the cliffs and peaks among lateral cañons of the Colorado.

During the past season the party has discovered many more ruins of the communal houses once occupied by the pre-historic people of that land. Many of these houses stood on the cliffs overhanging the cañons, and many more are found in the valleys among the mountains to the west. Stone implements, pottery, basket-ware, and other articles were found buried in some of the ruins.

The major found a tribe of Utes on the Kaibab Plateau who still make stone arrow-heads and other stone implements, and he had opportunity to observe the process of manufacturing such tools.

PROFESSOR MARSH'S EXPLORATIONS IN 1871.

A late number of the *College Courant*, of New Haven, contains a detailed account of the exploring expedition under Professor Marsh, which occupied the greater part of the warm season of 1871, and of which we have already furnished occasional notices to our readers. The general plan, as already stated, embraced excursions from several points, exploring as many different fields, with special reference to the examination of regions comparatively little known.

The first starting-point of operations was Fort Wallace, and from this post the cretaceous deposits of Southwestern Kansas and the region of the Smoky River were investigated. The second proceeded from Fort Bridger, in Western Wyoming, to examine the ancient tertiary lake basin previously discovered by Professor Marsh. Salt Lake City was the initial point of the third exploration, and the party proceeded thence to the Shoshone Falls, on Snake River, and from there to Boisé City, in Idaho; thence they passed over the Blue Mountains to the head waters of the John Day River, and followed down to Cañon City. On the route they made extensive collections of fossil fishes. They also explored two basins, one of the pliocene and the other of the miocene age, and in these remains of extinct animals were found in large numbers, the upper bed containing the bones of the elephant, rhinoceros, lion, etc., with several species of the fossil horse; the lower and older basin was found to contain species of the rhinoceros, oreodon, turtles, etc. From this point the party proceeded to the Columbia, and thence to Portland, Oregon, whence they took a steamer to San Francisco. Here the expedition divided, a portion going to the Yosemite and elsewhere, while several, with Professor Marsh, sailed, *via* Panama, for New York, reaching that city on the 14th of January. We understand that the expedition was thoroughly successful in every respect, securing the collection of large numbers of fossils, as also numerous skeletons of recent animals, together with valuable antiquities, etc. The expense of the exploration amounted to nearly $15,000, exclusive of the value of the services rendered by the government. This was defrayed entirely by the gentlemen composing the party; and it is understood that the material results are to be placed in the museum of Yale College, which thereby will be rendered the richest in America in this department of natural history. —*College Courant, Feb.* 3, 1872.

EXPLORATIONS OF DR. STIMPSON.

Dr. Stimpson, the late eminent director of the Chicago Academy of Sciences, was engaged during the winter of 1871–72, as we have already informed our readers, in prosecuting deep-sea explorations in Florida. He first accompanied the United States Coast Survey steamer *Bibb*, when making soundings between Cuba and Yucatan for a submarine cable, but found the sea-bottom very poor in animal life. We have previously mentioned that the bottom temperature in the deepest water was about 39.5° Fahr., which may possibly account for the scanty fauna. The bottom consisted of sand and globigerina mixed, in which scarcely any thing occurred but shells, mostly dead. Some of the species were identical with those obtained by Gwyn Jeffreys at a similar depth off the European coast.

On their way back from the cable work, the expedition made one haul of the dredge off the Cuban coast, near Havana, in two hundred and fifty fathoms of water, and obtained a superb specimen of the very rare *Pentacrinus Caput Medusæ*, the first ever obtained so near our coast, and perhaps hardly represented as yet in any of our museums.

After returning to Key West the doctor took charge of the dredging on board the Coast Survey steamer *Bache*, but ill health prevented his prosecuting this to any extent, and soon after the return to the north he succumbed to the fatal malady (consumption) which had fastened many years before upon his system.

SUBSIDENCE OF THE ANDES.

A comparison made at different points of the Andes, extending over a period of more than a hundred years, is published in *Ausland* for May 13, which shows that the chain has measurably diminished, and that the reduction is progressing. Thus Quito was found by La Condamine in 1745 to be 9596 feet above the sea, by Humboldt in 1803 to be 9570 feet, by Boussingault in 1831 9567 feet, by Orton in 1867 9520 feet, and by Reiss and Stübel in 1870 9350 feet. Quito has thus sunk 246 feet in 125 years, and Pichincha 218 feet in the same period; its crater has sunk 425 feet during the last 26 years, and Antisana 165 feet in 64 years.—13 *A*, *June* 15, 1872, 232.

NICARAGUA SHIP-CANAL.

A correspondent of the New York *Herald*, under date of the 16th of June, gives some account of the proceedings of the United States Nicaragua Ship-canal Expedition. It will be remembered that the officer originally in charge, Commander Crossman, lost his life by drowning, in the West Indies, on the passage to Central America. The command then devolved upon Captain Chester Hatfield; this officer has been occupied since the 20th of April last in surveying the various routes suggested for the canal. One of these routes is that of Colonel Childs, in 1850, which continues to be considered quite favorably. The second route, extending from Sopoa to Salinas Bay, is thought impracticable. What is called the Ochomogo route promises to be the best yet discovered. Indeed, there are five practicable routes within the limits of this republic, three of which have been already surveyed—*e. g.*, first, that from Brit, on the Pacific, to El Cojin, or Pass San José, on Lake Nicaragua: distance, twenty miles; highest elevation above the level of Lake Nicaragua, forty feet. Second, from Ochomogo, on the lake, to Ascalanta, on the Pacific: distance, about twenty miles; highest elevation from thirty-four to thirty-six feet, and the cutting through this summit only about five or six hundred yards. Third, from Ochomogo to Nagualapa: distance, twenty-six miles, with an elevation about the same as last; the deep cutting along this route will be about two miles.

RETURN OF THE NICARAGUA SHIP-CANAL EXPEDITION.

The officers of the Nicaragua Ship-canal Exploring Expedition returned to New York on the 25th of July last, having completed their labors for the present season. As we have already informed our readers, this expedition was fitted out by the Navy Department, in pursuance of an act of Congress, for the purpose of determining which of several routes suggested was most favorable for the construction of a ship-canal across Nicaragua from the Atlantic to the Pacific, or else to find a new and better one, and in this they have been occupied since April last. The Sapoa route was found to be inadvisable in consequence of the great elevation, and the Child route was considered to be the best, as the greatest altitude was only about forty-five feet. Explorations were being carried on along several lines, when the heavy rains set in and prevented any farther labor.—*Washington Daily Chronicle, July* 25, 1872.

EXPLORATIONS OF SEYBOLD IN CHILE.

Herr Seybold, a German resident of Santiago, Chile, made, during the past year, an exploration of the Cordilleras of that country for the purpose of ascertaining their altitudes. Among his other adventures he experienced a snow-storm, with heavy thunder and lightning, at an altitude of 14,300 feet. Besides the discovery of a number of new species of animals, an interesting result of his expedition was the finding, at an elevation of from ten to twelve thousand feet above the sea, traces of early inhabitants in the form of stone implements and stone walls, the former of which had certainly not been used by the natives since the period of the Spanish discovery.—*Mitth. Geog. Gesellschaft, Wien, Dec.*, 1871, 601.

HIGHEST MOUNTAIN IN BRAZIL.

According to Dr. Petermann, the peak of Itatiaiossu, the highest mountain in Brazil, was ascended during the past summer, and its altitude determined by Mr. Glazion, the director of the Imperial Parks in Rio de Janeiro. It proved to have an elevation of 8899 English feet, being somewhat less than had been previously estimated. Many species of plants were found on the mountain, and, what is of great interest, a large number of Alpine species, especially the *Compositæ*, were collected at from three to seven hundred meters below the summit.—17 *A*, *Jan.*, 1872, 38.

CRUISE OF CHILIAN SHIP CHACABUCO.

Among other interesting discoveries made by the Chilian exploring vessel, the *Chacabuco*, was a lake, previously known to the Jesuits, at the foot of Mount San Clemente, situated at the neck of the peninsula of Paytoo, on the southern end of the Chonos Archipelago. This receives an immense glacier from the mountain that pushes far down into the water in a fan shape, its terminus being a perpendicular wall of blue ice three miles in length, and rising at its lowest parts one hundred feet out of the water.—*Semi-weekly N. Y. Tribune, June* 25, 1872.

CRUISE OF CHILIAN SHIP CHACABUCO.

The Panama *Star and Herald* quotes from a recent report of the cruise of the Chilian surveying ship *Chacabuco*, in regard to researches in Patagonia. In this it is stated that the Andes have been crossed by a detachment of the party through the valley of Aysen, in 45° of latitude south, opening a route to the centre of a rich and fertile country. No difficulty was anticipated in making a wagon road or railroad across the continent through the region referred to.—*Panama Star and Herald, June* 5, 1872.

EXPLORATION OF PROF. HARTT IN BRAZIL.

The return of Professor C. F. Hartt, of Ithaca, from his late expedition to Brazil, has been already announced in the papers; and we are glad to learn that he succeeded in making many important discoveries in natural history and the geography of the country, and especially the languages of the native tribes. By his researches in this latter direction he has already become quite an authority, and, we presume, will before long begin to publish his linguistic results. In the course of his expedition Professor Hartt took occasion to examine the great Kjoekkenmoedding, near Santarem, referred to by various travelers, which, however, yielded him only a few fragments of coarse pottery and a few bones. He was very fortunate in the opportunity of excavating the sites of a number of Indian villages on the edge of the bluffs bordering the Amazon and the Tapajos, in the angle made by the two rivers. Here he found an immense quantity of broken pottery, often highly ornamented—idols, stone implements, etc., probably derived from the Tapajos, now extinct as a tribe, or merged into the mixed Indian population of the Amazon.

In an ancient burial-place on the Tapajos he dug up a number of burial-pots, none, however, containing complete skeletons. An examination of the mounds of the island of Marajo was to be made by some of his associates who remained behind.—*Letter.*

MERIDIAN FOR GEOGRAPHICAL REFERENCE.

Among other questions considered at the late Geographical Congress at Antwerp in August last was that of the proper meridian for geographical reference. It is well known that while many of the Germans still continue to use the meridian of Ferro, the English adhere to that of Greenwich, and the French to that of Paris. A curious compromise was suggested, namely, to use Greenwich as the meridian for sea charts, and Paris for land maps.—7 *C*, 1871, 575.

DISCOVERIES IN PALESTINE.

The operations of the British Palestine Exploration Society continue to be prosecuted with much vigor and with very successful results. In the month of January, the base-line having been previously measured, the triangulation was carried over nearly one hundred square miles, of which eighty have been filled and laid down on the large sheets. The triangulation included Jaffa. Numerous identifications of

Scripture places have been made, some of them quite different from those heretofore adopted. Rock-hewn tombs were found in various places, and excavated cisterns, shaped like bee-hives or inverted funnels, are very common. Subterranean store-chambers were also met with, and are still used by the natives.—22 *A*, 1872, 311.

PALESTINE EXPLORATION SOCIETY.

A society was organized in New York some time since, under the name of the "Palestine Exploration Society," with Rev. Dr. J. P. Thompson, chairman, Dr. Howard Crosby, secretary, and James Stokes, Jun., treasurer, with a list of members including the principal archæologists of the Eastern States. Its first report was published some time ago, embracing an account of the American explorers in Palestine, and the proceedings of the English Palestine Exploration Society, notices of the late explorations in Jerusalem, the Moabite stone, etc., and concluding with an appeal to all persons interested for contributions of funds to aid in carrying out the proposed researches of the society.

The field of investigation proposed includes the territory east of the Dead Sea and the Jordan Valley, as also Hermon, Lebanon, and the valleys and plains of Northern Syria. A simultaneous prosecution of researches in this field by two such bodies as the American and English societies will probably be productive of very important results, especially if supported with proper official documents from the Turkish government.

As so much of what is now on record in regard to the geography and condition of Palestine is due to Americans, it is much to be hoped that the work may be continued by them toward a successful completion. It is well known that the labors of Dr. Edward Robinson, in 1838, gave the first impulse toward the modern explorations in the Holy Land. His report of that exploration, as also that of a second one made in 1852, continues to this day the great store-house of information upon the geography of the country. The first critical examination of the Dead Sea was made in 1848 by Lieutenant Lynch, of the United States Navy, and his report is also a standard authority. Other American works on the same subject are "The Land and the Book," by Dr. W. M.

Thomson, in 1859; "The City of the Great King," by Dr. Barclay, 1858; "Jerusalem—Past and Present," by Mr. Washburne, in 1859; "Illustrations of Scripture," by Professor Hackett, in 1860; and numerous other works of more or less magnitude.—*Report.*

AMERICAN PALESTINE EXPLORATION SOCIETY.

The American Palestine Exploration Society has lately received paper squeezes of two basaltic stones inscribed with Phœnician characters similar to, and perhaps companions of, the celebrated Moabite stone, of which we have heard so much. The acquisition of the stones themselves has been a subject of much rivalry between the British and American societies, in consequence of which, the Arabs, believing them to be extremely valuable, have hidden them, although it is hoped without destroying them, as was done with the Moabite stone. These squeezes were obtained by two well-known Americans, Rev. D. Stuart Dodge and Frederick S. Winston, and have been forwarded by them to New York.

Pen-and-ink copies have already been received, and have lately been lithographed and distributed among American scholars. It is not certain that the stones from which these squeezes were taken are genuine antiquities, the Orientals being unfortunately too well versed in the art of manufacturing such objects so as to meet any demand. There is, however, a strong probability that they are what they profess to be. At any rate, they will probably, before long, be subjected to such an examination by experts as will determine their true character.

EXPLORATIONS IN ASIA MINOR.

The expedition for the explorations in Asia Minor, of which mention has been made in the daily papers from time to time, was at Smyrna on the 23d of September last, and embraced Professors Curtius, Stark, Adler, of New York, and a German military officer. The gun-boat *Meteor* had been placed at their service in order that they might touch at various points, and penetrate thence into the interior, as well as visit the various islands. After spending several days in examining the result of certain excavations made at Ephesus under the auspices of the Dilettanti Society of London, the party proceeded to Sardis.—*Explorations in Asia Minor*, *Wissensch. Beil. Leipziger Zeitung*, *Oct.* 22, 1871, 472.

EXPLORATIONS IN MANTCHOORIA.

A Russian priest stationed at Pekin, the Archimandrite Palladius, has made an exploration to Mantchooria, under the auspices of the Geographical Society of Russia, and obtained much information in regard to this little-known country, bearing both upon its geography and natural history. He informs us that Chinese immigrants have nearly superseded the original inhabitants of Tartary and Mantchooria, becoming agriculturists, bankers, and merchants, and speaking all the languages except Mantchoo. Monkden, one of the principal towns, is the centre of a large Russian and Chinese trade, consisting mainly in furs, ginseng, and nephrite (a precious gem). Coal is found near this town and used as fuel. The agricultural products are principally pease and beans, and they are endeavoring to establish the cultivation of opium.

Mantchooria embraces three provinces, with a total area of 400,000 square miles, and a population of about 15,000,000, three fourths of whom are Chinese. There are no roads, and the country is impassable during the greater part of the year, excepting in the winter, when alone it is possible to go to market.—17 *A*, *March* 1, 1872, 236.

NATURAL HISTORY OF CEYLON.

Mr. Gregory, the new governor of Ceylon, proposes to make use of his position in stimulating investigations into the natural history of the island, and will appoint a zoological curator to the Colombo Museum with special reference to this object.—12 *A*, *June* 20, 1872, 150.

APPOINTMENT OF W. T. BLANFORD TO THE BELOOCHISTAN EXPEDITION.

Mr. W. T. Blanford, of the India Geological Survey, has been appointed a member of the British expedition for the survey of the boundary between Persia and Beloochistan. The region is one the natural history of which is entirely unknown, and it is probable that interesting discoveries will be the point of Mr. Blanford's enterprise.—12 *A*, *Dec.* 28, 1871, 169.

EXPLORATIONS IN AFRICA.

An extended exploration of the interior portions of Western Africa is in contemplation by Messrs. Buchholz, Lühder, and Reichenow, the first-mentioned gentleman having been a member of the German north polar expedition of 1869–70 on the *Hansa.* They expect to spend several years in the labor, and to proceed first to Calabar for the purpose of studying its fauna and making collections of all kinds. They do not expect to penetrate far into the interior, but will do what they can in this direction. They intend to have suitable apparatus to enable them to fix their route with precision, and to record the physical phenomena that may present themselves.—17 *C*, *June*, 1872, 230.

RETURN OF DR. SCHWEINFURTH TO GERMANY.

Dr. Schweinfurth has returned to Europe from Africa, after an arduous exploration, the results of which have been of much interest. Most of our readers have seen his account of his journey to the country of the Niam-Niams of the Western Upper Nile. The collections made by him during his visit up to the beginning of December, 1870, together with his scientific equipment, were destroyed by fire, with the exception of a small portion that had been sent to Berlin. His subsequent explorations were made under great disadvantages from the loss of his apparatus; but his experience as a traveler enabled him to prosecute his labors under this embarrassment and obtain important results. His most important geographical determination was the fact that the Baehr el-Arab is the main stream of the basin which empties into the Nile at the Baehr el-Ghazal.—13 *A*, *February* 15, 1872, 72.

THE "LAND OF OPHIR."

Considerable interest was excited a year or two ago by the announcement that Carl Mauch, the well-known German traveler, had discovered the land of Ophir of the Bible, whence the Tyro-Israelitish navy of kings Hiram and Solomon "came once in three years, bringing gold and silver, ivory, and apes, and peacocks." The region referred to by Mauch lies in Southeastern Africa, north of Natal; and the country, which was highly auriferous, was found to abound in ruins which certainly must have been of very great antiquity.

A recent circular of Dr. Petermann contains additional information from Herr Mauch of the discovery of an ancient city, situated in latitude 20° 14′ south and longitude 31° 48′ east, 200 geographical miles due west of the port of Sofala, and about 100 miles north of the Limpopo River. Here ruins of buildings were found with walls 30 feet high, 15 feet thick, and 450 feet across; a tower and other erections formed exclusively of hewn granite, without mortar, and with ornaments which seem to show that they are neither Portuguese nor Arabian, and not improbably of the age of the Phœnicians, or Tyrians, and King Solomon.

Mr. Charles Beke, in a communication to the *Athenæum*, reviewing these supposed discoveries, remarks that if this be the original location of Ophir, it does not at all follow that the gold exported therefrom was produced in the vicinity, since, even if collected there from a great distance, and there first brought into general commerce, it would not be unnaturally "Ophir" gold. Thus he instances the "Turkey" rhubarb, "Mocha" coffee, "Leghorn" hats, "Zanzibar" copal, etc., all of them articles not produced in the places mentioned, but simply exported thence.—15 *A*, *February* 10, 1872, 180.

DISCOVERY OF LIVINGSTONE BY STANLEY.

The successful accomplishment by Mr. Stanley of the mission intrusted to him by the New York *Herald*, namely, that of finding and succoring Dr. Livingstone, has created an excitement throughout the civilized world, and the European and American press vie with each other in their commendations of the enterprise undertaken by the journal, and the ability and energy with which it was satisfactorily accomplished by the agent.

Mr. Stanley, after receiving his instructions from the *Herald* to find Dr. Livingstone, "dead or alive," proceeded to Zanzibar, and thence penetrated the African continent, as nearly as possible by the route that Dr. Livingstone was thought to have taken, and arrived at Unyanyembe on the 23d of June, 1871, which was the date of the last advices previously received from him. He experienced drawbacks in the sickness and death of his men, which weakened his company very considerably, so that he was glad to join some Arabian caravans on their way to the west. Their progress, however, was impeded by the opposition of Mirambo, an African king, who first insisted on levying black-mail upon the caravans, and finally absolutely refused permission to pass. This involved a war with the potentate named, in which the combined forces of Stanley and the Arabs were at first successful; but, in consequence of an ambush on the part of Mirambo, the party was demoralized and put to flight, leaving Stanley ill with a fever, and with only nine attendants.

Finding so much difficulty in traveling by the route originally contemplated, Stanley made a detour, and, after various adventures, finally succeeded in reaching Ujiji, where, to his delight, he found Dr. Livingstone, in good health and condition, and greatly rejoiced at the meeting. The precise date of the arrival of Stanley at Ujiji is not mentioned in his dispatches, although he states that on the 16th of October, in company with Livingstone, he left Ujiji, and arrived November 2 at Unyanyembe, where they spent twenty-eight days in exploration, returning to Ujiji and passing Christmas day in company, and then leaving again for Unyanyembe on the 26th of December, where they arrived after fifty-four days of travel. This journey was for the special purpose of enabling Dr. Livingstone to obtain supplies of goods and provisions, which had been sent him from the British consulate at Zanzibar, but which had been detained on the way a very unnecessary length of time.

Stanley himself, in parting with Livingstone, turned over to him large quantities of material for presents, and also a portable boat, tools, fire-arms, and ammunition, leaving him on the 14th of March on his return to Zanzibar. He was commissioned by Dr. Livingstone to forward to him fifty well-armed men to act as soldiers and servants to accompany him on a new expedition that he is organizing, which will occupy about a year and a half, to complete the problems which remain to be solved before his return. His plan is to proceed to the copper mines of Katanga, then eight days south, to discover the fountains of Herodotus, returning by Katanga to the underground houses of Rua; thence to Lake Kamolondo, and, after making some explorations in that vicinity, to go back to Lualaba, and by way of Uguhha to Ujiji, and thence to the coast. In this work he expected to examine the north shore of Tanganyika Lake, and the 180 miles of the Chambezi River not visited by him.

An abstract of Dr. Livingstone's explorations up to the time that Stanley met him, published in the New York *Herald*, informs us that in March, 1866, he left the coast of Eastern Africa below Zanzibar, and was proceeding up the Boyuma River, when the report of the existence of hostile tribes farther on reached the party, which caused most of his twenty-eight men to desert, and, as an excuse for their cowardice, they spread the report of his death, which was so widely circulated. The doctor, however, in spite of this defection, continued his journey around by the south end of Nyanza Lake, and finally reached the Chambezi River, which he skirted for 700 miles, and became satisfied that this was the real source of the Nile, making the total length of that river 2600 miles. He also ascertained that Lake Tanganyika was not a tributary of this river. After arriving within 180 miles of the head of the Chambezi, he was obliged to return to Ujiji for want of supplies, and was there met by the commander of the *Herald* expedition.

It was Livingstone's intention, when Stanley left, in March, 1872, to explore the north shore of the Tanganyika Lake and the remaining 180 miles of the Chambezi, which he expected would occupy him for the next two years.—*N. Y. Herald.*

EXPLORATIONS OF CAPTAIN BLAKISTON IN JAPAN.

At a meeting of the Geographical Society of London a communication was presented by Captain Blakiston containing the result of certain investigations of the island of Yesso, in Japan. This gentleman, formerly belonging to the Royal Artillery, was some years ago engaged in taking magnetic and other observations in the Rocky Mountains of the Hudson Bay Company's territory north of the United States line, and during his residence there made a very valuable collection of birds and eggs, of which an account was published in the London *Ibis*. He has, since then, been almost entirely occupied, without intermission, in explorations of China and Japan, and has added very much to our knowledge of those countries. In the course of his last exploration he went to visit Akis Bay, in the southwestern coast, and thence by land almost entirely along the shore, round the island to Hakodadi. He gives interesting details of the physical features of the island, as also of the inhabitants, who are known as the hairy men, or Ainos, a race entirely different from the Japanese proper, and characterized by a thick growth of hair on the body as well as on the head and beard.—15 *A*, *Feb.* 17, 1872, 212.

EXPLORATIONS OF RICHARD BRENNER IN THE INDIAN OCEAN.

According to Petermann, the exploration of Richard Brenner along the west coast lands of the Indian Ocean, originally undertaken for commercial ends, has been unexpectedly successful, and has also furnished important discoveries in geography. This traveler, after an absence of a year and a half, has lately returned to Germany, and, as soon as the grasp of malarial fever leaves him sufficiently, he expects to prepare a detailed statement of his adventures for the *Mittheilungen.*—17 *C*, x., 390.

BRITISH EXPLORATIONS IN THE PACIFIC.

According to the English *Naval and Military Gazette*, a screw corvette, named the *Challenger*, is to be commissioned by the Admiralty early in the summer for a voyage of exploration and research. This idea was presented by some English naturalists last year as worthy of adoption, and it is a source of gratification to them to learn that the authorities are likely to carry it out. The expedition will probably be accompanied by several scientific specialists, with Captain Nares in command; and it is expected that some years may be employed in the work, and that the research will be especially directed to the vicinity of the islands of the Pacific.—3 *A*, *Feb.* 17, 1872, 137.

NEW HEBRIDES AND SANTA CRUZ ISLANDS.

Lieutenant Markham, of the Royal Navy, has communicated to the Geographical Society of London a paper upon the New Hebrides and Santa Cruz Islands, in the Southwest Pacific, visited by him in the *Rosario* between the months of October, 1871, and February, 1872. The islands lie in a north-northwest and south-southeast direction, and contain some of the most continuously active volcanoes on the surface of the globe. The volcanic cones may be traced in a linear direction for 600 miles. The islands are remarkable for the absence of coral reefs around them, which is attributed by Dana to the destruction of the zoophytes by the heat produced by marine eruptions. Lieutenant Markham ascended the volcano of Gosowa, on the island of Tauna, and watched an eruption from the edge of the crater. During the intervals between the explosions the sheets of liquid fire seemed to flow back to three distinct openings in the bottom of the funnel-shaped crater; masses of scoriæ were hurled up vertically to a height of 1000 feet. The Melanesian (black, curly-haired) and Polynesian (straight-haired) races appeared to be curiously dovetailed in their distribution throughout the northern portion of these archipelagoes.—13 *A*, *June* 15, 1872, 252.

MOVEMENTS OF THE RUSSIAN CORVETTE WITJAS.

The Russian corvette *Witjas*, of nine guns, has lately made quite an interesting voyage. She passed from the Bay Islands in Upolu, of the Navigator group, through the middle of the Pacific Ocean, and its many clusters of islands, directly to Nagasaki in Japan, and in her course entered many almost or entirely unknown bays. Among these was one in New Guinea, where no European had ever been before, and where the inhabitants do not know the use of iron, and are cannibals. Captain Nasimow gave to the bay the name of "Bay of the Grand Duke Constantine."—3 *C*, *November* 17, 1872.

VISIT TO NEW GUINEA.

According to the Sydney *Herald*, the schooner *Surprise* has lately made a visit to the coast of New Guinea, penetrating fifteen miles up the Manoa River. Contrary to the general impression, the natives, who were hitherto supposed to be ferocious in their character and opposed to the visits of strangers, were found to be mild and gentle in disposition. They were of the Malay stock, and had never seen white people before. On the departure of the schooner, under Captain Paget, they exhibited every demonstration of sorrow, the women weeping and the men accompanying the party to a considerable distance.—19 *A*, *March* 2, 1872, 187.

EXPLORATIONS IN NEW GUINEA.

After a long period of comparative immunity from the visits of civilized nations, New Guinea is in a fair way of soon becoming well known, in consequence of the numerous expeditions that have been or are about directing their course toward her shores. A late article in the *Mittheilungen* of Dr. Petermann gives a summary of the more important of these movements, of which we give an abstract. Dr. A. B. Meyer has been engaged in investigating the natural history first of Celebes and then of Macassar. The last advices from the Russian expedition under Von Miclucho-Maclay, of which we have made repeated mentions in our columns, were dated at Astrolabe Bay, in New Guinea, where Maclay expected to remain some months, studying the language and prosecuting his investigations. He found the Papuans very rude, without a knowledge of iron, and almost ignorant of the existence or appearance of Europeans. Into this same bay, to which on modern maps but a slight extent is given, Captain Edar, of the schooner *Emma Patterson*, lately penetrated for two hundred miles without reaching the end, and observed from the interior of the bay very high mountains, which appeared to stretch inland like an Alpine chain.

Another expedition is of Italian origin, under Beccari and De Albertis. This, intended principally for a natural history and commercial investigation, has not been heard from for some time.

Very important results are anticipated from the operations of the London Missionary Society, which has established mission stations at several places on the southeastern peninsula of New Guinea. The missionary reports of Messrs. Murray and Macfarlane, published in the Sydney *Morning Herald* in October, 1871, furnish some very important geographical indications. From Redscar Bay, according to their accounts, is visible a mountain over 13,000 feet in height, presenting a magnificent appearance in the landscape. The natives in that vicinity were found to be a perfectly harmless race, and entirely without warlike weapons.

A Dutch expedition is also said to have been occupied in visiting New Guinea in 1871, partly in the interest of science, and partly for the purpose of watching with jealous eye the anticipated movements on the part of the Australians and Germans in establishing colonies in the island.—17 *C, June*, 1872, 209.

AMERICAN EXPLORATIONS IN THE PACIFIC.

An editorial in the New York *Herald*, written evidently by one who has excellent opportunities of knowing, furnishes some indication of the plans of the Navy Department in carrying out the appropriation of Congress directing a systematic survey of the waters of the Pacific Ocean. The necessity of this has been urged upon Congress for many years by the department, in view of the increasing interests of American commerce, and of the number of dangerous islands and reefs that require a careful survey and record.

Commodore Wyman, Chief of the Hydrographic Office, is now engaged in planning the work, and it is understood that the first effort will be to survey that part of the Pacific running from the coast of Lower California to the northwestern boundaries of the United States, off Alaska and along the Aleutian group of islands, thence southward to the Sandwich Islands. Included in this programme will be the exploration of the Sargasso Sea lying to the westward of the California coast, and also that of the great ocean current known as the Kuro Siwo, to which the north coast of America owes so much of the mildness of its temperature.

After the general survey of the North Pacific it is proposed that the expedition shall return to Honolulu, and thence carefully examine the entire breadth of the ocean, taking belts of latitude of five degrees at a time, and extending the work from the fortieth degree of latitude north to the fortieth degree of south latitude. It is probable that at least ten years will be required for the labor in question, and for which additional appropriations will be needed. We trust that the authorities having this matter in charge will include in the programme of operations a thorough investigation into the natural history as well as the physics of the deeper portions of the Pacific. Within the last five or ten years much attention has been directed to these subjects, and the brilliant results obtained by the British, German, Swedish, Russian, and other government vessels have tended to upset previous ideas, and add vastly to our knowledge. The British government will send out one of its vessels this fall to the same ground for the purpose of deep-sea exploration, and it would be very mortifying if our government, which has always taken the lead in enterprises of this kind, should fall short of the expectations of men of science. Dredges of the most approved character, and every variety of apparatus that has been devised and found useful within the past few years, should be supplied, and trained experts should be invited to accompany the expedition, so as to secure the best possible results. It is not necessary to make voluminous collections of natural history on such expeditions, as the most interesting objects are usually those that can be compassed in a small space, and whatever the Navy Department may do in this direction will be gladly received as an earnest of its sympathy with the scientific movements of the day.

It is, of course, to be presumed that nothing will be omitted in the way of deep-sea thermometers, current indicators, etc., such as belong to the more purely physical portions of the inquiry, as but little additional outlay will furnish the material for completing it in every possible direction.—*New York Herald, July* 2, 1872.

SOUTH POLAR RESEARCH.

We have already presented to our readers an account of the proposed exploration of the south polar region by Dr. Neumayer, of Vienna, and we see by the reports of the Geographical Congress at Antwerp that he brought the subject before that body for its consideration. The Congress promised its hearty concurrence in the plan of the learned doctor, and appointed a committee to devise the best methods of securing the success of this enterprise.—*Mitth. Geograph. Gesellschaft, Wien*, 1871, 438.

SWEDISH NORTH POLAR EXPEDITION.

The Swedish North Polar Expedition, under Professor Nordenskjöld, after various delays, left Tromsö in the iron steamer *Polhem* on the 21st of July. The professor is accompanied by two medical men, a naturalist, an Italian naval officer, a first mate, two engineers, ten picked seamen, and four Lapps for attending the reindeer, from forty to fifty of which, with 3000 sacks of reindeer moss, and other necessaries for wintering in the arctic regions, have been taken by another (hired) steamer, the *Onkel Adam*, to the intended winter quarters. The Swedish government has placed the brig *Gladan* at the professor's disposal till the beginning of winter. This vessel has likewise started from Tromsö, having on board the house in which the party is to winter in the Seven Isles; she will return to Tromsö, and thence take back a second cargo consisting of coals.

The expedition is further furnished with 1545 pounds of photogen, which is to serve as lighting and cooking material on the sledge journey. The house contains six living-rooms (one of which is to be used as a work-shop), in addition to a kitchen, pantry, bath-room, and frost-proof cellar. The expedition has also taken from Stockholm three "observation sheds." It is amply provisioned for two years, and well supplied with warm winter clothes, including complete suits of Lappish clothing for every person in the expedition. On the sledge journey, among other things, concentrated rum, photogen compressed into cakes, sleeping-bags, tents of tarpaulin, and a large sleeping-carpet will be taken. Three boats, weighing respectively 300, 200, and 150 pounds, and specially adapted for ice traveling, with sledges, had been shipped at Copenhagen. To assist the Laplanders in the management and supervision of the reindeer, they have with them five reindeer dogs. Three live pigs also form part of the provisions. The expedition is well provided with the necessary scientific instruments.—2 *A*, *August* 24, 1872, 132.

ARCTIC EXPLORATIONS IN 1872.

As the season for summer explorations in the far North comes to an end, we begin to receive some information as to the results accomplished by the many expeditions that have been fitted out for the above-mentioned purpose. Among the earliest returns is that from the vessel which visited Spitzbergen under Captain Altmann, as communicated through Dr. Petermann. The east coast of Spitzbergen was found to be remarkably free from ice, and safe for navigation; and indeed there were so few obstacles that Captain Altmann was able to visit King Carl's Land, which, although seen at a distance, had never been actually landed upon. This was supposed by him to consist of three large and many smaller islands lying in the throat of the polar stream that pours round Spitzbergen.

A still later announcement from Dr. Petermann contains the result of the investigations by Captain Nils Johnson in the same region as that explored by Captain Altmann.

Captain Johnson sailed on the 8th of May in the twenty-six-ton yacht *Lydiona*, with a crew of nine men, starting from Tromsö, in Norway. By the end of June he had reached a point fifty miles east-southeast of the islands of East Spitzbergen, in the middle of the usual position of the polar stream, which generally carries great quantities of ice toward Spitzbergen and the Bear Islands. It seems, however, that during the present summer this current had a more easterly direction, toward Nova Zembla, leaving the western half of the sea free from ice.

By the 16th of August he had reached 78° 18′ north latitude and 30° east longitude, and shortly afterward came in sight of land, which first appeared on the maps in 1817 as Wiche Land. The captain anchored near the point of this land, in 79° 8′ north latitude and east longitude 30° 15′, for the purpose of exploration and fishing, and for supplying himself with drift-wood, which had accumulated in great amount along the shore. Ascending a mountain near the coast, he soon found that what Captain Altmann had supposed to be three large islands were in reality connected together so as to form a continuous body of land, with several outlying islands. The east and southeast coast of this land was traversed in the course of several successive days, the whole body of water, as far as the eye could see, being wholly destitute of ice. Birds, seals, and reindeer were found in great abundance, and immense piles of drift-wood extended along the coast twenty feet above the highest tidal mark, furnishing important hints in regard to the physical history of that region. Further details are promised by Dr. Petermann in subsequent numbers of the *Mittheilungen.—Circular from Dr. Petermann, October* 10, 1872.

PAYER-WEYPRECHT EXPEDITION.

The latest advices received by Dr. Petermann in regard to the expedition of Messrs. Payer and Weyprecht were dated the 16th of August, when it was near the Bear Islands, in latitude 76° 17′ north and longitude 60° 41′ east. The expedition found immense masses of thick ice, but easily penetrable by steam-vessels. At the date mentioned the expedition was in sight of Cape Nassau, at least 220 nautical miles in a straight line from the ice-barrier in latitude 74.5° north and longitude 48° east, which had been reached on the 25th of July.—*Circular from Dr. Petermann, October* 10, 1872.

RECENT EXPLORATIONS IN THE UNITED STATES.

The various government exploring expeditions have been busily engaged in carrying on the important work intrusted to them; and it will be safe to expect as the result a larger addition to our stock of detailed information respecting the western regions of America than has ever been brought together during a single year. The more important of these parties are the northwest-boundary survey, the geological explorations of Mr. Clarence King along the fortieth parallel, and the surveys of Lieutenant Wheeler in Nevada and Arizona, under the War Department; that of Professor Hayden, in two divisions, under the Interior Department; and that of Major Powell in Colorado, under the Smithsonian Institution.

Among the most thoroughly equipped and elaborate explorations is that of Lieutenant Wheeler, which is now fairly in the field, and engaged in carrying on its work. This has for its object a complete investigation of the region west of the hundredth meridian, for the purpose of determining its geographical position, thoroughly working out its topography, and investigating its geology, natural history, and climatology.

As the basis of this work, it is proposed by Lieutenant Wheeler to divide the region referred to into eighty-five rectangles of equal size, and to mark their corners with great precision, then, taking each one in detail, to determine its astronomical, physical, and natural-history features. This, of course, will require considerable time for its completion; and it is hoped that Congress will grant the necessary authority, so that the work may be accomplished as speedily as may be. As each rectangle is elaborated, it will, of course, join on to those previously investigated; and an index map is to be carried along simultaneously for the more ready understanding of the details. Eight rectangles have been completed by Lieutenant Wheeler in his previous expeditions, and it is expected that thirteen will be finished by the end of the season.

To carry out this programme certain points are to be determined astronomically with great precision, and these as nearly as possible along a continuous parallel. Those already selected are, according to the *New York Herald*, a point near Beaunois, near northwestern Kansas; the crossing of the Union Pacific and the western boundary of Nebraska; Cheyenne; the eastern limit of the survey of the fortieth parallel by Clarence King; Sherman, the highest point on the Union Pacific; Fort Steele; Laramie City; the crossing of the Union Pacific and the western boundary of Wyoming; the crossing of the Central Pacific and the 120th meridian; and a point on the western boundary of Nevada.

Telegraphic determinations of the longitude will be used very freely, and for this purpose Brigham Young has kindly permitted the employment of his well-equipped observatory in Great Salt Lake City. It is proposed to establish a principal station at or near Sherman, the position of which will be determined with the utmost accuracy, and to use this as a point of reference for the other stations referred to. The work of the present season will be carried on almost simultaneously in Utah, Arizona, and Nevada, several divisions of the main party having already been organized and set to work. The southern and southwestern portions of the Salt Lake basin are to be explored; also the mining regions on the Virgin and in Eastern Nevada. It is proposed to establish astronomical points, by means of which to determine with greater accuracy the location of the mineral veins. The Wasatch Mountains will constitute the eastern limit of operations during the year.

The expedition, as organized, embraces the following among the more important of the *personnel:* Lieutenant George M. Wheeler, United States Engineers, in command; Lieutenants R. L. Hoxie and W. L. Marshall, United States Engineers; Dr. H. C. Yarrow, surgeon and naturalist; T. V. Brown, hospital steward and meteorologist; G. K. Gilbert and E. E. Howell, geologists; J. H. Clark and E. P. Austin, astronomical observers; Louis Nell and John E. Weyss, chief topographers; H.

W. Henshaw, assistant naturalist; M. S. Severance, ethnologist; and William Bell, photographer.

At the latest advices the latitude and longitude of Beaver, in Utah, were being determined by Mr. Clark; Mr. Austin being stationed at the Salt Lake City Observatory. Pioche, in Nevada, will be the next point to be occupied. One branch of the expedition, under Lieutenant Hoxie, and accompanied by Dr. Yarrow as naturalist, is exploring the regions west of Great Salt Lake City; while the other, under Lieutenant Wheeler, is surveying the Wasatch and the Sevier River regions east of it. From these main divisions parties are sent out to examine the water-courses and mountain regions of the country traversed. They will all concentrate at Beaver, Utah, about the 1st of October, and proceed together toward the south.

EXPLORATIONS OF WILLIAM H. DALL.

The United States Coast Survey party, in charge of W. H. Dall, arrived in San Francisco on the 20th of September, on the *Humboldt*, after an absence of thirteen months. This time had been chiefly spent in the region between Kadiak and Oonalaska, among the Aleutian Islands. The lowest temperature recorded by him during the past winter was 13°, the average from October to March being 33°.

Notwithstanding a large amount of unfavorable weather and some very severe storms, the party had preserved good health, and been very successful in their work. This comprised general hydrographic notes on the region explored, examination of the tides and currents, meteorological observations, soundings, and reconnoissance surveys of those portions of the district least known. Among the more important results of the work was the determination of ten islands and rocks, fourteen harbors and anchorages (and many minor details), not on any chart; the determination of a great oceanic current, a reflected branch of the great North Pacific easterly stream, which sweeps to the south and west, south of the peninsula of Alaska and the islands, having a breadth of about three hundred and fifty miles; and the discovery of new fishing banks off the southern end of Kadiak.

Geological and zoological researches were carried on by the members of the party during that portion of their time when hydrographic work was impracticable; and though these investigations were entirely subsidiary to the regular work, they were crowned with unexpected success, especially in the departments of botany and geology, and the various groups of marine invertebrates.

These collections, although still but superficially examined, indicate a curious resemblance in some particulars between the fauna of the region visited and that of the Straits of Magellan, a number of forms found being common to both, and not yet discovered in the intervening regions.

SURVEY OF THE NORTHERN BOUNDARY OF THE UNITED STATES.

The detail for the joint survey of the northern boundary of the United States, between the Lake of the Woods and the Rocky Mountains, has been completed, and a party rendezvoused at St. Paul on the 5th of August. The American branch of the expedition consists of Mr. Archibald Campbell, commissioner, with Major Farquhar, chief of the survey; Captain Twining, chief astronomer; Lieutenants Gregory and Green, and four engineer officers, with Professor Clarke and L. Bass, assistants in the astronomical department.

During the present season the survey will probably be occupied on that portion of the line between the Lake of the Woods and Pembina; the precise determination of the latitude of the latter being of great importance, since a conflict of jurisdiction has already arisen in reference to the Hudson Bay Company's post close by. A complete equipment of apparatus has been provided, and every effort will be made to render this work not inferior to others prosecuted under the direction of the United States government. — *Washington Daily Chronicle, July* 25, 1872; *and* 22 *A*, *Aug.* 24, 1872, 175.

EXPLORATIONS OF BECKWITH AND ELDER IN THE BAY OF FUNDY.

Among other explorations made during the present year may be mentioned that undertaken in the upper part of the Bay of Fundy by Captain N. W. Beckwith, of Hantsport, and Professor William Elder, of Acadia College, Nova Scotia. Their labors were prosecuted principally in the Basin of Minas, and consisted in dredging and other investigations in the waters, and in mineralogical examinations of Cape Blomidon and other interesting localities. The promontory of Blomidon, so conspicuous to all who make the voyage by sea between St. John's and Windsor, was ascertained by them to be 1250 feet in height.—*St. John's Telegraph.*

AMERICAN PALESTINE EXPLORATION SOCIETY.

The American Palestine Exploration Society has sent out an expedition under the direction of Lieutenant E. Steever, U.S.A., who will have special charge of the topographical survey, and of the preparation of a reliable map. He is accompanied by Professor John A. Payne, late of Robert College, Constantinople, who will superintend the archæological department, and make what collections he can in natural history and geology; but, being himself especially a botanist, he will devote his principal attention to that branch.

THE LIVINGSTONE RELIEF COMMISSION.

The members of the Livingstone Search and Relief Committee, which had for its object the securing of funds and the institution of measures for the discovery of Dr. Livingstone, lately made a report to the Royal Geographical Society of London. In this it was remarked that the party which left England on the 9th of February reached Zanzibar on the 17th of March, and that, after completing their preparations and securing their escort and goods for their own and Dr. Livingstone's purposes, they crossed to Bagamoyo, on the mainland, on the 27th of April. The very day after three messengers, sent in advance by Mr. Stanley, arrived and announced that that gentleman had found Dr. Livingstone. Lieutenant Dawson, on the 3d of May, called a meeting of the members of the expedition, and stated that, as the objects of the search expedition had been accomplished, it only remained to send supplies to the doctor. He then resigned his command into the hands of Lieutenant Henn, who agreed to lead the relief caravan to Unyanyembe. On the 7th of May Mr. Stanley himself arrived at Bagamoyo, and informed Lieutenant Henn, then in command, that Dr. Livingstone had ample supplies. The command of the expedition was then turned over to Mr. W. O. Livingstone, son of the doctor, who proposed to accompany it with a portion of the stores, the remainder being sold at auction in Zanzibar. Goods and money to the amount of nearly two thousand dollars were thus supplied from the fund. Ultimately Mr. Livingstone concluded that, in view of the severity of the season, it would be inexpedient for him to start through the country, and he returned to Zanzibar, the supplies themselves destined for the doctor being sent off with the party organized by Mr. Stanley for the purpose.—19 *A*, *August* 17, 1872, 171.

NEWS FROM LIVINGSTONE TO JULY 1.

The London journals contain a letter from Dr. Livingstone, addressed to Sir Bartle Frere, and dated at Unyanyembe, July 1. In this he states that the opportunity furnished by the departure of a native to the coast is embraced for the forwarding of his letter, and he proceeds to give a short account of his intended movements whenever the expected supplies of men and material shall have reached him.

His plan embraces, among other projects, that of first visiting Katanga, and then going ten days to the northeast, to extensive under-ground excavations used as places of retreat and safety. In the course of his earlier explorations he reached one of these locations, to which he had been refused entrance. He remarks, however, that it was of sufficient extent to receive the inhabitants of a large district and all their gear. He assigns a high antiquity to the construction of these burrows.

After returning to Katanga, he proposes to go twelve days to the northwest of the head of Lake Lincoln, and then to turn back along Kamalondo.

He expresses his regret that he has been made to appear in a false position to Dr. Kirke, the British consul at Zanzibar, on account of what he had said in reference to the sending slaves as assistants instead of freemen, and that this had been taken to heart by that gentleman, and at the same time he disavows any intention of making any personal allusion.—*Washington Daily Chronicle*, *November* 10, 1872.

VENEZUELAN MOUNTAINS.

The chain of mountains which detaches itself from the ridge of the Venezuelan Andes, near Barquisimeto, presents two great heights near Caraccas. The lower is the Silla of

Caraccas, and was ascended by Humboldt, and its height has lately been ascertained to be 8833 feet above the sea level. The other is the peak of Naiguata, which has been generally considered inaccessible; but in April last it was ascended by Mr. James M. Spence, with a party of friends, among whom may be mentioned Mr. Antonio Goering, the well-known correspondent of the Zoological Society of London. The elevation was determined, by means of an aneroid barometer, to be 9430 feet. Much interesting information was obtained in regard to the structure of the peaks, and various collections of plants and animals were brought back, including several new to the flora of the country. One grass was decided by Dr. Ernst to be new, and was named by him *Chusquea Spencei.*—22 *A*, *August* 24, 1872, 186.

THE IDENTITY OF THE CONGO AND THE LUALABA.

A very important paper has been published by Dr. Petermann in reference to the late discoveries of Dr. Livingstone, having especially for its object to prove that the Lualaba River is identical with the Congo. To this end he discusses the comparative levels of the Lualaba, Lake Tanganyika, and the River Kir, or Bahr el Djebel, which empties from the Albert Nyanza, and incorrectly called the "White Nile," of which it is only one of the main streams. The elevation of Lake Tanganyika is estimated by Dr. Livingstone at about 3000 English feet, while the Lualaba is considerably lower, according to his estimate, or only about 2000, and the Albert Nyanza is from 2500 to 2700 feet. If Dr. Livingstone's estimate of the level of the Lualaba as compared with that of the Tanganyika is correct, it is of course certain that this river can not join the Albert Nyanza; and indeed there is reason to suppose that the Lualaba would have to penetrate a range of high mountains if it emptied into the Albert Nyanza, and through this into the Bahr el Djebel.

Again, the lower level of the Lualaba is against the assumption of its junction with the Tanganyika, even if the explorations by Livingstone and Stanley had not proved that it receives no great river in that direction. The largest of its affluents from the north, the Rusiri, is very shallow, and only thirty yards broad. The idea of the union of the Lualaba with any of the western streams of the White Nile is precluded by the occurrence of the Welle, a river found by Dr. Schweinfurth to run from east to west and northwest. This Welle is supposed not to belong to the system of the Nile, on very good grounds, and there is also reason to believe that it can not be the lower course of the Lualaba.

Another warrant for not admitting the identity of this river with the Nile is found by a comparison of the quantity of water contained in the two rivers. As regards the Lualaba, Dr. Livingstone found that in the dry season the current was one and a half to two English miles per hour, with a great depth. If we estimate the minimum breadth at 2000 yards, the depth eight feet, and the current one and a half miles per hour, we have a volume of 124,000 cubic feet per second for the Lualaba. A calculation of the water found in the White Nile and its tributaries at the same season of the year shows that its volume is scarcely one third as great as that of the Lualaba, from which consideration it is very evident that the latter can not be an affluent of the former.

On the other hand, the Congo possesses all the magnitude which the Lualaba must acquire after receiving the Quango and other tributaries. The estimated flow of this river is 1,800,000 cubic feet per second, its breadth being estimated at 9000 feet, and its depth sixty. It is thus shown to be larger than the Mississippi, which, according to Humphries and Abbot, carries down only a mean of 675,000 cubic feet per second. The Congo collects this water from an area of 800,000 square miles, the Mississippi from an area of 1,200,000.

If we take from the Congo the basin of the Lualaba, there would not remain more than 400,000 square miles, which area would be insufficient to maintain the lowest estimated volume of the Congo, especially as the rain-fall in the interior of equatorial Africa in the rainy season does not exceed fifty-eight inches. For this reason Dr. Petermann concludes that, while the Congo is the only river capable of receiving the Lualaba, so it requires this latter river to account for the enormous volume of the former.—15 *A*, *October* 26, 1872, 532.

EXPLORATIONS OF THE NAVY DEPARTMENT IN THE NORTH PACIFIC.

The arrangements for an extended exploration of the Pacific Ocean by the Navy Department, already referred to in a previous page, have been brought almost to a conclusion, and it is understood that the *Portsmouth*, under Captain Skenett, will leave New York about the middle of November for the scene of operations. The vessel will proceed, with only the necessary stops, by way of Cape Horn, to the the west coast, and will commence her work in the Gulf of California. Two years will probably be spent in the investigation of the hydrography of the peninsula, including the entire gulf region, as also in the exploration of the Revillagigedo group of islands.

A subsidiary object, to receive a due share of attention, will be a general investigation into the physics and natural history of the deep seas and of the adjacent islands. Dr. Street, the surgeon of the expedition, has already distinguished himself as a naturalist and collector in the Darien expedition, and will doubtless win new laurels on the present occasion. The astronomical department will be in charge of Paymaster Tuttle, well known as the discoverer of an asteroid and of a telescopic comet.

The *Narragansett*, now on the Pacific station, has also been detailed for the same service, and will probably refit at Callao for the purpose. There are few portions of America more interesting in a natural-history point of view than that to be immediately explored by this expedition, the Galapagos themselves being scarcely more noteworthy. This is shown by the researches of Mr. Xantus and of Colonel Grayson. The former gentleman spent several years at Cape St. Lucas in the service of the United States Coast Survey and of the Smithsonian Institution, and obtained large numbers of specimens in all branches of natural history, many of which were entirely new to science. Colonel Grayson, in his explorations of Socorro Island, one of the Revillagigedo group, found that, as at Cape St. Lucas, there were many animals peculiar, or unknown elsewhere, most of them being then undescribed. They have, however, lately been published by Mr. George N. Lawrence, in a memoir of the collections of Colonel Grayson.

THE EXPLORATION OF THE CHALLENGER.

We find in *Nature* a more detailed account than has hitherto appeared of the great circumnavigating exploring expedition now being fitted out by the British Admiralty for the purpose of investigating the physics and natural history of the deep seas. The vessel selected is the *Challenger*, a corvette of 2306 tons, to be under the command of Captain Nares, an experienced and accomplished officer. Second in command is Commander J. P. Maclear, son of Sir Thomas Maclear, late Astronomer Royal at the Cape of Good Hope.

The scientific staff of the expedition consists, in the first place, of Professor Wyville Thomson, the director; under him Mr. J. J. Wild, of Zurich, who will act in the capacity of private secretary. The chemist is Mr. J. Y. Buchanan. The naturalists and collectors are Mr. H. N. Moseley, Dr. Von Willemoes Suhm, and Mr. John Murray. The former two will devote their attention particularly to the invertebrates, Mr. Murray taking charge of the vertebrata. The collecting of land and marine plants will be intrusted to Mr. Moseley. An experienced photographer will also form one of the party. A committee of the Royal Society, consisting of the president and officers, together with Dr. Carpenter, Dr. Frankland, Dr. Hooker, Professor Huxley, Mr. Gwyn Jeffreys, Mr. Siemens, Sir William Thomson, Professor Wyville Thomson, Dr. Williamson, and Mr. Alfred L. Wallace, has been formed for the purpose of preparing the necessary instructions.

The *Challenger* is an auxiliary screw-steamer of 400 horse-power engines, and carries two cutters, a steam pinnace, a South Sea whaling-boat, a jolly-boat, two gigs, and a dingy. Stages have been erected amidships, from which the dredges will be worked, and immediately aft of the stages is the steam winding-in apparatus. The fore magazine is arranged for stowing a large quantity of alcohol and of bottles for preserving the specimens. A chemical laboratory and a work-room for the naturalists have been fitted up, and the alcohol is laid on to the work-room by means of a pipe leading from a metal cistern placed in the nettings. Several hundred miles of best whaling-line have been prepared at Chatham for the service of the dredges, of which there will be about forty.

The stores include traps of various forms, harpoons, a harpoon-gun, fishing-tackle of all kinds, trawls, trammels, nets, lobster-pots, etc. Special attention is being paid to all the forms of apparatus required for physical research. Among these, somewhat worthy of notice, is a new deep-sea pressure guage, and an instrument for bringing up samples of water from the bottom. A hydraulic machine will also be carried on board to test with accuracy all the physical apparatus, thermometer, pressure guages, etc. Piano wire will be used for sounding-lines, according to Sir William Thomson's method; and an aquarium will be kept on board to aid in prosecuting the study of the development of interesting animals.

The route proposed, which, of course, may experience some modification hereafter, is to start from Portsmouth about the beginning of December for Gibraltar, making a haul of the dredge in the Bay of Biscay on the way, and thence proceed to St. Thomas, Bermuda, and the Azores; thence to Bahia, and across to the Cape of Good Hope; then southward to the Crozetts, Marion Islands, and Kerguelen's Land. A run as far southward as possible will next be made, and then the vessel will proceed to Sydney, New Zealand, the Campbell and Auckland groups, Torres Strait, New Guinea, and New Ireland. A long cruise, of perhaps a year, will be made among the Pacific islands, after which the expedition will visit Japan for a stay of two or three months; thence go northward to Kamtschatka, whence a run will be made through Behring Straits, and then among the Aleutian Islands, and back through the deep eastern region of the Pacific by Easter Island, and possibly to the Galapagos Islands, and around Cape Horn, and home. The expedition is expected to last about three years and a half.

It is needless to say that, under the auspices of the gentlemen who have charge of this expedition, nothing will be left undone to make it a perfect success; and it is earnestly to be hoped that our own expedition, about proceeding to the Pacific Ocean for a somewhat similar purpose, will not be far behindhand in its preparations. The results of such explorations as those referred to will be looked forward to with interest by the entire scientific community, and will undoubtedly add greatly to our knowledge of the past and present of life upon the globe.

DREDGING IN ICELAND.

An account is given in the *Magazine of Natural History*, by Verkruzen, of a dredging excursion to Iceland, in June and July of 1872. His labors were prosecuted in the Bay of Reykjavik, where he had considerable difficulty in obtaining good boatmen, as the Icelanders were not accustomed to the labor of dredging, and were quite easily fatigued. The list of mollusca obtained, principally at a depth of from twenty to thirty fathoms, embraces eighty-three species; but what astonished Mr. Verkruzen was the absence of species of *Brachiopoda* and *Pecten* (except *islandicus*), *Lucina borealis*, *Cardium edule*, *Dentalium entalis*, and others, so frequently met with in Norway and other northern coasts.

REPORTS OF GERMAN EXPEDITIONS.

The report of the second German north polar expedition, in 1869 and 1870, under Captain Koldeway, is in an advanced stage of preparation, and will shortly be published by Brockhaus, under the direction of the German North Polar Association of Bremen. This will consist, in the first place, of a narrative of the voyages of the *Germania* and *Hansa*, including the thrilling account of the perils to which the latter vessel and her crew were subjected, as also a memoir upon Greenland and its earlier history. This portion of the work will embrace numerous maps and charts, with illustrations of the scenery of East Greenland and of the adventures of the vessel. The second volume will be occupied entirely by a systematic account of the scientific results obtained in astronomy, botany, zoology, geology, meteorology, and hydrography, the geological determinations, geodetic and magnetic observations, all accompanied by suitable illustrations. Among the collaborators of this part of the work are some of the most eminent naturalists in Germany, and it will undoubtedly be of great scientific value. The whole will be comprised in two stout octavo volumes, with numerous illustrations, and it is proposed to furnish the book at the remarkably low price of ten or twelve thalers.

Herr Radde, the well-known traveler in Siberia, has been engaged since 1864 in exploring the Caucasus and the southern part of the Transcaucasus, and he has more recently traversed the eastern bank of the Caspian Sea in Leukoran, and the high plateaus of Armenia and its valleys. He has made some very interesting ethnological discoveries in Mongolia and in the Caucasus, and has visited the so-called grave of Noah, to the southeast of Nachitschewan, which is environed by three thousand tombs of beautiful carved sandstone. At Nachitschewan he found stone hammers of diorite, and oval stones of the same material, with round holes in the centre, used probably as weights to fish nets.

He also ascended the summit of the Lesser Ararat, 5263 meters high, to the top of which the Tartars are in the habit of carrying their dead bodies, in order to have them buried at a sacred altitude.—12 *A, October* 31, 1872, 52.

NICARAGUA SHIP CANAL EXPEDITION.

The expedition, under Commander Edward P. Little, United States Navy, intended to renew the surveys for an interoceanic canal through Nicaragua, is in an advanced state of forwardness, and soon leaves for Greytown. At that point it will disembark, and proceed up the San Juan River to the lake, and afterward Captain Little will divide his force into two parties of about twenty-five men each, for the further prosecution of his labors. Dr. J. F. Bransford will accompany the expedition in the capacity of surgeon and naturalist, and will, it is understood, pay particular attention to collecting zoological specimens. The other officers of the expedition will be Lieutenant-Commander Schultz and Lieutenant Jefferson P. Moser, both of whom have seen service in the Darien expedition.

SURVEY OF THE BOUNDARY BETWEEN ALASKA AND THE BRITISH POSSESSIONS.

General Banks has introduced a bill into Congress to provide for the determination of the boundary line between the British possessions on the Pacific coast and the Territory of Alaska. It contemplates the appointment of a commissioner, a chief astronomer, and a surveyor, to act with officers to be named by Great Britain, together with an assistant astronomer and surveyor, a secretary to the commissioner, and a clerk to the chief astronomer and surveyor, to be appointed by the President. For the purpose of aiding in the demarkation of said line, the President is authorized to direct the employment of the Coast Survey and its officers and vessels so far as he may deem necessary or useful, and he may detail officers of the regular army of the United States for the purposes of the expedition.—*Bill, House of Representatives*, 3254.

OPERATIONS OF THE NORTHWEST BOUNDARY EXPEDITION.

A partial report of operations on the Northwest Boundary Line during the year 1872 has been sent into Congress by Mr. Archibald Campbell, the commissioner. The work commenced at a very late period during the past summer, as the appropriations for the purpose were not available until the 1st of July. It is expected, however, that the portion of the line between the Red River and the Lake of the Woods will be accurately determined and marked. The work of the next season will commence at a point where the Pembina River crosses the boundary. An estimate is presented for conducting the work in 1873 on a large scale, the force available under the present appropriation being entirely inadequate to do justice to it, or to meet properly the corresponding arrangements on the part of Great Britain. A detail from the battalion of engineers is urged by the commissioner as facilitating and economizing the operations of the commission, as well as placing it upon a more equal footing with that of the British commission. It is thought this will enable the commissioner to dispense with an escort of soldiers, whose services would otherwise be necessary.—*Pub. Doc.*

TORREY AND GRAY PEAKS OF THE ROCKY MOUNTAINS.

The twin peaks, known as Torrey and Gray Peaks, the highest of the Rocky Mountains, as far as known (rising considerably over 14,000 feet), were last summer visited by their discoverer, Dr. C. C. Parry (who first ascended and named them in 1862), and by the botanists whose names he attached to them. The occasion was made one of considerable ceremony on the part of the citizens of Georgetown, who were well aware of the scientific reputation of these gentlemen.—5 *D November*, 1872, 709.

MARKHAM ON THE DISCOVERIES OF PAYER AND WEYPRECHT.

Mr. Clements R. Markham makes a communication to *The Academy*, in which he contests the value of the evidence by Messrs. Payer and Weyprecht of an open polar sea, the fact being, according to Mr. Markham, simply a confirmation of a well-known series of observations of the sea between Spitzbergen and Nova Zembla by the Dutch and other navigators.

The polar pack in this part of the arctic seas has usually been found in 76°; but occasionally, when the heavier fields have not drifted down during the summer, vessels have, toward the end of the season, found open water as far north as 82°. Thus Scoresby, in 1806, reached the latitude of over 81°, and Captain Gillis, in 1807, attained the same degree. This is simply because the heavy polar pack had not drifted south as usual, while the looser floes had been cleared away by the unusual prevalence of particular winds.

Mr. Markham also remarks that the true route for polar exploration is not the one taken by Payer and Weyprecht, but up Smith's Sound; and that two well-equipped gun-boats moving in that direction, with officers instructed by men like Osborne, M'Clintock, or Koldeway, would explore all the Greenland coast, reach the north pole, and settle most of these arctic problems in one season. He, however, makes no mention of the movement of Captain Hall in that same direction, entirely ignoring the American polar expedition.—13 *A*, *December* 1, 1871, 538.

RESULTS OF THE BRITISH PALESTINE EXPEDITION.

The first results of the labors of the British Palestine exploring expedition have been received in three sheets of an ordnance map of the country, on the scale of one inch to a mile, based on an accurate trigonometrical survey, including the district between Jaffa and Jerusalem, and the country north of Jerusalem toward Nablous, and embracing an area of 560 square miles. The survey has been already completed over an area of about 1000 square miles, and further sheets may be soon expected.—12 *A*, *November* 14, 1872, 35.

PROFESSOR MARSH'S EXPLORATIONS.

We find in the *College Courant* a detailed history of the late exploring expedition of Professor Marsh to the Rocky Mountains. This consisted, in addition to Professor Marsh, of Messrs. Russell, Hill, Hoppin, and M'Naughton, the party concentrating at St. Louis, and proceeding to Fort Wallace by way of Kansas City. Here they received an escort of eight soldiers, under command of Lieutenant Pope, with army wagons and mules, and started for the Smoky Hill Fork, where they remained twenty-five days. They were surrounded most of the time by immense numbers of buffaloes, one herd being estimated as containing 15,000. The party was principally occupied, however, in collecting fossils, among which were numerous saurians, pterodactyls, and birds.

After returning to Fort Wallace, the party left for Denver, and thence proceeded to Cheyenne, where they found the thermometer fifteen degrees below zero, and with little prospect of an opportunity to prosecute out-door researches. They remained here four days, or until the weather moderated. They left Cheyenne for Crow Creek, in Colorado, and spent seven days there, most of the time in sight of Pike's Peak. This part of their work was not so successful as the first, though they obtained some rhinoceros' teeth, bones of rodents, and numerous fossil turtles.

From this point they proceeded to Salt Lake City, and thence to Green River. The party then divided at Ogden, a portion of it going on to San Francisco, with the intention of coming back by the way of Panama, and the others returning direct to Omaha, and home.—*College Courant, December* 14, 1872, 257.

WHYMPER'S EXPLORATIONS IN GREENLAND.

A recent number of *Nature* contains a communication from Edward Whymper, written in Greenland, detailing the result of his explorations in that country during the past summer. It will be remembered that this gentleman visited Greenland in 1867, but was unable to accomplish the work he had proposed to himself on account of various obstructions. On the present occasion, however, he has been more fortunate, and he has had an opportunity of visiting some very interesting localities. He reports that the season in Greenland has been long and brilliant, that the floe ice disappeared in Umenak Fiord in the middle of May, six weeks earlier than usual, and that men went about in summer attire in April at Godhavn. On the 6th of July, the date of his arrival in the country, the land was covered with flowers, and almost all the snow had vanished from the sea-level up to 2000 feet.

All this would appear to be highly favorable to the operations of Captain Hall and his band of explorers. Mr. Whymper reports having discovered a great valley leading into the interior of Disco. He also ascended one of the highest peaks on the Noursook side of the Waigat, but was unable to discover the lakes given as occurring on Rink's map. He, however, found a large one, which has one or more glaciers coming into it, at a height of 2000 feet above the sea. This valley is the most important one hitherto discovered in North Greenland. The stream traversing it has the appearance of a great river, and not of a torrent. After descending through many windings, a course of at least 100 miles, it pours into the sea a volume of water equal to that of the Rhone at the Lake of Geneva.

At Umenak Fiord he ascended a mountain about 7000 feet in height, taking his theodolite to the top, and making numerous observations. He was enabled to correct the geography of many of the points, and the estimated determinations of the heights. On Hare Island, which has a height of 1800 feet, he collected a large number of fossil plants, and from its summit at midnight he distinctly recognized a mountain, called Sanderson's Hope, near Upernavik, distant 140 miles. The general collections made by him were equal to those of 1867, and there was a greater number of fossil plants than he procured at that time. He obtained a great number of stone implements, and of good quality, and numerous zoological objects.—12 *A*, *November* 7, 1872, 8.

COMMISSION FOR INVESTIGATING THE GERMAN SEAS.

A scientific commission for the investigation of the natural and physical history of the German seas, with its head-quarters at Kiel, has been in existence for several years, and under the supervision of its president, Dr. H. A. Meyer (a brother-in-law of Senator Schurz), has already succeeded in collecting and determining many interesting facts. Dr. Meyer, in reporting the result of this summer's work, remarks that, although the discoveries in general may be somewhat inferior in interest to those of some of the preceding seasons, yet that much progress has been made in accomplishing the objects of the survey. The work was principally performed on board the *Pommerania*, a German government vessel assigned to this duty, and which left Kiel on the 21st of July and returned on the 9th of November, having, therefore, been occupied 111 days. Several harbors of other nations were visited during the cruise for the sake of obtaining provisions and coal.

The equipment was very complete, and included steam apparatus for working the dredge and sounding-line. The weather was very favorable, much more so than in the previous year, although at one time a long-continued wind kept them on the coast of Norway longer than they desired. The dredge was worked in 127 localities, several hauls usually being made in most cases. The towing-net, as also nets dragging at different depths, were also used freely, and numerous specimens of the sea bottom were saved, partly in alcohol and partly dried.

The collections have been intrusted to various specialists in Germany for further investigation. Particular attention was paid to the determination of the gases found in the sea-water; and the services of Dr. Jacobsen were brought into requisition to devise apparatus especially for collecting samples of the water. The surface temperature was noted in 260 localities, and in most instances that at various depths recorded, the whole number of water temperatures taken amounting to 600. Over 500 tests of the specific gravity of the water were taken on the voyage. Meteorological observations were also recorded, as well as the indications of the surface, and of deeply-seated currents. Important facts were obtained from the Norwegian fishermen in regard to the fisheries. They stated that only once in the past century, and at no time in the present, did the herring keep so far from the usually fished portion of the Norwegian coast as in the last winter. On the other hand, an especially productive fishery has been prosecuted within the last year or two between latitudes 66° and 69°. It was thought possible that the fish had changed their breeding ground, although there were no certain data for this opinion.

Reference is made by Dr. Meyer to the fact that, in view of the great importance of its fisheries, the Norwegian government has kept two eminent scientists occupied — Dr. Axel Boeck with the herring, and Dr. Sars with other species.—*Circular d. Fischerei-Verein*, 1872, x., 242.

RECENT EXPLORATIONS ON THE SUPPOSED SITE OF ANCIENT TROY.

The New York *Herald*, with characteristic enterprise, devotes an entire page of its issue of December 21 to an account of the excavations now being made on the supposed site of ancient Troy by Dr. Henry Schleimann. The interest of the article is enhanced by a detailed map representing Troy and its vicinity. Dr. Schleimann remarks that as early as 1868 he commenced his excavations on the heights of Bunarbashi, between the village and the Scamander, not so much in expectation of finding the site of the ancient city as to show conclusively that it was situated elsewhere; but it was not till the beginning of October, 1871, that he commenced work in the locality assumed to be the correct one. He had considerable difficulty in obtaining permission to make the excavation; but the aid of the Turkish government having been invoked, he was enabled to proceed; and, with the aid of eighty workmen, he began by digging a trench, which, when he was stopped by the winter's rains, had attained a length of about seventy-five yards and a depth of thirteen.

In the course of this excavation he found remains of different ages of human history, occurring in strata of comparative regularity. Those of historic times never extended lower than a depth of about two yards. But from this to a depth of five yards there were no stones, and the calcined ruins led him to infer that all the buildings had been of wood. The remains found at a depth of from five to nine yards were characterized by an entire absence of metal, while stone implements of various kinds, fine pottery, and houses built of small stones united with earth, were to him an evidence that the inhabitants were Arians.

Still farther down, to a depth of thirteen yards, the houses were all built of unburned brick, while many copper weapons and instruments were found, although the implements were principally of diorite stone. At a depth of eleven yards he found immense masses of large stones, which he believed to be the veritable ruins of Troy.

In April, 1872, he began his labors again, with a force of one hundred men, which was afterward increased considerably, operations being resumed where he left off the preceding season, and the trench was sunk down to the native rock, which was here found at a depth of about eighteen yards. Having passed through the stratum of large stones before referred to, he began to find remains of what he believed to be the temple of Minerva; and his perseverance was rewarded by discovering various engraved slabs, with finely-inscribed characters, as well as several articles of sculpture of greater or less interest. He subsequently discovered the remains of an immense wall of solid masonry, forty feet thick and twenty feet in height, built on the primitive rock, which he suggests may have been part of the great tower of Ilium, to which Andromache went up to "scan the plain in search of Hector." He thinks this tower may have been at least forty yards high, estimating from the amount of rubbish which forms the slope of one of its sides. Other remains of a period contemporaneous with that of the construction of this tower were very varied, embracing a large amount of pottery, copper nails, and a great variety of stone implements, such as flints, millstones, knives, etc.

Our space does not permit us to repeat the details of this article, all of which are of great interest. We presume that the work will be continued, and that ultimately an elaborate report, somewhat like that of Layard upon Nineveh, will be presented to the public.—*New York Herald, Dec.* 21, 1872.

EXPLORATIONS OF PROFESSOR POWELL IN 1872.

Professor Powell has returned from the exploration of the Colorado River of the West, having completed the examinations of the wonderful series of cañons along the course of this river about the 1st of October last. He then visited a group of volcanic mountains north of the Grand Cañon, composed of about sixty basaltic cones, to which he has given the name of Uinkaret Mountains (the Indian name, signifying "Where the pines grow").

An extensive series of "faults" has been examined by the party this year. These run in a northerly and southerly direction across the Grand Cañon, and north into the plateaus at the head of the Sevier, and some as far as the Wasatch Mountains. They are from 50 to 200 miles in length, and the drop from 100 to 3000 feet. The fissures of these "faults" have been vents for volcanic eruptions, and along their courses vast floods of lava have been poured out and cones built up.

A number more of the ruins of ancient communal houses have been discovered, making, in all, more than a hundred so far found by the party in the valley of the Colorado. One of these was situated on the crater of a volcanic cone.

The collection of picture-writings (etchings on the rocks) has been much enlarged; and the seven ancient towns, called by the Spaniards the province of Tusayan, have been revisited for ethnological purposes.

The professor has also continued his studies of the Ute Indians. He has discovered among them an extensive system of mythology and a great number of rude songs, and brought with him a large collection of articles illustrating the state of the arts among the people who inhabit the valley of the Colorado, composed of stone implements, pottery, basket-ware, clothing, implements for hunting and entrapping animals, musical instruments, ornaments of feathers, bones, teeth, and claws, and various miscellaneous articles.

Professor Thompson remains in the field for the purpose of extending the explorations north, toward the Wasatch Mountains.

The passage of the Grand Cañon in boats was again successfully accomplished this year, but made perilous at one time by a sudden rising of the river during the night. The river came up fifteen feet, and covered a pile of rocks on which the boats had been landed, and the party was compelled to raise them with lines, and hang them against the wall until daylight came.

REPORT OF THE CIRCUMNAVIGATING COMMITTEE OF THE ROYAL SOCIETY.

The Circumnavigation Committee of the Royal Society, appointed to prepare instructions for the use of the expedition of the *Challenger*, has presented a report, which has been transmitted to the Admiralty. The communication is made in considerable detail, and will serve as an excellent basis for operations of a similar character on the part of the United States. After rehearsing the route as planned by the Admiralty, and which we have already given to our readers, the report takes up successively the subjects of physical observations, chemical observations, botanical and zoological observations, and miscellaneous operations.

Under the head of Physical Observations, the points indicated as worthy of special attention are, first, the surface temperatures of the sea, as also of the air; these to be taken regularly every two hours during the day and night. Second, temperature soundings, and the determination not only of the bottom temperature, but also of the intermediate strata. For deep-water serial soundings, those from 250 fathoms down to 1250 are considered desirable, after which the intervals are to be filled up in such details as may seem important. For this the instrument devised by Mr. Siemens is considered especially adapted, although it is to be used in conjunction with the Casella-Miller thermometer, the special object of this being to ascertain how far the two instruments are comparable. It is anticipated that the most important results will be in the Southern oceans.

The determination of the movements of the ocean are to be discussed under the twofold division of surface currents and under-flow, both to be prosecuted by the apparatus already in use by the Admiralty. Tidal observations and bench-marks, the specific gravity and transparency of the water, and the relation of barometric pressure to latitude, are also to be carefully attended to.

Under the head of Chemical Observations, samples of sea-water are to be collected for chemical analysis, and portions of it boiled *in vacuo*, and the amount and nature of the gases ascertained. Specimens of the sea bottom are to be brought up, and carefully dried and preserved for future investigation. The gases contained in the swimming-bladders of fishes caught near the surface and at different depths are also considered worthy of attention. It is thought that determinations of the chlorine in sea-water can be made under ordinary circumstances, but that no trustworthy analyses of gases can be made on board ship, unless in harbor.

The botanical work is to include collections of plants of all interesting localities, and observations upon life, history, and structure in special cases. Certain islands are mentioned in the report, the botany of which is almost unknown. Among those indicated are, in the Atlantic Ocean, Fernando de Noronha, Trinidad and Martin Vaz (off the Brazilian coast), and Diego Ramirez; in the Indian Ocean, the Ammirantes, Socotra, Prince Edwards, the Crozets, and the Marion groups; in the Pacific Ocean, the Marshall and Caroline islands, Masafuera, Pitcairn, Bounty, Antipodes, Emerald, and Macquarie islands.

The indications in regard to botanical research are extremely full and ample, and will doubtless elicit satisfactory responses. The zoological instructions are given in rather less detail, on the ground that the director, Professor Wyville Thomson, is an accomplished zoologist, and has had much experience in marine exploration, and is fully aware of the desiderata.

Under the head of Concluding Observations, attention is invited to the geology of districts hitherto unexplored, the propriety of taking photographs of native races to one scale, and of making the necessary observations in regard to their personal history and past condition. Collections of hairs of the unmixed races are considered to be valuable. Each station is to have a special number associated with it in the regular journal of the day's proceedings, to be noted prominently on every thing connected with that station, so that, in case of labels being lost, or other references failing, the conditions of the dredging or other observations may be easily ascertained by reference to the number in the journal. All specimens procured are to be carefully preserved in spirit or otherwise, and packed in cases with the contents noted. A diary, giving the general proceedings and results of each day, is to be kept by the scientific director, with the assistance of his secretary, and each member of the scientific staff is provided with a note-book in which to enter any observations and proceedings; this to be submitted to the scientific director, who will then abstract the results and incorporate them, to be sent home to the Admiralty at every available opportunity.

We learn that the Hydrographic Office at Washington proposes to reprint this pamphlet for the use of the United States navy.

ARCTIC COMMITTEE OF THE LONDON GEOGRAPHICAL SOCIETY.

The Arctic Committee of the Council of the Geographical Society of London has, it is understood, come to a conclusion in reference to the scene of labor of the proposed British expedition for arctic exploration. They premise that any proper scale of arctic discovery must embrace three essential points: the certainty of exploring an unknown area of great extent, the probability of valuable discoveries in various branches of science, and reasonable certainty of a safe return. As these can only be secured where an extensive coast line is known to exist, the region specially indicated is along the northern side of Greenland and Smith's Sound. Various scientific societies in London have been invited to prepare instructions and memoranda for best serving the interests of which they are the representatives respectively, and it is understood that her Majesty's government is waiting to receive a deputation which shall lay the whole matter before it.—15 *A*, *December* 7, 1872, 735.

EXPLORATIONS OF THE PORTSMOUTH.

The United States exploring ship *Portsmouth*, which has been busily engaged in preparing for her cruise to the Pacific, has finally left for her destination. As already stated, her officers consist of Captain Joseph R. Skerrett, in command; Lieutenant-Commander J. J. Read, executive officer; Lieutenant J. E. Noel, navigator; Dr. Thomas H. Streets, assistant surgeon, together with other officers. She carries a crew of one hundred and thirty-seven men, with twenty-three wardroom officers. The scientific corps of the expedition is to consist of Messrs. Byer and Beardsley, from the Hydrographic Office, Washington, Paymaster Horace P. Tuttle as astronomer, and Dr. Streets as naturalist. The *Portsmouth* will carry three steam-launches for cruising around shoal places. Her armament will consist of four eight-inch guns on the gundeck, one thirty-pound rifled Parrott, two twenty-two-pound howitzers, and two twelve-pound howitzers.

AFRICAN CONGO EXPEDITION.

Dr. Petermann gives an account of an expedition which is now fitting out under the direction of the Geographical Society of Berlin for the purpose of proceeding to the west coast of Africa and exploring the regions to the north of the Congo, with a view of contributing to the solution of the Central African problem. According to Petermann, no more important exploring enterprise could be undertaken than the journey from Loando to the west coast of Africa. An additional inducement to this is the great success that has attended Dr. Schweinfurth's recent explorations, and the fact that Dr. Bastian is now at the head of the movement is an assurance that this labor will be prosecuted energetically, since he himself has acquired distinction in African exploration. In 1857 he proceeded from Loando to Ambassi, or San Salvador, the upper town of Congo, which had not been visited by any scientific traveler since the sixteenth century. The principal object he had in view was to become acquainted with the people and the country sufficiently to carry on an expedition along the Congo River, which he had had in contemplation for a long time.—17 *C*, XI., 1872, 431.

EXPLORATIONS BY PROFESSOR HAYDEN IN 1872.

The very liberal appropriation made by Congress for the United States Geological Survey of the Territories during the Forty-second Session, for the year 1872, enabled the chief geologist to organize two large and well-equipped parties for field work. These parties were each provided with a topographer, astronomer, meteorologist, and geologist, with their assistants, and a number of naturalists. One party, under the immediate direction of Professor Hayden, the chief geologist, took Fort Ellis, Montana, as its initial point, proceeding up the valley of the Yellowstone, over pretty much the same ground as the party traveled the previous season. The survey of this region was completed, with much detail, to the sources. Then the Madison and the Gallatin rivers, with their various branches, were carefully surveyed from their sources to the Three Forks. A map of the region explored will be prepared in contour lines of 100 feet. The second party, under the direction of Mr. James Stevenson, surveyed a route from Ogden, Utah, to Fort Hall, Idaho, where full preparations were made for a pack train, with supplies, to proceed up Snake River. The party passed up the west side of Snake River, and, forcing their way across the mountains, made a careful survey of the little-known Teton Range, then passed up the valley of Henry's Fork, entered the Madison through the Targee Pass, and reached the Geyser Basin of the Madison on the 14th of August. Both parties met in this basin on the same day, though starting from points several hundred miles distant from each other.

The first party descended the Madison River, while the second party explored the Snake River from its sources to Fort Hall. The results of these explorations were most satisfactory, and will prove of great importance to science, as well as of vast practical value to the country.

In making the examination of the region about the sources of the Madison and Snake rivers, it was found that the existing maps were greatly in error. For example, the Madison Lake, which had received its name in the belief that it was the source of Madison River, was discovered to be really the source of Snake River. The lake is about twelve miles long and eight miles wide. From this body of water flows a stream about one hundred feet wide, which at a distance of five miles empties into a second lake, four miles long and one and a half miles wide. The first of these lakes was named Lake Shoshone, and the other Lake Lewis, in honor of the great explorer of the Northwest.

At the upper end of Lake Shoshone a new geyser basin was discovered, containing about 130 geysers, twenty or thirty of which are of the largest size. The ornamentation about these springs was thought to be more interesting and elaborate than those in the Fire-Hole Basin. One of the geysers throws up a column of water seventy feet in height once each day, and continues the watery eruption each time about twenty minutes.

The divide between the Yellowstone Lake and Lake Lewis is 50 feet above the former, and about 200 feet above the latter. From a high mountain above this lake a view was obtained embracing a radius of not less than 150 miles, within which 470 mountain peaks worthy of a name could be distinctly observed. The area which could be swept by the eye from this point could not be less than 50,000 square miles, embracing a variety of grand and beautiful scenery, of mountain and valley, probably without a parallel on the continent. Ten large lakes and many smaller ones were embraced in the view, and the entire Yellowstone Park was displayed to the eye. To the east, the Wind River and Big Horn ranges of mountains, with Fremont's, Union, and Cloud peaks, bounded the view. On the north, the Snowy Range, with Emigrant Peak, and the loftiest peaks of Montana, were readily distinguished. To the west, the Salmon River mountains of Idaho only shut out the view; while to the far south the mountains near Fort Hall and the Wahsatch Range in Utah completed the mighty amphitheatre. This area embraces a large portion of Wyoming, Idaho, Montana, and Utah territories—an extent which will be difficult of belief to any one who is a stranger to the singular purity of the atmosphere in high altitudes.

Much better routes to the National Park were discovered than those of the previous year. From the head of Middle Fork to the main valley of Snake River there is a pass in the range with an elevation of but eight feet above the valley on either side. A wagon road through this pass would make the distance from Market Lake, on the Corinne and Helena stage road, to Yellowstone Lake only 100 miles.

The opening of the Snake River Valley will doubtless prove one of the most important events in the annals of our scientific explorations during the year 1872. The barometrical elevations show most feasible routes for railroads connecting the entire Northwest with the Pacific railroads. It will also open up to settlement a vast territory of land equal to the finest in that section of our country. A railroad up the Snake River Valley from Utah, which is now contemplated, will bring into market a tract of pine timber estimated at 2500 square miles in extent, and a much larger area of grazing and arable lands.

The ascent of the Grand Teton must be regarded as one of the most important events of the season. Thirteen members of the party attempted to ascend the highest peak, and only two succeeded in reaching the summit, Mr. James Stevenson and Hon. N. P. Langford, Superintendent of the National Park. They are undoubtedly the only white men that ever reached its summit; yet there were indications that human beings had been there before them. On the top of the Grand Teton, and for 300 feet below, are great quantities of granite blocks of different sizes. On the summit these blocks have been placed on end, forming a breastwork three feet high, inclosing a circular space six or seven feet in diameter; and, while on the surrounding rocks there is not a particle of dust or sand, the bottom of this inclosure is covered with a bed of minute particles of granite, not larger than the grains of common sand, which the elements have worn off from these vertical blocks, until it is nearly a foot in depth. This attrition must have been going on for hundreds, and perhaps for thousands of years. We may infer, therefore, that these granite slabs were, most probably, placed in their present position by Indians many centuries ago. The height of the Grand

Teton was found to be 13,700 feet, thus making it one of the monarch peaks of the continent. The scenery of the Grand Teton Range is truly Alpine in its character, approaching that type more nearly than any other known in the West.

One of the most interesting and important geographical points in the West is the region of the four passes at the head of Henry's Fork. These passes represent the four points of the compass, and are within a few miles of each other. Henry's Lake is located in the centre. The Targee or East Pass is 7063 feet elevation, and forms one of the great gateways to the Madison Valley, and the sources of the Madison and Yellowstone. Henry's or South Pass is about 6300 feet elevation, and opens into the Snake River Valley. Red Rock or West Pass is 7271 feet elevation, and connects the great valley of the Jefferson Fork; while the Madison or North Pass opens into the lower Madison, with an elevation of 6911 feet.

The remarkable passes, thus linking the Atlantic with the Pacific slope, are so smooth that a carriage could be driven over them at a high rate of speed.

Observations for latitude and longitude were made by both parties every night when possible. As nearly all the nights in summer are clear in this mountain region, the observations have been very numerous, and their value in locating important points, as well as correcting old maps, is very great.

The collections in geology, mineralogy, paleontology, botany, and other branches of natural history, were far greater, and richer in new material, than those of any previous year.

The discovery by Professor Bradley, geologist of the Snake River division, of a higher member of the Potsdam group than had been previously known in the West, was a very important addition to our geological knowledge.

Besides the two parties above mentioned, there have been five smaller parties operating in different parts of the West under the auspices of the Survey. Some differences of opinion appeared to exist among geologists in regard to the age of groups of strata belonging to the cretaceous and tertiary formations of the West, and therefore it seemed desirable to secure all the evidence that would throw any light on these relations. Professor Joseph Leidy and Professor E. D. Cope spent the summer in studying the ancient lake basins in the interior of the continent, which have now become celebrated all over the world for the richness and variety of their vertebrate fossils. These eminent gentlemen were most successful, and obtained a vast quantity of valuable material, which will be embodied in a series of memoirs, illustrated with plates, which will form Vol. I. of the 4to series of final reports.

Professor Leo Lesquereux, our great authority on fossil botany, made a careful study of the coal regions of the West, and procured a mass of valuable information, which will form a portion of Vol. II. on the "Extinct Flora of the West."

Mr. F. B. Meek, assisted by Mr. H. M. Bannister, of the Smithsonian Institution, was engaged for several months along the line of the Pacific Railroad. He procured much evidence from the fossil invertebrata. He is preparing Vol. III. on the "Invertebrate Fossils of the West."

Professor Cyrus Thomas spent the entire season investigating the agricultural resources of the Northwest. He also made large collections in entomology. He has just completed an important memoir entitled "Synopsis of the *Acrididæ* of North America," which will constitute Part I., Vol. V., on the zoology and botany of the survey.

Very valuable collections in all departments were made, which are now deposited in the National Museum.

MARINE ZOOLOGY OF THE BAY OF FUNDY.

In the January number of the *American Journal of Science* Professor Verrill gives a detailed account of the researches prosecuted by him and his associates into the marine zoology of the Bay of Fundy and the adjacent region, in connection with the operations of Professor Baird, United States Commissioner of Fisheries. He remarks that the special subjects to which he and his immediate party directed their attention were: *First*, the exploration of the shore and shallow waters, for the purpose of obtaining the shore fauna and flora, and studying the habits of the animals. *Second*, the extension of similar observations, by means of the dredge, trawl, tangle, etc., into the deepest waters of the Bay of Fundy. *Third*, the determination of the depth and temperature of the waters, and the preparation of lists of the animals and plants in special localities. *Fourth*, to investigate life on the surface of the waters, by means of hand and towing nets. *Fifth*, to preserve the specimens in the best manner, with a view of an exhaustive study of them hereafter, and of distributing series to the museums throughout the country (after the National Museum and Yale College were supplied), this involving the accumulation of large numbers of duplicates, filling many thousands of bottles. *Sixth*, the species of animals which could not be readily preserved for study were to be examined and described while living. Notes of this kind already made amount to over 1000 pages. *Seventh*, drawings were to be made of living animals, especially such as change their form in alcohol. For this object Mr. Emerton, of Salem, was employed, who made more than 164 drawings from living animals. *Eighth*, the relation between the fishes, and the lower animals which serve as food for the latter, was to be borne in mind. To this end the stomachs of a large number of fishes were to be examined, and lists made of their contents. *Ninth*, parasites, both external and internal, were to be collected and preserved for future study. *Tenth*, similar investigations were to be prosecuted on the Georges Banks, on the United States steamer *Bache*, in connection with her regular Coast Survey work.

For this purpose Professor Peirce, Superintendent of the Coast Survey, authorized the Commissioner of Fisheries to place on board two of his associates: at first, Mr. S. I. Smith and Mr. Oscar Harger, and afterward Dr. A. S. Packard, Jun., and Mr. Caleb Cooke, of Salem. All this was in addition to and independent of the researches carried on by Professor Baird and his immediate assistants in reference to the natural history of the fishes themselves.

Professor Verrill remarks in his article that, as the result of these labors, at least 350 species, exclusive of foraminifera and entomostraca, were added to those known before he commenced his researches in this vicinity a few years ago. Many of these are undescribed; but the majority are known from Northern Europe. Four actinoid and three alcyonoid polyps were added to the list. Thirty-eight species of acalephs were added to those previously known from this region; ten species of echinoderms. Ninety-five species of mollusca were also added, 125 of worms, and 100 of crustacea, exclusive of entomostraca and a large number of sponges.

Among the most interesting discoveries was that of a new species of *Octopus*, or cuttle-fish, found at a depth of 60 to 120 fathoms, in the Bay of Fundy.

Of algæ about sixty-five species were enumerated, several of them entirely new to our coast.

A branch of the party was located for a time at Cape Porpoise, on the coast of Maine, and then changed their seat of operations to Grand Manan. This consisted of Professor H. E. Webster, of Union College, Schenectady, assisted by Mr. Charles Pond, and numerous and valuable collections were made by them.

The exploration of the Georges Banks was one of very great interest and importance, and the results accomplished would have been much larger had the steamer been able to give a greater number of days to the work. They succeeded in obtaining one cast of the dredge in 430 fathoms—a deeper water than had ever been reached on our coast north of Florida. This was in north latitude 41° 25′, west longitude 65° 42′. The temperature of the air at the time was 66°, of the surface of the water 65°, of the bottom 51°. In this last case the temperatures were considerably higher than those observed in the Bay of Fundy, where the surface was 48°, and the bottom, about 100 fathoms, was 37½°. Off Cape Sable, at a depth of forty-five fathoms, the bottom temperature was about 35°, and that of the surface 56°.

Very interesting collections were also made on this expedition by means of the towing net, especially in north latitude 42° 3′, west longitude 63° 49′, the temperature of the water at the surface being 72°. The existence of powerful currents in the vicinity of the Georges was determined by the officers of the steamer, and the greatest depth indicated was 1800 fathoms, no bottom being reached on this occasion. How much lower the depth may be in that region it was impossible to determine; but as the work will probably be resumed another season by the Coast Survey, we hope to be placed in possession of the actual facts with all the details.—4 *D*, 1873, V., p. 1.

ARCTIC EXPEDITION OF 1872.

The December number of Petermann's *Mittheilungen* includes an account of seven expeditions for polar research, which, starting out during the year 1872, have already safely returned. First among these is that of Wittscheck to Spitzbergen and Nova Zembla. The article then passes in review the discoveries of Hardemann, Johnson, and Nilsen to the east of Spitzbergen, then the voyage of Leigh Smith and Captain David Gray to West Spitzbergen and East Greenland. The second expedition of Whymper to East Greenland is then considered. In addition to these are mentioned the expedition from America under Captain Hall, and that of Payer and Weyprecht, which expected to pass the winter in the north, as also the Swedish expedition, of which such unsatisfactory news has lately been received. The article concludes by reference to the winter expedition of the *Albert*, which was sent out to the relief of the Swedish party under Nordenskjöld, and to the exploration which Captain Maack proposes to initiate as early in 1873 as possible, with a view of following out a route midway between Spitzbergen and Nova Zembla. —17 *C*, 1872, XII., 457.

THE VOYAGE OF THE HASSLER.

The voyage of the United States Coast Survey steamer *Hassler* from Boston to San Francisco, in 1872, will ever be memorable in the annals of science as carrying a party of investigators, under the direction of Professor Agassiz, who succeeded in making natural-history collections of enormous extent, and in securing a mass of observations on the natural history of the ocean, such as certainly has never before been paralleled in the same space of time—if, indeed, at all equaled by any one expedition. Professor Agassiz's companions consisted of Mrs. Agassiz, Count Pourtalès, Dr. Thomas Hill, Dr. White, Dr. Steindachner, and Mr. James H. Blake. The vessel was commanded by Captain P. C. Johnson, with Messrs. Kennedy and Day as lieutenants.

The *Hassler* left Boston on the 4th of December, 1871. The first observations of much interest were made upon the gulf-weed, with its well-marked varieties, distinguished by differences of stem and leaves. Large collections were secured of the hydroid communities inhabiting the Sargassum, and also of the small fishes, crustaceans, and other animals finding shelter within its branches. There was no reason to suppose that the Sargassum originates as a floating plant. On the contrary, all the masses found, however large, bore marks of having been torn from some attachment. An account has already been given of the nest of the fish *Chironectes*, built of gulf-weed, and obtained during this voyage.

The first port, St. Thomas, was reached on the 15th of December. Here were made very large collections of both marine and land animals—fish, corals, sea-urchins, star-fishes and ophiurans, crustaceans, shells, lizards, snakes, toads and frogs, insects and birds. From this port alone were shipped eleven barrels and boxes of specimens. The next collecting ground was Barbadoes, where the first casts of the dredge were made, and with remarkable success. The collections forwarded from this port were not so large, but were, perhaps, more interesting than those of St. Thomas. The fauna upon the shoals off the islands of Barbadoes strangely resembled that of a past geological time. The *Comatulæ*, pedunculated *Crinoids*, *Pleurotomariæ*, *Syphoniæ*, and *Cnemidiæ* found upon these shoals recalled forms which belonged especially to the mezozoic ages. This dredging was also rich in corals, sea-urchins, star-fishes, and ophiurans, and in a great variety of beautiful and rare shells. In some notes of Count Pourtalès, he says of this same dredging: "December 29th and 30th, off Barbadoes, about six miles north of Bridgetown, numerous casts of the dredge were taken in depths varying from 17 to 120 fathoms, with very rich returns in mollusks, crustaceans, echinoderms, polyps, and sponges. Many of them were new to science, others either very rare or of much interest on account of their geographical distribution. *Pleurotomaria* is an example of the former, *Asthenosoma*, *Heraiophorus*, *Rhizocrinus*, and other echinoderms, of the latter. Deep-sea corals were obtained in considerable quantity, but none appear to be identical with those of the North Atlantic; they seem also to differ more from those of Florida than would have been expected."

Between Barbadoes and Brazil there was little opportunity for observation, except upon the motions of the flying-fish, the habits and appearance of the *Physalia*, etc. But at about a day's sail south of Pernambuco an interesting dredging in 500 fathoms was made, from which was obtained, besides other specimens, a living shell closely allied to the *Pecten paradoxus*, as described by Goldfuss. Another cast about 45 miles east of Cape Frio, in 45 fathoms, gave a new crustacean singularly like the ancient trilobites. With reference to temperature off the coast of Brazil, Count Pourtalès's notes give the following details: "Off Macayo, Brazil, January 17th, in lat. 90° 45′ S., long. 35° W., the surface temperature was 80.5°; at 100 fathoms it was 67°; at 485 fathoms, 44.5°; at 556 fathoms (a few miles farther west), 42.5°. In lat. 11° 49′ S., long. 37° 10′ W., surface, 80.3°; at 613 fathoms, 39°. A number of dredgings were taken in the same parallel, but nearer shore, with moderate success." He adds that subsequent "casts of the dredge were taken at various points along the east coast of South America and in the Straits of Magellan, but almost always in depths less than 50 fathoms, where temperature presented no particular interest."

A delay of three weeks at Rio de Janeiro interrupted the work at sea, but advantage of it was taken to make large collections from the market of Rio de Janeiro, and from the neighboring rivers and brooks. The most valuable contribution to science made there, however, consisted in preparations of large numbers of fish-brains, both marine and fresh-water.

The next port was Montevideo. Entrance to the city was prevented by quarantine, but an opportunity was presented of studying glacial phenomena on a hill in the harbor, where a landing was permitted. Here were found erratic material of an unquestionably glacial character, and other evidences of glacial action. Indeed, the most striking fact of all is that the hill itself is a true "roche moutonnée."

On leaving the Rio de la Plata, February 22d, the dredge was dropped in some seven fathoms, and came up laden with valuable specimens. Among other things, this cast gave a large voluta, and the egg of a voluta (of which many afterward were found belonging to different kinds of volutas), many olivas, renillas, crustaceans, and echinoderms. It is not important to record all the dredgings; they were frequent—sometimes very remunerative, sometimes the contrary. One dredging of especial value for its rare mollusks and echinoderms was taken off the mouth of the Rio Negro.

The next point of great interest was the Gulf of San Mathias, at the head of which is the so-called Port San Antonio. The collections made in this region were large and various; among other treasures, an interesting accumulation of tertiary fossils is recorded. The cliffs were largely composed of them. The original programme had included a reconnoissance of the rivers Negro and Santa Cruz, and a visit to the Falkland Islands, where Professor Agassiz especially desired to inspect the so-called "rivers of stone," believing that they are of glacial origin; but the circumstances of the vessel and the lateness of the season made it important to proceed with haste, and this part of the scheme was reluctantly relinquished. No other point was visited between the Gulf of San Mathias and the Straits of Magellan, though a cast of the dredge was made off the Gulf of St. George, which was rewarded with some superb star-fishes of immense size (astrophyton, or basket-fish), besides other valuable specimens.

The vessel rounded Cape Virgins on the 13th of March, and made its next anchorage at Possession Bay. Accounts of the work in this region have already been published in Professor Agassiz's reports. The most important results obtained in this locality were Count Pourtalès's discovery that Mount Aymon is an extinct volcano, with a very perfect centre, and forming the nucleus, as it were, of a cluster of smaller volcanoes, and some geological observations less striking by Professor Agassiz, which, however, it is not important to detail at present.

Three weeks were passed in the Straits of Magellan and in Smythe's Channel, the vessel anchoring at the close of each day. The zoological results throughout this region were very satisfactory. Large collections—chiefly marine, of course—were made; but the glacial phenomena were here even more deeply interesting than the fauna. From the character of the drift, and the constant presence of erratic materials, evidently quite foreign to the soil, and recurring along the Patagonian coast throughout the Straits of Magellan, and, as was afterward found, high up on the Chilian coast; from the glacier-worn surfaces on the two sides of the Straits as compared with each other, and on the walls of Smythe's Channel, it was evident that there has been a movement of ice from the south northward, preceding all local glacial phenomena, the latter being, indeed, only the remnant of the former.

Leaving Smythe's Channel, the *Hassler* kept along the coast to the southern end of Chiloe Island, making a run up the Gulf of Carcorado, in the hope of passing through the Archipelago of Chiloe. As the vessel was without charts, however, the captain feared to attempt the inside passage, and, after making some collections in Port San Pedro, she returned to the open sea, and reached San Carlos de Ancud, at the northern end of the island, on the 8th of March. Here was found again the erratic material of the Straits and of the Patagonian coast, resting upon the breccia of Ancud, showing the chronological relation of the volcanic formations of this region to the glacial phenomena.

From San Carlos the ship proceeded without pause (except at Tola for coal) to the Bay of Concepcion. A fortnight was spent here, and at no point were fuller or more valuable collections made. From Concepcion Bay the *Hassler* went to Juan Fernandez; but, as it was desirable to see something of the geology between the coast and the Andes, a journey to Santiago was made by land. The observations here confirmed previous impressions as to the glacial phenomena. There was very little evidence of local action proceeding from the Andes; but the whole Chilian valley lying between the Coast Range and the Andes proved to have been modeled in a south-northerly direction by ice. The valley is, in short, a glacier bottom. At Valparaiso the vessel was rejoined. The following are some notes from Count Pourtalès concerning temperatures, etc., based upon soundings, etc., taken on his voyage to and from Juan Fernandez: "In the Pacific Ocean soundings were taken between Talcahuana, Chile, and Juan Fernandez. The hundred-fathoms' line was found to be about 35 miles off shore. At a distance of 52 miles the depth was 1006 fathoms. In lat. 35° 30′ S., long. 75° 11′ W., the depth was 2410 fathoms, temperature 35°; mud and fragments of a delicate sponge were obtained by the lead; but the dredge-line, having been damaged by dampness, parted when hauling up. About 2 miles north of Juan Fernandez, surface temperature 61°; at 377 fathoms, 41.5°; at 656 fathoms, bottom temperature 61°. The dredge brought up only a few small stones. About 3 miles off the N.W. corner of the same island the depth was 1144 fathoms, bottom temperature 36°. The dredge brought up nodules of clay, pebbles, worm-tubes, and a small isis. About 25 miles north of the island a depth of 2214 fathoms was found, with a bottom temperature of 36°; bottom of reddish mud. The dredge was lost again, with a large quantity of line. On the way from Juan Fernandez to Valparaiso, a cast of the lead was taken in lat. 33° 33′ S., long. 77° 2′ W. Depth, 1585 fathoms; bottom temperature 36°; fine white globigerina mud. The hauling up of the line took more than six hours, on account of the constant precautions needed to prevent it from parting. Further attempts were thereafter given up."

From Valparaiso the expedition proceeded up the coast, touching at all the principal points, and collecting every where. One of the richest collecting grounds was Parraca Bay, where the fauna was of astonishing richness and variety. The geology was also exceedingly interesting, and the thanks of the explorers are due to Lieutenant Murray Day for a very detailed map of the drift formation in that region.

From Payta the vessel's course was to the Galapagos, where she arrived on the 10th of June, and remained until the 19th, touching at Charles's Island, Albemarle, St. James's, Jarvis's, and Indefatigable islands. The zoology of these islands was intensely interesting, not only from the peculiar character of the fauna, but also from the physical conditions in which it occurs—all these islands being of such recent volcanic formation as to preclude the idea of a migration of animals from the main-land, and their subsequent adaptation to new circumstances. The collections at the Galapagos were exceptionally large. Iguanas, both marine and terrestrial (the two species of *Amblyrhynchus* first made known by Darwin), fishes, crustaceans, lizards, birds, seals, turtles, besides a great variety of mollusks and radiates.

From the Galapagos, the *Hassler's* course was to Panama, where she arrived on the 25th of June. A detention of three weeks was turned to profitable account by industrious collections. The loss of the greater part of the dredging apparatus between Juan Fernandez and Valparaiso had, indeed, made dredging in deep waters impossible, but it served as a stimulus to more energetic efforts to collect in shoal waters, along shore, and on land.

Acapulco, the next port, was reached on the 4th of August. Several days were here consumed in making additional collections; two days also were passed in drawing the seine in Magdalena Bay. From Magdalena Bay the vessel sailed directly to San Diego, which port was reached on the 15th of August. In the Bay of San Diego the collections were largely increased. Here, and, indeed, all along the coast from Valparaiso northward, were found many specimens of cetaceans and selachians. A large number of cestracions alone were secured. Leaving San Diego on the 25th of August, the expedition reached San Francisco on the 31st, and, though the voyage ended here, Professor Agassiz remained in San Francisco for some weeks, for the purpose of completing collections formerly made for him in this region. Both there and in Sacramento, with the aid of friends, he succeeded completely in his object.

It would be impossible at present to give more than a very vague and imperfect idea of the extent and value of the collections derived from this voyage, as the work of unpacking has but just begun. The number of barrels and cases, however, forwarded to Cambridge during the ten months' absence of the voyagers was 265—almost a barrel a day. It would have been simply impossible to have collected on this scale but for the cordial assistance rendered the explorers by the captain and officers of the ship, and, under their direction, by the men, who were always cheerfully ready for the work of the seine and dredge. Dr. Hill and Dr. White, physicists of the expedition, when not engaged in their own duties, were prompt to assist in every way. Dr. Hill made also a valuable and admirably-preserved collection of marine plants, gathered at every anchorage where time was allowed for landing. All details respecting the special work of the chemical and physical departments under the charge of Dr. Hill, ex-president of Harvard, and Dr. White, of Philadelphia, can be obtained by application to these gentlemen, or to the Superintendent of the Coast Survey.

Professor Agassiz's special party for zoological work consisted of Count Pourtalès, Dr. Steindachner and Mr. Blake. Count Pourtalès, while sharing in all the general work of the expedition, had especial charge of the dredging operations. Dr. Steindachner, although an admirable collector in all departments, was especially engaged in the care of the ichthyological collections. His great knowledge and untiring industry made his assistance invaluable; indeed, without him the comprehensive scheme for collecting which had been planned could not have been carried out. Mr. Blake had special charge of the mollusks, and his time was chiefly employed in the drawing of perishable specimens. As an accurate summary of the zoological collection can not be given, a slight sketch of the general scheme alluded to above is appended, that its significance as a whole may be understood.

In the first place, the endeavor was made to collect as many specimens of the same species as possible, in every stage of growth and every condition of development, in order to ascertain the range of variation in each species. The second object was to learn the boundaries of the different faunæ, especially along the Pacific coast, from the Straits of Magellan to California. In this was included, wherever it was possible, the fishes from the rivers on the western slope of the continent for comparison with those of the eastern; this part of the plan, however, it was difficult to execute, because Professor Agassiz had not the means of collecting in his own hands. During the whole journey care was taken to have made large numbers of anatomical preparations of such parts of marine animals as can rarely be well studied from alcoholic specimens. The most valuable of these preparations were those of fish-brains.

It is hardly necessary to add that the great opportunity for scientific investigation afforded by the voyage of the *Hassler* is due to the liberal policy of the Superintendent of the Coast Survey, who is ever ready to combine the larger interests of science with the special work of the survey, where it can be done without detriment to the latter. It is proper to state, however, that the means for making the zoological collection were contributed by gentlemen of Boston, who raised nearly $20,000 for the purchase of alcohol, jars, and other apparatus for collecting on a large scale, and for charges of freight in forwarding the specimens from foreign ports. The latter charges, however, were comparatively small, owing to the liberality of both railroad and steam-ship companies, of the commanders of our naval forces in various ports, and of the captains of vessels employed upon whaling voyages or in private mercantile enterprises.

EXPLORATION IN CENTRAL AMERICA.

General Banks has introduced into the House of Representatives a resolution instructing the Secretary of the Navy to make an examination and survey of that section of the American isthmus which lies between Valencia Point and the Changenola River, on the Atlantic side, and the Boca Chica, the Rio Pedrigal, and the upper part of Golfo Dolce, on the Pacific side. This is to include an examination of the intervening country, of the two cordilleras, and exploration of the courses of the rivers from their outlets to their sources, within the above limits, for the purpose of ascertaining the possibility of such a connection as may be feasible for the construction of an interoceanic canal.

ROHLF'S TRAVELS IN AFRICA.

An appendix to Petermann's *Mittheilungen*, recently published, contains the report of the journey of Gerhardt Rohlfs through North Africa, from Kutha to Lagos, and is illustrated by two maps, executed in the usual elegant style of every thing emanating from the establishment of Justus Perthes. The paper contains valuable additions to the general subject of the geography, physical character, and meteorology of Africa. Dr. Petermann states that a second German expedition (that of Buchholz, Lühder, and Reichenow) is at present occupied in moving from the Gulf of Benin northward into the country covered by the present report.

POWELL'S REPORT.

The report of Major Powell of his survey along the Colorado of the West, during the year 1872, has just been printed by Congress, and embraces as its most striking feature an account of a remarkable series of folds and faults in the earth's strata, of the highest interest to the geologist. Numerous practical results of value are recorded, especially the discovery of coal, salt, and metals. Very large collections of special ethnological interest were gathered. An appropriation of $20,000 is asked for by the major to continue the work during the current year.

G. GENERAL NATURAL HISTORY AND ZOOLOGY.

GRANDIDIER ON THE ZOOLOGY OF MADAGASCAR.

M. Grandidier, the well-known explorer of Madagascar, and one to whom we owe so many novelties in natural history, has lately published in the *Revue Scientifique* an abstract of his experiences in the island. He calls especial attention to the animals of the country, both recent and fossil, remarking upon the peculiar forms of quadrumana, such as *indris*, *lemurs*, *chirogales*, etc. The fossil vertebrates are not less interesting. Among these he mentions a small hippopotamus found in the quaternary sands of the south coast, and the *Æpyornis*, of which three species have been detected among the specimens brought by him, and submitted to Professor Edwards for examination.

He calls attention to the remarkable fact, which is also adverted to by Hartlaub and Edwards, of the absence of any species of woodpeckers, and the presence of black parrots, in which, as well as in some other matters, there is a close analogy between the faunas of Madagascar and of Australasia, and little or no relationship to that of the adjacent continent of Africa. Indeed, Professor Edwards is of the opinion that at some period, geologically not very remote, Madagascar and New Zealand must have been united by land which is now below the surface of the ocean, the close relationship between the *Æpyornis* of Madagascar and *Dinornis* of New Zealand rendering this very evident. He finds a source of congratulation to the inhabitants of Madagascar in the entire absence of venomous serpents, none of the comparatively few species of snakes having poisonous properties.—8 *B*, *May* 11, 1872, 1083.

VISIT OF ABBÉ DAVID TO THIBET.

Among those who have devoted themselves to making collections of natural history in foreign countries few have been so successful as the Abbé David, of Paris. This gentleman, in the course of the last few years, has been so fortunate in exploring certain portions of Western China and elsewhere as to find large numbers of new and remarkable forms of mammals, reptiles, birds, etc. Among these may be mentioned a deer, called after him *Elaphurus davidi*, a new species of *Sieboldia*, or giant salamander, etc. He has now been commissioned anew by the Museum of Natural History of Paris, and has started for Thibet with the purpose of carrying on scientific researches.—1 *B*, *Jan.*, 1872, 239.

FULFILLMENT OF THE PREDICTIONS OF PROFESSOR AGASSIZ.

Some of our readers may remember the letter written by Professor Agassiz to Professor Peirce in December, 1871, just before starting upon the *Hassler* expedition, in which he announced beforehand the general nature of the discoveries that he expected to make. His ability to make these predictions with any degree of certainty was much questioned by those who were not familiar with the method of research in natural history, and of the almost mathematical nature of the inferences to be derived from certain given premises.

We now have a second letter addressed to Professor Peirce, written at Pernambuco on the 16th of January, giving an account of experiences up to that date, which go far toward showing that the professor really knew of what he was speaking in the first instance. Owing to various adverse influences, among them the necessity of hastening with all possible dispatch to reach the Straits of Magellan at the earliest possible date, only four hauls of the dredge were made in water of any great depth, those being at depths of from 75 to 120 fathoms off Barbadoes. The results of these were in the highest degree satisfactory, however, "the extent and variety of material obtained being enough to occupy," in the professor's words, "half a dozen competent zoologists for a whole year, if the specimens could be kept fresh for that length of time."

As anticipated by the professor in the letter referred to, the most interesting discoveries were certain forms of animals, the allies of which had previously been known in greater part or entirely as fossils of older formations. Among these may be mentioned a remarkable sponge, a crinoid very much like *Rhizocrinus*, a living *Pleurotomaria*, only three having been previously known, although a great many are described as fossil, etc. The crinoid, especially, is one of the very few living representatives of what was originally the prevailing character of the marine fauna of the silurian and other epochs; and while now they occur only in the very deepest water, they were formerly found crowded in the shallower seas. The inquiry, therefore, suggested itself to the professor as to the reason of this difference, and he makes the suggestion that in the progress of the earth's growth we may look to such displacement of conditions favorable to maintaining certain low types as may recall most fully the adaptation to former ages, and that the deeper waters of the present constitution of our globe possibly approximate the conditions of animal life in the shallow seas of former ages as nearly as any thing can, in the present order of things on the earth. The depth of the ocean alone, he thinks, can place animals under the high pressure which the heavier atmosphere of the earlier period afforded. But as such pressure can not be a favorable condition for the development of life, it is to be expected that the lower forms only will occur in the deep seas.

Other causes acting in the same direction are the decrease of light in the greater depths, the smaller amount of free oxygen, the reduced amount and smaller variety of nutritive substances, etc. He does not think, however, that facts warrant the conclusion that any of the animals now living are lineal descendants of those of the earlier ages, nor that we may justly assume that the cretaceous formation is still extant, notwithstanding the similarity of forms. It would be just as true to nature to say that the tertiary period is exhibited in the tropics on account of the similarity of the miocene mammalia and those of the torrid zone.—*Letter to Prof. Peirce.*

PROFESSOR AGASSIZ'S PROPHECIES.

The prophetic announcements of Professor Agassiz in regard to the discoveries he *intended* to make during his proposed deep-sea dredgings in the southern waters continue to be realized, as we learn from a letter to Professor Peirce, dated at Rio on the 12th of February last. The weather had not been favorable for dredging for some time; but, a suitable occasion presenting itself, the work was prosecuted for one day, with very interesting results.

The first discovery mentioned by the professor was that of a living *Pecten*, very similar in general appearance to a fossil form known as *P. paradoxus*, found in Germany, and which he had been inclined to consider a distinct genus, on account of certain peculiarities which are not shared by any living shells known up to this discovery. The specimen found is, however, strictly referable to the same genus as the *paradoxus*, especially as it has the same prominent radiating ribs arising on the inner surface of the shell valve, to which the fossil is indebted for its specific name. Although of very small dimensions, being scarcely two thirds of an inch in diameter, it is yet a specimen of very great significance.

The second discovery was that of a very remarkable crustacean, and is, in part, the realization of the expectation of finding "genera reminding us of some amphipods, and isopods aping still more closely the trilobites than *Serolis*." A specimen answering fully to this statement was taken in forty-five fathoms, and at first sight seemed like an ordinary isopod, with a broad, short, flat body. This, however, is not referable to any of the orders or families of Milne-Edwards or Dana, and, for reasons adduced, it has very striking relations to the trilobites, and is, indeed, like them, one of those types combining the structural features of several independent groups. It resembles the trilobites in the fact that the head is distinct from the thoracic regions; and the large faceted eyes and the facial suture across the cheeks connect it so closely that but for the presence of antennæ, which project from the lower side of the anterior margin of the buckler, the resemblance would amount to an absolute identity in structure with the trilobites. The character of the mouth is also that of the trilobite, while the antennæ cause its reference to the isopod. For this new genus the name of *Tomocaris peircei* is proposed.—*Letter to Prof. Peirce.*

SMITH ON TOMOCARIS PEIRCEI.

Professor Smith, of Yale College, in discussing the announcement by Professor Agassiz of a remarkable new crustacean (*Tomocaris peircei*) discovered off the coast of Brazil, states that, from the description, it is evidently congeneric, if not identical with the *Brongniartia trilobites* of Dr. James Eights, described many years ago, and since referred to the genus *Serolis.*—4 *D*, *May*, 1872, 373.

MIXTURE OF BRACKISH AND MARINE FAUNAS.

It is an interesting fact in marine zoology that where organic masses are in the process of decomposition in the sea a true brackish fauna makes its appearance. This has lately been shown in the Bay of Messina, such a fauna having arisen in a locality where large quantities of refuse are thrown into the sea, and forming a striking contrast with that of the surrounding area. It is suggested that this fact explains the sudden appearance of brackish shells with marine ones in the same deposit, and accounts for the fact that, with a very few exceptions, all coal-beds contain representatives of a brackish fauna.—13 *A*, *March* 1, 1872, 94.

SALE OF WOMBWELL'S MENAGERIE.

The celebrated traveling menagerie known as "Wombwell's" was recently sold by auction at Edinburg, Scotland, when large prices were realized by some of the more remarkable animals. The chief purchasers were agents for the zoological gardens in London, Manchester, Bristol, and Paris, Mr. Jamrach, the well-known dealer in wild beasts, the proprietor of Van Amburg's traveling menagerie, and a few private individuals. The sale produced between fourteen and fifteen thousand dollars.

MEMOIRS OF THE CAMBRIDGE MUSEUM.

The valuable series of illustrated catalogues of the Museum of Comparative Zoology at Cambridge, Massachusetts, has lately been increased by the addition of two numbers; one upon the immature stages of the *Odonata*, by Lewis Cabot, and the other on the *Ophiuridæ* and *Astrophytidæ*, by Theodore Lyman.

The first-mentioned work is restricted to the sub-family *Gomphina*, although the history of the remaining five families of the *Odonata* is promised in their succession. The riches of the museum in this group of insects are shown in the fact that, while two species only were known previously, seventeen are here described—eleven from America (four of these from South America), three from Asia, and three from Europe. Specific determinations were made by Dr. Hagen, the well-known entomologist connected with the museum. A series of three well-drawn plates illustrates the book. The work on the *Ophiuridæ* is a supplement to an elaborate catalogue by Mr. Lyman, published about six years ago, and includes many additional species, especially some forms obtained in the deep-sea dredgings off the Florida coast. The work, like its predecessors, is intended to include the literature of the subject to date, in addition to descriptions of new species actually exhibited in the Museum of Comparative Zoology.

MARINE AQUARIUM AT BRIGHTON.

The great marine aquarium at Brighton was formally opened to the public on the 12th of August, on the occasion of the meeting of the British Association for the Advancement of Science at that place. This establishment is the largest and best appointed of its kind in the world, and has been planned with the sole object of presenting the wonders of the sea in the most complete and attractive manner possible. The building is 715 feet in length, with an average width of 100 feet. Its front consists of five circular-headed arches, connected by terra-cotta columns. The exterior of the aquarium is highly ornamented, and presents a very striking appearance. The interior is arranged with a view of furnishing accommodations of ample extent for all the varieties of marine life likely to be brought within its inclosures. The aquarium proper is divided into three corridors, the first subdivided into nineteen bays, and covered by a groined roof of brick. Its extreme length is 220 feet, broken by a central square 55 by 45 feet, in the centre of which is to be placed a terra-cotta fountain of elegant design. Fourteen tanks are ranged on each side of this corridor, varying in dimensions from 55 by 30 feet to 11½ by 20 feet. The largest of all, which occupies the whole north side of the square, is over 100 feet in length, capable of accommodating a whale of considerable size. The front of the tank is composed of Portland stone, ornamental iron, and heavy plate glass, secured by water-proof cement.

The second corridor is 80 by 23 feet. It has no tanks, its main purpose being to serve as an approach to the conservatory, the first corridor, and the terrace. The third corridor is 23 feet wide and 160 feet long, and contains twenty tanks, some to be used with fresh and some with salt water. The conservatory is also 160 feet long, 40 feet wide, and 30 feet high; is intended as a lounge and resting-place, and is ornamented with a great variety of marine plants and small aquaria. A series of shallow tanks is to be erected on the north wall for the purpose of illustrating the culture of salmon. The whole basement of the building is occupied by reservoirs for the storage of sea-water, which is pumped up as required into the tanks, and an arrangement has been devised by which a constant circulation of the water is kept up.

The work on this aquarium was commenced in July, 1870, the first brick laid February 2, 1871, and the entire cost of the work was $250,000. It is under the direction of Mr. John Keast Lord, well known by workers in science, both in America and Europe, as an excellent practical naturalist, and as having added much to our knowledge of the zoology of Northwestern America. While in this country he occupied the position of naturalist to the British division of the Northwestern Boundary Survey, and published a work upon the natural history of Vancouver's Island and British Columbia, based upon an extended collection made by him, and now deposited in the British Museum. He has been lately engaged in explorations in Egypt, Arabia Petræa, and the Red Sea, where he has gathered large quantities of scientific objects. He has been for some time closely connected with *Land and Water*, and has contributed many articles upon deep-sea fisheries, etc., to that paper.—22 *A*, *August* 10, 1872, 123.

ZOOLOGICAL OBSERVATORY AT NAPLES.

Recent letters from Dr. Anson Dohrn speak of the continued progress and success of the great zoological station at Naples, and of the generous assistance afforded to it by the Italian government. Mr. W. A. Lloyd, the director of the aquarium at the Crystal Palace, Sydenham, has been instructed by the directors to proceed to Naples, to offer what assistance he can to Dr. Dohrn.

RECEIPTS OF THE BERLIN AQUARIUM.

As an illustration of the success which generally attends well-conducted zoological gardens and aquaria, we may state that, although quite recently organized, the receipts from 216,000 visitors to the aquarium at Berlin for the year 1871 amounted to $40,000.

SEA-SERPENT.

Nature quotes from the Natal *Colonist* the following account, by Mr. Cobbin, of Durban, of a "sea-serpent" seen by him, which we give for what it is worth: "During my late passage from London I saw no less than three sea-serpents, but an account of the last will suffice. On the 30th of December last, on board the *Silvery Wave*, in latitude about 35′ 0″ S., and longitude 33′ 30″ E., at 6 20 P.M., solar time, an enormous serpent passing nearly across our bows compelled the alteration of our course. He was at least one thousand yards long, of which about one third appeared on the surface of the water at every stroke of his enormous fan-shaped tail, with which he propelled himself, raising it high above the waves, and arching his back like a land snake or a caterpillar. In shape and proportion he much resembled the cobra, being marked by the same knotty and swollen protuberance at the back of the head on the neck; the latter was the thickest part of the serpent. His head was like a bull's in shape, his eyes large and glowing, his ears had circular tips and were level with his eyes, and his head was surmounted by a horny crest, which he erected and depressed at pleasure. He swam with great rapidity, and lashed the sea into a foam, like breakers dashing over jagged rocks. The sun shone brightly upon him, and with a good glass I saw his overlapping scales open and shut with every arch of his sinuous back, colored like the rainbow.—12 *A*, *June*, 1872, 130.

DISCOVERY OF A PREHISTORIC CORPSE.

In digging up a peat-bog in Holstein, not long since, a human body was discovered, almost entirely preserved, and belonging to a period at least as remote as the beginning of the Christian era, if not earlier. It lay in an outstretched position, with the belly upward, with one arm thrown over the breast, and had a wound in the forehead which probably was the cause of death. It was clothed in a garment of twilled woolen material, with broad sleeves, and over it a tunic composed of pieces of sheep and calf skin sewed together. The sewing, especially that of the belt, indicated no inconsiderable degree of skill.

The body was of the male sex, and in a good state of preservation, although of a dark color, in consequence of saturation by the acids and tannin matter of the peat. The skin and muscles, under the microscope, exhibited their original condition, although the intestines seemed to have mainly disappeared. The bones were blackish-brown, light, but generally of firm consistency, with the exception of the skull bones, which were so soft and distorted as to prevent a satisfactory investigation of their character.

An important feature of this object consisted in the horizontal wearing or abrasion of the teeth, which, in Europe, is said only to occur in skulls found in the graves of the Stone period, thus proving the great age of the body. While the dress seems to indicate an antiquity about equal to that of the Christian era, the teeth would carry it considerably farther back. The body has now been thoroughly dried, and will be preserved in the Museum of Antiquities at Kiel.

A second body was subsequently obtained, not far from the locality in which the first was discovered, at a depth of two and a half feet. This was in a poorer condition of preservation, and nothing is said of the nature of the dress.—*Corr. Blatt. d. Gesellsch. Anthropol., etc.*, 1871, 29.

PREHISTORIC BEADS.

Dr. Rau, the well-known ethnologist of New York, has made a communication to the German Anthropological Society in regard to the occurrence of *Coscinopora globularis* upon the island of Rügen. These are small globular fossils of the Chalk period, with a central axis of a softer material, which sometimes rots away, or is removed artificially, allowing them to be strung like beads. The diluvial strata of Amiens, in which, as is well known, very ancient flint implements, as well as the bones of extinct animals, occur in profusion, also embrace a number of these stony objects; and it has been suggested that they were gathered by the men of the Mammoth epoch as ornaments, since their accumulation in particular places is much greater than can be ascribed to any geological conditions. Dr. Rau is quite inclined to accept the idea that these "Rügen pearls" were gathered purposely by the early race and used for decorations.—*Corr. Blatt. d. Gesellsch. Anthropol., etc.*, 1871, 31.

A NEW BONE CAVE IN GERMANY.

Messrs. Escher von der Linth and Desor, at the last meeting of the Association of Swiss Naturalists, made a communication upon the discovery of a new bone cave in the Swabian Alps by Professor Fraas, a gentleman who has already made important discoveries in regard to the deposits of Primitive Man in the moraines of the old glacier of the Rhine, near Schussenried, in Upper Swabia. The cave itself, known as "the Hohlenfels," is one of the largest and best known in the Swabian Alps, and is reached through a passage-way of about ten feet in height and twelve in width. After penetrating one hundred feet it opens into a wide chamber, formed by a magnificent arch about fifty feet high, the bottom of this hall being covered with a layer of stone fallen from the roof, and under this a stratum of black mould, partly resulting from the dung of bats, with which it is infested by thousands. Beneath this there is a second stratum of stones, and under these the red ferruginous and moist clay, which incloses immense numbers of fossil bones. This has been carefully investigated in the interest of the Natural History Museum of Stuttgart, and the collections made will doubtless in time furnish an important feature of this extensive museum.

The remains hitherto discovered embrace, among others, a number of bones belonging to a huge cat allied to the lion, and of gigantic dimensions. There was also an antelope allied to one described from the diluvium of Puy-de-Dome; two species of oxen, one very small and the other very large—the aurochs; three kinds of bears, a horse, and the bones of many birds. Bones of the reindeer, the rhinoceros, and the mammoth also occurred. No human bones have yet been found, but numerous traces of the abode of man in the cavern have been detected; among these are numerous bones which have been split and crushed for the purpose of extracting the marrow. Some of the horses' teeth are perforated, apparently for the purpose of use as ornaments. Fragments of pottery occur also in considerable profusion, together with various forms of flint and bone implements.

The antiquity of these remains undoubtedly dates back to the Ice period; but Professor Fraas maintains that it also extends into the end of the Tertiary period, which may involve the assumption that man occupied the cave at the time when Central Europe had not received its present configuration. However this may be, we have here a primitive race, living exclusively by the chase, without a single tame animal, not even a dog. Subsequently the race vanished from Middle Europe, probably retreating, with the reindeer, to the arctic regions, while their giant contemporaries, the mammoth and rhinoceros, ceased to exist.—7 *C*, 1871, 665.

NEW LACUSTRINE VILLAGES ON LAKE BIENNE.

Nature records an interesting archæological discovery which has recently been made on the shores of the Lake of Bienne, in Switzerland. The Swiss government has been for a long time endeavoring to drain a considerable tract of land between the two lakes of Morat and Bienne, but, in order to do this effectually, it has been found necessary to lower the level of the latter by cutting a canal from it to the Lake of Neufchatel. At the beginning of the present year the sluices were opened, and the waters of the Lake of Bienne allowed to flow into that of Neufchatel. Up to the present time the level of the Bieler See has fallen upward of three feet, and this fall has brought to light a number of stakes driven firmly into the bed of the lake. This fact becoming known, a number of Swiss archæologists visited the spot, and it was decided to remove the soil round these stakes to see whether any remains of a lacustrine village, which they suspected had been raised upon them, could be traced. At a distance of between five and six feet from the present bed of the lake the workmen came upon a large number of objects of different kinds, which have been collected, and are at present under the custody of Dr. Gross, of Locrass. Among them are pieces of cord made from hemp, vases, stags' horns, stone hatchets, and utensils used apparently for cooking. The most precious specimen is, however, a hatchet made of nephrite. This hatchet is sixteen centimeters long by seven broad, and is by far the largest yet discovered in any part of Switzerland, no other collection having any measuring more than eight centimeters in length. A quantity of the bones found at the same time have been sent to Dr. Uhlmann, of Münchenbuchsee, and he finds that they belong to the following animals, viz., stag, horse, ox, wild boar, pig, dog, beaver, goat, mouse, etc., together with a number of human bones. If the level of the lake continues to sink, it is hoped that further discoveries will be made, and the scientific world in Europe is waiting the result of the engineering operations with keen interest.

MAN IN THE POST-TERTIARY OF HUNGARY.

According to a communication to the Geological Society of Hungary, the remains of a man, associated with post-tertiary remains of mammalia, together with a stone hammer, have lately been discovered in the loess deposits of Hungary, in the neighborhood of Brüx, in Bohemia. These were in nearly a complete condition. The cranium strongly resembles in its characteristics the well-known fragment from the Neanderthal, although differing in certain peculiarities mentioned in the article. The skeleton was found lying with the head raised, in a sand-bed of diluvial age, at a depth of two feet from the surface.—13 *A*, *Feb.* 1, 1872, 54.

PERFORATION OF FOSSIL SHARKS' TEETH.

Mr. J. Charlesworth has exhibited to the Geological Society of London some sharks' teeth from the crag (pliocene) formation, bearing marks of having been bored by a sharp instrument, which Professor Owen and others considered as possibly due to human agency.

PRESERVATION OF MEGALITHIC MONUMENT AT AVEBURY.

The great megalithic monument at Avebury, in Wiltshire, one of the most remarkable in England, has been purchased by that indefatigable archæologist, Sir John Lubbock, to preserve it from threatened destruction.

LACUSTRINE REMAINS ON LAKE LEMAN.

A new discovery of lacustrine remains has lately been made on the borders of Lake Leman, in the Gulf of Condrée. Here the piles occupy considerable space, and appear equal in extent to the settlement at Morges, which faces it on the opposite shore. This locality seems to appertain to the Bronze age, all the implements hitherto detected being of that character, nothing of stone having been discovered.—22 *A, March* 9, 1872, 239.

BRITISH STONE IMPLEMENTS.

A very important scientific work has just issued from the press in England, "The Ancient Stone Implements, Weapons, and Ornaments of Great Britain," by Mr. John Evans, F.R.S., Honorary Secretary to the Geological Society of London, one of the first authorities in every thing relating to prehistoric archæology. It contains a complete history of all finds of this description yet made in Great Britain.

DISCOVERY OF A VIKING BOAT IN NORWAY.

It is well known from Scandinavian traditions, as also from the evidence of the sagas, that during the last centuries of paganism, constituting the Viking period, or the earlier Iron Age (700 to 1000 B.C.), deceased sailors were frequently buried in their boats, and a tumulus heaped over them. This has been verified by the occasional discovery, in Norway and Sweden, of tumuli containing boats, which, however, in nearly every instance, were so much decayed as to furnish very little information in regard to their mode of construction.

Quite recently, in excavating a tumulus in the parish of Tune, near the town of Fredriksstad, the timbers of a boat were brought to light, and this fact being communicated to the Society for the Preservation of Norwegian Antiquities, the disinterment was prosecuted with the greatest caution. The lowest layer of the tumulus proved to consist of stiff potters' clay, and the upper of different kinds of earth. The portion of the vessel imbedded in the clay was preserved almost perfectly, that above it being almost entirely decayed. The central portion was in the best condition, as there the clay was thickest, the extremities being considerably injured. On removing the surrounding earth the remaining timber proved to be quite firm and hard, most of the nails being undamaged and still holding their places. The boat was clinker-built, of oak, and put together with iron nails; only the ribs and the wooden nails found in some places were made of fir. The keel, which consists of a single piece of wood in good preservation, is forty-three and a half feet in length, and the boat was probably fully thirteen feet in width, and not more than four feet in height from the keel to the gunwale, and with both ends pointed.

The vessel must have been low and flat, and probably unfit for stormy seas. It was prepared for using both oars and sails, the remains of a mast being still very evident. The work was executed with great care, and the vessel must have been quite elegant in its time. All the boards are ornamented with mouldings, both inside and out, and there were carved ornaments to be seen on the upper side of the ribs.

No small implements were seen except the rudder, which was made of fir, the blade being four feet seven inches long and ten inches wide. At the top of the stern is a square hole for the tiller, standing perpendicularly on the flat side of the blade.

The body of the owner of the vessel was buried in the space just behind the mast beam, the spot being indicated by small flat wooden blocks sunk in the clay, and laid in a square alongside of the boat and across it. With the human bones were associated the bones of a horse, accompanied by a few colored beads, some cloth compactly rolled together, the fragments of a saddle, part of a snow-skate, etc.

It was inferred from the bits of cloth that the body was buried in its clothing, with the horse, saddle, and snow-skates by its side. The article from which we borrow this account states that this is the only vessel extant from the Viking period, so far as known, and the most ancient that has been preserved, with the exception of one in Denmark. The vessel and the articles found in it have been taken to Christiania and added to the collection of Norwegian antiquities belonging to the university.—*On an ancient Vessel found in the Parish of Tune, Christiania*, 1872.

REMARKABLE CAVE SKELETON.

According to a late Paris paper, the Natural History Museum of that city has added to its collection an extraordinary skeleton, supposed to be the remains of a cave inhabitant. This is five feet eight inches in height, the arms being of immense length. The chest bones are enormous, and the skull, which suddenly recedes from the root of the nose, leaves scarcely any forehead visible, while the back of the head is large and perfectly square. It is possible that this paragraph refers to the skeleton the discovery of which, at Laugerie-Basse, was lately announced to the Academy of Sciences in Paris. This was obtained in carrying on excavations at a great depth in one of the caves inhabited by the human race during the Reindeer period.—2 *A*, *April* 27, 1872, 286.

HUMAN SKELETON FROM A CAVE OF THE REINDEER PERIOD.

It is well known that human bones have been seldom met with in superficial deposits of the Reindeer period, although the bones of animals used as food by man occur in great abundance. Quite recently, however, in excavating a celebrated cave deposit in Laugerie-Basse (Dordogne), numerous objects of great interest were obtained, among them remarkable sculptures, representing animals, etc., together with implements and utensils. The work was more or less interrupted by the occurrence, all through the earth floor of the caves, of enormous blocks of the rock, which appeared to have fallen from the roof. In removing one of these for the purpose of the better examining the subjacent earth, a skeleton was found, evidently that of a person who had been struck down by the falling block and pinned there beyond the power of his fellows to rescue him.

A careful study was made of the surroundings of this skeleton, and about twenty shells of different species were found immediately about it. These were distributed in pairs along the body, two pairs in front, one near each humerus, four in the region of the knees, and two upon each foot. These were all pierced, and seemed to have been affixed as ornaments to the clothing, which had entirely rotted away.

The bones occurred about twelve feet below the surface of the earth of the Reindeer period, beneath a layer of rocks which, during the whole pre-quaternary period, must have resisted every attempt to remove them, so that there can be no doubt as to the great antiquity of the bones.

A detailed description of the skeleton is promised by the gentlemen who found it, Messrs. Massenat, Lalande, and Cartailhac. It is reported that this presents some extraordinary peculiarities, shortly to be discussed.—6 *B*, *April* 15, 1872, 1060.

THE CAVE-SKELETON OF LAUGERIE-BASSE.

M. De Mortillet, in an article upon the human skeleton lately found in the Reindeer cave of Laugerie-Basse, in Dordogne, refers to the accompaniment of certain shells, of the genus *Cypræa*, or cowry, belonging to two different species, one of them found only in the Mediterranean, and the other occurring on the Atlantic coast of France. This, in his opinion, shows clearly that the Reindeer people must have had relations with the Mediterranean to enable them to secure these objects of adornment. He thinks, too, that it is incorrect to call the cave-dwellers "troglodytes," inferring thereby that they lived exclusively in such localities. He rather inclines to believe that they only occupied the caves during the summer seasons, being nomadic more or less, and spending a considerable part of the year possibly in a different climate.

He is also of the opinion that it is improper to use the term "Reindeer people," since there have been discovered in certain caves near Menton, on the borders of France and Italy, remains evidently of precisely the same age as those of France, but where no reindeer bones are to be met with, and showing conclusively that in this region the reindeer did not occur. He proposes, therefore, to replace the vague term of "the Reindeer period" by the more rational one of "the epoch of the Madelaine," a nomenclature that he has himself adopted in the arrangement of the specimens in the Museum of Saint Germain. M. De Mortillet also thinks, contrary to the assertion of some writers, that the climate of the Mediterranean, even in that period, was much the same as it is at present, and very different from that of the Atlantic slope of France, this difference being shown by the animal remains. Thus, on the western side there occurred the reindeer, the saiga antelope, the chamois, and the ibex, all of them animals belonging to cold regions, and none of them met with on the southern side. It is, therefore, not very astonishing if we find the man of the Madelaine period going north in the summer to hunt the reindeer, and returning in the autumn to the shores of the Mediterranean to enjoy the milder climate.—8 *B, May* 4, 1872, 1069.

HUMAN SKELETON FROM MENTONE.

We not long since gave an account of the discovery of a remarkable human skeleton found at a depth of twelve feet in the earth of a cave of the Reindeer period, in Laugerie-Basse, Dordogne, France, and we now have a notice by Rivière of a skeleton of about the same age found in a bone cave near Mentone, in Italy, on the 26th of March last. The cave itself had been frequently explored in the interest of archæology, numerous interesting specimens having been discovered of marine and lacustrine shells, various bones, bone implements, teeth and jaws of cave bears and pachyderms, ruminants, etc., etc. The skull was covered with numerous perforated shells of the genus *Nassa*, as also with certain perforated teeth of the deer. A pointed bone implement was laid upon the skull, and behind it two flint arrow-heads. The bones had maintained their shape tolerably well, although somewhat distorted by the superincumbent pressure.

Around the skeleton were various implements of unpolished flint, an awl, the incisor bones of oxen, deer, pig, etc., and various shells.—6 *B*, *April* 29, 1872, 1205.

CHIPPED FLINTS IN INDIA.

At a late meeting of the Asiatic Society of Bengal a collection of chipped flint implements was exhibited by Mr. Blanford, found about forty miles west of Bhadrachalan, on the Godavery. The forms of these implements were those most frequently found in the French gravels, and varied in length from three to five inches. The place where they occurred was in a dense jungle, and the implements had evidently been chipped from pebbles.—12 *A*, *Dec.* 14, 1871, 131.

NEPHRITE AXE FOUND ON THE AMOOR RIVER.

In making an excavation on the banks of the Amoor River, a stone axe of nephrite, or jade, and beautifully finished, was found at a depth of about three feet. This fact is the more interesting as it bears upon the question in regard to the celebrated stone-tipped arrows which were used by the primeval inhabitants of Mantchooria as late as the twelfth century. It was with arrows winged with eagles' feathers and tipped with nephrite points that this people paid their tribute to

China while they were under its dominion. The precise locality of nephrite in Mantchooria is unknown, although it is stated by some to have been on a mountain to the northwest of that country.—1 *C*, I., 1872, 16.

EXPLORATIONS ABOUT JERUSALEM.

The explorations about Jerusalem are bringing to light a number of interesting objects, among them a fragment of a basaltic slab with Phœnician letters upon it, and another containing two large Phœnician inscriptions. A portion of this exploration is in charge of Rev. H. B. Tristram, a gentleman well known both in Europe and the United States as an ornithologist and traveler of great eminence. This gentleman, with some companions, was recently taken prisoner by the Arabs, and some £600 demanded and obtained for their release.—15 *A*, *March* 9, 1872, 310.

THE TANIS STONE.

A good deal of attention has been excited among Egyptologists by the comparatively recent discovery in excavations made at Tanis, on the eastern or Pelusiac branch of the Nile, of a trilingual stone, somewhat of the character of the celebrated Rosetta stone, but much more perfect, and believed to be of about two hundred and fifty years greater antiquity. This, which is now deposited in the Museum of Egyptian Antiquities at Cairo, is a perfect stela, about six feet high, two and a half feet broad, and one foot thick, the summit being arched.

The inscriptions cover one entire face and most of one side; hieroglyphics occupy about three fifths (the upper portion) of the face, and the Greek version the remainder, while the Demotic translation covers scarcely more than two thirds (the upper part) of the left side. The letters are small, closely crowded, and all perfect and sharply cut, the stone not having been defaced in the slightest degree. In the extent and perfection of the inscriptions, it is, therefore, much superior to the Rosetta stone. Casts of this have been recently taken to supply the museums of London and Berlin, and a third was obtained, through the instrumentality of the Rev. Dr. Lansing, for Monmouth College, Illinois. At the request of Dr. Lansing, and through the liberality of Dr. Wallace, president of the college, this cast of the stone, forming three large slabs, on reaching New York was forwarded to the Smithsonian Institution, in order that a mould might be taken from which to supply copies for the museum of the Institution.

According to Dr. Seyffarth, of Dansville, New York, who has paid particular attention to the Tanis stone, one of the most important results of his critical study is that the idea of Champollion, that every hieroglyphic text consists half of symbolic figures and half of pure letters, like the Hebrew, without any signs for syllables, is erroneous, and that, on the contrary, the hieroglyphic writing is syllabic, each figure expressing the two or three consonants which the name of the figure contains. Thus the owl, which in Coptic is called mulak, expresses the word melek—king, both words containing the same consonants. This idea, suggested by Dr. Seyffarth in 1826 from the study of the Rosetta stone, is, in his opinion, entirely confirmed by the critical study of the Tanis stone.—5 *D*, *Oct.*, 1871, 664.

WAY COLLECTION OF EGYPTIAN ANTIQUITIES.

The announcement, a year or two ago, of the purchase by an American of the celebrated Hay Collection of Egyptian Antiquities, at the time on exhibition at the Crystal Palace in London, created quite a sensation in England, in view of its intrinsic value, and the desire which had been manifested to procure it for the British Museum.

In the increasing rarity of objects of this kind, resulting from the great demand on the part of national museums throughout the world, it is believed quite unlikely that such a collection will again be brought together. Its richness in mummies, objects in bronze, marble, alabaster, etc., together with those of smaller size usually found in Egyptian tombs and elsewhere, is very great. While this collection does not embrace many statues or immense sarcophagi, it is believed to be equal to any in the completeness of its series of the smaller objects of religious and domestic Egyptian antiquity, and not inferior to the best collections of Paris, London, Berlin, or Leyden.

It was purchased by Mr. Samuel A. Way, of Boston, removed to that city, and offered to the Museum of Fine Arts, under certain conditions, which the directors did not think best to accept. At the death of Mr. Way, however, it passed into the possession of Mr. Charles Granville Way, himself an artist of merit, who has in turn offered it to the same establishment without condition other than that it is to be kept in a room by itself, and to be called the Way Collection. This stipulation was gladly agreed to, and the collection accepted by the trustees, and its treasures will doubtless before long be opened to the public.—*Boston Advertiser*, *June* 29, 1872.

GERMAN CENTRAL MUSEUM OF ETHNOLOGY.

Several months ago we announced to our readers the offer for sale of the celebrated ethnological collection of the late Dr. Gustavus Klemm, of Dresden. This cabinet had obtained a world-wide celebrity from its richness in illustrations of dress and ornaments, household utensils, furniture, warlike, fishing, and hunting implements, etc., extending from the earliest times down to the immediate present. It was in the market for a long time, and could have been purchased for $10,000; and it is a matter worthy of great regret that it was not secured to the United States. We now learn that this collection has been purchased by subscription, and transferred to Leipsic, where it forms the nucleus of the new German Central Museum of Ethnology, and around which is to be grouped whatever additional material can be procured in illustration of the general plan. An earnest appeal is made by the officers and others interested in this enterprise to their countrymen and others in the United States for contributions, and we doubt not this will be responded to liberally. It will occupy the place in Germany of the great Archæological Museum of Copenhagen; of Mr. Blackmore at Salisbury, in England; of the Museum of St. Germain, near Paris, under direction of M. Mortillét; and of the Smithsonian and Peabody Museums in the United States.—*Circular.*

STRANDING OF A JAPANESE JUNK ON THE ALEUTIAN ISLANDS.

As an illustration of one way in which distant and uninhabited lands may become peopled by the human race, it is stated that during the past summer a Japanese junk, which was dismasted and had lost its rudder in a typhoon off Jesso about the beginning of 1871, and was driven about by the wind and currents for nine months, finally came ashore on the island of Adahk, one of the Aleutians, where the crew were rescued by a hunting party of natives, and subsequently sent down in the schooner *Johnson* to San Francisco. They had burned up their deck for fuel, and had only fifteen pounds of rice left, were without instruments excepting a compass, and had no chart. This is only one of a number of cases of similar character, giving some plausibility to the hypothesis that the Aleutian Islands and the northwest coast of North America were originally peopled in this way from Japan.—*Letter.*

EDUCATIONAL MOVEMENT AMONG THE JAPANESE.

Much interest has been excited in the United States and England by the movement among the Japanese looking toward the introduction of the English language and its literature into the Japanese empire; and it has even been stated that there is a possibility that our mother tongue may in time become their national language. The principal difficulty in the way of this desirable consummation lies in the peculiarities of the English language, and the number of irregular verbs characterizing it, as also the want of uniformity in its pronunciation. The idea has been suggested of forming an improved English language for the benefit of our Oriental friends by making all the verbs regular, and improving the orthography. Should this be carried out, it is not impossible that the reform may be in time adopted by ourselves.

The choice of a new language by the Japanese lies, it is said, between the English and the German, and the selection of the latter is warmly urged by the Germans. Indeed, that language appears to be quite a favorite one in Japan, as attested by the existence of an extensive German book-store there doing a large business, and by the establishment of quite a number of schools for teaching the tongue.—17 *C, June,* 1872, 229.

ESQUIMAUX SETTLEMENTS IN EAST GREENLAND.

Herr Pausch, a member of the late German polar expedition, recently made a communication to the German Anthropological Society in regard to certain abandoned habitations of the Esquimaux in East Greenland. He remarked that at each of seven different points they found three stone houses, some of them certainly over one hundred years of age. These were winter huts, the remnants of their summer abodes being indicated by stone rings. In many places there were indications of stone graves, and from the skeletons found in them tolerably well-preserved crania were obtained, agreeing with the Eastern Esquimau type as described by Virchow, and exhibiting the carnivorous habit in the highest degree. Remains of wood carving, tolerably well executed, occurred with the dead bodies, and in the heap were found bone knife-handles, harpoons of bone, arrow-tips, and even knife-shaped pieces of iron, probably obtained from the English expedition of 1823.—*Correspondenz-Blatt der Deutschen Gesellschaft. für Anthropologie, etc.*, 1871, 35.

RINK ON THE ESQUIMAUX.

At a meeting of the Anthropological Institute, a paper by Dr. Rink "On the Descent of the Esquimaux" was presented to the society. In this the author attempts to show from traditional and historical evidence that this race is thoroughly American, and not Asiatic in its origin, as some ethnologists have maintained.—15 *A*, *April* 27, 1872, 530.

RELATION OF INDIANS TO GAME IN THE NORTH.

Dr. Rae responds, in *Nature*, to a communication in that same journal referring to the death of 3000 Indians from smallpox in the Saskatchewan district during the past year. The most valuable portion of the traffic of the Hudson Bay Company with the Indians in that region is in the skins of the marten, or Hudson Bay sable, and the doctor calls attention to a well-known relation between martens, rabbits, and Indians. The rabbits of the country, *Lepus campestris* of Bachman, have varying periods of abundance, increasing for a number of years, and then becoming suddenly attacked by an epidemic which carries them off in immense numbers.

When most numerous they are preyed upon by the martens, which collect about the haunts of the rabbits in great abundance, and the Indians flock to the same region; and while finding ample sustenance from the rabbits, set their traps for the martens, the skins of which they secure. The natives, therefore, have plenty to eat, and can obtain all they need otherwise than by trading their peltry. Whenever the rabbits become scarce, however, the martens do not congregate, and the Indians have no fixed points at which to establish themselves for the season; and being reduced to very great straits for lack of food, are then obliged to depend upon fishing, or hunting the buffalo, deer, or other animals.—12 *A*, *January* 25, 1872, 240.

USE OF THE BOOMERANG BY AMERICAN INDIANS.

It is a fact not generally known among ethnologists that the Indians along the Colorado River and elsewhere in Arizona and California make use of an instrument shaped almost precisely like the Australian boomerang. This instrument, as used in Australia, consists of a flat piece of wood, bent with one or two gentle curves nearly in the same plane, and generally with a slight twist. It requires great skill to use this weapon with effect, but the Australians perform great feats in knocking down and killing objects of the chase with it. The American boomerang, however, lies more commonly in one plane, instead of being slightly twisted, and is principally used by the Indians in killing rabbits, in which they acquire very great skill.

Specimens of this implement, obtained from the Yuma Indians by Dr. Edward Palmer, are in the ethnological department of the National Museum at the Smithsonian Institution. —*San Francisco Bulletin*, *June* 21, 1872.

DWARFED HUMAN HEAD.

Among the more interesting collections lately received by the Smithsonian Institution, in the department of ethnology, is a mummied human head, retaining all the form and features of life, including the hair, lips, etc., but reduced by some peculiar process so as not to exceed the size of an ordinary fist. These heads are found among the Javaro tribes in the province of Chimborazo, in Peru, and are said to be of very great antiquity, there being no indication of recent preparation. They are believed to be the heads of enemies slain in battle, and preserved in this way as trophies of victory.

The interior of the head has been entirely emptied of flesh, bones, and brain; and the skin, which alone remains, by its contraction is thickened to the amount of more than the eighth of an inch. The lips are closely compressed, and through them are strung a series of knotted cords, which in their character call to mind the guipos of the ancient Peruvians. There is also a cord which is knotted inside of the top of the head, by which it is suspended.

No satisfactory explanation of the mode of preparation has been given, although there is a tradition that it is effected by introducing heated stones or sand into the cavity after the removal of the portions of the head referred to.—12 *A, May* 2, 1872, 13.

SHELL MOUND NEAR NEWBURYPORT.

A very large shell-heap, of over an eighth of an acre in extent, on Parker River, near Newburyport, was recently plowed up, bringing to light immense numbers of shells, bones of animals, portions of a human skeleton, and numerous implements of stone, bone, etc. This will probably furnish an excellent opportunity for the members of the Essex Institute, of Salem, and of the Peabody Academy of Science, to make valuable additions to their stock of ethnological objects.

INDIAN RELICS FOR SALE.

A valuable collection of Indian relics from Chiriqui is now on sale at Heidelberg, and in the variety of its contents and the moderate price asked for them presents a strong inducement for its acquisition by some of the new museums of art or science in New York. The catalogue enumerates one hundred *terra cotta* figures and vessels of different kinds, most of them handsomely ornamented in colors. There are also numerous stone figures, images in chalchiutl or green jade, grinding-stones, etc.; seventeen gold images, representing frogs, eagles, human figures, etc.; and quite a number of clay and stone figures from Peru. The price asked for this collection is $800.—*Letter of Von Frantzius.*

JOURNAL OF THE ANTHROPOLOGICAL INSTITUTE OF NEW YORK.

We have before us the first number of the Journal of the Anthropological Institute of New York, an institution newly organized upon the base of the former Ethnological Society of that city. In the change the scope of the society has been greatly enlarged, and many of the difficulties attendant upon the maintenance of the old organization have been obviated. Several papers of more or less interest are to be found in this first number, and there is little doubt that the new society will occupy a prominent place in advancing knowledge in the world.

PREFERENTIAL USE OF THE RIGHT HAND AMONG SAVAGES.

As is well known to his correspondents, Mr. Darwin has been engaged for some time past in endeavoring to ascertain whether the movements of the muscles used to express emotions among civilized nations are employed under similar circumstances by the different savage tribes, as also to what extent such movements are shared by the brutes, such as monkeys, dogs, etc. The question, too, whether the use of the right hand in preference to the left is common to all nations has also occupied Mr. Darwin's attention. Inquiries of travelers among the North American Indians have resulted in showing that the right hand is used by them generally just as among civilized people, and, indeed, that left-handed persons are looked upon as possessed of some evil spirit, and are as much contemned as if they were deformed.—*Letter of Gen. E. S. Parker.*

DEFECTIVE BRAIN AND DEFORMED FEATURES.

Attention has lately been called to an article by Professor Laycock, written as long ago as 1862, in which he notices the coexistence of weakness or defective organization of the brain with certain peculiarities of formation of the face, and especially of the parts answering to the ribs of the cranial vertebræ. Congenital defect of the brain and tendency to tissue degeneration are very prominently associated with a defective and receding chin, and the structure of the ear presents a similar harmony. In the perfect ear the cartilage is compressed within an ellipse or ellipsoid proportionate to the head, and to this is attached a geometrically formed helix and a pendent ellipsoid lobule. In proportion as these are defective, or as the ear is monstrous, triangular, square, or of irregular form, is indicated a tendency to cerebral degeneration or defect. Monstrous ears, with defective helix or lobules, are very common in idiots or imbeciles. The defective form, and absence of the lobule in the female Aztec cretin, and in the case of dementia, are instances in point. The ear of the male Aztec cretin is also defective, but it more nearly resembles the ear of the chimpanzee.—20 *A*, *March* 16, 1872, 320.

CHARACTERISTICS OF HIGHER GROUPS OF MAMMALS.

In a memoir on the characteristics of the primary groups of mammals, Professor Gill has given detailed descriptions of all the orders and more comprehensive groups of the class in question. He has accepted the division into three subclasses now generally recognized; and the orders of the subclass of placental mammals, which embraces the bulk of the class, are combined into two larger groups named super-orders, which are distinguished by modifications of the brain, and especially by differences in the development of the *corpus callosum*, or great transverse commissure of the cerebrum. The orders are distinguished by characteristics of the osseous and nervous systems chiefly, and are as follows:

SUB-CLASS MONODELPHIA.

SUPER-ORDER EDUCABILIA.

Four-footed Educabilia.

1. *Primates* (man, monkeys, and lemurs).
2. *Feræ* (carnivores, as cats, dogs, etc., and seals).
3. *Ungulates* (ordinary hoofed animals, or cattle, camels, horses, etc.).
4. *Toxodonts* (extinct).
5. *Hyracoids* (the "cony" of the Bible).
6. *Proboscideans* (elephants and mastodons).

Swimming Educabilia.

7. *Sirenians* (manatus, dugong, etc.).
8. *Cetaceans* (whales, porpoises, etc.).

SUPER-ORDER INEDUCABILIA.

9. *Chiropters* (bats).
10. *Insectivores* (shrews, moles, hedgehogs, etc.).
11. *Glires*, or gnawers (mice, rabbits, etc.).
12. *Bruta*, or edentates (ant-eaters, sloths, armadillos, etc.).

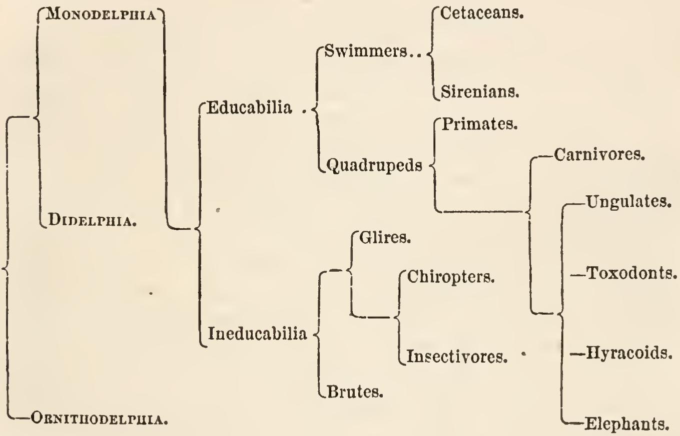
SUB-CLASS DIDELPHIA.

13. *Marsupialia* (opossums, kangaroos, etc.).

SUB-CLASS ORNITHODELPHIA.

14. *Monotremata* (ornithorhynchus, or water-mole, and spiny ant-eater of Australia).

The supposed relations of these orders are attempted to be expressed in a graphic manner, like the genealogical trees which are employed to represent the lineage of human families, and which are now considerably used by naturalists. Such a mode of representation, it may be remarked, is equally useful in conveying an idea of relations of various forms for those who disbelieve in evolution as for those who accept that doctrine, but for the latter they serve also as true genealogical tables. We reproduce the table referred to as an example:



APES IN THIBET.

Apes and parrots are generally considered as belonging exclusively to the tropical zone. Dr. Hensel, however, has observed that in the most southern part of Brazil, with a climate similar to that of Southern Europe, several species of monkeys exist. Abbé David has lately discovered two more of these extra-tropical species, a short-tailed macacus (*Macacus tibetanus*) and *Semnopithecus roxellana.* They were found in the almost inaccessible forests of Eastern Thibet.—3 *C, April* 1, 1872, 336.

FOSSIL MONKEY FROM ITALY.

Professor Gervais, in a communication to the Academy of Sciences of Paris upon a fossil monkey lately discovered upon Monte Bamboli, near Leghorn, in Italy, remarks that the total number of fossil genera of monkeys from the tertiary of Europe at present known amounts to five, two of these being lower forms, namely, Macaques and Semnopitheques; and three of them, anthropoid apes, entirely peculiar to Europe, and all extinct, namely, *Dryopithecus*, *Pliopithecus*, and *Oreopithecus.* The latter name is applied to the new species, forming the subject of M. Gervais's communication. This was considerably smaller than the gorilla, although equal in size to the large chimpanzee.—6 *B*, *May* 6, 1872, 1223.

FUR-BEARING ANIMALS OF NEW JERSEY.

We note an article in the Germantown *Telegraph* of February 21 upon the fur-producing animals of New Jersey, in which the various species are enumerated. This, while evincing a certain amount of familiarity with the subject, is evidently a little at fault in regard to the species, especially in the statement that the American badger is to be met with within these limits. It will, we think, be news to the naturalists of Pennsylvania and New Jersey to be told that the badger is an inhabitant of the latter state. Its distribution has been generally considered as confined to the prairies of the West, finding its eastern limit, perhaps, in Illinois. It is quite likely that the animal referred to is the woodchuck, which sometimes bears that name; but we doubt whether any considerable number of skins of this animal could be sold, as stated, at three dollars each.

Of the foxes four species are named—the gray, red, cross, and silver fox. We doubt very much whether any silver foxes have been killed lately in New Jersey, and the case is but little less improbable in regard to the cross foxes. We would also consider the occurrence of the beaver in the state as extremely doubtful, although, of course, they may have maintained a footing in some of the less disturbed districts.

CAPTURE OF BASSARIS IN OHIO.

Mr. Joseph Sullivant, of Columbus, Ohio, a well-known naturalist, publishes an account in the *Ohio State Journal* of the capture of the *Bassaris astuta*, or ring-tailed cat of the Rio Grande region. It was taken in Fairfield County, Ohio, and was said to have been accompanied by a second specimen.

The occurrence of this animal so far north is very remarkable, and it may be a question whether it had not been brought from Mexico or California, and escaped from confinement. It is an animal very much sought after as a pet, being clean in its habits, and readily becoming very tame and affectionate; indeed, it would seem to be quite a desirable animal to domesticate and keep about the house as a protection against rats and mice. Some years ago a specimen of this same animal was brought into the Smithsonian Institution, having been captured in a hen-coop near the city; it was in capital condition and in full fur, but it had evidently escaped from captivity, as shown by the marks of the rubbing of a collar around the neck.—*Newspaper.*

LAW IN REGARD TO KILLING BUFFALO.

A bill was introduced into the U. S. Senate during the session of 1871–72 (but failed to become a law), by Mr. Wilson, of Massachusetts, in regard to killing the buffaloes upon the plains, except with the object of using the meat as food, or for the hides, making it unlawful for any person to kill the bison, or buffalo, upon the public lands for any other purpose, and for the violation of this law the offender is, upon conviction by a court of competent jurisdiction, to pay a fine of $100 for each animal killed, one half the fine to be paid to the informer.—*Bill.*

HIBERNATION OF THE JUMPING MOUSE.

In an article in the June number of the *American Naturalist* Professor Tenney announces the interesting fact that the jumping mouse (*Jaculus hudsonius*) hibernates during the winter in the manner of various well-known species of mammals. His attention was drawn to this fact by discovering an individual of this species coiled up in the earth while making an excavation during the past winter in an Indian mound. Although he at first supposed it to be entirely dead, he discovered that, on warming the animal, it gradually became active, and that it was thrown back into its winter sleep by exposure to cold. The experiment was repeated a number of times in succession, always with the same result. —5 *D, June*, 1872, 330.

BELGIAN BATS AND THEIR PARASITES.

Professor P. J. van Benéden, in a memoir upon the bats of Belgium and their parasites, calls attention to the very great interest of such researches as he has been prosecuting. These animals have less relationship to man than almost any other mammal, and are under the absolute rule of natural selection. The entire group have the same insectivorous nutriment, and they are entirely dependent upon variations in the atmosphere for their food—more so than any other animal.

The question now arises how the insectivorous mammals, living first with the mammoths, and bears, and reindeer before the glacial epoch, have been able to pass that period without disappearing entirely, and the suggestion is raised as to whether it was possible for them to enjoy a hibernation of ages as well as that of a single season.

The professor sums up a series of inquiries in regard to the entozoa of the bats as follows: First, that the cheiroptera nourish parasites as well as the other mammals; second, that these parasites belong to a special group and series; third, that the order of the cheiroptera can be determined by the contents of their intestines; fourth, that the ascarides, so common in other mammalia, are entirely wanting in the bats; fifth, that all their parasites, as far as at present known, belong to the group of nostosites; sixth, that their xenosites are individuals which have strayed away from their natural habitation; seventh, that bats nourish the same parasites throughout the year; eighth, that the period of hibernation has its effect upon their worms as well as upon their numerous ascarides. The term *nostosites* is one derived by the professor not long ago to include entozoa that have reached their final destination and are not liable to any farther transformation; and the *xenosites* are forms which are in a transition state, and able to develop into something different when the external circumstances are changed.—*Bull. Acad. Royale de Belgique*, 1872, III., 223.

NEW AMERICAN MASTODON.

Among some collections of specimens of natural history and ethnology lately presented by Governor W. M. F. Arny, of New Mexico, to the Smithsonian Institution, were some mastodon remains, which were submitted by Professor Henry to Professor Leidy for examination. These were found to indicate the existence of a very remarkable species of mastodon (*M. obscurus*), very different from the common *M. americanus*, and previously known only by a few fragments from California and a tooth found many years ago in the miocene formation of Maryland.

One peculiarity of this species consists in the existence of enamel on the tusks of the upper jaw, which does not occur in the more modern *americanus*. It also had tusks in the lower jaw, projecting from the prolongation of the jaw, as in the adult of the miocene *Mastodon angustidens* of Europe, and known only in the young animal of *M. americanus.*

The specimen referred to will be figured by Professor Leidy in his forthcoming report to Dr. Hayden on the vertebrate fossils of the Western Territories.

NEW DISCOVERIES OF THE MAMMOTH IN SIBERIA.

Great interest was excited by the announcement many years ago of the discovery in Siberia by Mr. Adams, a merchant in St. Petersburg, of the carcass of a mammoth, which had been melted or washed out from the frozen soil, and which for a long time had served as food for the dogs of the nomad tribes. When visited by Mr. Adams, however, only the skeleton remained, together with a small portion of the skin and of the hair, all of which are now preserved in the museum of the Academy of Sciences at St. Petersburg. More recently several additional discoveries of a somewhat similar character have taken place, although, unfortunately, none of them were made public in time to be utilized in the interest of science.

The latest discovery of the kind is one mentioned by Dr. Von Schrenck, in the form of a communication to the Academy of Science of St. Petersburg, in which he gives the history of the steps—detailed in a letter to him from Mr. Maydell, dated February, 1869—to secure such a specimen. It seems that certain persons in Mr. Maydell's employ reported to him that the foot of a mammoth was found protruding from the frozen soil in a locality betwen Indighirka and Alaseja, on the route to Nishne-Kolinsk. An agent was sent to this locality, who reported that little else could be detected than the original leg; and, on visiting this same place himself, Mr. Maydell found portions of skin and hair, but was led to conclude that what was found was broken off from the carcass, of which the greater part had been carried away by one of the floods of the country.

In the course of this research on the part of Mr. Maydell he obtained information of two other similar cases, but he was not more successful in his search for these than for the first. Dr. Von Schrenck, in his communication, gives a full account of all the steps taken in connection with these discoveries, and discusses at length the methods by which the inhumation of such gigantic animals might have taken place. —*Mélanges Biologiques de l'Acad. Imp. des Sciences, St. Petersburg.*

SYNTHETIC TYPE OF FOSSIL MAMMALS.

Professor Leidy has recently made known the lower jaw of an animal which he justly regarded "as one of the most remarkable fossils which had yet been discovered in our Western Territories." It was discovered by Dr. J. Van A. Carter, in an early tertiary, probably eocene bed near Fort Bridger. The jaw, as indicated by the teeth, belonged to an old individual, about the size of the larger peccary. The peculiarity of the animal consisted in the combination of true rodent-like incisors and molars like those of pachyderms, such as the rhinoceros, tapir, etc. This union is as remarkable as unexpected, although to some extent paralleled among the lemuroid primates by the aye-aye (*Daubentonia* or *Cheiromys*). The name *Trogosus castoridens*, meaning the beaver-toothed gnawing-hog, has been proposed for it.—2 *D*, 1871, 114.

COPE ON BATHMODON AND PTERODACTYLS.

At the meeting of the American Philosophical Society on the 16th of February last, Professor Cope read a paper on *Bathmodon*, a new genus of extinct hoofed animals, with the teeth having the character both of ruminants and pachyderms. The size was equal to that of the rhinoceros. A second animal was also described as the *Loxophodon semicinctus*, quite similar in its general characters, and about as large as a tapir.

At the meeting on the 1st of March Professor Cope described two new species of *Ornithosauria*, or of pterodactyls; these belong to the genus *Ornithochirus*, and one of the species he states to be the most gigantic of the group, the spread of the wings probably measuring fully twenty-five feet. He also described some species of *Protostega*, an extinct tortoise genus of the cretaceous formation of Kansas, somewhat similar to *Sphargis*, and one of them the largest known marine turtle.—2 *D*, *MSS.*, *Feb.* 15, *March* 1, 1872.

BIRTH OF A YOUNG HIPPOPOTAMUS.

A young hippopotamus was recently born at the gardens of the Zoological Society in the Regent's Park, London, the third time such an event has occurred in Europe. The first infant born at the gardens lived only a week, and this last was even more short-lived, dying the day after its birth. As on the previous occasion, the mother became so ferocious immediately after the birth had taken place that it was with the greatest difficulty the keeper could enter the cage. Neither time did the mother suckle her child.

BABY HIPPOPOTAMUS.

Much interest was excited about a year ago, in England, in regard to the birth of a young hippopotamus, at the Zoological Gardens of London, an occurrence which had never taken place before in Great Britain, although Amsterdam had previously had a similar experience. As before, this young animal made no attempt to suck, although its mother was amply provided with milk. An attempt was made to remove it, for the purpose of supporting it by artificial sustenance, but the mother was so savage as to render this impossible. Death ensued in three days, apparently from want of nutriment.

It seems quite remarkable that the instinct of the baby hippopotamus did not teach it to obtain food, as both it and the mother had been in the water together, as well as on the land. The length of this young animal was three feet four inches from the tip of the nose to the root of the tail, the head being ten inches in length. The skin was very much corrugated, and seemed covered with a glass-like varnish.—2 *A*, *January* 13, 1872, 26.

VERTEBRATE FOSSILS FROM WYOMING.

It seems almost impossible to exhaust the richness of the deposits of vertebrate fossils of the West, Professor Leidy having lately added to the number by the description of two extinct tapir-like animals, one about the size of a raccoon, and the other about the size of a rabbit, and an insectivorous animal of the dimensions of the hedgehog. These are from the tertiary formation of Wyoming Territory.—2 *D*, *February* 6, 1872.

HAIRY RHINOCEROS IN ENGLAND.

The frequenters of the Zoological Gardens of London have been much interested in the recent arrival of a female specimen of the gigantic hairy rhinoceros from Sumatra, being the first ever seen living in Europe. This specimen was taken about five years ago in Chittagong, when partly imbedded in quicksand, and was secured by the united efforts of some two hundred men. She was brought with great difficulty to Chittagong and kept there for some time. When first captured she was about six feet in length, and four feet in height. Quite recently Mr. Jamrach, a well-known dealer in live animals, had her sent to England, although many difficulties attended the experiment. It was necessary to prepare a cage of teak, of the very strongest character, twelve feet long, nine feet broad, and eight feet high.

The animal has now been safely delivered at the Zoological Gardens in London, where it attracts a great deal of interest. This species agrees with the African rhinoceros in having two horns, but differs in being covered with very coarse hair, and having a soft and flexible skin instead of a hard and horny one. The ears are also provided with a curious fringe of the same hairs.—2 *A*, *March* 16, 1872, 187.

NEW FOSSIL SIRENIAN IN BELGIUM.

Professor Van Beneden announces the occurrence in Belgium of the remains of a new genus of fossil animals allied to the manatee and dugong. The extinct genus *Halitherium*, belonging to the same order, has been known in Belgium for some considerable time, and has excited much interest from the fact that, although entirely extinct at present, bones of the animal have been found which had been apparently pierced by an arrow or some similar weapon. To the new form has been assigned the name of *Crassitherium robustum*, in allusion to the thick walls of the skull, in which respect it is very different from any of its allies, but more like the *Rhytina*, or sea-cow of Steller, from Behring Island. This latter animal, unlike the *Halitherium*, has been exterminated within the historic period, although it is more than one hundred years since it has been seen alive by any one. According to Professor Van Beneden, there have been found in the Antwerp Sands four genera of seals, one of *Zeuglodonts*, and the form just referred to.—*Bulletin Acad. Royale des Sciences de Belgique*, 1871, 164.

NEW HUMPBACKED WHALE IN THE CARIBBEAN SEA, ETC.

The cranium of a humpback whale, from the Caribbean Sea, has been recently sent to the Academy of Sciences, Philadelphia, and Professor Cope, after a careful examination, recognizes it as a new species, which he names *Megaptera bellicosa*. At the same meeting he exhibited portions of the fossil skeleton of a large crocodile from the green sand of New Jersey, which he called *Holops pneumaticus*, from the hollow condition of the bones of the limbs.—2 *B*, *January* 23, 1872.

NEW WHALE IN CALIFORNIA.

Professor Cope has announced the existence in California of an extinct species of whale, as shown by a fragment of a jaw found in digging a well at San Diego. This he names *Eschrichtius davidsonii*.—2 *D*, *February* 27, 1872.

AMERICAN BIRDS IN EUROPE.

A remarkable fact connected with the interchange of animal species between Europe and America is seen in the frequency with which North American birds occur in England, and the scarcity of European birds in America. Nearly seventy species of the birds characteristic of the American fauna have so far been detected in Great Britain, the latest announcement of this kind being that of the black-billed cuckoo, which was taken at the end of September, 1871, in Antrim, ten miles from Belfast. Very few of the European land-birds have been found in North America, with the exception of a few species that are really arctic in their distribution, although less frequently seen in the New World than in the Old.

The water-birds of Europe are more common as stragglers. Among them we may mention the English green-winged teal, the widgeon, the woodcock, etc. The entire list, however, does not amount to a dozen species. The causes of this difference are doubtless to be met with in the comparative prevalence of certain winds. Most of the captures of American species take place in Ireland in autumn and early winter, and in all cases are species belonging to the northern portion of America, which migrate southward at the close of the breeding season. At that time the prevailing winds are from the west, and the birds in their flight become confused, and are carried across by the winds, taking an occasional rest on passing vessels.—2 *A*, *March* 30, 1872, 219.

PROTECTION OF WILD-FOWL IN GREAT BRITAIN.

A bill has been introduced into the British Parliament for the protection of wild-fowl, in which, after enumerating the kinds that come legitimately under this heading, embracing the principal waders, ducks, and geese that breed within the British Islands between the first day of April and the first day of August, it provides a forfeiture of a sum of money not to exceed one pound sterling for each and every bird killed. By this means it is hoped to check the hunting and unnecessary destruction of birds while engaged in the process of reproduction.

It is well known that in past years the British Islands were a favorite summer resort of myriads of birds of the kinds mentioned, but these have been greatly reduced in number, until many species may now be considered as almost entirely exterminated. Should this bill become a law, and be enforced as effectually as the act for the preservation of the sea-fowl, the same result may be anticipated, namely, that of increasing their numbers enormously.

It is much to be desired that similar laws should be enacted in all the states of our Union which do not already have them on their statute-books, and that they should be thoroughly enforced in the spirit of the regulation. We are all aware of the extent to which the supply of wild-fowl and game has been reduced—this applying more especially, perhaps, to ducks and geese, of which but a small percentage are now found compared with their numbers twenty years ago.—2 *A*, *February* 24, 1872, 136.

A SWIMMING HEN.

A writer in *The Field* states the very curious fact that a hen, after hatching out two ducklings from eggs placed under her for that purpose, and attempting in vain to induce them to come out from the water to which they had immediately betaken themselves, herself swam in after them, and, pushing them before her, actually forced them to the land.—19 *A*, *May*, 1872, 25.

KING PENGUINS IN THE ZOOLOGICAL GARDENS.

Among the late interesting additions to the Zoological Gardens of London is a specimen of the king penguin of the Falkland Islands. Animals of this class are rarely seen alive in Europe, and this specimen shares the interest which another species of the penguin family, previously received, had been in the habit of exciting.—12 *A*, *January* 11, 1872, 210.

NEW ZEALAND DUCK.

A duck found in the interior of New Zealand is said to differ from other ducks in not exhibiting any solicitude for the safety of its young. Captain Hutton, an eminent naturalist, thinks that this supports the Darwinian theory, as the ducks belong to a genus peculiar to New Zealand, where there were no destructive animals previous to the arrival of man, and in which genus, therefore, instinctive fear has not been developed; indeed, the absence of fear is said to be a peculiar characteristic of the animals of New Zealand.—12 *A*, *January* 11, 1872, 216.

EJECTION OF YOUNG BIRDS FROM NESTS BY YOUNG CUCKOOS.

The fact has long been known that the English cuckoo lays its eggs in the nests of other brids to be hatched out, and that the parasite occupies the nest to the exclusion of the rightful owners. A communication by Dr. Jenner to the Royal Society of London gave the first record of this exclusion on the part of the cuckoo, and the method by which it was accomplished, and Mr. Blackburn, of the University of Glasgow, has lately verified and authenticated his statement. In one instance he found the nest of a titlark with two eggs in it, as well as one of the cuckoo. This was carefully watched, and at a subsequent visit to the nest the titlarks were found hatched, but not the egg of the cuckoo. At the end of forty-eight hours the young cuckoo was found in the nest, and the titlarks were outside of it, down a bank, apparently quite lively. They were returned to the nest with the cuckoo, which struggled about till it got its back under one of them, when it climbed, backward, up the side of the nest, and threw the titlark over the margin and down the bank. This was repeated in several instances, quite often enough to show that it was a regular instinct of the animal. The most remarkable fact in the case was that the cuckoo was perfectly naked, without a vestige of feathers, and its eyes still unopened, while the titlarks were more or less feathered and with bright eyes. A second case of similar character is recorded by Mr. G. E. Rowley in the May number of *Hardwicke's Science-Gossip*.—12 *A*, *March* 14, 1872, 382.

FOSSIL BIRDS OF FRANCE.

The study of the fossil birds of France by A. Milne-Edwards has tended to throw a good deal of light upon the question of the climate which prevailed during the prehistoric period, some species then abundant having disappeared entirely, and others receding to the north with the mammalia. Some ethnologists have maintained that the presence of the reindeer in France in the early ages is to be attributed, not to the climate, but to its having been introduced as a domestic animal by the Finnish population. This explanation, however, can not apply to the grouse and snowy owl, the remains of which are very abundant, and which are equally characteristic of a high northern climate.

Among other birds, the cock occurs abundantly, which, therefore, shows that, instead of having been introduced from India, it must have been contemporaneous with the first ages of mankind.

The middle tertiary deposits of France have furnished a very rich harvest of separate varieties, among about seventy species and a great number of groups. A remarkable fact here is the occurrence of types no longer known in Europe, such as parrots, the salanganes, swifts, the trogons, the secretary bird, marabout storks, flamingoes, etc., recalling more the peculiarities of Central Africa than those of any other part of the world.

As might naturally be supposed, the species most abundant are those belonging to the water, their remains being more likely to be preserved. Gallinacea of large size, and little inferior to the peacock, and genuine pheasants, have, however, also been met with. The gypsum beds in the vicinity of Paris have also furnished large numbers of the remains of birds, some of them very different from the modern forms, rendering it necessary to establish quite a number of new groups.

The many peculiarities observed in the species of this fauna render it a still greater cause of regret that those of the cretaceous period are unknown, this resulting from the fact that there were very few fresh-water deposits during that period in which such remains could have accumulated. Could we be more successful in exploring these forms, Professor Edwards thinks the immense gap which exists between the Jurassic *Archæopteryx* and the typical birds of the present period might be satisfactorily filled up.—6 *B*, *April* 15, 1872, 1030.

FOSSIL BIRDS OF THE MASCARENE ISLANDS.

M. Alph. Milne-Edwards, of Paris, the son of the eminent naturalist of the same name, has been engaged for many years in the publication of a great work upon fossil birds, which he is just about bringing to a conclusion. To this labor he has brought a thorough knowledge of comparative anatomy, and especially that of birds, both recent and fossil, such as perhaps is possessed by no other living naturalist; and the work in question, although unfinished, has already become a standard and guide to those who are engaged in similar pursuits.

In a late communication to the Academy of Sciences in Paris, referring to the approaching completion of his book, he makes some general remarks, which contain matter of much interest. In reference to the birds of the Mascarene

Islands (Mauritius, Rodriguez, and Bourbon) he remarks that, as far as the indications go, these are the points still remaining of an ancient continent, which, little by little, has sunk beneath the ocean. Upon these, thus converted into islands, have been concentrated the inhabitants of the land, where they have been crowded together, as shown by their fossil remains, and where they became exterminated, sooner or later, either by the action of man or other agencies.

M. Edwards thinks Madagascar was not connected with these islands at any time, since, when first discovered by Europeans, the latter contained no mammals at all, and therefore, of course, none of the forms at all peculiar to Madagascar, such as the lemurs, etc. On the other hand, there is evidence to show that Madagascar and New Zealand were formerly united, since three species of *Æpyornis* from Madagascar bear a close generic relationship to *Dinornis*, *Palapteryx*, and *Apteryx* of the latter region. All these belong to the same zoological type, and communication must have existed between the countries, possibly by groups of islands, forming intermediate stations, and now unfortunately submerged, leaving no trace behind.—6 *B*, *April* 15, 1872, 1030.

NEW WINGLESS BIRD FROM QUEENSLAND.

Professor Owen has discovered, among certain specimens lately submitted to him, a new form of wingless bird from the post-tertiary deposit of Queensland, Australia. This he refers to a new genus of struthiones allied to the emu, which he proposes to call *Dromornis*.—12 *A*, *May* 16, 1872, 52.

GIANT RAPTORIAL BIRDS IN NEW ZEALAND.

Among certain remains of *Dinornis* lately exhumed in the Canterbury Province of New Zealand there have been detected bones which are considered as belonging to a gigantic bird of prey. This was probably at least twice the size of any of the raptores now found in Australia or New Zealand, and it is supposed to have had as its special mission the preying upon the young *Dinornis*. The natives have a tradition of the former existence of a huge bird of the eagle kind, long since extinct, and it is thought not improbable that this may have had actual reference to the species in question.—5 *D*, *May*, 1872, 312.

CATALOGUE OF THE BIRDS OF NEW ZEALAND.

A descriptive catalogue of the birds of New Zealand, by Mr. Hutton, the assistant geologist connected with the government museum at Wellington, has just been published. This author enumerates one hundred and sixty species as indigenous to the island, and fifty-two introduced by the settlers. Among the latter are the robin-redbreast, the nightingale, the song thrush, the rook, the jackdaw, starling, American meadow-lark, American red-winged blackbird, the American scarlet tanager, the bullfinch, the goldfinch, linnet, skylark, and some other species.

EGGS OF THE MOA.

The Colonial Museum of Wellington, New Zealand, has lately distributed casts of several specimens of eggs of the moa belonging to its collection, sending a series to the Smithsonian Institution in Washington. These eggs are of great interest from their enormous size, being inferior only to those of the *Æpyornis* of Madagascar. The largest of three eggs was found in the Kaikoras Peninsula, between the legs of a human skeleton which had been buried in a sitting posture, and which was supposed to be of great antiquity, not only from the accompaniment of the egg, but also from the body having been placed in a sitting position, a posture very unusual among the Maoris.—*Letter.*

NEW FOSSIL BIRD.

Professor Marsh reports to the *American Journal of Science* the discovery, during his explorations in 1871, of a remarkable fossil bird. It was found in the upper cretaceous deposit of Western Kansas, and the remains consist of the greater portion of the skeleton, at least five feet in height, and which, although a true bird, as is shown by the vertebræ and other parts of the skeleton, differs widely from any known recent or extinct forms of that class, and affords a fine example of a comprehensive type. The bones are all well preserved. The femur is very short, but the other portions of the legs are quite elongated. The metatarsal bones appear to have been separated. On his return the professor proposes to describe this unique fossil under the name of *Hesperornis regalis.*—4 *D, January*, 1872, 56.

NEW FOSSIL BIRDS.

Professor O. C. Marsh describes in the *American Journal of Science* for May four new species of fossil birds, three of them belonging to the genus *Graculavus*, probably closely allied to the cormorants of the present day, and occurring in the cretaceous deposits of New Jersey and of Kansas. The fourth is a species of *Palæotringa*, from the cretaceous green-sand of New Jersey. The same paper contains a more elaborate description of the very remarkable new fossil bird named by him in January last *Hesperornis regalis.* This has numerous peculiarities, although it seems to resemble most closely the common loon of the United States. It was, however, much larger, as its complete skeleton would measure nearly six feet from the tip of the bill to the end of the toes. It occurs as a fossil in the gray shale of the upper cretaceous formations near Smoky Hill Fork, in Western Kansas.—4 *D*, *May*, 1872.

SERPENTS IN THE BRITISH MUSEUM.

It appears that the British Museum now possesses 920 species of serpents, represented by 5500 examples, and that of these 366 are types of new species.—13 *A*, *January* 15, 1872, 30.

NEW NORTH AMERICAN SERPENTS.

Professor Cope has lately found, among some reptiles sent him by Dr. Yarrow from the vicinity of Fort Macon, North Carolina, a species of *Dromicus*, the first instance on record of the occurrence in the United States of a genus of serpents common to the West Indies and Mexico. The close affinity of this to a Jamaican relative is a circumstance strongly suggestive, according to Professor Cope, of an introduction by carriage in drift-wood floating on the current of the Gulf Stream, the time elapsed having been sufficient to differentiate it into a distinct species, which has now been named *D. flavilatus.*—*Pr. A. N. S.*, 1871, 223.

COPE ON PYTHONOMORPHA.

In a paper by Professor Cope upon the *Pythonomorpha*, or Python-like fossil saurians of the cretaceous formation of

Kansas, presented to the Academy of the American Philosophical Society of Philadelphia, he shows that America is the home of this group, four species only having been described from Europe. Forty-two North American species are already known, of which fifteen belong to the greensand formation of New Jersey, seven to the limestone region of Alabama, seventeen to the chalk of Kansas, and three to other localities. Of the Kansas species, six are described as new by Professor Cope in the paper referred to.—2 *D*, MSS., *December* 15, 1871.

FIGHT BETWEEN A COBRA AND A MONGOOSE.

A correspondent in *Nature* gives an account of a fight between a cobra di capello and a mongoose, the latter a small mammal well known for its services in destroying the poisonous serpents of India. The writer states that the mongoose was bitten by the cobra in the course of the fight, but that the latter was ultimately killed, and its destroyer went into the jungle for a time, as though in search of some remedy, and came back in a few hours after the fight apparently quite well.—12 *A*, *January* 11, 1872, 204.

ANTAGONISM OF HARMLESS SERPENTS TO POISONOUS ONES.

It appears to be a well-established fact that certain harmless serpents, like the black snake and some other species that kill their prey by compression, take an especial delight in destroying the rattlesnake, in this way serving a very useful purpose in the economy of nature by antagonizing and restraining the increase of such noxious reptiles. Authentic instances in regard to the black snake (*Coluber constrictor*) are on record; while the species known as chain snake, or ring snake, in the Southern States (of the genus *Ophibolus*), is carefully protected from destruction on account of a like habit.

We now learn that a similar habit belongs to a California species, called ring snake (*Pityophis cotenifer*), a case being lately recorded in which one of these snakes is described as having attacked a rattlesnake by creeping stealthily toward him until within a few feet, and then, by a sudden spring, leaping upon and coiling around his antagonist, crushing him to death in his coils.

BLOOD FROM THE EYE OF THE HORNED TOAD.

We published not long ago a notice of a peculiarity of the horned toad of California in the expulsion of a blood-like fluid from the eye, and a reader of the *Weekly* writes to give his own testimony to the fact. He states that he has caught numbers of them in Texas, and frequently noticed the ejection of a bloody fluid from the inner canthus of the eye, once receiving the discharge in his own eye while holding the animal at a distance of at least a foot. The sensation experienced was quite painful for a few minutes.

NEW FOSSIL REPTILE.

A new fossil reptile from the cretaceous strata of Kansas has just been described by Professor Cope under the name of *Cynocercus incisus.* The peculiarity of this reptile consists in having the articular faces of the vertebræ deeply excavated above and below, so as to give them a transverse character. A new crocodilian from the same region was also described, under the name of *Hyposaurus webbii.*—2 *D*, MSS., *January* 5, 1872.

MARSH ON THE PTERODACTYLS.

Among other collections made by Professor Marsh during his explorations in 1871 were additional specimens of the pterodactyl, first obtained in 1870. Portions of five individuals were procured; and among them nearly all the bones of the right wing of one, which exhibited the pterodactyl structure in its perfection.

The teeth found with the other remains were somewhat similar to those of the pterodactyls of the cretaceous of England, being smooth, compressed, elliptical, and somewhat curved. A second species, still larger than the other, was obtained in the upper cretaceous, near the Smoky River, in Western Kansas. The expanse between the tips of the fully extended wings was probably as much as twenty-two feet.

In all, Professor Marsh has determined the existence of three species from the same region, and which he characterizes in advance sheets of the April number of the *Journal of Science.* In the same journal Professor Marsh refers to the interesting discovery that the body of mososaur reptiles was probably covered with plates, as in some crocodiles, the head itself being smooth. This fact has been ascertained in regard to specimens of all the American genera, so that probably all the species possessed it.—4 *D*, *Advance Sheet*, *April*, 1872.

NEW HADROSAURUS.

The April number of the *American Journal of Science* contains an account by Professor Marsh, the indefatigable paleontologist, of his discovery of a new species of *Hadrosaurus*, a giant lizard; one of which, found in New Jersey, from its enormous size, constitutes one of the chief attractions of the Academy of Sciences of Philadelphia, where it is deposited. The present animal is scarcely one third the size of the New Jersey specimen. It was discovered near the Smoky Hill River, in Western Kansas, and is named *Hadrosaurus agilis*. —4 *D*, *April*, 1872.

METAMORPHOSES OF FROGS.

Mr. Jourdain calls the attention of physiologists to the peculiarities exhibited in the reproduction of various forms of frogs, some of these having tadpoles of enormous size, much larger than the adult which is developed from them, while others, again, are scarcely larger in the tadpole condition than afterward. The author compares the species having the small tadpoles to insects with incomplete metamorphosis; these feeding and growing in a regular and gradual manner throughout their entire life, up to the time that the adult requires its normal and definite dimensions, growing and becoming perfect gradually, like the hemiptera. The case is different with the very large tadpoles. These, from the period of their emergence from the egg, grow very rapidly, and quickly acquire a considerable size, like the caterpillar of a butterfly, to which they may be compared during this first period, which they make use of in acquiring an ample nutritive reserve. In the second period they take little or no food, but the substance stored is expended in building up the new structure. Their volume diminishes, the animal living and feeding by the absorption of its tail and the other parts, which are taken up or lose their importance. This period the author likens to the pupa condition of insects with complete metamorphosis, the animal feeding upon substances stored up by the larva.—6 *B*, *May* 27, 1872, 1417.

HORNED FROGS VIVIPAROUS.

A correspondent of the *Weekly*, referring to the horned frogs of the Western Plains (*Phrynosoma*), informs us that, when crossing the Plains some years ago, he carried with him several specimens, and on examining them one night found that twenty-four young ones had suddenly made their appearance, each one about the size of a dime, and all very lively. This shows that, instead of producing eggs deposited externally, they are ovo-viviparous, as is the case with many other reptiles.—*Letter.*

STRUCTURE OF MOSASAUROID REPTILES.

In the June number of the *American Journal of Science*, Professor Marsh, of Yale College, has an important paper on mosasauroid reptiles, which are so well represented in the cretaceans of this country. Among the new points established by Professor Marsh are: 1st, the correct position of the *quadrate bone*, which has been reversed by some previous writers; 2d, the discovery of the *stapes;* 3d, the discovery of the *columella;* 4th, discovery of the *malar arch;* 5th, determination of the *quadrato-parietal arch* in several genera; and, 6th, the number of the cervical vertebræ. The anterior and posterior links of the order are also fully described.

Two new genera, *Lestosaurus* and *Rhinosaurus*, are established. The paper is illustrated by four plates, in which both the anterior and posterior arches and limbs of this group are figured for the first time.

COPE ON THE FOSSIL FISH OF THE KANSAS CRETACEOUS.

Professor Cope has shown, in a paper read to the American Philosophical Society, that the greater number of the fossil fishes of the cretaceous strata of Kansas belong to three families, namely, the *Saurodontidæ*, the *Pachyrhizodontidæ*, and the *Stratodontidæ*. Of the first family four genera and ten species are described in his paper, some of them (as those of the genus *Portheus*) being among the most formidable of marine fishes. Of the second family one genus and four species are introduced, and three genera and seven species of the third. The *Stratodus*, a genus of the *Stratodontidæ*, is provided with multitudes of minute shovel-headed teeth. He finds a great resemblance between this Kansas fauna and that of the English chalk, no less than six of the eight Kansas genera having been found in the latter.—2 *D*, MSS., *February* 2, 1872.

USE OF THE PECTORAL FINS OF FISH.

Mr. Hansen, in discussing the movements of the fins of fishes in water, remarks that the propelling power of the pectoral fin is directed upward and forward, and is intended to assist the passage of the water into and out of the gills, and thus aid in respiration. When only one pectoral fin is moved, the body rotates around its longitudinal axis; a more decided movement of both fins will raise the anterior extremity of the body in the water. When flying-fish ascend quickly to the surface by means of the active movement of the pectoral fins, they describe an arc over the water, but ultimately fall back into it. For this reason they are scarcely to be included among flying animals.—1 *C*, 1870, XLV., 720.

NEST-BUILDING FISH.

The first contribution to science from the *Hassler* expedition, under Professor Agassiz, appears in the form of a letter addressed to Professor Peirce, dated St. Thomas, December 15. In this it is stated that, in the course of the frequent examination of the floating Gulf-weeds, made daily, for the purpose of collecting the marine animals that usually inhabit them, a mass of this weed was found, the branches and leaves of which were united together by fine threads, wrapping it in every direction into the form of a ball. The threads forming the connecting material were elastic, and beaded at intervals; the beads being sometimes close together, sometimes more remote, a bunch of them occasionally hanging from the same cluster of the threads. From the accounts of the professor it would appear as if a globular mass had been formed by wrapping up a small quantity in the thread, and then adding more, and continually wrapping it up, until a ball of considerable size was produced.

A careful examination of these beads showed that they were in reality the eggs contained in the substance of the threads, and in some the embryo was sufficiently far advanced to prove that they belonged to a fish. The mass was preserved and watched until some became detached and were free in the water; and by a very interesting process of critical investigation, the fish itself being too small for identification, it was ascertained, mainly through the structure of the pigment-cells, that they belonged to a small species, quite common in the Gulf Stream, known as *Chironectes pictus.* In this genus the pectoral fins are supported on arm-like appendages, giving them the power of hands; a somewhat similar structure in some allied forms enabling them, when thrown on the shore, to walk or crawl back leisurely into the water.

It is somewhat remarkable that these eggs should have been found in the month of December, when the great majority of species lay their eggs in early spring. It is possible that *Chironectes pictus* may be an exception to the general rule.

A scarcely less interesting peculiarity is seen in regard to the eggs of the goose-fish, or the common fishing-frog, of the Atlantic coast. This is an extremely hideous-looking species, shaped like a much-depressed tadpole, with an enormous head and huge mouth, and sometimes weighing from fifty to one hundred pounds. It is known to naturalists as *Lophius americanus.*

The eggs of this species are contained in an immense flat sheet of mucus, sometimes thirty or forty feet long, and twelve to fifteen inches wide, which, when floating along the surface of the ocean, resembles nothing so much as a lady's brown veil. The mucus is so tenacious as to admit of being wrapped around an oar and dragged on board a vessel, but is extremely slippery, and readily escapes from one's grasp. The eggs, or embryos, are disseminated throughout this sheet at the rate of ten to twenty to the square inch, and by their brownish color tend to give the impression just referred to. The number of eggs in one of these sheets is enormous, in some instances exceeding a million.—*Letter of Professor Agassiz to Professor Peirce.*

ANOTHER PELAGIC FISH-NEST.

Mr. J. Matthew Jones, who was engaged for many years in the investigation of the natural history of the Bermudas, and who has just returned to Halifax from a recent visit to the islands for the purpose of continuing his labors, informs the editor of *Nature* that he also has obtained a pelagic fish-nest similar to that described by Professor Agassiz, and possibly of the same species. This was taken from some floating Gulf-weed, and forms a mass about eight inches in depth by five in breadth. The whole is thicker at the top, and woven together by fine elastic threads, forming a raft, from which hang the clustering masses of eggs, about the size of No. 7 shot. These threads are very strong, especially at their terminal bases on the fucus sprays, where several are apparently twisted together like the fibres of a rope. The sea-weed is not only on the summit, but sundry sprays are interwoven with the mass of eggs, thus rendering the fabric solid and secure.—12 *A*, *April* 11, 1872, 462.

RESPIRATION IN FISH.

M. Gréhaut, in the course of a lecture on respiration in fishes, states that, as shown by previous writers, fish are able to live in water until almost the whole of the oxygen it contains in a state of solution has been exhausted. This was shown by a chemical examination of some water in which live fish were preserved, and which, after the expiration of a certain time, showed an entire absence of oxygen, no change in the amount of nitrogen, and double the amount of carbonic acid.

Another curious fact noted by the lecturer was that fish breathe by their skin as well as by their gills, nearly as great a change in the composition of the gases contained in the water being observed when the animals were suspended up to their branchiæ as when the whole body was immersed. He also stated that the presence or absence of the swimming bladder had little effect on the product of respiration.—13 *A*, *December* 1, 1871, 538.

GENESIS OF HIPPOCAMPUS.

Canestrini, of the University of Padua, has lately discovered that the young hippocampus, or sea-horse, a small fish well known on our coast, is provided with a rudimentary caudal fin, the adult lacking this appendage, the tail being converted into a prehensile organ. A fossil fish (*Calamostomus*), however, from Monte Bolca, agrees with the young

Hippocampus in the character of this tail, and suggests the idea of a genetical relationship between the two genera. A similar relation exists between the genera *Nerophis* and *Syngnathus;* the latter, the pipefish of our coast, being provided with a caudal fin, while the former is without it.—13 *A, March* 15, 1872, 111.

CHINESE CYPRINIDÆ.

Dr. Bleeker, the indefatigable ichthyologist, of Holland, has lately published a paper upon the cyprinoids of China. In this he enumerates fifty species already described, and adds to them twenty from collections made by Daubry and the Abbé David. He is, however, of the opinion that this number scarcely embraces half of the cyprinoids actually belonging to the fresh waters of the Chinese empire. The forms are rather those of Japan and Europe than of tropical Asia.—13 *A, April* 15, 1872, 152.

DEATH OF AN AGED CARP.

According to the *Journal des Debats*, a carp has just died at Chantilly, in France, aged three hundred and seventy-five years. How much longer it would have lived it is impossible to conjecture, as its death was prematurely hastened by a combat with a huge pike. It is stated that this fish belonged to a merchant of Chantilly, who bought it a year ago for 1300 francs, and that it was hatched out in 1497, or a little after the period of the discovery of America by Columbus.

SALMON FLY-FISHING ON THE NORTHWEST COAST OF AMERICA.

The fact that in the waters of Oregon and of Washington Territory, as well as of Alaska, salmon can not be captured with the artificial fly—nor, indeed, taken at all with the line—has been a subject of much surprise and no little disappointment to sportsmen who have tried the experiment, and the subject has been dwelt upon as exhibiting a strong contrast between the habits of the Western fish and those of the North Atlantic.

It is also maintained and generally believed that of the myriads of salmon that ascend the Western rivers, few or none retrace their course to the sea, but succumb to the fatigue and dangers of the ascent, and to the exhaustion produced by the spawning operation. Certain it is that the shores of the Columbia and other great streams during the salmon season are lined with dead fish throughout their entire length, furnishing food for innumerable hawks, eagles, buzzards, crows, etc., as well as to mammals of various kinds.

Quite recently, however, it has been ascertained that while the salmon will not take the fly, as stated, in the rivers, they will do so in the salt water outside their mouths. We are informed that, this fact having been ascertained within a year or two past, the officers stationed at Fort Disappointment, on the north side of the mouth of the Columbia, have been enjoying rare sport in salmon fishing. The best ground is said to be near the light-house, directly inside the mouth of the river, where they are taken in the spring just previous to their upward migration. The fish are caught here in great numbers, and of such size (up to forty pounds) as to be very difficult to handle.

It is also maintained by Mr. Stone that the salmon, when in the upper Sacramento River, will take the fly readily, and are frequently caught with a bait of salmon spawn.

VENOMOUS FISH IN THE MAURITIUS.

Europe has a small fish, known as the weaver (*Trachinus*), which is capable of inflicting a very severe wound by the spines of its dorsal fin; and another form (*Thalassophryne*) has been described by Dr. Günther, from Central America, as collected by Captain Dow, in which the dorsal spines are constructed precisely like the fang of a venomous serpent, with a poison sac, secreting venom at the base, which is injected into the wound made by this animal. A well-known fish of the Mauritius, named *Synanceia verrucosa*, is said by Dr. Le Juge to be still more dangerous. This possesses thirteen spines in the dorsal fin, each provided at its base with a bag containing poison, and with a pair of deep grooves, along which the poison is guided to the wound. When the fish is seized by the hand, a wound is inflicted into which the poison is injected. Fatal results are more or less frequent from handling this fish, although the action of the poison appears to be less rapid than in the case of serpents.—13 *A*, *April* 15, 1872, 151.

TEETH IN YOUNG STURGEONS.

The discovery announced some months ago of the existence of teeth in the young sturgeons has been verified by another observer, who states that in the young of the sterlet there are ten teeth in the upper jaw and eight in the lower. This illustrates a very striking difference in habit between the young and the old. The latter, as is well known, have no teeth, and are believed to be somewhat herbivorous in character, or, at least, to feed only on sluggish invertebrates, while the former are quite voracious in their attack upon free-swimming animal prey. The precise period at which these teeth disappear has not been ascertained.—13 *A*, *March* 15, 1872, 111.

MONSTER COD.

A contributor to *Land and Water* speaks of the capture of a monster cod, which he considers to be the largest ever taken on the British coast. Although this fish had neither roe nor milt, and was in so poor a condition as to be without any fat in the stomach, it weighed 60 pounds. It had a length of 4½ feet, and a circumference round the thickest part of the body of 3 feet. It measured 1½ feet from the end of the nose to the outer edge of the gill-cover, and the head weighed 15 pounds when removed from the body. These figures, however, are very often paralleled on the coast of the United States, several instances being recorded of the capture of cod weighing 80, 90, and even 100 pounds.

The same writer refers to the capture of a ling measuring 6 feet in length, in the stomach of which was found a salmon measuring 27 inches, and in good preservation. In the opinion of the writer, this shows that the salmon go a long way to sea, as the ling was taken full 8 miles from the coast, in from 30 to 40 fathoms of water.—2 *A*, *March* 16, 1872, 187.

STONES IN THE STOMACHS OF CODFISH.

The occurrence of stones of decided magnitude, and in considerable number, in the stomachs of codfish, is a fact well known to our fishermen, and various surmises have been made to account for it. It is a popular impression, however, that these are taken on board as ballast just before a severe storm, in order to prevent being knocked about too mercilessly by the waves. A writer in *Land and Water* suggests, as a more plausible explanation of their origin, that upon these stones are affixed barnacles and other marine animals and shellfish, and that they are swallowed for the sake of their attachments. These being digested by the fish, the stones of course remain, and perhaps can not be ejected without difficulty.

The same writer refers to the relations between the codfish and the hermit-crab, namely, that the former feed upon the winkle and other large univalve shells, and, digesting the soft parts, throw out the shell, which is very soon seized by the hermit-crab and taken possession of for its habitation.—2 *A*, *February* 17, 1872, 113.

BLUEFISH ON THE SOUTHERN COAST.

The Norfolk papers report the occurrence, off the coast of North Carolina, of very large schools of immense bluefish, averaging twelve pounds each in weight. The steamer *Cygnet* brought in from Currituck Inlet, on the 20th of November, 3000 fish, which were taken in nets, and weighed nearly eighteen tons.—*Norfolk Paper.*

DARWINIAN IDEA OF THE ORIGIN OF INSECTS.

At a meeting of the Linnæan Society of London on November 2, Sir John Lubbock, Bart., F.R.S., read a paper on the origin of insects, which has always presented one of the most difficult problems to the Darwinian theory of evolution. There is great difficulty in conceiving by what process of natural selection an insect with a suctorial mouth, like that of a gnat or butterfly (Diptera or Lepidoptera), could be developed from a powerful mandibulate type like the Orthoptera, or even the Neuroptera. M. Brauer has recently suggested that the interesting genus *Cambodea* is, of all known existing forms, that which most nearly resembles the parent insect stock, from which are descended not only the most closely allied *Thysanura*, but all the other great orders of insects. In these insects we have a type of animal closely resembling certain larvæ, which occur in both the mandibulate and suctorial series of insects, and which possess a mouth neither distinctly mandibulate nor distinctly suctorial, but constituted according to a peculiar type capable of modification in either direction by gradual changes, without loss of utility. The complete metamorphosis of insects belonging to the Lepidoptera, Coleoptera, and Diptera will then be the result of adaptive changes brought about through a long series of generations.

CRY OF DEATH'S-HEAD MOTH.

Mr. H. N. Moseley publishes in *Nature* for June 20 the result of an elaborate series of experiments for the purpose of ascertaining the cause of the singular cry produced by the death's-head moth (*Acherontia atropos*), about which many treatises have been written, referring it to a great variety of different organs. Mr. Moseley appears to have satisfactorily determined that it proceeds from the proboscis of the insect.

NEW BUTTERFLIES.

In an article in *The Academy*, Mr. J. O. Westwood, an eminent entomologist, notices sundry works that have been published in Europe upon the Lepidoptera, and remarks upon the immense number of new forms of these animals that still continue to be brought to light, notwithstanding the amount of attention they have received for many years past. He states that Mr. Buckley, who has just returned from a twelve months' visit to the eastern slope of the northern Andes, has brought back with him from one hundred and fifty to two hundred new species; and that in an immense collection of fifty thousand specimens of Costa Rica butterflies lately carried to London by Dr. Van Patten, a gentleman well known to American naturalists, there are not less than fifty species not previously described.

He takes occasion to read entomologists a lecture for their fondness for upturning the established nomenclature of species by bringing to light names which, although in reality prior to such as have been generally accepted, have yet been published in obscure works, and the introduction of which will tend very greatly to unsettle the ideas as to nomenclature that have been entertained by the great body of naturalists. It is not impossible, however, that in this he is mistaken; and if what is generally called the inflexible rule of priority is to be adopted for a binomial nomenclature, then the sooner the proper name is brought to light and insisted upon as the proper designation of the species, the sooner will the subject be carried beyond the danger of further disturbance.

It may seem awkward to the present generation of students, who have become familiar with certain names, to change them, but their successors will not experience the same difficulty; and in having the subject settled authoritatively once for all, they will have occasion to thank the bold innovator who risks the objurgations of his fellows for his daring conduct.—13 *A*, *May* 1, 1872, 168.

FLIGHTS OF URANIA LEILUS.

The Panama *Star and Herald* records the first arrival on the 2d of April at Panama, on its annual eastern migration, of the beautiful sphinx moth (*Urania leilus*). The immense flights of this moth, and the extreme regularity of their recurrence year by year, have repeatedly been dwelt upon by the *Star*, and much interest has been excited as to its starting-place and ultimate destination.—*Panama Star and Herald*, *April*, 1872.

EDWARDS'S WORK ON NORTH AMERICAN BUTTERFLIES.

The ninth number of the illustrated work on the butterflies of North America, in course of publication by Mr. William H. Edwards, has just made its appearance, and we are informed that the tenth number, to appear very shortly, will conclude the first volume. This number, like its predecessors, is accompanied by a great many quarto plates in the highest style of pictorial excellence, depicting some extremely beautiful species and varieties of butterflies. Among these are three varieties of *Papilio ajax*—namely, *walshii*, *P. telamonides*, and *marcellus*—to which we have already referred in a previous number of the "Scientific Intelligence."

Mr. Edwards, in his paper, makes some judicious remarks upon the uncertainty that exists in regard to the true character of many butterflies, which some naturalists consider as perfectly distinct species, and others as mere varieties. He takes the ground that the only way of coming to a satisfactory conclusion is to breed them, and ascertain whether the eggs from the same female develop similar larvæ or not, and whether these, even if different, produce the same perfect insects or different ones. The attempt at discriminating from the perfect insect alone he considers extremely unsatisfactory.

THE KING-CRAB NOT A CRUSTACEAN.

Professor Van Benéden, who has been lately studying the embryonic development of the common American king-crab (*Limulus polyphemus*), comes to the conclusion, first, that these are not crustaceans, as none of the characteristic phases of the development of crustacea can be distinguished; and that, on the other hand, their development shows the closest resemblance to that of the scorpions and other arachnids. Second, that the affinity between the limuli and trilobites can not be doubted, and that the analogy between them is the greater in proportion as we examine them at a less advanced period of their development. Third, that the trilobites, as well as the *Eurypterida* and *Pœcilopoda*, must be separated from the class Crustacea, and form, with the arachnids, a distinct division.—13 *A*, *January* 15, 1872, 30.

HAVE TRILOBITES LEGS?

The question as to whether trilobites possessed legs or not is one that has been discussed of late quite extensively. Professor Dana, Professor Smith, and Professor Verrill, of New Haven, have taken the ground that the animal was without these appendages. Mr. Henry Woodward, of the British Museum, however, on the strength of specimens collected by Mr. E. Billings, of Montreal, insisted that the animal had real legs. To this Professor Dana rejoins that a renewed examination by himself and colleagues only tends to confirm them in their previously expressed opinion, that the arches which were supposed to carry the legs are so slender as to be incapable of bearing the free legs of so large an animal, the diameter of the joints being hardly more than a sixteenth of an inch outside measure, consequently affording insufficient room inside for the required muscles. Legs of such proportion, according to Professor Smith, do not belong to the class of crustaceans. He also thinks that the regular spacing of these arches along the under surface renders it very improbable indeed that they supported legs. If crowded together the argument would be of less weight, but while they are so very slender, they are one fourth of an inch apart.—4 *D*, *March*, 1872, 222.

EARLY STAGES OF THE AMERICAN LOBSTER.

An important contribution to zoology has appeared in the June number of the *Journal of Science*, in the form of a paper upon the early stages of the American lobster, by Professor S. I. Smith, of Yale College. It is somewhat remarkable that the modifications which take place in the growth of so prominent a crustacean as the lobster in its progress from the egg to the adult have not been studied out before, in view of the great abundance of the animal and the ease with which it can be procured upon the coast. The research of Professor Smith, however, covers nearly the entire period in question, with the exception of one stage prior to that which immediately represents the form of the adult. The materials examined were obtained by him in the summer of 1871 in the vicinity of Wood's Hole, on the Vineyard Sound, in connection with the explorations of the United States Commissioner of Fish and Fisheries.—4 *D*, *June*, 1872, 401.

PROFESSOR GILL'S ARRANGEMENT OF MOLLUSKS.

Professor Gill has prepared an "Arrangement of the Families of Mollusks" for the use of the Smithsonian Institution, and as a guide for the arrangement of its collections, which embodies the most recent results of the relations of the families among themselves, as viewed from an anatomical standpoint. In an extended introduction prefacing the list of families, he has discussed the principles of classification, especially their application to the mollusks, and has retained the true mollusca and molluscoidea in a common primary subdivision of the animal kingdom. Admitting that no common characters have been recognized which can be used as an exclusive diagnosis of the common groups, it is thought that the difficulty of framing such a diagnosis "appears to be the result of the diversity of secondary modifications and ramifications, and the extreme specialization of some forms, and loss of common primitive characters, rather than of the divergence of the two types from a generalized *protozoon*, or original primordial stock." But the relations of the mollusca and molluscoidea, as established by such forms as *Rhodosoma*, *Rhabdopleura*, etc., are so much more intimate with each other than in either case with other branches, it is considered advisable to represent such relations by the combination of the groups into one great primary type.

In the Mollusca vera are three classes:

1. Cephalopoda, with two orders—*Dibranchiata* and *Tetrabranchiata.*

2. Gasteropoda, with five sub-classes and eleven orders: Diœca, with *Pectinibranchiata*, *Heteropoda*, *Rhipidoglossa*, *Docoglossa*, and *Polyplacophora;* Pulmonifera, with *Pulmonata;* Opisthobranchiata, with *Tectibranchiata* and *Nudibranchiata;* Pteropoda, with *Thecosomata* and *Gymnosomata;* Prosopocephala, with *Solenoconchæ* (*Dentalium*) only.

3. Conchifera, with five orders: *Dimyaria*, *Metarrhiptæ*, *Heteromyaria*, *Monomyaria*, and *Rudista.*

These three classes contain 283 families, recent and fossil. The remaining three classes and nine orders, constituting the *Molluscoidea*, embrace 73 families.

AMERICAN OYSTERS IN ENGLAND.

Mr. Frank Buckland, in *Land and Water*, refers to some "Saddle Rock" oysters which a friend had just sent him from New York. They were pronounced by the critic to be white, fat, and plump, and altogether first-class eating, with, however, a slight "mussel" taste about them. According to Mr. Buckland, the proper way of packing oysters, so as to keep them for a long time, is to place them carefully with the concave shell downward, by which means the moisture is all preserved, and the breathing apparatus is kept moist by the natural fluid.—2 *A*, *December* 16, 1871, 419.

ORIGIN OF PEARLS IN OYSTERS.

According to Mr. Garner, in a paper read before the Linnæan Society, the production of pearls in oysters and other mollusks is caused by the irritation produced by the attacks of the minute entozoon known as *Distoma;* and he thinks that by artificial means the abundance of this parasite may be greatly increased. British pearls are obtained mostly from species of *Unio*, *Anodon*, and *Mytilus*, but it is probable that all mollusks, whether bivalve or univalve, with a nacreous lining to the shell, might be made to produce pearls. —18 *A*, *March* 29, 1872, 51.

EMBRYOLOGY OF TEREBRATULINA AND ASCIDIA, AND PROTECTIVE COLORATION OF MOLLUSCA.

Professor Edward S. Morse has presented, in a late memoir to the Boston Society of Natural History, the results of his researches on the early stages of terebratulina, a brachiopod common to our coast. The paper is illustrated by two quarto steel plates containing fifty-eight figures. Relations heretofore believed to exist between the brachiopods and a low group of animals (the polyzoa) are, in the opinion of the author, still further proved in this investigation. These studies give us, for the first time, a knowledge of the early stages of a group of animals which has long attracted the attention of naturalists, Cuvier, Owen, Vogt, Hancock, Huxley, and many distinguished European *savants* having contributed largely to a knowledge of the adult animals of this group. This memoir of Professor Morse has been reprinted in the *Annals and Magazine of Natural History* of London, and has called forth complimentary notices in other European publications. In the current volume of the society's proceedings are several articles from the pen of the same author. In one, on the protective coloration of mollusca, Professor Morse shows that the theory of protective coloring, as advanced by Wallace, applies equally to our native mollusca, and many instances are cited in support of this view. Another paper by Professor Morse, on the early stages of an ascidian, illustrated by a steel plate, will interest those who are acquainted with Kowalevsky's startling comparisons between the embryology of the ascidians (considered by many to be a low group of mollusks) and the embryology of the vertebrates. Additional facts and suggestions are presented by Professor Morse.

SANDWICH ISLAND ACHATINELLAS.

A very interesting and important contribution to our knowledge of the variation and geographical distribution of species is published in a recent number of *Nature*, by Mr. John T. Gulick, in an account of the species of the Helicidæ, known as the *Achatinellinæ*, found in the Sandwich Islands.

The family is quite peculiar to this group of islands, and is characterized by the columella having a spiral twist; but the singular fact is that most of the genera, and all the species, are restricted, not only to a single island, but to very small areas in the islands. In Oahu, an island 60 miles long and 15 broad, there are about 185 species of Achatinellinæ, none of which are found on any other of the islands (with scarcely an exception), and no species occupies a large proportion even of this area. Nearly all are confined to the forest regions skirting two ranges of mountains, about 40 miles in length by five or six in breadth; and no one species is distributed over even one half of this small mountain range, the greater number being restricted to areas from one to five miles in length. The two ranges of mountains are inhabited by species belonging to two different sections of the group. From each side of the main range project mountain ridges, which separate deep valleys a mile or two in width; and in each of these valleys is a subordinate section, having its own varieties, and in many instances its own species, which are found nowhere else. The species of one genus found in the same district are connected together by innumerable varieties, presenting minute gradations of form and color, while those found on different islands are not so completely linked by intermediate forms. Granting the hypothesis that all these various forms have sprung from a common ancestor by a process of evolution, Mr. Gulick is quite unable to account for the prevalence of particular forms in particular localities by the theory of the "Survival of the Fittest," or any other theory that has yet been propounded.

PARASITES AND COMMENSALS OF FISH.

A paper by Professor Van Benéden upon the fish of the coast of Belgium, appearing in the memoirs of the Academy of Science of Brussels, has an important bearing upon the general economy of fishes, containing, as it does, very detailed accounts of the food of the different species, and of the animals, parasitic and otherwise, found in connection with them. Professor Van Benéden, in this paper, remarks that all animals harbor a greater or less number of parasites, and that there are very few that are more favored (or otherwise?) in this respect than fish, which, as a general rule, especially the bony fishes, constitute a nest of worms, etc., lodging a living population which is never seen elsewhere. These are all characterized by their different peculiarities, many of them occupying internal cavities in which they never see the light. These parasites are also remarkably constant to particular species of fish, Professor Van Benéden stating that usually, wherever found, the same fish will have the same parasites, the latter very often playing an important part in the identification of the species. Among the species examined, the turbot was perhaps the most thickly crowded with intestinal worms, while *Atherina presbyter* was absolutely the only one in which such parasites did not occur. A corresponding species very common on our own coast (the *A. notata*), known as the fryer or sand-smelt, probably shares in this peculiarity.

In further continuation of his subject, Professor Van Benéden remarks that worms and crustaceans found living upon the skin of fish are not all to be considered as parasites, since this involves the living of the one at the expense of the other, and many forms merely ask of their neighbor a place of refuge and defense, without taxing him in any way for support. Animals of this kind associating in common, each having its independent condition without preying upon or deriving food in any way from the other, are called *commensals*—a term which signifies their feeding at a common board, and not upon each other. These commensals may be divided into various groups. Thus some of them are tied, while young, to a good neighbor, who lets them go when they have been towed to their destination. Others are adherent at all periods of their lives, but can let themselves go at will, exercising their own discretion in selecting the place of attachment to the body of their neighbor, as in the remora, or sucker-fish. Others, again, have freedom of choice while young, and at a certain period attach themselves permanently for the rest of their lives. Their lot is then connected with that of the host they have chosen. This is the case with some of the barnacles, etc.

Other commensals, again, are never fixed, but take up their position near a neighbor, and never leave him. They remain in the digestive tube, at one end or the other, or they place themselves under the mantle of their acolyte, and make occasional sorties at favorable moments, as in the common oyster-crab. The commensals of the first series carry with them the marks of their servitude; those of the second have no feature by which they can be specially recognized. The series of uniformly fixed commensals he calls *oikosites*, and divides them into perpetual, temporary, and while young. The free commensals he calls *cœnosites*, whether inhabiting the digestive canal, the mantle, or the outside. The true parasites, or those that feed upon their hosts, are also divisible into free and attached, the former being classified by Van Benéden into those that are free during their whole lives, as leeches, fleas, etc., and those that are free for part of their lives only. These may confine themselves to one host, whether while young, as the ichneumons, or when adult, as the lerneans; and they may have several hosts while young, as the distomas and cestoid worms. To this general group the name of *phagosites* has been applied, and they are really the guests of the hotel, which profit only by the table of the host, while the others have at the same time both food and lodgment.

These latter are divided into three essential classes, those (*xenosites*) that travel about and arrive at their destination, like pilgrims, with a definite object before them, being parasites in transit. They are also agamous, and are lodged in the close cavities like the brain, the muscles, or the serous membrane. They do not grow after they are introduced, but assume the character of a cyst, waiting in a lethargic state the day of their awakening in the stomach of a new host. These generally, when liberated by the digestion of the external covering in the stomach of another animal, assume some other transformation.

The next division of these internal parasites is that called the *notosites*, embracing such as, having arrived at their destination, can give themselves up to the business of reproduction, taking the attributes of sex in the most appropriate organs at the end of their journey. The third, or the *planosites*, are those that have gone astray, and can never arrive at the end of their journey. These never quit their retreat, especially such of the agamous worms as are confined to the voracious fish, like the sharks, etc., which have scarcely a chance of passing with their host into the stomach of the animals for which they were destined.—*Mém. Acad. de Belgique*, XXXVIII., 1871.

"QUADRUPED" DREDGED BY THE AUSTRALIAN ECLIPSE EXPEDITION.

The remarkable announcement is made by a member of the Australian Eclipse Expedition that the party dredged up an animal on a piece of coral, the body of which was that of a fish, but which had, instead of fins, four legs, terminated with so-called hands. The fish, somewhat resembling a lizard, stood up on its four legs when placed on the skylight of the steamer!—12 *A*, *June* 20, 1872, 150.

WORMS IN THE TROUT OF THE YELLOWSTONE LAKE.

In referring to the explorations of Dr. Hayden about the Yellowstone Lake during the past summer, mention was made of the fact that the trout all seemed very much infested with a peculiar kind of worm, which interfered considerably with the enjoyment of eating them. Specimens of this animal have been submitted to Professor Leidy, of Philadelphia, who reports that they represent a new species or type of worm, of the genus *Dibothrium*. Two species of the genus have long been known as infesting salmon and other members of the trout family in Europe, but both are decidedly different from the new form just mentioned.—MSS.

RESTORATION OF EXCISED BRAIN IN PIGEONS.

Fifty years ago Mr. Flourens removed the brains of cats and rabbits, and demonstrated that these animals could live without them. Recently Mr. Voit, of Munich, has obtained still more remarkable results. On several occasions he removed the brain of a pigeon, and found, to his astonishment, that after some months it had grown again. The learned physiologist says that for some weeks after the operation the birds seem to sleep, with their heads under the wings, after which they open their eyes and commence to fly about. They do not strike against any obstacle, and skillfully avoid being caught. This shows that they can both see and hear. When some of the animals were killed, five months after the operation, the cavity of the skull was filled with brain matter in two lobes, between which a dividing membrane (septum) was found.—3 *C*, *November* 16, 1872.

EFFECTS OF QUININE ON WHITE BLOOD CORPUSCLES.

Additional experiments are adduced by Kerner to show that quinine puts a stop to the motion of the white blood corpuscles, and renders them round and darkly granulated. He also shows that this action is not due, as Stricker and others have supposed, to the presence of free acid, as perfectly neutral hydrochloride or carbonate of quinine, in the proportion of one part in 4000 of fluid, produces this effect when dissolved either in water or serum. Solutions of salicine, caffeine, atropine, and sodium-arsenite, in like concentration, had either no effect at all or very little.—21 *A*, *March*, 1872, 254.

CELLULOSE IN ANIMAL TISSUES.

The announcement of the occurrence of cellulose in the animal kingdom, made by Schmidt in 1845, was at first received with much incredulity; the possible existence of such a non-nitrogenous substance in an animal being a startling proposition. Recently Shäfer has renewed the examination of certain animals, such as *Pyrosoma*, several *salpas*, and *Phallusia mammillaris*, and by a carefully conducted chemical process he has succeeded in isolating a substance which, by all tests, exhibits an absolute identity as a chemical body with cellulose of plants. The proofs of this, as given, are as follows: first, the quantitative composition; second, the assumption of a violet-blue color on the addition of iodine, after previous action with sulphuric acid; third, the solubility in ammoniacal oxide of copper, and the precipitation from this solution by acids; fourth, the alteration of this cellulose precipitated from ammoniacal oxide of copper, not only in its physical, but also in its chemical condition, and with the retention of its behavior to iodine; fifth, the transformation into fermentable sugar by long action of sulphuric acid; sixth, the transformation into a nitrous body by the action of fuming nitric acid, which product is partly identical with gun-cotton and partly with collodion.—19 *C*, *March* 23, 1872, 94.

VARIATION IN THE SIZE OF BLOOD CORPUSCLES.

Dr. Manassein, of St. Petersburg, has ascertained that every influence which occasions a great alteration in any of the functions of the body alters materially the character of the red corpuscles of the blood. Among other points he ascertained that all circumstances tending to increase the temperature of the body reduced the size of the corpuscles, such as septicæmia, or poisoning an animal by the injection of putrid matter into its vessels, exposure of the body to a high temperature, and keeping the animal in a room surcharged with carbonic acid. On the other hand, the breathing of oxygen, exposure of the whole body to cold, the administration of hydrochlorate of quinine, cyanic acid, and alcohol tend to lower the temperature of the body, producing at the same time an enlargement or expansion of the corpuscles. Muriate of morphia constituted an exception; for, though producing depression of temperature, it also causes diminution of the size of the corpuscles, which is probably explicable on the supposition that it exerts an inhibitory influence on the respiratory acts, and therefore leads to the accumulation of carbonic acid in the blood. Acute anæmia also was found to cause dilatation of the corpuscles.—13 *A*, *Dec.* 1, 1871, 539.

MODIFICATION OF BLOOD GLOBULES.

Mr. Ritter, of St. Petersburg, has published a report of an extended investigation into the relationships between the modifications of the blood globules and those of the excretions, and sums up the result of his inquiries in the following propositions: 1. In subjecting man or animals to the influence of tartar-emetic, or of the sulphuret of antimony, of arsenious acid, or of phosphorus, large or poisonous doses produce an extensive alteration of the blood, while feeble ones have a much less energetic action. 2. The blood globule is distorted, while crystals of hæmoglobin appear simultaneously. 3. The blood is anæmic, the albumen and the globules diminish, the fibrine increases, and the proportion of gas diminishes. 4. The amount of glucose usually increases, though in certain cases it diminishes. 5. Fatty bodies always increase. 6. This is also the case with cholesterine, the variations in the amount of which are much greater than those of the fatty bodies. 7. Their variations are in direct relation with the dose of the poison and the alteration of the globule. This fact would seem to support the hypothesis that the fatty bodies and cholesterine are the product of deoxidation. 8. The composition of the urine varies in a manner similar to that of the four bodies just mentioned. 9. The total quantity of the nitrogen and of the urea diminishes. 10. The acidity of the urine diminishes, and, in fact, may be replaced by alkalinity. 11. The uric acid always increases. 12. When the blood globule is greatly modified, and especially when the crystals of hæmoglobin appear, the urine contains the abnormal substances which are most frequently the coloring matters of the bile, albumen, and sometimes of the hæmoglobin. 13. These compounds increase the formation and deposit of fat, but only when administered in certain doses.—4 *B*, *April*, 1872, 363.

OCCURRENCE OF HÆMOGLOBIN IN THE ANIMAL KINGDOM.

Mr. E. Ray Lancaster discusses the presence of hæmoglobin in the muscles of mollusca and its distribution in the living organism, and remarks that the only mollusca in which this substance occurs are *Planorbis* and the allied species, in which the blood is of a brilliant red color. He thinks that possibly in other gasteropods this substance may be present in quantities too small to be detected.

The localities in which the hæmoglobin has been detected by means of the spectroscope are, first, the red granules of the blood of the vertebrata, except in *Amphioxus*, where it occurs in the plasma only; second, in most of the striped muscles of mammalia and birds, but only in the cardiac muscles and in certain very active muscles of other vertebrata; third, in the unstriped muscle in the human rectum; fourth, in certain annelidæ; fifth, in fluid from the perivisceral cavity of the leech; sixth, in the plasma of the so-called blood of the larva of *Chironomus* (a dipterous insect), but it has been sought for in vain in other insects, myriapods, and arachnids; seventh, in the blood plasma of some crustaceans, but not in others; eighth, as a rule, it is absent from the blood of the mollusks, excepting in that of *Planorbis*.—21 *A*, *March*, 1872, 255.

TRANSVERSELY STRIATED MUSCULAR FIBRE IN ACARI.

Mr. Dall some time ago announced the discovery of transversely striated muscular fibre in the mollusca; and we are informed by Flögel that the same attribute applies to the muscle of a species of *Trombidium*, one of the *Acari*. These striæ are very wide apart, each fibre appearing to be composed of a semi-fluid substance, which remains uncolored in perosmic acid, and is filled with denser columns, the fibrils.—13 *A*, *May* 1, 1872, 170.

ABSORPTION OF INSOLUBLE MATTER BY ANIMAL MEMBRANES.

Dr. Auspitz, of Vienna, who has been engaged in certain investigations upon the absorption of insoluble matter by animal membranes, has arrived at the following conclusions on the subject: 1. That in mammals insoluble matter (starch-flour granules), starting from the peritoneum and subcutaneous tissue, is able to reach the lungs, and through these organs to reach the general circulation. 2. That these granules, in order to go over into the veins, pass through the lymphatic system. (That they are taken up exclusively in this way is not as yet proved.) 3. That the epidermis always presents a considerable, though only relative and not absolute obstruction to the absorption from the integumentary surface. 4. That the absorption is essentially promoted by the medium of fat, which goes over into the circulation in the same manner as starch flour, though even more easily. Finally, the supposition may be offered, even if the direct proof be provisionally deficient, that all that is true of starch-flour, and in a higher degree of fat, may also be asserted of other insoluble bodies of finer division, and therefore less permanence of form, than the starch flour. The supposition is not in any way contradicted by the discoveries of Auspitz made in connection with his well-known experiments with mercury.—3 *A*, *April* 15, 1872, 308.

EFFECT OF SWINGING IN LOWERING THE TEMPERATURE OF RABBITS.

Some experiments recently made by Dr. Manassein upon rabbits subjected to the action of swinging showed that, when the swing made from thirty to forty vibrations in the minute, the temperature of the interior of the body fell in all instances, the maximum depression being 1.2° C., the minimum 0.3° C., and the average 0.66° C. The effects were fully marked in about fifteen minutes, and lasted for about two hours. The tendency to sleep was always distinctly expressed. The depression in the temperature of the body was not occasioned by the mere renewal of the air in contact with the surface, as this was carefully guarded against by enveloping the animal in wool. These experiments are of practical value, as showing that swinging has the same effect in depressing the animal temperature in rabbits made ill (feverish) by the injection of fetid pus into their vessels. Their temperature may, in such case, even be lowered to the normal degree.—13 *A*, *November* 1, 1871, 500.

SENSIBILITY IN THE SNOUT OF THE MOLE.

According to an abstract in the *Academy* of an essay by Schultze, the snout of the mole is a tactile organ of extraordinary power. The fore part of the muzzle in this animal can be seen with the naked eye to be beset with numerous papillæ. These, when examined with the microscope, appear as low elevations, varying from 0.09 to 0.2 of a millimeter in diameter, composed of cells, and with an axial cavity traversing them from base to apex, and containing a structureless mass, which is probably a modification of connective tissue. The shape of the cavity is that of a dice-box, or of two cones joined by their apices: The terminations of the nerves are in the outer cone, and may be very distinctly brought into view with chloride of gold. The snout is very richly supplied with nerves, presenting the usual medullated character; but, having reached the base of the "tactile cones" of the papillæ, they lose their medulla, and the axis cylinders, to the number of about twenty, are prolonged in the gelatinous tissue of the interior of the cones, almost as far as to the surface, at least to the fifth layer of epithelial cells. The axis cylinders are arranged in the form of a circle, with one, two, or three in the centre. A few fibres penetrated the epithelium outside the cones, and terminated in or between the cells themselves. The number of the papillæ Schultze estimates at about 5000, and the number of nerve ends in the cones alone must therefore be about 100,000; and as they are thus almost exposed to the air, they must constitute a wonderful sentient organ.—13 *A*, *October* 15, 1871, 481.

TRANSPLANTATION OF THE PERIOSTEUM.

Mr. Philippeaux, whose experiments upon the transplantation of animal tissue from one part of the body to another, or from one animal to another, have excited much attention, has been investigating the subject of the periosteum. In the course of his researches he introduced a slip of the periosteum of the tibia under the skin of the belly of a rabbit, and found that at the end of thirty days a long bone was developed, presenting the microscopic structure and the density of a regular osseous tissue, the ossification being complete in about fifty days. At the expiration of one hundred and twenty days, however, every trace of this substance had disappeared, the newly-found bone having been entirely absorbed. The important conclusion derived from these facts seemed to be that if ossification be readily produced as the result of the periosteal transplantation, the new tissues are not permanent. A different result is seen when the periosteum is stripped up, as, if this remain attached to the bone by one of its extremities, an ossification takes place which is permanent.—8 *B*, *November* 18, 1871, 504.

RELATION OF GLYCOGEN TO MUSCULAR ACTION.

According to Weiss, muscular action has a very close relation to the amount of glycogen in muscle, as shown by a series of experiments for determining the percentage of this substance in muscle before activity and afterward. The comparison was made by tetanizing the muscles of one leg of a decapitated frog by induction currents, while those of the other remained perfectly at rest, the sciatic nerve being cut. In one set of experiments the percentage of loss was over 24, in another 28, and in a third, where only the larger muscles were compared with each other, the loss was 50 per cent. It was also ascertained, in the course of these inquiries, that the heart, which is the muscle in most constant activity, has a store of glycogen amounting to more than two thirds that of all the other muscles. The general tenor of the experiments seemed to show that even in starvation muscular energy is retained as long as the store of glycogen lasts.—21 *A*, *February*, 1872, 156.

ORIGIN AND DEVELOPMENT OF FIBRINE FROM ALBUMEN.

Dr. Goodman publishes a paper in the *Chemical News* upon the origin and sources of development of fibrine in the animal organism, in which he attempts to show that genuine fibrine is derived from albuminous substances by the agency of water. In illustration of this, he states, as the result of his investigations, 1. That albumen, from the egg, suspended in ropes in cold and pure water, and exposed for some little time to its influence, loses its character of albumen, and spontaneously assumes the nature, appearance, and constitution of fibrine. Thus it coagulates, and independently of the application of heat, and becomes solid and insoluble—characteristics which distinguish fibrine from all other analogous substances. 2. That under the microscope, which was used in all these experiments, albumen thus transformed by water exactly resembles blood fibrine, with the same reactions, etc. So great was the resemblance that a medical gentleman from Manchester selected this substance under the microscope for the real genuine blood fibrine, in preference to a specimen of the fibrine substance itself.—1 *A*, *January* 5, 1872, 4.

GROWTH OF FINGER NAILS.

A curious investigation has lately been made by Professor Dufour, of Lausanne, in regard to the rate of growth of the finger nails, in which it is stated that the professor has extended his examinations over a period of more than twelve years. The actual results obtained, however, do not seem quite commensurate in importance with the time that must have been occupied, the principal conclusion being that the rapidity of growth in the nail of the little finger is less than that of the larger fingers and the thumb—the difference being about one ninth. As a general rule, the nail grows one millimeter, or the twenty-fifth of an inch, in ten days, and the rapidity of the growth of the thumb nail is probably a little greater than that of the finger nails.—3 *B*, *May* 9, 1872, 110.

INFLUENCE OF SCARCITY OF FOOD ON WOMAN'S MILK.

M. Decaisne, of Paris, has lately communicated to the Academy of Sciences of that city an important paper on the modification which woman's milk undergoes in consequence of insufficient food, having unfortunately too good opportunities for such determination during the starvation period of the siege of Paris. After detailing the particulars of his experiments, he sums up the results in the following conclusions:

1. That the effect of insufficient food on the composition of

woman's milk presents great analogy with that observed in the case of animals. 2. That these effects vary according to constitution, age, hygienic conditions, etc. 3. That insufficient food always gives rise, within varying proportions, to a diminution in the amount of butter, caseine, sugar, and salts, while it generally augments that of albumen. 4. That in three fourths of the cases observed the proportion of the albumen is in inverse ratio to that of the caseine, under an insufficient diet. 5. That the modifications in the composition of the milk due to a reparative diet always manifest themselves in a striking manner by the end of four or five days. —20 *A*, *November* 25, 1871, 657.

PHYSIOLOGICAL ACTION OF COFFEE, TEA, ETC.

An elaborate article is published by Dr. Marvaud, in the Memoirs of the Academy of Bordeaux, upon the physiological and therapeutical effects of certain substances which excite to labor or to slumber, some of which are known as the promoters of vital combustion. Among these the author enumerates alcohol, coffee, tea, coca, maté, guarana, and other substances, each of which is specially used in some particular region of the globe. After discussing the entire subject in all its bearings, he sums up the whole in the following conclusions in regard to the substances mentioned, all of which he thinks possess incontestable physiological and therapeutical properties.

1. Their physiological properties consist, first, in a general excitation of the cerebro-spinal system, and consequently of the vital functions of relation; second, in a relaxing of disassimilation, and in a depressing of the organic heat.

2. As stimulants of the nervous system, or as force-producers, and as preventives of waste of tissues, alcohol acts directly upon the sensitive apparatus of the medulla, and indirectly upon the motor apparatus. Coca acts directly upon the motor apparatus, which it excites in the manner of the strychnines. Coffee, tea, and maté act principally upon the brain. Alcohol and coca are to be considered as muscular beverages in distinction from coffee, tea, and maté, which are intellectual beverages, the former exciting the muscles to labor, the latter the intellect. In addition to this, they act as economical elements by lessening the wear of the tissues,

checking the organic excitations, and diminishing the loss by secretion.

3. The abuse of these substances is attended by two evils; first, in the excitation which they cause of the nervous system they may produce fatigue, weakening, and even inertia of the system; and, second, by the obstacles which they oppose to disassimilation, and their impediment of other important functions, they may arrest and even suppress the act of nutrition, and produce torpor and a fatty degeneracy, etc. The therapeutical qualities of these substances result from their physiological action, and they will be available in proportion as they can be used as excitants of the nervous system, as decreasing the heat of the body, and as preventing the waste of tissue.—*Actes Acad. de Bordeaux.*

PHYSIOLOGICAL ACTION OF QUININE.

The physiological action of quinine has lately been the subject of detailed experiment by Binz, who found it to have extraordinary power in arresting the process of fermentation and putrefaction, and to be a powerful poison for low organisms, or, in other words, for all moving bodies consisting of protoplasms. It appears to kill fungi and bacteria, which accompany fermentation and putrefaction, and puts a stop to these processes. It arrests the motion of the white blood corpuscles, and thus prevents them from making their exit from the blood-vessels. It therefore diminishes or arrests the formation of pus in inflammation, pus consisting in great measure of an accumulation of white corpuscles which have issued from the vessels. It also destroys the power of certain substances to produce ozone. The red blood corpuscles have this power, and, by depriving them of it, quinine, when present in the blood, must diminish the change of tissue in the body, and thereby lessen the production of heat.

It is also found that quinine lessens oxidation in the blood; other substances, such as snake-poison, increasing it. When putrid fluids are injected into the circulation of an animal, its temperature rises; but if these are previously mixed with quinine, this rise is arrested or very much diminished. According to Zuntz, the use of quinine has a marked influence upon the excretion of urea, the amount diminishing very greatly.—21 *A*, *December*, 1872, 1203.

EFFECT OF TOBACCO ON MAN AND ANIMALS.

Dr. Lebon, of Paris, has given a great deal of attention to the question of the effect of tobacco upon man and animals, and has lately presented a report on the subject to the Medico-Chirurgical Society of Liege. Among the conclusions which the author has reached in the course of his researches, the following may be mentioned as most important: 1. Smokers, and persons who, without smoking, are enveloped in an atmosphere of tobacco-smoke, absorb for each quantity of ten grammes of tobacco a proportion of nicotine varying from some centigrammes to a gramme. They absorb also about an equal amount of ammonia. 2. The quantity of tobacco consumed daily by a single individual addicted to its use is scarcely less than twenty grammes. A smoker is therefore liable to absorb daily a quantity of nicotine which may reach twenty-five centigrammes, with an equal proportion of ammonia. 3. Of all kinds of smoking, the most dangerous is that of smoking a cigar or cigarette and swallowing the smoke; the least dangerous is that of smoking a nargile, or pipe with a long tube, in the open air. 4. The effect produced by the result of the condensation of tobacco-smoke is analogous to that of nicotine. Nevertheless, there must be added the effects produced by the ammonia, which the smoke contains in considerable quantity. 5. The resinous semi-liquid which condenses in the interior of the pipe contains a considerable proportion of nicotine. It is little less poisonous than nicotine itself, and rapidly destroys the life of animals exposed to its action. 6. The liquid product which condenses in the lungs and mouth of the smoker contains water, ammonia, nicotine, fatty and resinous bodies, and coloring matters. A dose of one drop of this speedily produces paralysis of motion in small animals, and a state of apparent death. These effects quickly disappear, but death actually supervenes if the dose is carried up to several drops. If, instead of administering the liquid internally, the animal is made to breathe it for some time, it dies all the same. In this last case the effects seem due in a great measure to the presence of ammonia. 7. In a dose of a single drop dangerous results are not produced upon large animals, but those of small size are killed instantaneously. Among the effects observed the most constant are fibrillar tremblings, a general congestion of the superficial vessels, stupor, and especially the tetaniform contraction of the muscles of the abdomen. 8. Nicotine is one of the poisons the effect of which is most speedily dissipated, and the habituation to which is soonest accomplished. 9. Contrary to what has generally been assumed, the vapor of nicotine at the ordinary temperature is not dangerous, but it is quite otherwise if the liquid is carried to ebullition. It then produces palpitations, a decided suffocation, precordial pain, and vertigo. Smaller animals exposed to this vapor die almost instantaneously. 10. Among the effects of tobacco-smoke upon man may be mentioned, in small doses, excitation of the intellectual faculties for the moment; in repeated doses it produces palpitations, troubles of vision, and more especially a decrease of the memory, and particularly the memory of words.—1 *B*, *May*, 1872, 93.

ACTION OF ANÆSTHETICS ON THE NERVOUS CENTRES.

M. Prevost, in the course of some experiments in reference to the mode of action of anæsthetics and chloroform upon the nervous centres, has reached conclusions quite different from those of Claude Bernard. This physiologist asserts that chloroform, in acting upon the brain, causes anæsthesia not only in this organ, but acts also at a distance upon the spinal marrow, without being in contact with it.

M. Prevost has repeated the principal experiments of Bernard, which consisted in stopping the circulation of the blood in frogs by a ligature beneath the axillæ, then injecting chloroformed water—in some beneath the skin of the anterior portion of the trunk, and in others beneath the skin of the posterior portion. By varying the position of the frogs in these experiments, Prevost found, contrary to the opinion of Bernard, that chloroform introduced into the hind quarters produced anæsthesia in the anterior when the frog is placed with the posterior limbs in the air, while chloroform introduced into the fore quarters does not produce anæsthesia in the hinder if care has been taken to place the frog with the head downward. He thinks, therefore, that M. Bernard has not been sufficiently guarded against the filtration of chloroform across the tissues.

Upon applying pure chloroform upon the denuded brain of a frog, the aorta of which had been tied, and the animal placed in the position indicated above, M. Prevost has produced anæsthesia in the head of the animal alone, leaving the functions of the spinal marrow unaffected; but upon subsequently untying the aorta, the frog returned to the normal condition, which proves that the chloroform in this experiment has acted only as a simple anæsthetic, and not as a caustic, which destroys the brain, leaving the frog in the condition of a decapitated animal. M. Prevost therefore thinks he is entitled to conclude from his experiments that chloroform produces anæsthesia in the nervous centres only in the portions with which it is directly in contact, and that it does not act at a distance, as M. Bernard supposed.—*Mém. Soc. Physique de Genève*, XXI., 1870, 350.

ORIGIN OF NERVE FORCE.

Mr. St. Clair Gray has lately published a paper upon the origin of nerve force, which he illustrates by what he considers to be a new source of electricity. In the course of some of his experiments he prepared a cell containing a solution of caustic potash, in which sticks of phosphorus and sulphur were placed; and within half an hour he found that, while the sulphur was apparently unaffected, the phosphorus was reduced to an oily mass at the bottom of the cell. After a time, however, it was ascertained that several salts of potassium occurred in the solution, and that the sulphur at the point of contact with the phosphorus had sustained a considerable loss of substance. Similar conditions being found at the end of three months, the phosphorus still fluid, and the sulphur having a continued waste, the amount of electricity generated was tested by Thomson's electrometer, and the electric motive force was discovered to be 162°; and as a Daniell cell only gave 120°, the difference in favor of the new cell was 42°. The constancy of this battery was shown by its continuing to work steadily after the expiration of several months.

Acting upon these hints, Mr. Gray proceeds to suggest a new hypothesis in regard to the origin of nerve force; and, starting with the assumption that nerve power has in it an electric element, he endeavored to ascertain its source, and finally thinks it is to be found in the sulphur and phosphorus of the human body, as the brain is known to contain a considerable amount of phosphorus, while sulphur exists in the liver, and an alkaline solution is in circulation between them. He took a frog, and, having secured anæsthesia by the application of chloroform, an incision was made through the abdominal walls in the right hypochondriac region, and a copper wire passed into the substance of the liver. The eyeball was then pierced, and a similar piece of copper wire brought in contact with the brain by passing it through the optic foramen. The free extremities of the copper wires were then brought in contact with the exposed sciatic nerve of another frog's hind leg, when powerful convulsions were immediately induced in the muscles.

Fortified by this experiment, Mr. Gray thinks that a portion, at least, of this current is generated by the action of the alkaline fluid on the sulphur and phosphorus contained in the organs mentioned. Although the living body is known to have other sources of electricity, Mr. Gray thinks that the prime agent in nervo-motor power is derived from the reaction of the brain and liver, especially in view of the fact that the kidneys excrete about 72 grains per diem of phosphoric acid, and of sulphuric acid nearly 100 grains are produced per diem, chiefly from the brain and liver.

Mr. Gray also thinks that the sympathetic nerve, with its branches and ganglia, is not a separate or isolated system, but merely a constituent part of the general nervous system, having the function of regulating the movements of involuntary muscular fibre, and obtaining its nerve force from the brain. An arrangement similar to that of the Leyden jar is suggested, as occurring in the membranes inclosing the viscera, the lungs, the heart, and the great serous cavities of the body.—18 *A*, *December* 15, 1871, 317.

MENTAL CHARACTERISTICS OF LOWER ANIMALS.

Dr. W. Lauder Lindsay, an eminent physician, in charge of the Royal Insane Institution at Perth, has lately published some interesting articles upon the mental characteristics of the lower animals, in which, as the result of long-continued investigations prosecuted by him, he takes the ground, first, that certain of the lower animals possess minds of the same nature as that of man; second, that there is no essential mental distinction between man and other animals; third, that many of the influences which are the causes of insanity in man operate frequently in the same way, and to the same degree, on the mind of animals; fourth, that man and other animals are alike subject to certain diseases, including especially those of the brain and general nervous system; fifth, that the same sudden and marked changes of character or disposition that in man so commonly constitute the prodromata of insanity occur equally in animals; sixth, that in animals, as in man, there is hereditary transmission of predisposition to disease, of qualities acquired by education, of deformities accidentally produced, and of morbid lesions artificially created; seventh, that the diseases common to man and other animals are frequently, at least, due to similar causes; eighth, that the lower animals are liable to the same kind of mental disorders as man; ninth, that, in comparing the mental or other diseases of animals with those of man, due allowance must be made for *ordinal*, *generic*, and *specific* —for anatomical, physiological, and therefore, also, pathological—*differences*, as well as for *individual idiosyncrasies* or predispositions.

In support of these propositions Dr. Lindsay adduces numerous instances, drawn partly from his own experience and partly from the testimony of others, and certainly makes out a very strong case. He promises a series of articles, first, upon the *physiology of mind* of the lower animals; and, second, upon the *pathology*. Under the first head he proposes to inquire into the differences, real or apparent, between animality and humanity, and into comparative psychology; and under the second to discuss, first, madness in animals, and, second, insanity in animals. The last of these subjects has been treated by him in the *Journal of Mental Science*, and in the *British and Foreign Medico-Chirurgical Review* likewise.

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 matter, and not of the living tissues. In all cases (excepting *Nocti-*

luca) 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 spectroscope, of the light of phosphorescence.—12 *A*, *December* 14, 1871, 132.

PHOSPHORESCENCE OF PYROSOMA.

Professor Panceri, of Naples, to whose experiments upon marine animals we have had frequent occasion to refer, has lately published an account of certain observations upon *Pyrosoma*, a transparent compound ascidian found floating in shoals both in the Atlantic and Pacific Oceans. This is among the most luminous of marine invertebrates, and Professor Panceri has ascertained that the light-emitting organs are two large granular patches, placed on either side, near the mouth of each of the tunicate constituents of the compound mass. He also ascertained that from a single egg four embryos are developed, while the "cap" to which they are attached represents a fifth embryo, which attains its development first, has a mouth, nervous system, and a heart that pumps blood into the chain of four embryos encircling it.—15 *A*, *April* 13, 1872, 466.

PRESERVATION OF JELLY-FISH.

All marine zoologists are aware of the difficulty experienced in preserving certain forms of marine animals, the jelly-fishes especially, so as to exhibit them in their natural shapes and relationships; and it may interest them to learn of the experiences of Professor Van Benéden in solving this problem. He not long since exhibited before the Academy of Sciences of Belgium preparations of specimens of various kinds of *Medusæ*, *Ctenophoræ*, etc., which had been prepared for several weeks, and were remarkable for the excellence of their condition. Two different substances were made use of for the purpose in question; one a weak solution of osmic acid, and the other a solution of picric acid. Osmic acid has of late come into extensive use in histological investigations. It has the property of hardening the tissues of the more delicate organs, so as to allow very thin sections to be made for microscopical purposes. It has also the valuable peculiarity of coloring, first brown and then black, the fatty matters in general, particularly myeline. It tinges the epithelial cellules brown, as well as the muscular elements. It brings out distinctly the fibrillium of the cylinder of the axes of the nervous fibres, showing the isolated nervous fibrils, and generally defining the limits of the cellules, and showing their different characteristics. To use this osmic acid in preparing *Medusæ* and *Ctenophoræ*, so as to keep them from the destructive agency of alcohol, they are to be treated in a feeble solution of the osmic acid (one sixth to one tenth per cent. to one hundred of water) for a period varying, according to the nature of the objects, from fifteen to twenty-five minutes. After this lapse of time the animals assume a very slight brownish tinge, the cellules of the endoderm and the organs formed at the expense of the endodermic sheet alone becoming colored; the other tissues preserve their primitive transparency. Thanks to this property, the endodermic cellules and the extra vascular canals become admirably defined, while the cirrhi are more distinct than in the living medusa. At the same time all the tissues become hardened, and the objects can then be removed from the acid solution; and after being carefully washed, they are to be placed in strong alcohol, without any danger of their ultimately losing either their elegance or the transparency of their tissues. Indeed, the organization and structure of these delicate objects can be studied weeks after, and perhaps even months, as well as if they were living under the eye.

Another method which Professor Van Benéden has employed with success consists in the use of a concentrated solution of picric acid. He preserved in this way, for about six weeks, some small medusæ, and, on exhibiting them to the Academy, they presented all the clearness of their forms, and, to a great degree, all their tissues. The only change was in certain smaller medusæ, which became slightly opaque. The *Noctilucæ* he was able to study, thus prepared, as well as though living before him.—*Bulletin Acad. Royale des Sciences de Belgique*, 1871, 179.

NEW EDITION OF DARWIN'S "ORIGIN OF SPECIES."

Some idea of the amount of interest experienced in regard to the views of Mr. Darwin upon the genesis of species may be gathered from the fact of the recent publication, by Murray, of the sixth edition of the work entitled "The Origin of Species by Means of Natural Selection." Numerous corrections and additions have been made to the work as it was previously known; and with his usual candor, Mr. Darwin has made use of the numerous criticisms of his works that have appeared, and has allowed them to modify materially his opinions in certain directions. As might have been expected, much of the new matter is devoted to answering the objections of Mr. Mivart, perhaps the most able of his antagonists. Mr. Bennett, in his notes on the work, thinks that each successive edition of the "Origin of Species" lessens the distance between Mr. Darwin and those who believe that the influence of natural selection, though a *vera causa*, have been overrated as an element in the evolution of species.

If it is admitted that important modifications are due to "spontaneous variability," that natural selection is not the exclusive means of modification, Darwinians and non-Darwinians have equally before them the problem to discover what these other laws are which are co-efficient in the production of new species, and what part each of these plays in producing the final result.—12 *A*, *Feb.* 22, 1872, 316.

MICROSCOPIC FORMS IN CHICAGO WATER.

Mr. Babcock, of Chicago, has contributed an interesting article to the "Lens" upon the effect on the hydrant water of the reversal of the current of the Chicago River. It is well known that during the past year an engineering enterprise of much magnitude, initiated some time since, was completed, namely, the connecting of the Chicago River with a tributary of the Mississippi, by which its stagnant waters were carried southward toward the Gulf of Mexico, and their place supplied by a continuous stream of pure water from the lake.

One desired effect of this enterprise, namely, an improved sanitary condition of Chicago, was speedily accomplished; and not only did the effluvium from the river measurably diminish, but the hydrant water has been greatly improved in purity. The shaft through which water is admitted to the tunnel from the water-works is situated in the lake, some two miles from the shore, and, although so far removed from the drainage of the city, more or less of impurity continually found its way into its mouth. This was proved both by chemical and microscopical examinations, numerous forms of infusorial objects, such as diatoms, vegetable and animal germs, etc., being readily discernible. Somewhat to the inconvenience of microscopists, the new arrangement has tended to reduce the number of such objects very materially, so that the water sometimes scarcely repays the labor of searching for microscopical material.

Mr. Babcock is inclined to believe that, so long as a moderately rapid current is kept up in the Chicago River from the lake, the city will be provided with water nearly equal in purity to that at Mackinaw, which has become proverbial for its excellence.—*Lens, April*, 1872, 103.

INTERNATIONAL CONGRESS OF ANTHROPOLOGY.

The International Congress of Anthropology and Prehistoric Archæology met at Brussels on the 22d of August and closed on the 30th, with an attendance of six hundred men of science from various parts of the world. The sessions were held in the Ducal Palace, under the presidency of M. D'Omalius d'Halloy, the eminent Belgian geologist, and probably the dean of living naturalists, as he has nearly attained his ninetieth year.

The vice-presidents for other countries were M. Virchow, for Germany; M. De Quatrefrages, for France; Mr. A. W. Franks, of the Christy collection of the British Museum, for England; M. Nilsson, for Sweden; M. Steenstrup, for Denmark; and M. Conestabile, for Italy. There was no one there to represent America in this connection. The special object of the Congress was the discussion of subjects connected with archæology and the prehistory of Belgium; and the principal results reached by the discussion are stated to be that the elements of the prehistoric populations, even of the age of stone, are discernible in the present people; also that even in the most remote ages the migration of races took place on a scale much more extensive, and with more frequency than has been believed until quite recently. In addition to the papers laid before the meeting, various excursions took place for the purpose of examining the prehistoric remains in the vicinity of Brussels. Before closing it was decided to hold sessions hereafter biennially instead of annually.

The next meeting is to be held at Stockholm in 1874, and Prince Oscar of Sweden (now king) was nominated by acclamation for the presidency.—12 *A*, *August* 29, 1872, 355.

SKELETON OF BAOUSSÉ-ROUSSÉ.

The discovery of a human skeleton in a cave on the Italian frontier near Mentone, by Dr. E. Rivière, has excited great interest among ethnologists, in view of its association in point of time with the remains of extinct animals, being one of the best authenticated occurrences of the kind on record. At the time of the discovery Dr. Rivière was engaged in the exploration of bone caves, under the authority of the French government, and had obtained numerous remains of birds, gigantic stags, hyenas, rhinoceroses, and other animals.

The cavern in which the discovery took place (Baoussé-roussé) is near the line of railway from Mentone to Vintimille, and the skeleton was found beneath a layer of earth several yards in thickness. It is of the ordinary size, and entire, with the exception of the ribs, which were broken by the pressure of the superincumbent earth. The teeth and lower jaw are in a good state of preservation. The skull differs from the rest of the bones in being of a deep brick-red color. From the attitude it would appear as if the man had died in his sleep, and was carefully covered over without disturbing the earth beneath. Stones were placed at the back and sides, as if to indicate the outline of the grave.

Numerous small shells and deer teeth, all pierced with a hole, were found around the skull, as if they had been twined in the hair or formed part of a head-dress. Around the skeleton were found many stone implements and bone needles. Associated with these were bones of various animals.—5 *A*, *July*, 1872, 283.

PREHISTORIC (?) MAN IN AMERICA.

Several years ago General James H. Carleton, U.S.A., visited the abandoned drift of the Hanover copper mine, on the side of a mountain ten miles northeast from Fort Bayard, Grant County, New Mexico. The passage was made through a body of earth to reach the solid rock. At the distance of twenty-five feet from the mouth, and where the earth overhead was perhaps equally thick, a portion of the dirt roof had fallen away, and revealed an object which, on examination, proved to be the cranial portion of an inverted human skull. With a bowie-knife the general broke off a considerable portion of the calivarium, the remainder being imbedded so firmly that he could not remove it.

He was unable to determine whether the rest of the skeleton was there or not, but is satisfied as to the completeness of the cranium. In his visit he was accompanied by Governor Robert B. Mitchell and Hon. Charles P. Cleaver, both of whom were cognizant of the circumstances. The fragments of the skull obtained by him were presented to David L. Huntingdon, U.S.A., then stationed at Fort Bayard.

EFFECT OF INTERMENT ON THE STRUCTURE OF BONE.

According to Carl Aeby, bones interred in the earth experience a similar change in the course of time to that which takes place in surface rocks. The carbonate of iron of the water acts upon the phosphate of lime, so as to produce carbonate of lime and phosphate of iron. The enamel of teeth found in the pile dwellings is colored by vivianite, and Göppert has observed the formation of large crystals of vivianite in human bones.

Mr. Aeby maintains that if the bones of domestic animals from the pile dwellings contain less gelatine than recent bones, they have been deprived of it not by time, but by the process of boiling.—30 *C*, *July*, 1872, 567.

LEFT AND RIGHT HANDEDNESS.

In a notice in *Nature*, by Mr. Pye Smith, of a pamphlet upon left-handedness by Dr. Daniel Wilson, of Toronto, it is stated, as general results from the investigations of the author and others, that we may conclude (1) that the primitive condition of man and other vertebrates was, as their early fœtal condition still is, one of complete bilateral symmetry of structure, and also of functional symmetry; (2) that this primitive ambidextrous use of the limbs is occasionally superseded in animals, and constantly in all races of men of which we have any knowledge, by a preferential use of one side, and that this is a necessary step in development as soon as the more delicate operations performed by a single hand take the place of those of digging, climbing, etc., in which both take part. It is, in fact, a differentiation produced by the same causes which have led to the specialization of the fore and hind limbs in frogs, birds, or kangaroos, compared with their uniformity of structure and function in fishes, crocodiles, and horses. (3) The prevalent choice of the right hand when differentiation was established must have depended on some slight advantage, at present unascertained, by which dexterity at last suppressed *gaucherie.* (4) The occasional preference of the left hand, which is often partial and sometimes hereditary, does not depend on any "coarse" structural abnormality, but is an instance of atavism—of reversion to the primitive and universal ambidextrous, or to a subsequent and partial left-handed condition.—12 *A*, *June* 13, 1872, 120.

A SEA-SERPENT IN A HIGHLAND LOCH.

A very remarkable communication, entitled "The Sea-Serpent in a Highland Loch," is published in *Land and Water* for September 7, and contains a circumstantial account, apparently considered veracious by Frank Buckland, of a remarkable beast in Loch Hourn. This, according to the article, was seen by the writer on two occasions in August, when the weather was still and hot, and the sea like glass. The animal resembled a serpent, and its length was estimated at about ninety-six feet. The body was thrown in a succession of undulations or curves, eight in number, in addition to the head and neck. The motion of the animal was caused by the undulation of these curves, and was extremely rapid; in fact, it made a hissing rush through the water, quite audible from the vessel of the observer, the sea being quite still, and no wind blowing.

The party observing the animal was in a sail-boat, and at one time within one hundred yards, at which distance, by means of opera-glasses, it could be seen very distinctly. When nearest, the sea could be plainly noticed running off its neck and the back of its head as it does from a low, flat rock which has been submerged by the waves. The curves into which it threw itself were supposed to be for the purpose of exposing as much of the body as possible to the air, as when moving rapidly it appeared to be perfectly straight. Some of the party thought that the tumult of water about the neck was caused by a lashing motion, as of a mane, but nothing of this kind was clearly distinguished. The head appeared flat, and the observers could see distinctly under the chin. Some thought they could distinguish a back fin sticking up, but of this they were not certain. In the distance the color was black.

The writer calls attention to the close resemblance of this animal in its general character to the sea-serpent so frequently reported as existing in the Norwegian fiords, and states that the resemblance heretofore noticed to a string of barrels, one after the other, was very striking. The idea of this being a school of porpoises was considered entirely absurd, as the water was perfectly clear, and the undulations were occasionally quite fixed for some seconds. The elongated head and neck were always manifest. Occasionally the greater part of the body would sink below the surface, leaving the head and neck exposed.

Mr. Buckland, in commenting upon this communication, refers to various drawings, figures, and descriptions of early writers as being corroborated in every respect by the account just given; and he thinks that the coasts of Norway and of Northern Scotland are certainly inhabited by living creatures which, for the want of a better name, may be called great sea-snakes. The theory of the animal being a string of porpoises or a basking shark he considers to be entirely inadmissible. He thinks it may possibly be a *Gymnetrus*—a large, slender fish, shaped like a sword-blade, sometimes attaining a length of fifteen feet; but the difficulty in this comparison would be that the undulations of this latter fish would be from side to side, and not in a vertical direction. The conger, too, when swimming, would move its body in horizontal curves. Flat fish, however, have a motion in the vertical plane, and it is therefore suggested that this may be a ground fish of some sort which occasionally comes to the surface.—2 *A*, *September* 7, 1872, 158.

AQUARIUM AT MANCHESTER.

The interest excited by the successful opening to exhibition of the great aquarium at Brighton, England, has led to the adoption of measures for a corresponding establishment, although possibly on a smaller scale, at Manchester. The permanent building will be completed and opened some time during next year, and arrangements have already been made for securing and preserving, at once, such marine animals and plants as can only be obtained during the summer season.

PROGRESS OF THE NAPLES AQUARIUM.

According to the report of the committee upon the establishment of zoological stations in different parts of the world, as presented at the meeting of the British Association, the zoological station at Naples, under Dr. Dohrn, will be completed and in working order by the beginning of January, 1873. Of this undertaking we have already spoken in our columns, and trust that it will meet the expectations of its disinterested founder. It has already become an institution of international importance, and is receiving gifts of books and money from various sources, although the great body of the expense is supplied by the private means of Dr. Dohrn, who has already laid out nearly $40,000. The object, as heretofore stated, is to furnish to naturalists conveniences for investigating the marine animals of the Gulf of Naples, by supplying comfortable working rooms, fitted up with instruments, books of research, and aquaria with an ample supply of sea-water, together with all the necessary boats, dredges, and the like. It is announced that some steam-ship companies are prepared to grant free passage to the naturalists of this establishment, with their goods and collections.

With the station is connected a magnificent aquarium for public exhibition, the receipts from which, it is hoped, will do much toward meeting the current expenses. Dr. Dohrn proposes, as a new method of securing an income, to offer to different scientific bodies working tables in the laboratory of the station for a certain annual sum. This will confer upon the body subscribing the right to appoint a naturalist, who, on presenting the proper certificate, will be furnished with a table and full participation in all the advantages of the building. In addition to the necessary personnel, several zoologists will be attached permanently, and will receive a regular salary from Dr. Dohrn. The present plan contemplates provision for about twelve tables, to be properly fitted up for use.—12 *A*, *August* 29, 1872, 362.

GENERATION OF EELS.

Much uncertainty prevails in regard to the mode of generation of eels, and many contradictory views have been presented, none of them bearing the test of critical examination. This animal forms a remarkable exception to the characteristics of the anadromous fish, such as the shad, salmon, etc., which run up from the sea as mature fish, and spawn in the fresh water and return again; their young remaining for a time, then visiting the sea, also to return to the rivers when the sexual instinct seizes them. The eel, on the contrary, spawns in the sea, and the young run up into fresh water and pass the period of immaturity, then going down to the sea and remaining there, their young in turn pursuing the same round.

It is now announced by Ercolani, an Italian physiologist, that the eel is really a perfect hermaphrodite; that the genitals are only completely developed at sea, during the month of December—the ovaries and testes being together in the same animal, with spermatozoa; and he believes that the ova are fertilized there before their emission from the body. This is a very remarkable statement, but one that may, perhaps, prove to be correct; at any rate, it comes nearer to solving the problem of the generation of the eel than any suggestion that has hitherto been made.—2 *A*, *June* 15, 1872, 399.

IS THE UNICORN A FABLE?

The question of the existence in nature of an animal corresponding to the unicorn of the Bible and of tradition has been again raised by Mr. Bouwer's account of a visit to a stone cave in Namaqua Land, about twelve days from Lake Ngami. On the walls of this cave are pictures of various animals, drawn by Bushmen with considerable accuracy, and among them is one representing an animal with a single prominent horn. Mr. Bouwer was informed by an old Bushman that he had himself seen the animal, and that it was very fierce, but that it has now disappeared.

A writer on the same subject, in commenting upon Mr. Bouwer's observations, remarks that, in his opinion, the unicorn existed recently in Africa, and that, although not proved to be extinct, the probability of its being in existence at present is not very great. He rests his opinion on the general accuracy of the sketches by savages in other parts of the world besides Africa, and asks, if the unicorn never did exist, why should native drawings of such an animal exist in Namaqua Land, Natal, the Transvaal Republic, and Cape Colony, all having the same general characteristics and the one particular feature?—12 *A*, *August* 8, 1872, 292.

PARASITE OF THE BEAVER.

Dr. Le Conte, writing from Lausanne, in Switzerland, addresses a communication to *Nature* in regard to a remarkable parasite of the beaver (*Platypsylla castoris*), which has been considered by some as belonging to the *Aphaniptera*, and to a family equal in value to the *Pulicidæ* (fleas, etc.), while others place it as a type of a new order of insects. Dr. Le Conte, however, who is well known as one of the most eminent of living entomologists, after a careful study, considers that it belongs to the *Coleoptera*, and that it is remarkable for the generic and specific peculiarities it presents. One special character which it shares with three other genera is the reception of the antennæ in cavities on the dorsal surface of the thorax. Special attention is invited to this insect on the part of those who have to deal with beavers, either in captivity or otherwise, who are urged to collect whatever insects may be found upon them; and it is suggested that the capybara and the musk-rat may support allied forms. The insect is not supposed to feed in any way upon the body of the beaver, but simply to burrow among the epithelial scales of its epidermis. It has no organs with which it can perforate animal substances, and it can not eat living tissues nor fluids.—12 *A*, *June* 27, 1872, 162.

NEW FOSSIL DEER.

Mr. Boyd Dawkins, in a paper on the fossil deer of the forest bed of Norfolk and Suffolk, describes a new species under the name of *C. verticornis*, which has certain characters allying it to the Irish elk, and which it must also have rivaled in size. In this new species the base of the antler is set on the head very obliquely; immediately above it springs the cylindrical brow tyne, which suddenly curves downward and inward; immediately above the brow tyne the beam is more or less cylindrical, becoming gradually flattened. A third flattening tyne springs on the anterior side of the beam, and immediately above it the broad crown terminated in two or more points. No tyne is thrown off on the posterior side of the antler, and the sweep is uninterrupted from the antler base to the first point of the crown.—12 *A*, *June* 20, 1871, 155.

CHONDRINE IN THE TISSUES OF TUNICATES.

According to Dr. Schäfer, the tissues of the tunicate mollusks contain a substance which in its properties and percentage of nitrogen corresponds closely to chondrine, usually considered a characteristic attribute to the vertebrata.—5 *A*, *April* 20, 1872, 203.

ALLEGED GIGANTIC PIKE.

Among the stock curiosities of the literature of fishes may be mentioned the story referred to in "Walton's Complete Angler," that a pike was taken in 1497, in a fish-pond near Heilbronn, in Suabia, with a ring fixed in its gills, on which were engraved the words, "I am the fish which Frederick the Second, Governor of the World, put into this pond 5th October, 1233;" by which it would appear that this fish had then lived 260 years. This fish was said to have been nineteen feet in length, and to have weighed 350 pounds.

Mr. Frank Buckland remarks that he has at present in his possession a painting of great antiquity which professes to be a portrait of the identical fish, and bearing an inscription corresponding somewhat to that referred to above. The length, however, of the fish represented is four feet nine inches; the ring around the neck measured ten and a half inches, and the fish would probably weigh about fifty pounds. What the facts may really be in regard to the fish in question, it is, of course, impossible to state; although it may be reasonably doubted whether any thing like the age mentioned could have been attained, and the length of nineteen feet must evidently be an exaggerated statement.—2 *A*, *July* 6, 1872, 6.

RILEY ON THE BARK-LOUSE OF THE APPLE-TREE.

At the meeting of the St. Louis Academy of Sciences on the 17th of June last, Mr. Charles V. Riley announced the interesting discovery of the male of the mussel-shaped bark-louse of the apple-tree (*Mytilaspis conchiformis*), and exhibited specimens and drawings. This is the insect that produces the so-called "scurvy" on apple-trees, and in the more Northern and Western States has been one of the most injurious of our orchard pests for many years past. Yet, common and injurious as it is, entomologists have been endeavoring in vain for a quarter of a century to discover the male. Recently in the Northwestern States, which have suffered most from this insect, it has suddenly become harmless, and is fast dying out and being exterminated by its natural enemies, while in that part of Missouri where the male has been discovered it is increasing rapidly. Mr. Riley concludes that organic reproduction is the more normal with this insect, but that, as with the closely-allied plant-lice (aphidæ), the male element is occasionally required to prevent degeneracy.—*Pr. St. Louis Academy.*

NATURE OF THE BLUE COLORING MATTER OF FISHES.

Pouchet has been investigating the cause of the blue color of certain fishes, which, as is well known, is extremely brilliant in certain species. In confining his attention to the French species exhibiting this color, he refers the characteristic in question to a constant anatomical cause. Beneath the skin of the portion of the fish so colored there is always a layer, more or less thick, of small ovoid or irregularly circular minute bodies, yellow by transmitted light, which are the product of the complementary blue color in diffused light. These he calls iridescent bodies, from certain analogies with anatomical elements found in the cephalopods and some acephala. The diameter of these iridescent bodies varies from two to four or five thousandths of a millimeter. In the *Callionymus* they are larger than elsewhere, and each is seen to be formed of a pile of extremely delicate lamellæ applied one upon the other, but readily separable under the field of the microscope. This blue color, complementary of the yellow, Pouchet considered to be due to a kind of fluorescence.—3 *D*, *June* 6, 1872, 228.

REMAINS OF THE MAMMOTH IN CANADA.

Dr. Alexander M. Ross, of Toronto, calls attention to the recent discovery near the village of Millbrook, Durham County, Canada, of the fossil remains of the mammoth (*Elephas americanus*), and remarks that this is the first instance of its discovery within Canadian territory. Various portions of the skeleton were exhumed, among them three molars in excellent preservation. The tusk was very much decomposed, but there was reason to infer that it had originally possessed a length of ten and a half feet and a diameter in the largest part of ten inches.—*Circular of Dr. Ross.*

SUPPOSED RELATION OF MEDUSÆ TO POTATO BLIGHT.

A writer in *Land and Water* thinks he observes a relation between the presence of jelly-fish, or medusæ, on the British coast and the potato blight. According to his account, the jelly-fish has been excessively abundant on the coasts of Scotland and Ireland during the past season; so much so, indeed, as to carry away or to clog up the salmon and herring nets so as to render them unfit for use. For a time they were closely packed along the entire coast, extending seaward forty miles, or even more, and the air was affected by the odor emitted by their decomposition.

They are considered so excessively poisonous to man and animals that the touch of their streamers on the hand or on the face produces a most intolerable itching and inflammation. The writer of the article referred to thinks that either the solid particles from the dried-up jelly-fish, or the emanations from their decomposing bodies, being carried inland from the sea, strike the potato vines and produce the disease!—2 *A*, *October* 5, 1872, 259.

CURIOUS HABIT OF BEES.

A correspondent of the Torrey Botanical Club of New York narrates an interesting fact in the history of the bumble-bee, as witnessed by him during the present season. In collecting some specimens of *Dicentra cucullaria* he observed that the spurs of many of their flowers had been perforated or cut, and, on looking about for the cause, he found that this was done by the bees, for the purpose of more readily getting at the honey inclosed. He observed that they alighted first on the lowest flower, and cut a hole in the spur with the mandible, and then inserted the proboscis and took a sip of the honey; thence going to a second flower and to a third, repeating the operation each time.

On another visit he found that the original hole would be used a second time without a renewal of the puncture. The bees appeared to know the exact moment when the flower was fully grown and the honey secreted. Honey-bees were noticed using the perforations made by the bumble-bees to obtain the honey, but never made any incisions themselves. Other species of *Dicentra*, as *spectabilis* and *eximia*, were similarly treated.—*Bulletin Torrey Botanical Club*, 1872, III., 33.

COMPARISON BETWEEN MASSACHUSETTS' AND EUROPEAN FAUNA.

Mr. Gwyn Jeffreys has lately presented to the British Association a comparative estimate of the mollusca of Europe and of Massachusetts, basing this upon the results of his visit to the United States during the summer of 1871. For Europe he enumerates about 800 marine, and 200 land and fresh-water species, while for Massachusetts he allows 367 distinct species, together with 40 considered as varieties. Of these 173 are considered as European—namely, 39 land and fresh-water (out of 110); and marine, 134 (out of 257). This peculiarity of the distribution of the American mollusca he explains by the suggestion that the land and fresh-water species probably migrated from Europe to Canada through Northern Asia, and that most of the marine species must have passed from the arctic seas, by Davis's Strait current, southward to Cape Cod; and the remainder from the Mediterranean and western coasts of the Atlantic, by the Gulf Stream, in a northerly direction. —12 *A*, *August* 29, 1872, 364.

MEETING OF THE AMERICAN ORIENTAL SOCIETY.

A meeting of the American Oriental Society was held in New Haven on the 9th of October, and counted among those in attendance many gentlemen interested in the objects of the society from various parts of the country. The whole number of persons present was about thirty, and several papers of much interest were presented. Professor Stengle, of Columbia College, read a paper upon the connection of the Semitic language with the Spanish; and another was given by Professor Whitney on the religions of India. President Woolsey made a communication upon the god Cronos, and Mr. Van Namee made some verbal remarks upon the relation between the Japanese language and that of China, and especially on the schools and literature of Japan.—*New York Herald.*

PROPOSED "CLOSE TIME" FOR LOBSTERS.

The question has arisen as to whether it is desirable to establish a "close time" for lobsters, during which the female at least should be protected from capture. It is alleged that on the coast of England, and on various parts of the sea-board of the United States, lobsters are diminishing appreciably both in size and number, and that, unless something be done to save them, they will ultimately run out altogether. Mr. Spence Bate, of England, suggests that for that country the capture of lobsters should be forbidden from February until May, and that of the female crab altogether.—15 *A*, *Proc. Brit. Assoc.*, *August* 24, 1872, 242.

NEW AMERICAN FOSSIL VERTEBRATES.

Professor O. C. Marsh, of New Haven, was diligently occupied during the summer of 1872 in elaborating the rich mass of fossil vertebrates collected by him the previous year and the year before in various parts of the West, and has published brief accounts of the new species, from time to time, in the pages of *Silliman's Journal.* The following are among his more important announcements:

Two large pachyderms allied to *Palæosyops*, a gigantic fossil tapir called *Hyrachyus princeps*, two carnivora allied to the *Viverridæ*, and, most important of all, two species of bats

(*Nyctitherium velox* and *N. priscus*), the first of the order ever detected fossil in this country.

A new genus of fossil mammals, named *Dinoceras mirabilis*, from the eocene formation of Wyoming, equal in size to the elephant. It presents a remarkable combination of characters, and, although allied to the recent elephant, the skull was armed with horns, and with huge decurved canine tusks. The top of the skull was deeply concave, and has around its lateral and posterior margins an enormous crest.

A second species, nearly equal in size, called *D. lacustris*, was also obtained, and the two recorded by Professor Marsh are placed in a distinct order, which he names *Dinocera*.

Fossil quadrumana from the eocene deposits of the Rocky Mountains. The genera *Limnotherium*, *Thinolestes*, and *Telmatolestes* are, in his opinion, closely related to the lemurs, especially in the correspondence of the larger bones. The teeth are more numerous than in any known quadrumana, some species having apparently forty—namely, two incisors, one canine, and seven premolars and molars on each side of each jaw. This discovery is considered one of great interest and importance.

Large carnivoræ of a new genus, under the name of *Limnofelis latidens*, in which the canines and premolars of the lower jaw resemble those of the hyena, but with only two incisors on either side. The single species is supposed to have been as large as a lion.

A fossil bird, obtained by Professor Mudge in the upper cretaceous shale of Kansas, and described by Professor Marsh. The remains indicate an aquatic form about the size of a pigeon, but differing widely from all known birds in having *biconcave* vertebræ. The rest of the skeleton, however, is quite similar to that of the average type. The species has been named *Icthyornis dispar*.

Five species of fossil birds of a new genus of waders, *Aletornis*, and one species of *Uintornis*, probably belonging to the woodpeckers; also a new species of *Catarractes* from the post-pliocene of Bangor, in Maine, together with a new turkey and a new crane from the post-pliocene of New Jersey.

Five new species of a new genus of fossil reptiles, which he calls *Thinosaurus*. These were large carnivorous lizards, resembling the *Varanidæ*, or monitors, but differing in certain features pointed out by the professor. They are all from the tertiary beds of Wyoming. Other species belong to two new genera, *Oreosaurus* and *Tinosaurus*, together with a new species of a genus, *Glytosaurus*, previously indicated.

A cretaceous reptilian, allied to *Mososaurus*, and possessing peculiar characteristics. The animal has been called *Colonosaurus mudgei*, after the discoverer, Professor Mudge, who obtained the remains in Western Kansas.

THE PROBOSCIDIANS OF THE AMERICAN EOCENE.

During the past summer Professor Cope, in charge of a division of Dr. F. V. Hayden's Geological Survey of the Territories, explored the paleontology of the eocene beds of Wyoming Territory. He obtained many species of plants, mollusks, and insects, and eighty species of vertebrata, of which some fifty are new to science.

One of the most important of the discoveries made was the determination of the type of proboscidians prevalent in that period. This is exceedingly peculiar and anomalous in many respects. Proboscidian limbs are associated with a dentition of the same type when the number and position of the teeth are considered. Thus a huge external canine alone occupies the front of the upper jaw (premaxillary bone); there are apparently no incisors, and the molars are but few. The incisor is shorter than in the mastodons, etc., and is compressed, trenchant, and recurved, forming a most formidable weapon. The great peculiarity is seen in the structure of the molars, which is nearly that of *Bathmodon*, Cope, an allied perissodactyl. This type is, however, graded into an approach to *Dinotherium* in another perissodactyl, *Metalophodon*, Cope, of which more below.

The type species of this group, called by Professor Cope *Eobasileus cornutus*, was as large as the Indian elephant, but stood lower, having proportions more as in the rhinoceros. The elongate form of the cranium added to this resemblance. The physiognomy was very peculiar. On either side of the front, above each orbit, rose a stout horn, its base continuous with that of its mate. The immensely prolonged nasal bones overhung the premaxillary, as in the rhinoceros, and supported on each side, near the extremity, a massive reverted shovel-shaped protuberance, which united at an open angle with its fellow on the middle line of the front.

These beasts must have lived in herds, like the elephants of to-day, judging from the abundance of their remains, no less than twenty-five or thirty individuals having left their bones within a short distance of one of the camps of the party. Three species were distinguished—*E. cornutus*, *E. furcatus*, and *E. pressicornis.*

THE ARMED METALOPHODON.

This is an extinct odd-toed ungulate discovered by Professor Cope in the lower "Green River" division of the eocene of Wyoming. The only species was named *M. armatus.* It possessed a full series of six superior incisors, and had a formidable knife-like canine, with cutting edges, and a groove on the outer face. The premolars are like those of *Bathmodon*—*i. e.*, with one outer crescent—while the molars differ in having the constituent crests of the single crescent separated on the inner side of the tooth, thus producing two subparallel crests. The lower premolars are singular in possessing one crescent, with a rudimental second by its side. This increases in proportion on the posterior teeth, till on the last inferior molar the two are nearly equally developed. Alternate ridges are, however, on this tooth reduced and rudimental, leaving a parallel two-crested tooth, approaching a tapir, or a *Dinotherium.* There were probably tusks in the lower jaw.

The species was about the size of the rhinoceros, and constituted another addition to the well-armed ungulates of the Wyoming eocene. The transitional forms seen in its tooth structure constitute a point of especial interest.

FOSSIL FISHES AND INSECTS FROM THE NEVADA SHALES.

In the tertiary coal group of the Rocky Mountains, Professor Cope made some interesting discoveries at Osino, Nevada, about twenty-five miles northeast of Elcho, on the Central Pacific Railroad. The associated shales contain fossils, consisting of leaves (principally of dicotyledonous plants), mollusks, insects, and fishes, the two last frequently in a fine state of preservation. The mollusks are similar to *Planorbis vivi-parus*, and the insects principally *Diptera* and *Nematocera.*

The fishes are all fresh-water forms, of which four species were obtained, all of them new to science. One of these belongs to the group of the suckers, now so extensively distributed in North America, and is, we believe, the first instance in which this has been found in a fossil state.

In one of the elevated valleys in the vicinity of this coal bed were found remains of the trunks of ancient forest trees completely silicified. Many of these must have measured five feet in diameter, and were variously altered, some becoming chalcedony, others opal; portions being black, red, yellow, purple, or white, of great purity.

BULLER ON THE BIRDS OF NEW ZEALAND.

An addition to the series of special works upon the natural history of particular regions is made by the appearance, in London, of the first part of a "History of the Birds of New Zealand," by W. L. Buller. The natural history of this country is extremely interesting, and that of the birds not the least so; and from the well-known ability of this gentleman to execute the task he proposes, we have every reason to expect a work of great merit. The birds of Australia have been illustrated by Mr. Gould in his usual magnificent style. The work of Mr. Buller will be of less extent, but will embrace colored illustrations of about one half the species, which amount to nearly one hundred and fifty.—13 *A*, *May* 15, 1872, 190.

REPORT OF THE MUSEUM OF COMPARATIVE ZOOLOGY.

The annual report of the trustees of the Museum of Comparative Zoology for 1871 has made its appearance, and presents the usual satisfactory account of progress in the preceding twelve months. No institution of the kind in this country, and few any where, has so extensive and thoroughly organized a corps of scientific assistants (amounting to between thirty and forty) as that at Cambridge; and, with the immense amount of material constantly coming in, the result in greater part of Professor Agassiz's indefatigable personal labors, supplemented by purchases of entire collections, it is not to be wondered at that the museum is rapidly occupying the foremost rank among such establishments.

Professor Agassiz, the director, calls attention to his expected absence from the country in the expedition of the *Hass-*

ler, gives an account of the arrangements made temporarily to supply his place, and presents the special reports of the various assistants upon the work accomplished in 1871, and to be continued during the year 1872.

"THE LENS," A NEW SCIENTIFIC JOURNAL.

An excellent illustration of the enterprise of Chicago is shown in the fact of its having commenced the publication, on the 1st of January last, of a quarterly journal of microscopy and the allied natural sciences, under the title of *The Lens*, and edited by Mr. S. A. Briggs, a well-known microscopist of that city. This first number is well written, embracing a number of excellent articles, and, if continued for any length of time in the same spirit, will undoubtedly prove a success. The most valuable article is a conspectus of the families and genera of the *Diatomaceæ*, by Professor Hamilton S. Smith. This is a subject to which much attention has been paid, on account of the variety of forms, and the interest attaching to their examination under the microscope; and we are glad to see that, after the many years of labor in this field, Professor Smith has at last commenced to publish his results. We hope now that, not satisfied with this conspectus, which embraces a diagnosis of the tribes, families, and genera, he will favor us with synopses and descriptions of the species, and with figures of the more interesting and important forms.

The journal also contains valuable suggestions by Dr. Woodward, of the Army Medical Museum, and others, on subjects mainly connected with microscopy.

COUES'S WORK ON AMERICAN BIRDS.

A work, entitled "A Key to North American Birds," prepared by Dr. Elliott Coues, one of our most accomplished ornithologists, has been published by the Naturalists' Agency at Salem. The plan of this manual is somewhat peculiar, in being prepared with special reference to use by persons entirely ignorant of the technicalities of the science. An analytical key is introduced, by which any one of ordinary intelligence can determine, in a comparatively little while, the genus of any North American bird, the labor of determining the species being much facilitated by the conciseness and simplicity of the descriptions. Figures are introduced of heads, bills, feet, etc., in considerable number, and the whole work is prefaced by the best account of the external anatomy of the birds in general, and the special peculiarities of the feathers, bones, etc., that has ever appeared in any American work. It also contains an account of all the species of fossil birds belonging to our fauna, furnished by Professor Marsh.

NEW ORNITHOLOGICAL PERIODICAL.

With commendable enterprise, Messrs. Maynard and Dean, of Massachusetts, announce their intention of publishing a periodical entitled *American Ornithology*, to be devoted to the scientific and popular history of birds. It is to appear bi-monthly, at the rate of five dollars a year, and will consist in part of popular articles on birds, and in part of more elaborate and technical memoirs. Each part will consist of about forty pages, and will contain a colored plate of some new or little-known American species.

In view of the difficulty of sustaining special journals in this country, this enterprise is one of no little daring, but will, we trust, be justified by the result. At present there are but two periodicals exclusively devoted to birds; one of them, the London *Ibis*, published quarterly, the other, the *Journal für Ornithologie*, of Cabanis, published bi-monthly in Leipsic.

EDWARDS ON NORTH AMERICAN BUTTERFLIES.

The tenth part of the illustrated quarto publication upon the butterflies of North America, by Mr. William H. Edwards, has just made its appearance. This should have completed the first volume, but, as better specimens have been obtained of several species heretofore figured, it is Mr. Edwards's intention to furnish these in a supplemental number, with the title-page and indexes.

This work, in addition to the numerous colored figures, and the elaborate descriptions of various species and their varieties, contains a synoptic list of North American butterflies, embracing 509 species, of which, previous to 1852, only 137 were known as belonging to North America. Sixty-one species were added between 1852 and 1860, and 311 since the latter year. There is every reason to believe that, with a thorough exploration of other regions of North America, many more will be found and added to this number.

SCAMMON ON THE WEST COAST CETACEANS.

The publication is contemplated of an important work on American natural history, and we trust its appearance will not be long delayed. We refer to the investigation of the cetaceans of the western coast of North America by Captain C. M. Scammon, of the United States Revenue Marine. This gentleman has for many years been directing his attention to the subject, and has collected a large amount of material in reference to the various species of whales and porpoises of the western coast, together with their zoological peculiarities and their habits.

In the extreme difficulty of securing reliable information in regard to these animals, the work of Captain Scammon will be welcomed by every one, especially as it will contain details of much practical importance to whalers relating to the distribution of the species. An interesting feature of the work will consist of a series of views showing the appearance of the species when swimming in the water, thus enabling them to be recognized without difficulty. Careful drawings of the external forms of the animals will also accompany the work, which will embrace a full account of the whale fishery as at present prosecuted in different parts of the globe, whether by civilized or savage men; and the statistics of production in different years and in different regions will be of great value.

The book will be printed in San Francisco by the publishers of the *Overland Monthly*, and the illustrations lithographed by Britton and Rey. It will be published by subscription, and but a limited number of copies issued.

CHARACTER OF THE GALAPAGOS.

Professor Agassiz, in discussing the observations and collections made by the *Hassler*, during its late visit to the Galapagos, considers this group of extreme importance in reference to the question of the development of species. It is so recent that most of the islands are barely covered with the most scanty vegetation—itself peculiar to these islands. Some parts of the surface are entirely bare, while in many places the lava from the volcanos is so fresh as scarcely to show any atmospheric influences whatever, suggesting the idea that their age is recent—belonging almost to the present period. As is well known, they abound in land animals; a few of them derived from the adjacent continent, but a large proportion not known elsewhere, and of the most peculiar character.

The question, therefore, arises, whence these inhabitants came, animals as well as plants? If descended from some other type, belonging to a neighboring land, the amount of difference they present shows that enormous intervals of time have not been required to modify them almost beyond the power of reference to their originals. If they were not created directly and originally in that form on the spot, whence were the germs derived, and what was their character?—*New York Herald, September* 6, 1872.

TRACES OF EAST INDIAN IMPLEMENTS AND CUSTOMS IN WESTERN EUROPE.

Mr. Evans, in his recent work upon the "Stone Age of Great Britain," refers to certain beautifully polished implements of foreign material and of exceptional finish, occurring at various localities, especially about the dolmens of France, England, and Scotland; and in view of the fact that similar implements are abundant in India, where they are kept in large numbers in the temples, and cared for with the utmost jealousy by the priests, and venerated as sacred, he has reason to infer that the dolmen builders came in the first instance from India, as, in addition to the similarity of these implements, megalithic structures are met with of a peculiar construction, such as now exist in the Shewaroy district in India, where the celt worship is still practiced. He suggests that the manufacture of these celts originated in India, and that the implements were brought to Europe by the Aryan ancestors of the European people. As traces of the Aryan language are found in English, and Aryan sepulchral architecture among English antiquities, it would be natural that Aryan tools should be met with, as, it appears, has really been the case.—12 *A*, *July* 18, 1872, 226.

INFLUENCE OF COLORED RAYS ON THE RESPIRATION OF ANIMALS.

The influence of the colored rays of light upon the growth of the living plant has been well substantiated. Messrs.

Selmi and Piacentini have lately been prosecuting investigations with the view of ascertaining their relation to animal life. A dog, a pigeon, and a chicken were placed in an air-tight inclosure into which light entered through colored glass. Through one opening air, freed from carbonic gas, was introduced, and again removed by aspiration. The air used passed through an apparatus for absorbing carbonic acid, the quantity of which was determined after the lapse of some hours. The three animals gave similar results, though not quantitatively alike. The following figures, taken from the observations on the dog, showing the nature of the differences. Taking 100 as the quantity of carbonic acid exhaled by the dog in white light during a certain period: under black glass it was found to be 82.07; under violet, 87.73; under red, 92; under blue, 103.77; under green, 106.03; and under yellow, 126.83. With the two birds the differences were still greater. The experiments were very carefully instituted, excluding as much as possible all sources of error, and taking the influence of temperature into account. It is especially interesting to note that the green and yellow rays, which exert the most decided action on plants, are also most favorable to the respiration of animals.—3 *C*, XXII., 528.

IRON IN THE BLOOD.

A French chemist has lately made an examination of the iron contained in the blood and in the food of animals, and finds that this metal is always a component, varying, however, with the animal. Thus, reducing the blood to ashes at a moderately low temperature, the proportion of metallic iron in 100 parts amounted to about 0.051 in man, 0.055 in the ox, 0.059 in the pig, 0.037 in the goose, and 0.042 in the frog, showing the least percentage in the bird, the next in the reptile, and the greatest amount in the mammal. An important conclusion from these facts is the necessity of supplying to animals generally food containing iron in some assimilable form, as if deprived of this metal the animal must necessarily perish in time, in consequence of the inability to form healthy blood.

A similar composition was found to exist in invertebrates; the blood, whether white or red, always containing an appreciable quantity of iron. The general conclusion arrived at was that the white blood of the invertebrates contained nearly as much iron as the red blood of the vertebrates, and that the plants exempt from green coloring matter, such as fungi, contain iron, as is the case with other forms of vegetation; also, that of all the nutritious substances consumed by man, blood is certainly the richest in assimilable iron. In Europe, however, it is only the blood of the pig that is used as an article of food, that of oxen and other animals having a peculiar odor which causes its rejection.—6 *B*, *May* 27, 1872, 1353.

DAVIDSON ON MORSE'S VIEWS OF THE BRACHIOPODS.

Mr. Davidson, in commenting upon the views of Professor Morse, in reference to the annelidan character of the Brachiopoda, takes occasion to dissent from the hypothesis, and places the group in a class independent of the mollusca, although most fairly related to them. He remarks that some of the characters are rather puzzling, but that any invertebrates may be "annelidized" by overrating certain points of their affinities.—15 *A*, *Proc. Brit. Assoc.*, *Aug.* 31, 1872, 273.

EMBRYOLOGY OF GORDIUS.

M. Villot, in a recent communication to the Academy of Science of Paris, describes what he considers to be the embryonic structure of the *Gordius*, or hair worm. This is a microscopic, cylindrical worm, scarcely 0.205 of a millimeter in length, and 0.045 in width, in which a body, head, and tail may easily be distinguished. The head is as broad as the body, and perfectly retractile. It is armed with a triple crown of large hooks, and is terminated anteriorly by a kind of sucking-tube. This is stiffened by four strong stylets, which serve as a frame. The head, in its movements of protraction and of retraction, is like the trunk of the *Echinorhyncus*, and when exterior to the body the point of the hooks is directed backward. The body exhibits numerous transverse folds, very regular and close together, forming, as it were, continuous rings. The tail is a little narrower than the body, and separated by a deep constriction. It is also distinctly annellated, and has four appendages toward the posterior extremity, two small ones at the centre, and two larger at the side.

When escaped from the egg the embryo has no means of locomotion, but probably attaches itself to pebbles, roots, or stems of aquatic plants, in which it awaits the larvæ destined to become its nurse. When the larvæ of certain tipulæ were introduced into the water containing these worms, they were seen to penetrate into the less-resisting integuments by means of the cephalic armor, and to introduce the head directly thereafter. As soon as this was well established the animal remained immovable, and a gradually hardening cyst formed around it.—6 *B*, *Aug.* 5, 1872, 363.

PEOPLE USING THE BOOMERANG.

Colonel Fox, in his address before the Anthropological Subsection of the British Association, refers to the use of the boomerang in different countries, and remarks that he has traced this primeval weapon of the Australians to the Dravidian races of the Indian peninsula, and to the ancient Egyptians; and he states that all these races have been referred by Professor Huxley to the Australoid stock, and that a connection between the Australian and Dravidian languages has been suggested by various philologists.

In reply to the objection that the Dravidian boomerang does not return, like the Australian weapon, he states that the return flight is not a matter of such primary importance as to constitute a generic difference, the utility of the return flight, due to the comparative thinness and lightness of the Australian weapon, having been greatly exaggerated. The essential principle of the boomerang consists in its bent and flat form, by means of which it can be thrown with a rotary movement, thereby increasing the range and velocity of the trajectory.

In this connection the recent discovery by Dr. Edward Palmer of the use of the boomerang among the American Indians possesses a high interest. This gentleman, in the course of his explorations, found this to be the principal weapon among the Moqui Indians of Northern Arizona and New Mexico, replacing the gun and the bow and arrow. It is used more especially in killing rabbits, the motion by which it is thrown for this purpose being similar to that of a stone made to skip on the surface of the water. At a distance of twenty-five to thirty yards the rabbit is rarely missed, however rapidly he may be moving. The animal furnishes the principal meat eaten by these Indians, while its skin is worked into rugs and robes.

The wood of which the Moqui boomerang is made is obtained from the crooked branches of a species of walnut, procured by the barter of sheep, corn, etc., from the Navajoes, who own the locality (the cañon of Chelly) in which it is found.

More recently the same weapon has been detected, according to a communication to the California Academy of Sciences, among some of the tribes of the California Indians; and it is possible that further investigation will show a still more extended use of it among the Indians.—12 *A*, *August* 15, 1872, 324.

ORIGIN OF THE DOMESTIC DOG.

Professor Jeitteles, in continuation of his very elaborate memoir upon the prehistoric antiquities of the city of Olmütz and its surroundings, discusses the character of certain crania of the dog family coming under his observation. He considers that the wolves of the present day represent only three species—*Canis lupus*, *Canis lycoides*, and *Canis sacalius*. The *Canis lupus* is the wolf of modern times, and has two races, one in the Old World and the other in the New. The second form has two sub-species, which he calls *lupaster* and *gracilipes*. To the first of these belong the small wolf of the Pyrenees, the wolf of the steppes of the Ural and Volga, the wold-dog of Africa, the dingo of Australia, the *Canis hodophylax* of Japan, and even the prairie-wolf of North America (*Canis latrans*), as also the dog of the bronze period, which is the first indication of the taming of any species of wolf. The second sub-species he calls *gracilipes*, referring to it the jackal of Senegal. This he considers to be the ancestor of the greyhound. To the third species, *Canis sacalius*, the author refers the jackal of Algeria, Farther Asia, and Europe, and considers this to be the ancestor of the dog of the peat-bogs. The modern races, known as the shepherd dog of Eastern Europe, the greyhound, the fox-hound, and the poodle, are all considered as having a very close relationship to the dog of the bronze period. The very great resemblance between the head of the prairie-wolf of America and

that of the Scottish shepherd dog had already been pointed out by Hamilton Smith in his volume on dogs in the Naturalist's Library. A similar close relationship between the skull of the prairie-wolf and that of *Canis lupaster* of Africa suggested itself to Dr. John E. Gray, who remarks that "the American species replaces the jackal of the Old World."
—*Mittheilungen der Anthropol. Gesellschaft, Wien, August* 15, 1872, 240.

THE MAMMALS OF THIBET.

The well-known French missionary of the order of Lazarists, Abbé Armand David, whose name has already been mentioned in these pages in connection with researches in Northern China, left Pekin in May, 1868, to visit Eastern Thibet. He explored a portion of that country almost unknown to geographers—an independent principality named Moussin, adjoining the southwestern boundary of China, and inhabited by a people called Montzes. It is invaded by the Himalaya Mountains, and thus, though in the same latitude as Egypt, has peaks covered with eternal snow, and its winters are very severe. The abbé fixed his head-quarters in one of the largest valleys, at an elevation of about 2200 meters above the level of the sea. He remained there a year, and formed a truly magnificent collection, and for a notice of the mammalogical portion thereof we are indebted to Mr. Alphonse Milne Edwards. According to this notice fifty-nine species of mammals were obtained, representing seven orders, as follows: Four monkeys, seventeen carnivores, nine ruminants, one hog, five bats, eight insectivores, and fifteen rodents. No less than seven of these represent as many new genera: A monkey (*Rhinopithecus*), a very remarkable bear (*Ailuropus*), a small deer (*Elaphodus*), a swimming shrew (*Nectogale*), a very short-tailed shrew (*Anourosorex*), a mole (*Uropsilus*) like the American and Japanese *Urotrichus*, but approaching nearer the shrews, and another mole (*Scaptonyx*), somewhat intermediate between the true moles and *Urotrichus*, and combining the feet of the latter with the head of a mole.

The most interesting of these animals to the general reader are the monkey and the bear.

The monkey, as he waxes old, turns up its nose more and more, and finally the end is on a line with the eyebrows; its color is black, and the face being greenish, it is prominent in more senses than one. The species is common, living in large troops in the forests of the high mountains, where snow is found for more than half the year, thus demonstrating that the popular idea that monkeys are necessarily confined to tropical countries is fallacious. In order to support the rigors of such a climate, it has a dense coat of fur, which the inhabitants use to cure rheumatism.

The bear is a very remarkable one, and differs far more from all those previously known than do any of those from each other. These differences especially relate to the teeth. In external appearance there is nothing so notable in form, except it be the longer tail. But the color is very striking: the head and body are straw yellowish or whitish, and the shoulders girdled with a black band, the legs very black, and the black on the fore-limbs extending upward in a narrowing band, and joining its fellow on the opposite side. The eyes are also surrounded by black circles, and the ears and nose are black, the contrast giving a remarkable appearance. It is difficult to obtain, living in almost inaccessible mountains, where it subsists chiefly on roots, and especially those of the bamboo.

It need only be added that of the fifty-nine species obtained thirty-five have been considered new, and several others have not yet been identified.

CHANGE OF COLOR IN FISHES.

Professor Pouchet, in an investigation into the mechanism of the change of color in fishes and crustaceans, remarks that, as is well known, this is due to the alteration in the size of the colored contractile cells placed in the skin. These he found to be under the influence of nerves of the sympathetic system. Upon cutting the nerve supplying a particular area of the skin of the turbot he was enabled to retain that area unchanged in color, while the rest changed, according as the fish found itself on a light or dark surface. When the animal experimented upon was blinded, no further change of color occurred on being removed from the light to dark or dark to light surroundings, from which he infers that the eye is the means by which the change in its condition is communicated, and that a reflex condition takes place, which works through the sympathetic nerves of the color cells.—15 *A*, *Pr. Brit. Assoc.*, *August* 31, 1872, 275.

MAYNARD ON THE BIRDS OF FLORIDA.

The first part of a work on the birds of Florida, by Mr. C. J. Maynard, of Massachusetts, has just appeared from the press of the American Naturalists' Agency at Salem, and it is to be followed by eleven others to complete the series. The work is in quarto and well printed, and accompanied by one plate, five plates being promised for the entire series.

Mr. Maynard is well known as an able, indefatigable ornithologist, and is especially familiar with the birds of New England and of Florida, having spent several successive winters in the latter state with a view of collecting information for his proposed book.

After a brief diagnosis of the higher group of birds, Mr. Maynard takes up each species known to occur in Florida in detail, and supplies a very well-written account of habits and peculiarities, interweaving the observations of others with his own original matter wherever the latter is at all deficient in detail.

This work promises to be a fit companion to that of Mr. J. A. Allen, although going very much more into particulars as to the habits of the species. Both gentlemen have done a great deal toward extending our knowledge of the birds of Florida, and in determining with great precision the peculiarities of the various local races. Mr. Maynard has increased the list of Florida birds by one new variety of *Pipilo*, and by a diminutive West India finch (*Phonipara zena*).

Other West Indian, or rather Bahaman, birds previously detected were the *Vireosylvia barbatula*, the *Certhiola bahamensis*, and the *Crotophaga ani.*

From the far West, Florida, according to Mr. Maynard, receives as winter residents the red-breasted teal of the west coast (*Querquedula cyanoptera*) and the Rocky Mountain plover (*Ægialitis montana*). To these are to be added the yellow-headed blackbird (*Xanthocephalus icterocephalus*), and the lark finch (*Chondestes grammaca*), which have been sent to the Smithsonian Institution from that state by its correspondents. In conclusion, we may state that the book of Mr. Maynard will be found indispensable to all those who desire to keep posted in the progress of American ornithology, as it is many years since any work so full of original biographical detail has been presented to the notice of the American public.

RATE OF GROWTH IN CORAL.

A suggestion in reference to the growth of coral is quoted by *Nature* from the *Honolulu Gazette* as follows: "Somewhat less than two years ago a buoy was moored in Kealakekua Bay. Last week the anchor was hoisted in order to examine the condition of the chain. The latter, which is a heavy two-inch cable, was found covered with corals and oyster-shells, some of which were as large as a man's hand. The large corals measured fourteen and a half inches in length, which thus represents their growth during the period of two years that the anchor and cable have been submerged. The specimens which we have seen show the nature of the formation of the coral by the coral animals very distinctly. The popular idea is that corals are of extremely slow growth, yet here we have a formation equal to a rate of over seventeen feet in a century."—12 *A*, *August* 29, 1872, 356.

ALLEN ON THE BIRDS OF KANSAS, ETC.

Mr. J. A. Allen, of the Museum of Comparative Zoology at Cambridge, has lately published "Notes of an Ornithological Reconnóissance of portions of Kansas, Colorado, Wyoming, and Utah," forming No. 6 of the third volume of the Bulletin of the Museum. This, like the preceding memoir on the "Birds of Florida," is a very important addition to the philosophy of American Zoology, giving, in addition to the facts observed, many important generalizations as to the climatic and other influences which tend to modify the forms, colors, and notes of birds.

According to Mr. Allen, in the woodlands of Eastern Kansas there is a decided general tendency to a greater intensity of color than at the northward. The males of the common indigo-bird are more than ordinarily lustrous, and the females also have a decided tinge of blue, which is not the case in the Eastern States; while in Middle Kansas the light band on the wing of the Baltimore oriole becomes either pure white or scarcely tinged with a pale yellowish color. In the plains proper the faded aspect of the birds generally struck his attention, especially of species that range across the continent. This abstraction of a dusky or melanistic shade of the birds tends to bring out the pattern much more distinctly, as seen in the representatives in that region of the night-hawk, the meadow-lark, etc.

Most of the species of this region, heretofore supposed to be distinct, Mr. Allen considers as simple races of forms found in the Atlantic States. The difference in color between the Pacific forms of the arid and the comparatively moist regions is greater toward the end of the breeding season, or just before the autumnal moult, than afterward, or in spring specimens, showing the more unmistakably the direct influence of the intensely heated dry winds and strongly reflected light upon the color of birds in semi-desert regions.

Another generalization referred to by Mr. Allen is that birds exhibit a greater tendency to the enlargement of the bill to the southward, along the Pacific slope of the continent, just as there is, to perhaps a less extent, in the Atlantic region. As regards color, there is a narrow belt extending from the valley of the Columbia River northward along the Pacific coast, where the annual rain-fall is nearly double that of any other portion of the continent, and in which the birds not only exhibit the brighter colors of the region east of the great plains, but frequently take on a peculiar deep plumbeous or dusky brown, accompanied by a partial obsolescence of spots and streaks, especially in the *Fringillidæ*.

Mr. Allen takes strong ground against the idea of hybridity in birds, by which it has been attempted to explain the occurrence of intermediate forms, linking the so-called species of the different provinces of North America along or near their supposed line of separation. These hybrids, according to some authors, Mr. Allen considers to be expressions of the same law of variation which established the primary races; and he suggests that, in passing from the Atlantic to the Pacific, the forms will be comparatively uniform as long as the physical conditions remain constant, while as these conditions change more or less abruptly the effect upon the birds will be more or less strongly marked.

The observations of Mr. Allen establish the occurrence of numerous eastern species at points several hundred miles to the westward, and of western species considerably to the eastward of localities hitherto assigned them. Northern species were also met with at points considerably farther south than their previously known range, having been found breeding above the timber line in Middle Colorado. The imaginary boundary of the eastern and western species, as existing along the 100th meridian, heretofore suggested, Mr. Allen is therefore inclined to remove, and to look to the extension of forests and plains, as well as of wooded river-bottoms, as determining the limits of the range of the birds. In consequence of the great irregularity of the surface, the faunæ of the middle and western portion of the continent have very irregular and broken areas, the more southern, while occupying the lower table-lands, extending also up into the lower mountain valleys to a limit varying with the latitude and the peculiar local condition of the valleys themselves. Above this basal zone are several other zones, which are continuous for considerable distances along the main chains, but also embrace distinct insular patches in the more isolated groups of mountains. The higher zones are still less regular in their continuity and in their respective areas, the highest having an arctic character, and occupying only the partially snow-covered summits that rise above the limit of tree growth.—*Bull. Mus. Comp. Zoology*, III., VI.

NEW THEORY OF ANIMAL HEAT.

In a paper by Blondeau upon *Pulmonary Respiration and Animal Heat*, exception is taken to the idea that animal heat is due to the direct combustion of carbon and the hydrogen of the blood by the oxygen of the air in the lungs and blood-vessels, and an attempt is made to prove, by reasoning and by experiment, that the carbonic acid which is disengaged in the act of respiration proceeds, in part, from a fermentation which takes place in the interior vessels, and from the combustion of products which results from this fermentation, the blood globules themselves, in his opinion, being only the globules of a ferment presenting the closest analogy to the yeast of beer.

He also maintains that the sugar contained in the animal system under the influence of the blood-globule ferment is transformed into alcohol and carbonic acid, and that the former of these bodies is burned by the oxygen of the air.—4 *B*, *August*, 1872, 631.

FILARIA IN THE BRAIN OF THE WATER-TURKEY.

In the course of some explorations in Florida several years ago Professor Wyman ascertained that, in a large percentage of cases, the brain of the Florida water-turkey (*Plotus anhinga*) contained numerous specimens of a *Filaria* (*F. anhingæ*) in the space between the cerebral lobes and the cerebellum. The professor demonstrated the fact that these worms are viviparous, their oviducts containing eggs in all stages of development, from the egg just formed to the mature embryo. In the lower portion of the oviduct the eggs were hatched and ready for exclusion.

A more recent investigation has shown the professor the existence of both sexes of the *Filaria* in some specimens of the *Plotus*, while two contained female worms only. Where both sexes were present the eggs were found in various stages of development; in the others, where females only occurred, the oviducts were equally full of eggs, but there were no signs of impregnation, and no developmental changes. From these facts it seems almost certain that impregnation, with the *Filaria*, takes place in the head of the bird, and that unless both sexes are present the brood fails. It is also inferred, on the supposition that the worms are migratory, that it is in the head of the *Anhinga* that the sexual organs are developed, the young arriving there in an immature state. Every effort to find traces of this worm in other parts of the body, or even of the brain, failed entirely.—*American Naturalist*, 1872.

USE OF THE BILL OF THE HUIA BIRD.

A puzzling fact in natural history has been the difference in the shape of the bill of the male and female of a certain New Zealand bird, called the huia (*Heterolocha acutirostris*), which in the former sex is lengthened and much curved, while in the latter it is nearly straight. Mr. Buller, however, in a recent work upon New Zealand ornithology, remarks that the two sexes work together in extracting grubs from rotten wood, the bill of the male being adapted for attacking the more decayed portions of the wood, chiseling out the prey after the manner of some woodpeckers, while the female probes with her long pliant bill the other cells, where the hardness of the surrounding parts resist the chisel of her mate. Mr. Buller has sometimes observed the male remove the decayed portion without being able to reach the grub, when the female would at once come to his aid and accomplish with her slender bill what he had failed to do. He noticed, however, that the female always appropriated to her own use the morsels thus obtained!—12 *A*, *July* 18, 1872, 219.

PEDALION MIRA, A NEW MICROSCOPIC ANIMAL.

A very remarkable microscopic animal is described in the *Quarterly Journal of Microscopic Science*, by Dr. Hudson, under the name of *Pedalion mira*, being a rotifer, with six large appendages, like the limbs of a crustacean, terminating in plumose hairs, and worked, as locomotive organs, by transversely striped muscles attached inside the appendages, which are, therefore, hollow, and identical in type with the limbs of insects and crustacea. The animal possesses at the same time a fine ciliated trochal disk, and a gizzard similar to that of other rotifers. The editor of the journal was supplied with specimens by their discoverer, and confirms his statements in every particular.—15 *A*, *October* 5, 1872, 435.

AQUARIUM AT THE VIENNA EXPOSITION.

One of the most striking features of the Vienna Exposition of 1873 will be a gigantic aquarium, to cost $175,000, and to be constructed by Mr. Driver, the architect of the Crystal Palace aquarium. It will be built under the direction of Mr. Lloyd, the superintendent of the same establishment. The nearest sea-port, Trieste, is twenty hours distant by a fast train, and it is expected that the cost of the freight on the water to be used will amount to $5000. The tanks will contain nearly 200,000 gallons of sea-water, weighing about 2,000,000 pounds.

If this experiment be a success, there is nothing to prevent the construction of similar establishments in almost any city in the United States, and no little attention will be evoked to the practical workings of this branch of the Vienna Exposition.

In this same connection we may state that one of the appendages of Dr. Dohrn's newly-established aquarium at Naples is to consist of a tank mounted on a railway car, in which animals can be carried from one part of Europe to another without the slightest inconvenience. Sleeping accommodations are provided for the attendants, and the water is to be kept in constant agitation by means of machinery worked by the wheels of the carriages.—18 *A, October* 25, 1872, 135.

A FOSSIL LEMUROID FROM THE EOCENE OF WYOMING.

Professor Cope recently read a paper before the American Philosophical Society on an extinct mammal from Wyoming, which he called *Anaptomorphus æmulus.* The number of teeth in the lower jaw is precisely the same as in man and the higher apes, but their structure is more nearly that of certain lemurs at present existing in Madagascar and East Africa. This resemblance is closer than has yet been discovered to exist in any fossil germs, but is somewhat diminished by the separation by suture of the halves of the lower jaw. The animal was as large as a squirrel.

BIRDS OF THE BRITISH ISLANDS.

In a valuable manual of British ornithology, entitled *Hand-Book of British Birds*, lately published by Mr. J. E. Harting, the species of the isles are divided into three groups. First, *Residents*, or those that rear their young annually in the British Islands, and are to be found in one part or another of the United Kingdom throughout the year; these are 130 in number. Second, *Periodical Migrants*, or those that arrive annually and regularly at particular seasons, and whose arrival and departure may be foretold with precision; these are 100 in number. Third, *Annual Visitants*, those that occur annually in some part of the British Islands, and in a comparatively limited number and at irregular intervals; in this group there are 30. In addition to the regular feathered inhabitants of the islands are the rare and accidental visitors, numbering 135; among which are 48 of European, 14 of Asiatic, 11 of African, and 42 of American origin, exclusive of oceanic birds.—13 *A, October* 15, 1872, 391.

COMPARATIVE ANTIQUITY OF THE MOA.

Dr. Hector reports the discovery of a moa's egg, containing the bones of an embryo chick, and still more recently that of the cervical vertebræ of a full-sized bird, with a skin partly covered with feathers still attached by the shriveled muscles and ligaments. This was found in a cave near Otago, into which it, with other remains, had been washed. The color of the barbs of the feathers is a chestnut red. The surface of the skin is a dirty red-brown, roughened by elevated papillæ.

Still other remains, found in 1871, had attached to the bones parts of the bird's flesh, which was simply dried, and could be easily separated into fibres. This, according to Dr. Hector, proves that the moa must have existed at no very remote period in the province of Otago.—13 *A*, *October* 15, 1872, 391.

PREHISTORIC REMAINS IN UNALASHKA.

At a late meeting of the California Academy of Sciences a communication was made by Mr. William H. Dall upon the recent explorations made by him in the Amaknak Island, on the shores of Captain's Bay, in Unalashka. While making certain excavations for the location of a signal station on the northern end of the Amaknak Island, he became satisfied, from the nature of the materials brought out, that he had found the site of an ancient village, although the oldest inhabitants in the vicinity were entirely ignorant of the existence of any thing of the kind.

He considers that the village must at least have antedated the Russian discovery of the Aleutian Islands in 1760; and, possibly, indeed, it may be very much older. A careful examination revealed to Mr. Dall the existence of three depressions, each of which he considered to be the sites of the Aleutian houses of the ancient fashion—that is to say, half underground, and of sufficient size to accommodate a number of families, each having a compartment to itself. The houses were entered by a notched stick through an aperture in the middle of the roof, which afforded the only admittance to the light.

On digging the hole for the signal-staff, two stone lamps for burning seal-oil were found, made of soft porphyritic rock. When used they were filled with dry sphagnum soaked in seal-oil, which supplied both light and heat. A bone arrowhead was also obtained. Several skeletons were also procured, which had been partially walled up in a compartment of the house, it being the custom of the ancient Aleuts to make this disposition of the bodies of the dead, the survivors still inhabiting their share of the house as before.

Another mode of burial detected among these prehistoric people consisted in building a wall at the foot of an overhanging cliff until the rock above was reached, a bank of earth or turf covering this wall on the outside. From the cavity inside the débris was removed, and in this space, upon layers of small sticks, the bodies were piled. In one place he found six skeletons, one above another.

Various bones of walrus, seals, sea-lions, bears, etc., together with shells of edible mollusks, were found.

Other articles of interest were bone implements, brought to a sharp edge, and probably used for dressing skins; and certain knives of a dark slate stone, shaped like a chopping-knife, spoons of carved bone, with a grooved handle, awls made from the wing bones of birds, and various other objects were secured. There was no ornamentation seen upon these articles except straight lines.

In all, Mr. Dall discovered the sites of seven villages on the island of Amaknak alone, of which one or two only were known to tradition.

Articles were also met with, such as stone knives for dressing skins; and near the skeleton of a woman were two bone labrets, shaped like those now in use among the Thlinkets and Botocudos. Besides these are a lot of needles of the wing bones of birds, a needle-case made of the humerus of some large bird, closed at the end by a wooden stopper, bone awls, stone knives, a whetstone made of fine grained sandstone, and many other articles.

Mr. Dall finds, from an examination of the skeletons, that the ancient Aleuts were in the habit of removing the viscera of the dead, and, after stuffing the body with dry grass and then drying it, of placing it for preservation in a dry cave, ornamented with gay apparel or covered with wooden carvings. The most remarkable of these are masks of large size, known as death-masks, painted in different colors and ornamented with feathers, tufts of hair, bristles, etc. Sometimes the bodies, placed in natural attitudes, were covered entirely with carved wooden armor, or placed in a miniature canoe, armed as if hunting, or holding a paddle. Mr. Dall's collections are all deposited in the National Museum at Washington. — *Weekly Bulletin, San Francisco, November* 8, 1872.

PRESENT POPULATION OF THE GLOBE.

In an elaborate paper by Behm and Wagner, published in Petermann's *Mittheilungen*, we have the result of a careful inquiry into the present population of the globe, the summation of their results being as follows: Europe, 301,600,000; Asia, 794,000,000; Australia and Polynesia, 4,365,000; Africa, 192,520,000; America, 84,524,000; or a total of 1,377,000,000. These figures are derived from the estimates or statistics of population for the years 1869, 1870, and 1871.

In the enumeration of the population of towns, London stands at the head, with 3,251,000; next Su-tschan, in China, with 2,000,000; Paris, 1,835,000; Pekin, 1,648,000; Jeddo, 1,554,000; Canton, 1,236,000; Constantinople, 1,075,000; Si-ang-tau, China, 1,000,000; Tschan-tschaufu, China, 1,000,000; New York, 942,292; Vienna, 833,855; Berlin, 825,389.—17 *C*, *Supplement No.* 33, 1872; 86.

ARCHÆOLOGY IN AMERICA.

A few years ago Dr. Schmidt, of Essen, Germany, visited the United States for the special purpose of investigating certain questions connected with the archæology and ethnology of America. He devoted special attention to the investigation of the crania of the aboriginal tribes of America, both ancient and modern, and after his return prepared a memoir detailing the result of some of his inquiries, which has just been published in the *Archiv für Anthropologie.* He passes in review various well-known crania, some of which are in the Army Medical Museum at Washington, Professor Whitney's Calaveras skull, the human pelvis found by Mr. W. Dickinson in the bluffs of Natchez, and others, including the alleged discoveries of human remains in the post-pliocene beds at Charleston.

As a summary of his observations, he remarks that five well-authenticated instances of human remains of extreme antiquity have come to his knowledge: first, those referred to by Holmes in South Carolina; second, implements found in caves in Anguilla; third, the California skull; fourth, the human pelvis found in the bluff; and, fifth, a skull found in a limestone fissure in the drift formation in Illinois, and presented by Mr. M'Connell to the Smithsonian Institution, by which it was transferred to the Army Medical Museum.

These he considers to be of much importance, since, until very recently, our knowledge of the early condition of the human race was extremely slight in any part of the world; and the California skull takes us at least beyond the glacier period, and, as Dr. Schmidt believes, is the very oldest monument of the human race in existence. He thinks that the ice period in America occurred simultaneously with that in Europe, and that consequently the primitive inhabitants of California must have lived even before those of the valley of the Somme and of the Neander.

The case, however, is complicated by the high condition of development of the California skull; this at least shows that the race must have experienced a considerable development at that time, while the contemporary implements are oftenmet with in California, exhibiting a great deal of skill in their manufacture.—*Archiv für Anthropologie*,V, *August*, 259.

PREHISTORIC REMAINS IN WYOMING.

According to Dr. Leidy, the plains and ravines of the buttes, and the lower mounds at the base of the larger buttes, near Fort Bridger, in Wyoming, are thickly strewn with stone fragments, sharply fractured in such a manner as to have the appearance of artificial origin. Mingled with them are many implements of the rudest construction, while there are some of the finest finish. Between these and the stone sprawls, of less doubtful or natural origin, there occurs every variety of form, so as to render it impossible to say where nature ceased her labors, and where primitive man commenced his.

The material of these splintered stones consists of jaspers, quartzites, some of the softer rocks of the buttes, and less frequently of black flint, the last probably transported by human agency from the locality of its natural occurrence, as it is only known to occur in position in the tertiary strata of Henry's Fork of Green River. In visiting a party of Indians encamped near Fort Bridger, Professor Leidy informs us that the only stone implement found among them was one called the teshoa, obtained from a quartzite boulder by a single smart blow made with another stone, and used for scraping the green hide of the buffalo.

In an Indian grave, exposed to view by the wearing away of the edge of a bluff, he found a teshoa and some perforated canines of elk, which are highly prized by the Shoshones as ornaments. This form of adornment is quite common to primitive man, as it occurs abundantly in the shell heaps of New England, and among the prehistoric remains found in France, Germany, and Switzerland.

PREHISTORIC REMAINS AT SOLOUTRÉ.

Some interesting prehistoric remains have lately been found by Ferry and Asetin at Soloutré. This locality is situated at the foot of a high rock, and the surface is covered by broken flints. In the superficial layer there are fragments of pottery of the Middle Age period, but broken and entire bones of horses occur at a greater depth. Under this layer are found the food refuse, reindeer and horses' bones, stone implements, etc. The hearths are set off with flat stones. Remains of the cave lion and mammoth are also to be met with; and a rude drawing of a reindeer was found inscribed on a bit of slate.

The bones of horses were extremely abundant, the soil being filled with them in every direction. The most interesting discoveries were certain graves, consisting of rude stone boxes, partly in the earth and partly lying on the hearths. The skeletons of the adults lay upon large hearths, and those of the children on the smaller. According to Pruner-Bey, all the human remains belong to a Mongoloid race. The discoverers estimated the antiquity of the remains of this locality at about the earliest period of the reindeer epoch.—7 *C*, x, 624.

PECULIAR MOUND CRANIA.

An interesting paper upon certain peculiarities of the crania of the mound-builders has lately been published by Dr. J. W. Foster, in the *American Naturalist*, and contains an account of some very peculiar crania received by him from what is called Kennicott's Mound, near Chicago.—5 *D*, *December*, 1872, 738.

TRADITIONS OF THE DELUGE FROM ASSYRIAN TABLETS.

A paper read by Mr. Smith, of the British Museum, upon certain Assyrian tablets, containing the text of the deluge, and belonging to a period 668 years before Christ, has caused great interest among archæologists. The tablets themselves date from the reign of Assurbanipal, and are copies of more ancient tablets, supposed to be of the date of 1600 B.C. This forms part of a series of legends belonging to the reign of a king of the name of Izdubar. This personage is supposed to have had an interview with a being called Sisit, who, in answer to a question from Izdubar, relates the story of the flood. This narrative is strikingly similar to that of the Noachian deluge; so close, indeed, as to render it more than probable that we have here the veritable tradition of that catastrophe, such as must have been handed down by its survivors.—15 *A*, *December* 7, 1872, 736.

MIGRATIONS OF THE CALIFORNIA GRAY WHALE.

A specimen which is interesting as throwing some light on the migrations of whales has been recently received from Mr. W. H. Dall by the Smithsonian Institution. It is the bone or ivory portion of the head of an Esquimau harpoon, which is labeled as having been taken out of a California gray whale (*Rhachianectes glaucus*, Cope) in Scammon's Lagoon, on the Lower California coast, one of the great breeding localities of this species. The weapon had evidently been lost by some Esquimau whaleman on the coast of Alaska or the Aleutian Islands (probably the latter), and was recovered again in the semi-tropical waters of the western shores of Mexico.

OBJECTS FROM THE FLORIDA MOUNDS.

Professor Wyman calls attention to the similarity between the St. John's River, of Florida, and the Nile, in respect to an annual overflow of the reservoirs at the head waters, and a consequent rise of the streams lower down. By reference to the rain-chart recently published by the Smithsonian Institution, it will be found that during the summer season the head waters of the St. John's are in the region of maximum rainfall, embracing as they do numerous large lakes and swamps, which become filled, and occasionally produce quite a flood.

The effect is to cause the stream to push beyond its bounds, and flow far and wide over the adjacent country.

In this fact we have an explanation of the numerous Indian mounds along the St. John's, erected evidently not for burial purposes, but simply consisting of scrapings from the adjacent river, including shells, etc., heaped up to serve as an island in the event of the floods in question. The lower layers of shells in the mounds, according to Professor Wyman, being situated directly on the river-bank, are filled with river-mud, the whole thrown loosely together.

FOSSIL ELEPHANT IN ALASKA.

Among other collections brought back from Alaska by M. Pinart was a tooth of a fossil elephant, which has been reported upon by Mr. A. Gaudry. This specimen is considered to be the sixth upper right molar of *Elephas primigenius*, in a state of preservation which will scarcely permit it to be called a fossil. There are certain peculiarities of the teeth, as with the Old World *primigenius*, which seem to indicate the fact of a well-marked race, although scarcely worthy of a specific distinction. The most important difference is the greater number of transverse plates—namely, one plate for each centimeter, instead of a decidedly smaller proportion. The enamel is said to be peculiarly thin. The analogy between the European and American mammoth, in Mr. Gaudry's opinion, indicates the probable existence of a communication between the Old and the New World during the first portion of the miocene period, especially as the miocene fossils of France have striking analogies to those of Nebraska, and there are equally well-marked relationships between the plants of Europe and North America in that same locality.—6 *B, November* 18, 1872, 1281.

YOUNG HIPPOPOTAMUS AT THE LONDON ZOOLOGICAL GARDENS.

The female hippopotamus of the Zoological Gardens of London has recently given birth, for the third time, to a young one. The first was born February 2, 1871, but lived only three days. In less than a year, namely, January 7, 1872, a second was born, which, like its predecessor, lived only three days, and during the whole of its life did not attempt to suck. A third made its appearance on the 5th of November, 1872, and at the latest advices was doing well. Great care was taken to prevent any disturbance of the parent on the part of spectators, and the young animal now sucks its mother freely, and there is a fair prospect of its being successfully reared.—19 *A*, *November* 9, 1872, 453.

ENUMERATION OF AMERICAN SERPENTS.

In 1842 a great work upon North American reptiles was published by Dr. Holbrook, of Charleston, filling five quarto volumes, and occupying the same rank in herpetology as the publications of Audubon in mammalogy and ornithology. The learned author was quite well satisfied that nearly all the American reptiles were embraced in his work, and that the labor of future specialists in this department would be mainly confined to determining their geographical distribution. Of serpents he enumerated 16 genera and 47 species; of lizards, 10 genera and 14 species; of turtles, 6 genera and 24 species; and of amphibia, 13 genera and 56 species—or a total of 45 genera and 141 species.

In 1853 the Smithsonian Institution published a work prepared by Professor Baird and his associate, Charles Girard, on the North American serpents in the museum of the Smithsonian Institution, in which 35 genera and 119 species are described. Some of these proved to be geographical races, or varieties of other more definite forms; but the greater number of the species indicated as new hold their place in the systems, and the memoir is still an approved manual of the subject. Since that time additional species have been published (principally by Professor Cope), and at present the enumeration of our serpents stands at 45 genera and 176 species (of which 5 genera and 22 species are venomous), all belonging to the United States, and occurring north of its southern boundary, being 35 species more than the aggregate of all the reptiles and amphibians given by Holbrook.

NOCTILUCINE.

A communication from Mr. Phipson appears in the *Comptes Rendus*, upon what he calls noctilucine, and which he claims to be a hitherto undistinguished organic substance, widely distributed in nature, and which constitutes the phosphorescent matter of animals, living or dead. This is not only the cause of the phosphorescence of dead fish and dead animal matter, but it is secreted by certain luminous worms (the *Scolopendra*, etc.), and probably by all animals which shine in the dark, and frequently by certain living plants (*Agaricus*, *Euphorbia*, etc.). It is also developed by the decomposition of vegetable matters, under certain conditions (fermentation of potatoes, etc.).

At the ordinary temperature noctilucine is an almost liquid, nitrogenized matter. It mixes with water, but does not dissolve in it, and appears to have a density little less than this liquid. It is white, and, whether extracted from a living or dead animal, is luminous, and possesses an odor resembling that of caprylic acid. It is insoluble in alcohol and ether, and is dissolved and easily decomposed by the mineral acids and alkalies. When fermented in contact with water, it disengages an odor of cheese. When fresh, it is strongly phosphorescent, the production of light being due to its oxidation in contact with moist air. Indeed, it will shine as well in water as in air. It is a little more brilliant in oxygen gas; and it has been observed that it is always most lustrous when the wind blows from the southwest—that is to say, when there is most ozone in the air. As soon as the oxidation of all the matter is accomplished the production of light ceases. If the slightest quantity of air adheres to it, it shines for some moments in moist carbonic acid.

In phosphorescent animals noctilucine is supplied from a special organ—as the bile is secreted by the liver—and appears to be employed to produce light almost as soon as it is formed. It is also produced in certain conditions of temperature and moisture by dead animal matter of various kinds; but, whatever its source, it always gives the same kind of light—that is to say, one that is almost monochromatic, giving a spectrum principally visible between the lines E and F, and possessing the same uniform chemical properties, as far as has been observed. It is secreted in a state of considerable purity by the *Scolopendra electrica*, and by causing several of these myriapods to run about on a large capsule of glass, enough can be obtained to allow an examination of its principal properties. From *Lampyrus* and the phosphorescence of dead fish it can always be obtained in a state of less purity.

The secretion of this substance by the luminous animals higher in the scale, such as *Lampyrus* and others, is, without doubt, up to a certain point, under the influence of the nervous system, this permitting them to shine at will. In this case the secretion is arrested for the moment, but it is known that the eggs of *Lampyrus* shine for some time after they are laid, probably from containing a small quantity of noctilucine. In the animals lower in the scale there appears to be the existence of a special organ for the production of light; and where we find scarcely any traces of a nervous system the secretion of luminous matter is often subject to external circumstances.—6 *B, August* 26, 1872, 547.

CARPAL AND TARSAL BONES OF BIRDS.

Professor Gegenbaur first demonstrated the existence of two bones in the tarsal joint of birds, with the joint occurring between the first and second tarsal bones, as in reptiles.

Professor Edward S. Morse, of Salem, Massachusetts, in a memoir on the carpus and tarsus of birds, just published in the "Annals of the New York Lyceum of Natural History," has shown the existence of an additional tarsal bone, and has also shown the relations of another bone discovered by Professor Wyman as belonging to the tarsal series, thus making four bones belonging to the tarsus.

Professor Morse's embryological researches have also added two, and in some birds three, bones to the wrist. These bones, as well as the bones of the tarsus, can only be seen in the early embryonic state; in the adult bird they unite or anchylose with the approximate bones of the member to which they belong. These studies were made on many of the common species of wild birds, and full illustrations of the parts, with their respective embryos, accompany the memoir. These discoveries establish still further the reptilian affinities of birds.

COUES ON THE BIRDS OF THE UNITED STATES.

The work of Dr. Coues, just published, upon the birds of the United States, includes a synopsis of the fossil forms supplied by Professor O. C. Marsh, who has made this branch of paleontology a special study. He enumerates no less than twenty-nine species, to which number must be added several others discovered by Professor Marsh in his late trip to the

Rocky Mountains. A single kind belongs to the woodpecker tribe, while two are raptorial, and three gallinaceous, namely, three kinds of turkeys. Twelve are waders and eleven are swimmers.

FOSSIL MAMMALS FROM THE WEST.

At the meeting of the American Philosophical Society, December 20, Professor Marsh, of Yale College, gave an account of the extinct gigantic mammals which he had discovered in the eocene of Wyoming, and recently assigned to the new order *Dinocerea*. These animals were about as large as the elephant, and had limbs somewhat similar, as stated in the original description of the type species (*Tinoceras anceps*, Marsh), which was found in 1870, and described in June, 1871. The skull in this group presents a most remarkable combination of characters. It is long and narrow, and supported two, and possibly three, pairs of horns. The top of the skull was concave, and on its lateral and posterior margin there was an enormous crest. There were large decurved canine tusks, resembling those of the walrus, but no upper incisors. The six premolar and molar teeth were quite small. Several species of these remarkable animals have already been described, but at present they can not all be distinguished with certainty. In addition to the type species already mentioned, Dr. Leidy has described a characteristic specimen as *Uintatherium robustum*, and a canine tooth, apparently part of the same animal, under another name. The remarkable feature of the skull in this group was first indicated in the name *Tinoceras*, which the speaker had proposed for one of the genera. Professor Marsh stated that he had described several species of this group, one of the most singular of which (*Dinoceras mirabilis*, Marsh), was represented in the museum of Yale College by a nearly perfect skeleton, and portions of several others. In all of the species the limb bones differ considerably from those of proboscidians, while the skull is so totally unlike any thing hitherto known that he could not refer these extinct animals to that group, and hence had proposed for their reception the order *Dinocerea*.

Professor Marsh, at the same meeting, gave a brief account of some of the more important results of his paleontological researches in the Rocky Mountain region during the last three years. He had devoted his attention mainly to the extinct vertebrates of the cretaceous and tertiary formations, and had obtained more than 200 species new to science, 150 of which he had already described. Among the new types of fossils thus discovered, were *Pterodactyls*, or *Ornithosaurians*, the first detected in this country. He had described three species of these from the cretatecons of Kansas, all of gigantic size. A second and quite unexpected discovery, of great interest, was that of the *Ichthyornidæ*, or cretaceous birds with bi-concave vertebræ, two species of which he had recently described. A third new type of fossils, not before observed in America was extinct *Chiroptera*, or bats, three species having been found in the eocene of Wyoming. A fourth discovery was that of extinct *Marsupials*, also from the eocene, and represented by several species. A fifth group of special interest was fossil *Quadrumana*, which he had recently shown were comparatively numerous in the eocene. Professor Marsh stated that he had found indications of fossil monkeys in Wyoming more than a year before, but had delayed announcing the discovery until the evidence was conclusive. The sixth discovery of importance, and perhaps the most interesting of all, was that of the gigantic eocene mammals just referred to, and which he had assigned to a new order, *Dinocerea.*

H. BOTANY.

NEW FRENCH BOTANICAL JOURNAL.

A new botanical journal, under the title of *Journal de Botanique*, has lately made its appearance in Paris, edited by M. G. Huberson. This will appear fortnightly, and will contain original communications, translations, extracts, and abstracts of botanical papers.—12 *A*, *April* 11, 1872, 469.

"THE GARDEN," A NEW JOURNAL.

A new horticultural journal, named *The Garden*, has lately been commenced in London, under the editorship of Mr. W. Robinson. This gentleman is well known as the horticultural editor of *The Field* newspaper, and is the author of a large number of works upon gardening in its various branches, one of the most important being a description of the parks of Paris—a book of remarkable beauty and interest. The new magazine is intended to contain original articles by the editor and by correspondents on gardening topics, illustrated by wood-cuts, instructions for gardeners, descriptions of new plants, etc.—12 *A*, *November* 30, 1871, 89.

"GREVILLIA," A NEW BOTANICAL MAGAZINE.

The first number of a new monthly magazine, entitled *Grevillia*, devoted exclusively to the subject of cryptogamic botany, has just been issued, under the editorship of Mr. M. C. Cooke. It is intended to serve as a medium of communication between cryptogamists and as a record of the discoveries of new species, and will doubtless supply a desideratum. —12 *A*, *July* 18, 1872, 228.

ADDITIONS TO THE BOTANICAL DEPARTMENT OF THE BRITISH MUSEUM.

The botanical department of the British Museum announces important additions to the herbarium during the year 1871. Among these were no less than seventeen thousand species of plants from various parts of Europe and America (in large part the herbarium of Auerswald, of Leipsic), and including about one thousand specimens collected in Yucatan by Dr. Arthur Schott, of Washington.

VISITORS TO KEW GARDENS IN 1871.

Dr. Hooker, in his report upon the Royal Gardens at Kew for the year 1871, remarks that while the actual number of visitors has been absolutely less than the two preceding years, the number of desirable visitors has been greatly increased. More than two thirds of the total number on the other days of the week visit the gardens on Sunday—Monday, the "artisans' day," showing a considerably larger number than any other week-day. The almost perfectly orderly conduct on this day contrasts very favorably with that displayed by some of the fashionable Saturday visitors. The usual facilities for students have been granted in the way of examination of living plants and the herbarium, and extensive interchanges of living plants and seeds have been made with similar establishments at home and abroad. Among other enterprises, a gardener has been sent out to Jamaica to re-establish the botanic garden there, which had been carried on for so long a time, but which of late had been allowed to fall into neglect.—12 *A*, *May* 12, 1872, 52.

HOOKER'S "FLORA OF BRITISH INDIA."

A valuable contribution to the literature of botany has just appeared in the form of the first installment of the "Flora of British India," by Dr. Hooker. This includes all the British territories in India (including the Malay Peninsula and the Andaman Islands), with Cashmere and Western Thibet, but excluding Afghanistan and Beloochistan as belonging to a different region—that of Western Asia. The total number of species of flowering plants to be included in this work is from twelve to fourteen thousand; and in giving a systematic account of this immense flora in a compact form, Dr. Hooker has earned the gratitude of all who have occasion to investigate the species of that region.—12 *A*, *May* 12, 1872, 52.

SUPPLY OF COLOMBIAN GUACO.

The Panama papers report an increasing demand for the Colombian guaco (*Mikania guaco*), and urge the government to the enactment of regulations to prevent the entire destruction of the forests of these trees in Darien, where they are most abundant. Instead of simply treating the trees for the juice, as the maples are managed in the United States, the tree is cut down, and, of course, no further benefit can be derived from it. In illustration of the extent to which this vegetable product is now being collected, the Panama *Star and Herald* informs us that one hundred and sixty tons had just been brought to that city as the cargo of a single vessel, mostly from the vicinity of Guayaquil.—*Panama Star and Herald, November* 19, 1871.

CUNDURANGO AGAIN.

Dr. A. Destruge, a well-known practitioner of Guayaquil, and, we believe, a citizen of the United States, makes a communication to *Nature* in regard to the botanical character of cundurango. He takes exception to the determination of Dr. Buyon and others, and remarks that the plant belongs to the Asclepiadaceæ, and to a division comprehending only five known genera, to none of which does the cundurango fall. He therefore concludes that it belongs to a genus which has not yet been characterized.

The flowers have a calyx of five divisions, obtuse, ovate, and villose in their inferior part, and of quincuncial præflorescence. The corolla is rotate, of five divisions, lanceolate, hairy at the base on the inside, and somewhat fleshy, with a membranous margin. The stamen has no appendage or corona; the anthers are terminated by a membrane, and the pollen masses are elongated and suspended. The stigma is pentagonal and conical. The flowers are numerous, and disposed in umbelliferous inflorescence. — 12 *A*, *January* 25, 1872, 243.

FLORA OF THE CANARIES.

According to M. De Candolle, the flora of the Canary Islands, while containing scarcely any plant peculiar to the western coast of Africa, includes a large number found also in Europe. This fact would seem to indicate that these islands were long ago united to Europe by a land connection, while they appear to have always remained separate from Africa.—*Mém. Soc. Physique de Genève*, XXI., 1870, 353.

VARIATIONS OF FLOWERING SEASONS.

Fritsch has lately published the result of an investigation into the variations of the seasons of flowering of plants in different countries in the same year and in different years, and, basing his conclusions upon fifty-two plants and twenty-three stations, he remarks that the variations of the seasons of flowering are greater as this time naturally falls in the earlier part of the year. Thus, of plants flowering in March, the variation will amount to thirty-seven days, while of those flowering in June it amounts only to twenty-four days. These variations, again, are, on an average, as great in positive seasons as in negative—that is to say, the acceleration of the flowering season, on an average, of each plant investigated, is as great as the retardation; and it is only necessary to divide the entire variation by two in order to obtain the deviation, whether positive or negative.—19 *C, February* 10, 1872, 48.

PREFERENCES OF CLIMBING PLANTS.

According to Mr. Henry, certain climbers evince a partiality for some particular species of plants, stretching out their tendrils and branches so as to come in contact with them, while to other species they have as decided an aversion, avoiding them, and never becoming attached to them, though they run up the surface of the wall side by side.—12 *A, January* 4, 1872, 192.

A THREAD ALGA IN THE STEM OF A DICOTYLEDONOUS PLANT.

Dr. Reinke, in making cross sections for microscopic examination of a stem of a plant known as *Gunnera scabra*, found a blue-green spot, which he discovered to constitute the cross section of a bluish-green thread alga, belonging to the genus *Scytonema*, and hence called *S. gunneræ*. This was completely inclosed in the parenchyma of the stem, and separated from the upper surface by a thick cellular stratum.—19 *C. February* 10, 1872, 47.

ALGÆ OF RHODE ISLAND.

Mr. Stephen T. Olney, a well-known botanist, resident at Providence, Rhode Island, has just published a list of the algæ of Rhode Island, as collected and prepared by himself.

In this he enumerates twenty-four species of melanosperms, or olive-colored algæ, forty-four of rhodosperms, or red algæ, and twenty-five of the chlorosperms, or green algæ, making ninety-three species in all. The remaining forms, principally microscopic, enumerated by him, and including zygnemaceæ, desmideæ, and diatomaceæ, bring the number up to one hundred and eighty-nine. Of most of these Mr. Olney possesses duplicates, which he will be happy to dispose of in exchange. —*Pamphlet.*

NEW PARASITE OF THE SPRUCE.

Much interest has been excited among botanists by the rapid development upon the black spruce and balsam firs of Northern New York of a parasitic plant belonging to the genus *Arceuthobium*, related to the mistletoe. In the vicinity of Warrensburgh about 75 per cent. of all the *Abies* were found to be infested, groups of forest trees forty feet in height being dead and bearing the peculiar marks of the infection. Dr. Gray remarks that what is curious about the discovery is, first, that it should not have been made before; and, second, that it should, after all this overlooking, be found during the same season by two persons in three different counties, and so abundant as to disfigure or even to destroy the trees it infests.—*Bull. Torrey Bot. Club*, II., 47.

INFLUENCE OF HEAT ON PLANTS.

Hugo de Vries, in a paper upon the influence of heat upon plants, discusses, in the first place, the upward limit of temperature for vegetable life, and finds occasion to agree with Sachs, who gives this limit at 120° to 130° Fahr. for the air, and 112° to 117° for the water, although some latitude must be allowed for the age and precise character of the plant. In cases of thermal springs which contain living algæ, this limit must, of course, be largely extended, as the result of special adaptation. In reference to the effect of rapid changes of temperature, the author finds that such alternations, however great and rapid they may be, do not exercise any injurious effect upon the vitality of plants as long as they remain below the maximum allowable and above the freezing-point, but that such changes do exercise a direct effect upon the movement of the protoplasm by causing its cessation, even in cases where the heating or cooling slowly to the same degree would not produce a similar effect. Inquiries into the influence of temperature upon the rapidity of germination confirm the results already obtained by Mr. Sachs—that for each species there is a most favorable degree of temperature for growth, since growth takes place at that point more rapidly than at any other temperature; and that below this point the length of a growing radicle increases in proportion as the temperature is elevated, while above that it is diminished more and more as the temperature ascends.—1 *E, Part V.*, 1870, 386.

CHANGES IN THE PROXIMATE PRINCIPLES OF HERBACEOUS VEGETABLES.

Deherain maintains that the proximate principles of vegetables migrate from the older to the newly formed leaves, and that this migration is associated with a transformation of glucose into cane-sugar, while, when the seed is formed, the cane-sugar is converted into starch and the albumen into gluten, both insoluble. In this way the conversion of soluble into insoluble principles and the accumulation of substances in the seed is accounted for, and is illustrated by the following experiment: If a porous vessel containing distilled water be placed in another vessel containing a solution of cupric sulphate, the salt penetrates by diffusion into the inner vessel. If then a few drops of baryta water be added to the inner vessel, the salt is precipitated, the equilibrium is disturbed, and a new portion of cupric sulphate diffuses into the inner vessel. The salt may be again precipitated by the baryta water, and the operations repeated till eventually the whole of the cupric sulphate will have passed into the porous vessel, and there become precipitated.—21 *A*, IX., *July*, 1871, 577.

EXTRACTION OF AMMONIA FROM THE ATMOSPHERE BY HUMUS.

In the course of certain experiments made by Bretschneider upon the extraction of ammonia from the atmosphere by humus substances, he came to the conclusion that the anitrogenous, brown, organic combinations which are obtained by boiling a solution of sugar with dilute sulphuric acid have the property, when moist, of extracting ammonia, in a dry season, from an atmosphere poor in ammonia; second, that this absorption of ammonia, although relatively slight, is yet incomparably greater than the power of absorption of a surface of water for the ammonia contained in the atmosphere, and also incomparably greater than that of moist quartz; third, if the brown combinations are mixed in ascending proportions, without quartz, so that the former constitute 1, 3, and 5 per cent. of the weight of the latter, the moist mixtures of the same surface have a disproportionately great power of absorption for the ammonia of the atmosphere in a dry season, and increasing more than proportionally with an increasing amount of ulmin.—22 *C*, *August*, 1871, 130.

EFFECT OF GERMINATION ON THE FAT IN SEEDS.

In a paper read before the Academy of Sciences, at Munich, by Dr. Vogel, upon the influence of the germination process on the fat contained in seeds, it is stated that this decreases in the ratio of from 0.094 to 0.320 per cent., or an average of 0.156 per cent.—1 *A*, *December* 8, 1871, 277.

SOURCE OF NITROGEN IN PLANTS.

It is well known that the quantity of nitrogen contained in the crops exceeds in enormous proportion that existing in the manures, the excess undoubtedly being derived from the air. It is now a question whether this is extracted directly from the air by plants, which would thus have the power of assimilating directly, or if it is first taken from the air by the soil, so as to combine with organic matter, and form an assimilable compound. According to Deherain, oxygen, in the presence of organic matter, combines directly with nitrogen to form a compound analogous to the humus of the earth or to ulmic acid. To illustrate this, he placed in a tube oxygen, nitrogen, glucose, and ammonia. On drying the tube and heating it, a black nitrogenized matter was left, and a portion of the nitrogen in the tube was found to have disappeared.—3 *B*, *December* 14, 1871, 600.

ABSORPTION OF NITROGEN BY PLANTS.

Dr. Cameron, in referring to certain experiments of Wagner, in which it was ascertained that maize grew and developed seeds in a solution in which kreatine was the only nitrogenous substance present, the kreatine being absorbed unchanged, remarks that, from his own experiments, he has found that plants may absorb unchanged, and apparently derive nitrogen from potassic nitrite, potassic cyanurate, and potassic ferrocyanide.—1 *A*, *December* 8, 1871, 273.

ABSORPTION OF MOISTURE BY LEAVES.

Mr. M. Cailletet has lately been investigating the question as to whether the leaves of plants are capable of absorbing water in a liquid state, and sums up the result of his experiments by stating that the fact seems to be demonstrated that a plant growing in a humid soil, and receiving by its roots the quantity of water necessary to its normal condition, does not absorb the water which moistens its leaves, but that such absorption takes place as soon as the leaves begin to wither, in consequence of the desiccation of the soil. In this way he explains the phenomenon of certain plants maintaining a healthy condition without any contact with the soil, and even absolutely isolated from all assimilable substances. Thus a specimen of *Pourretea*, a rootless Bromeliaceous plant, maintained a healthy existence and exhibited considerable increase in weight while suspended for more than six years in the air by a wire. No moisture ever reached it except that from the garden syringe, and yet it was continually putting out new leaves and flowering abundantly.—1 *B*, *September* 30, 1871, 334.

DIFFERENCE IN THE ASH OF GRAPE AND OTHER FRUIT WINES.

According to Dr. Tuchschmid, the difference in the ash of combustion of grape wine and of fruit wine may be used as a convenient mode of detecting the adulteration of the former by the latter, since, while fruit wine contains 1 to 4 tenths of carbonate of lime, grape wine, at the highest, contains only about 5 hundredths. — 6 *C*, *September* 28, 1871, xxxix., 398.

EFFECT OF THE RED RAYS ON THE ASSIMILATION OF GREEN PLANTS.

A series of experiments upon the influence of the different red rays upon the assimilation of green plants has resulted in showing that the middle red rays are in themselves capable of maintaining the growth of a plant, while the exterior red rays do not possess this power; also, that in this action it is by no means the luminous power, but simply the proper quality of the rays, that produces the effect.—19 *C, March* 16, 1872, 90.

CHARACTERS OF BACTERIA.

Dr. Cohn has been prosecuting a careful series of experiments upon the Bacteria, well-known forms of microscopic bodies that are supposed to enter very largely into the processes of fermentation and contagion, and he has reached a number of conclusions, which in some respects differ from, and in others agree with, the determinations of eminent writers, such as Bastian, Crace Calvert, Frankland, etc. He thinks he has abundant evidence to prove that Bacteria and *Penicillium* are independent of each other, that the former can not be developed from the latter, that the latter does not produce putrefaction, and, finally, that the germs are destroyed at a temperature of 176° Fahr. The other facts reached by Dr. Cohn in regard to the Bacteria are the following: *First.* Bacteria are cells which, as far as we can judge, contain a protoplasmic, and, very probably, nitrogenous matter, in the form of strongly refractive granules, which have a decided outline, apparently without cellulose, and a motion apparently not produced by cilia. *Second.* The protoplasm of Bacteria cells is colorless, although of a different refractive power from water, so that, whenever existing in large numbers in water, they impart a turbid appearance to it. This turbidity is therefore a microscopic indication of the development of Bacteria. *Third.* Bacteria cells multiply by transverse division into two equivalent daughter cells, which again divide transversely. This multiplication depends, on the one hand, upon the nutriment received, and, on the other, upon the temperature, and ceases entirely at a low temperature. *Fourth.* Bacteria assimilate nitrogenous combinations, from which they form protoplasm. Following the analogy of the fungi, it is probable that they take up by endosmosis the liquid albuminous combinations dissolved in water. According to Pasteur, they can form their nitrogenous cell matter out of ammonia combinations, but how far they can assimilate other nitrogenous matters is not yet established. *Fifth.* Bacteria are also able to assimilate fixed combinations of albumen not soluble in water, after they have previously rendered them fluid, as is the case with hard-boiled egg, etc. This liquefaction of solid or half-solid albuminous bodies, in combination with their assimilation by Bacteria, and the concomitant production of accessory matter, is generally termed putrefaction. *Sixth.* The Bacteria are the only organisms which produce putrefaction in albuminous substances. *Seventh.* As the nitrogenous food of Bacteria is consumed they gradually cease to multiply, and pass from the movable to the quiescent condition, during which they secrete an intercellular substance, and heap this up into palmella-like masses (*zooglœa*). In this state, however, they can still grow, and can again swarm out under favorable circumstances. When all assimilable nutriment is exhausted, these zooglœa masses settle to the bottom, and the water again becomes clear. Mucous masses form from these Bacteria, which are developed in moist air and on nitrogenous soil, and usually produce, as accessory products, red, violet, yellow, green, and brown coloring matters. *Eighth.* When water containing living Bacteria is evaporated, innumerable Bacteria are discharged into the atmosphere, principally as the smallest globular cells. The moisture precipitated from the air is filled with innumerable cells of this kind, which are sometimes globular and sometimes cylindrical. These are the germs of Bacteria, which are constantly ascending into the air during the evaporation of putrefying liquids, are inhaled into the lungs, are deposited with the rain upon all bodies, and therefore are able to produce putrefaction wherever they establish themselves. Their vitality is not affected by their abode in the air, as is the case with some of the infusoria, and the spores and gonidia of the fungi.—19 *C*, *March* 9, 1872, 8.

RECENT OBSERVATIONS ON BACTERIA.

As the result of still more recent researches in reference to the Bacteria, especially in their relation to putrefaction and contagion, Dr. Cohn informs us that the decomposition of bodies not containing any nitrogen induced by microscopic organisms we call fermentation, while an analogous decomposition of nitrogenous, especially albuminous, substances is termed putrefaction. The processes in the latter form of decomposition have not been determined as thoroughly as those of fermentation, yet we know that all putrefaction is accompanied by the development of Bacteria, and is entirely prevented by their exclusion; it progresses in the same ratio as these smallest of all organisms increase, and ceases as soon as this increase ceases. The Bacteria are then precipitated as a powdery deposit, or as gelatinous lumps (*Zooglœa*), just as the fungi are in sugar solutions when fermentation is finished. The question as to how Bacteria enter into nitrogenous substances has usually been answered by the assertion that they float in the air like the spores of fungi. This has been successfully refuted by Sanderson, who maintains that the infection is only caused by contact with unclean surfaces (of the skin, of tools, or vessels), or by the water, which, when not recently distilled, always contains germs of Bacteria. Even saliva, urine, blood, milk, and albumen of eggs become only mouldy, without putrefying, protected against the contact with water or other bodies containing Bacteria. Mr. Cohn's researches, however, do not absolutely confirm Sanderson's observations, as he is quite certain that germs of Bacteria may be evaporated to a slight extent.

Mr. Cohn also demonstrated that sugar or other fermentable matter is not necessary for the development of Bacteria; they propagate quite normally in any liquid which contains carbon in addition to ammonia or nitric acid.

Since Bacteria only assimilate nitrogen in the form of ammonia or nitric acid, their action in putrefaction may be considered as causing the division of albuminous substances into ammonia, which is assimilated, and into other bodies which give rise to the collateral products of putrefaction, so that the process is similar to fermentation, where the sugar is divided into alcohol and carbonic acid.

Sometimes the products of albumen, decomposed by putrefaction, are colored (as in boiled potatoes, bread, etc.), and in such cases another form of Bacteria—the globular—is always found. These are imbedded in slime, and without proper motion.

In several contagious diseases Bacteria have been found in the blood and the secretions, and may be considered as the carriers of infection. They disturb the normal functions of the organism by decomposing the blood, and, as they always belong to the globular species, Mr. Cohn thinks that the transfer of the contagion may in many cases be due to the drinking of water.—19 *C*, XIII.

FERMENT FUNGI.

Dr. Engel, of Strasburg, has ascertained that alcoholic fermentation is accompanied by the development of two different genera of fungous plants, while that of fruits embraces four kinds. These latter ferments are found almost always on the surface of the fruit, where they remain in a latent condition without development. When, however, the epidermis becomes cracked, or when the stem of the fruit is separated, the ferment (or its spores) comes into contact with the saccharine juices, and the ferment is then reproduced, but always in the form of ferment and never in that of mould. Engel maintains that the alcoholic ferment exists in nature, although the fact has been denied by others. Thus, as long as a cherry is intact it has a particular savor; when, however, the stem is detached or the epidermis is cracked, the cherry not only changes its color, but assumes a vinous taste, and exhibits a large number of fermented cellules.

He also remarks that the ferment of bread is of a different species from the yeast of beer, and that he has never been able to germinate the spores of ferments in vegetables which contained but little sugar, or none at all; but that, as soon as they come in contact with saccharine liquid, they germinate or reproduce the ferment.—3 *B*, *March* 7, 1872, 409.

NATURE OF CRYPTOCOCCUS.

According to Hallier, *Cryptococcus*, one of the lowest forms of fungi, is in reality susceptible of germination, contrary to the opinions entertained by his antagonists on this question; and he maintains that he has succeeded in demonstrating satisfactorily the following propositions: 1. The yeast of beer germinates whenever it is placed under favorable conditions. 2. As long as the germ tubes and their branches grow in a moist place, rod-like germ cells are constricted off at their extremities. 3. Beer yeast consequently belongs to the mould fungi (*Schimmelpilze*), of which it constitutes a one-celled form, and is in no way connected with the *Ascomycetes* of Reess, on which point Dr. Reess has fallen into an error, pardonable enough considering the difficulty of the investigation. 4. Smut (*Ustilago carbo*, Tulasne), when its germ tube grows in spots moistened with distilled water, itself behaves exactly like the germ-tube yeast—that is, rod-like cells are constricted off from the extremity of every fibre. 5. The parasite found in the urine of typhus patients, when placed in a nitrogenized solution of sugar and other fluids capable of undergoing fermentation, buds like *Cryptococcus*, and increases in the same manner. 6. Moreover, *Cryptococcus* cells germinate under favorable conditions, and their germs comport themselves like beer yeast when placed on a moist bed. 7. The germ cells of Haubner's skin fungus of the horse behave like those of yeast under similar conditions—that is, in fermentable liquids they develop *Cryptococcus* cells, which, under favorable circumstances, germinate and constrict off elongated cells from the ends of the fibres.—13 *A*, *May* 1, 1872, 170.

AMOUNT AND ORIGIN OF MINERAL MATTER IN PLANTS.

Baudrimont, in the course of an examination into the amount of mineral matter in plants, determined the composition of quite a number of species, and arrived at the following conclusions: First, that mineral matter is found in all plants, even those of aerial growth, which would scarcely seem likely to have the power of acquiring it; second, that the mineral matter contained in plants occurs in at least two distinct conditions, namely, as a simple solution in the vegetable juices, either not having been yet utilized or unassimilable as the product of dejection, or else as finally united to or fixed with organic matter; third, this latter mode of union may occur in variable proportions, from the smallest quantity indispensable to the production of organic matter to a maximum, where the reciprocal action becomes zero.

The variability of the relative proportion of the organic mineral matter shows that these are not united to each other as the fundamental chemical elements are united. In place of an intimate combination in definite proportions between the elements of molecules, there is only a simple adhesive union, with the preservation of the fundamental structure of organic products.

Baudrimont was much struck by finding that *Cactus peruvianus* contained 94 per cent. of water and volatile matter, and 0.4 per cent. of organic matter; and, therefore, that 0.5 per cent. of organic mineral matter was sufficient to give this plant a definite form, and a texture which enables it to resist atmospheric agencies.—1 *B*, *April* 21, 1872, 35.

INFLUENCE OF VARIOUSLY COLORED LIGHT ON VEGETATION.

As the result of a series of experiments upon the influence of variously colored light upon vegetation, Dr. Bert has arrived at the following conclusions: 1. That green light is almost as fatal to vegetation as darkness; 2. That red light is very detrimental to plants, though in a less degree than green light; 3d. That, though yellow light is far less detrimental than the preceding, it is more injurious than blue light; 4. That all the colors, taken singly, are injurious to plants, and that their union in the proportion to form white light is necessary for healthy growth.

The author has examined the transmitted light from the leaves of various plants, and finds that there is a slight difference in the rays which different leaves absorb and utilize; and this, he believes, explains the fact that certain plants flourish in the shade of trees, while others will scarcely exist; in the former case it is supposed that the rays required by the plant are not absorbed by the leaves of the trees, but in the latter they are.—21 *A*, *March*, 1872, 261.

RELATION OF RECENT NORTH AMERICAN FLORA TO ANCIENT.

The reports recently published by Dr. Hayden of his explorations in Montana contain a great deal of very valuable information, bearing not only upon the present condition of the country, but upon the geological changes through which it has passed. In an account of the results of an examination of certain tertiary fossil plants collected by Dr. Hayden, Mr. Lesquereux, of Columbus, Ohio, remarks upon the typical analogy of our present flora with that of the tertiary. This analogy he finds to become more evident as his researches are multiplied.

A large number of the genera to which the trees and shrubs of Northern America at present belong have been recognized as tertiary fossils. Among these, in addition to those previously mentioned, are the mulberry (*Morus*) and the Virginia creeper (*Ampelopsis*); and among the few modern forms not yet detected in the tertiary are *Asimina* or papaw, the *Æsculus* or horse-chestnut, the witch-hazel, etc. The absence of some genera may, however, be accounted for by the readiness with which their leaves become decomposed before a suitable cast can be made of them in the muds into which they fall.

The general similarity of the modern flora of North America to that of its tertiary and even cretaceous deposits, according to M. Lesquereux, indicates a very ancient origin of the former. The chain of connection, however, from the upper cretaceous to the modern dates is not entirely complete, there being several important links wanting, particularly that of the pliocene period. The only locality of strata of the later age known to Mr. Lesquereux is at Columbus, Kentucky, on what is called the Chalk Banks of the Mississippi, where he obtained sundry specimens not to be distinguished from living species; among them the live oak, chincapin, wahoo elm, the winter berry, calamus root, the pecan nut, etc.—*Hayden's Report.*

DEATH OF A. J. SPRING, OF BELGIUM.

An eminent Belgian botanist, Mr. Antoine Joseph Spring, died at Liege on the 17th of January, at the age of fifty-seven. This gentleman long occupied a conspicuous position among the men of science of his country, having been elected professor at the University of Liege in 1839. He had previously spent several years at the botanic garden in Munich, under the direction of Von Martius, and devoted himself especially to the study of the *Lycopodiaceæ*, assisting Von Martius in the elaboration of the species of this and some other families for the "Flora Braziliensis." He subsequently devoted considerable time to the investigation of the mushrooms, and published several papers upon them. He did not, however, confine himself to botanical investigations, but prosecuted researches in physiology, and upon the movements of the heart, with special reference to the mechanism of the auriculo-ventricular valves. He also took a prominent part in the discussion of questions connected with prehistoric man, and endeavored to establish a chronology in the so-called Stone Age. The first stage, which he called the preglacial, had reference to the tertiary man, the contemporary of the *Elephas meridionalis;* the second, or postglacial, embraced the celebrated

Enghis man, the contemporary of the mammoth; the third was the diluvial, which includes the period of the reindeer and a few other mammals, which have retreated toward the north or into the high mountains; and the fourth the mixed, or Celto-Germanic, in which the implements of the Stone Age are found, together with those of the Bronze and Iron.

As a memorial of its deceased member, the Academy of Sciences of Belgium has added the following to the prize questions of 1874: The polymorphism of the mushrooms is attracting more and more the attention of botanists and physiologists, and seems suited to furnish new elements for the solution of the problem of life in general. First, a succinct and critical summary of the known observations of the polymorphism of the mucedinæ is demanded; second, an exact determination, even if based upon a single species, of what relates, first, to the proper nature of the plant (its specific energy), and, second, to the exterior (the conditions of its development); third, the positive proof or disproval of the fact that the fungi of ferments, such as micrococcus, palmella, mycodermi, etc., under any circumstances, can be transformed into the higher fungi.—*Bulletin Acad. Royale de Belgique, February*, 1872, 103.

UTILITY OF THE WATER-PEST PLANT.

The American water-plant (*Elodea Canadensis*), which, under the name of Water Pest, has caused so much alarm in Europe by its rapid propagation in canals and streams, it is stated, serves a very important purpose as a purifier of water, especially in destroying the taste and smell of sewerage. It is admirably adapted, too, as a nutriment for young herbivorous fish, and as a refuge for young fish of any kind, and can be introduced to great advantage in fish-breeding establishments. It also furnishes an excellent manure for soils poor in lime and other inorganic constituents, as it contains an unusual percentage of lime, soda, potash, magnesia, and silica. The separation of these ingredients from the water tends to purify it, and render it much softer and more serviceable in domestic economy than otherwise. Indeed, the plant will not thrive in water that does not contain lime, at least in an appreciable amount; and when planted in a pond, it dies out as soon as the water is brought to a condition of approximate freedom from mineral ingredients.—2 *C, April*, 1872, 65.

CULTIVATION OF THE INK PLANT IN EUROPE.

For many years the juice of the ink plant (*Coriaria thymifolium*) has been used in South America as an ink, as it flows freely from the pen, and, although of a reddish color at first, becomes very black in a few hours. It does not attack steel pens, and is said to be absolutely ineffaceable. Quite recently attention has been drawn to its superior properties, and extensive efforts are now being initiated in Paris and elsewhere in Europe for the purpose of multiplying this plant, and bringing it into general use.—1 *A*, *July* 12, 1872, 23.

DIFFERENT CUNDURANGO PLANTS.

Professor Triana, as the result of a careful inquiry into the medicinal character of cundurango, has decided that the form so strongly recommended of late as a remedy for cancer constitutes an undescribed species of the genus *Gonolobus*, which he has named *G. cundurango.* Another plant, likewise called cundurango, and found in the high lands of New Granada, is properly known as the *Macroscepis trianæ* of Decaisne; while still another, sometimes called *Cundurango*, but more properly *Guaca* or *Gaucho*, also from New Granada, is the *Mikania guaco.* This latter plant has a high reputation in its own country as a cure for the bite of a serpent, for which it is considered infallible.—4 *B*, *August*, 1872, 650.

LIST OF NEW SPECIES OF NORTH AMERICAN PLANTS DESCRIBED IN 1872.

The following enumeration is believed to embrace the majority of species of plants described as North American during the year 1872:

Hedeoma graveolens, CHAPMAN. GRAY, Proc. Amer. Acad., p. 367. Florida.

Salvia Engelmanni. GRAY, l. c., 368. W. Texas.

" *Henryi.* GRAY, l. c., 368. New Mexico.

" *Greggi.* GRAY, l. c., 369. S. Texas and Mexico.

" *Parryi.* GRAY, l. c., 369. W. Texas.

Cedronella micrantha. GRAY, l. c., 369. S. W. Texas.

Scutellaria Wrightii. GRAY, l., c. 370. Arkansas and E. Texas.

Stachys Bigelovii. GRAY, l. c., 371. W. Texas.

Trichostema Arizonicum. GRAY, l. c., 371. S. Arizona.
Thalictrum occidentale. GRAY, l. c., 372. Oregon.
Isopyrum Hallii. GRAY, l. c., 374. Oregon.
Delphinium trolliifolium. GRAY, l. c., 375. Oregon.
Viola Hallii. GRAY, l. c., 377. Oregon.
Petalostemon Searlsiæ. GRAY, l. c., 380. S. E. Nevada.
Rosa pisocarpa. GRAY, l. c., 382. Oregon.
Glycosma ambiguum. GRAY, l. c., 386. Oregon.
Aster radulinus. GRAY, l. c., 388. Oregon.
" *Hallii.* GRAY, l. c., 388. Oregon.
Aplopappus Hallii. GRAY, l. c., 388. Oregon.
Chænactis brachypappus. GRAY, l. c., 390. S. E. Nevada.
Pentstemon Eatoni. GRAY, l. c., 395. Utah and Arizona.
Polygonum Shastense, BREWER. GRAY, l. c., 400. California.
Polygonum Bolanderi, BREWER. GRAY, l. c., 400. California.
Arceuthobium abietinum, ENGELM. GRAY, l. c., 401. Oregon.
Arceuthobium pusillum. PECK, Report to Albany Institute. New York.
Arceuthobium Americanum, NUTT. PORTER, l. c., 493. Wyoming.
Stenanthium occidentale. GRAY, l. c., 405. Oregon.
Lophochlæna refracta. GRAY, l. c., 409. Oregon.
Aster Haydeni. T. C. PORTER, Hayden's Geol. Report, p. 477. Wyoming.
Carex Hallii, OLNEY. PORTER, l. c., 496. Wyoming.
Anemopsis Bolanderi. C. DE CANDOLLE, Linnæa, 37, 333. California.
Rhynchospora nivea. BÖCKELER, Linnæa, 37, 527. Texas.
Stipa Bloomeri. BOLANDER, Proc. Calif. Acad., 4, 168. California.
Stipa Stillmani. BOLANDER, l. c. California.
Lilium Bloomerianum. KELLOGG, Proc. Calif. Acad., 4, 160. California.
Madia radiata. KELLOGG, l. c., 190. California.
Leptosyne gigantea. KELLOGG, l. c., 198. California.

I. AGRICULTURE AND RURAL ECONOMY.

ENDOWMENT OF LAWES'S EXPERIMENTAL FARM.

Mr. John B. Lawes, of Rothamsted, in England, well known for his many investigations, in connection with Gilbert, upon the physiology of plants, and other scientific questions connected with agriculture, has announced his intention of placing in trust his laboratory and experimental farm, with an endowment of half a million dollars, the interest of which, after his death, is to be expended in carrying on the researches that have rendered his name so famous. This act of princely liberality on his part will doubtless bear ample fruit in the future, as his own labors have done in the past.—12 *A, June* 6, 1872, 110.

RELATION OF SUN SPOTS TO THE WINE-CROP.

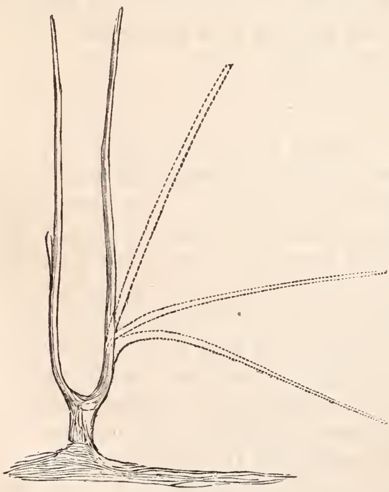
Mr. Schuster, of Manchester, calls attention, in *Nature*, to the apparent connection between the sun spots and certain terrestrial phenomena, and remarks upon the close coincidence of the years in which the wine-crop of Germany was unusually good with those in which there was a minimum of the sun spots.—12 *A, April* 25, 1872, 501.

THE SPECTROSCOPE IN TESTING THE PURITY OF WINES.

Among those who have made a practical application of the spectroscope to various purposes in domestic economy and the arts is Mr. J. C. Sorby, of England. He uses as a scale an interference spectrum with dark lines, by means of which the spectrum is divided into twelve optically equivalent sections. With this instrument he has lately investigated the coloring matters of Brazil-wood and of logwood in wine, first shaking the latter with ether, and then evaporating the etherial solution obtained, treating the residuum with water, displacing this with carbonate of ammonia, and then testing the solution with the spectrum microscope. The question of a mixture of the coloring matter of the ratany-root or of the poke-berry (*Phytolacca decandra*) is determined after the wine has been reduced to a smaller volume by evaporation, and the residuum treated with alcohol. The age of port and other dark wines may be determined by means of this apparatus.—18 C, *November* 15, 1871, 724.

INCREASING THE VIGOR OF GROWTH IN PLANTS.

A very important announcement has lately been made in France as to the effect produced upon the luxuriance of vegetation by the disturbance of the natural position of the branches. It has been known for some time that if two branches of a fruit tree be selected of about the same size, and the same upward inclination to the horizontal plane, and one of these be bent downward toward this plane, it appears to lose its vigor, while the other gains in a like ratio. It is now announced as the discovery of an ignorant peasant on the Danube, named Hooibreuk, that this law holds good only up to the horizontal position; and that, if the branch is depressed still further, and below the horizontal, it becomes characterized by much greater vigor than before, and, in fact, will put out leaves and branches to an astonishing and unheard-of degree. But this depends upon keeping the branches as nearly as possible in a straight line, the effect being measurably lost with a considerable curvature. In this case, only the buds which occupy the top of the arc are developed completely, at the expense of the rest, which remain in their original condition, contributing neither to the extension of foliage nor of fruit. (The successive positions of the branch are illustrated in the accompanying cut.)



Duchesne-Toureace, in communicating these facts to *Les Mondes*, attempts to show the causes which seem to determine so great a flow of sap to the branches inclined below the horizontal line, and thinks that the explanation is to be found in the establishment of a siphon arrangement, by means of which the juice is carried over the bend from the main stem in excessive flow. Be this as it may, the fact remains, as illustrated by an experiment prosecuted by this gentleman. In early spring, when the sap was running in the vines, he took four plants of about the same size, and trimmed them so as to leave one stem to each, these being arranged vertically, obliquely upward; horizontally, and obliquely downward. He then cut off the stems, and collected and measured what exuded, and found the amount from the branch inclined downward was more than three times greater than that from the others.—3 *B*, *March* 7, 1872, 381.

SCARCITY OF SMALL BIRDS IN FRANCE.

A recent writer in *Les Mondes* remarks upon the great scarcity in France during the present year of small insectivorous birds, and ascribes this to the extreme rigor of the preceding winter, which caused myriads of the feathered tribes to perish with hunger and cold. The consequences of this scarcity, according to the writer, were very soon manifested in the unusual amount of devastation caused by the caterpillars, which, not satisfied with devouring the leaves and young shoots, have even eaten into the wood, fruit trees being attacked in preference to others, and to such an extent that many orchards and groves in May were as destitute of foliage as at Christmas.—3 *B*, *October* 12, 1871, 122.

INFLUENCE OF FOOD UPON POULTRY AND EGGS.

The influence of the food of poultry upon the quality and flavor of their flesh and eggs has not generally been taken into consideration; but it is now well ascertained that great care should be exercised in regard to this matter. In some instances it has been attempted to feed poultry on a large scale in France on horse-flesh, and, although they devour this substance very greedily, it has been found to give them a very unpleasant savor. The best fattening material for chickens is said to be Indian corn-meal and milk; and certain large poultry establishments in France use this entirely, to the advantage both of the flesh and of the eggs.—12 *C*, *November* 1, 1871, 87.

INFLUENCE OF FOOD ON THE QUALITY OF PORK.

As the result of experiments in England upon the influence of food upon the quality of pork, it is stated that pigs nourished with milk give the best-flavored meat and the greatest weight; next to which come those fed with grain, maize, barley, oats, and pease. Potatoes furnish a loose, light, tasteless flesh, which wastes away very much in cooking; while that of animals fed upon clover is yellow and of a poor flavor. Oil-cakes and oil-seeds produce a loose, fatty flesh, of an unpleasant taste; beans a hard, indigestible, and unsavory meat; and acorns are but little better.—8 *C*, *October* 19, 1871, 42, 334.

CONVERTING WEEDS INTO MANURE.

A ready method for utilizing weeds and garden refuse so as to convert them speedily into valuable manure consists in laying them in a trench, in successive layers, with unslacked lime between, and then covering the whole with earth. The mass will be rapidly converted into an excellent manure, and the additional percentage of lime will also have its importance in the economy of the farm.—9 *C*, *February*, 1872, 25.

DESTROYING MOULD IN CELLARS.

According to Dr. Wiedehold, fungus growths in cellars may be combated either by burning sulphur or by pouring two parts of concentrated sulphuric acid over one part of common salt. In the first instance, sulphurous acid gas is produced; and in the second, hydrochloric acid, by means of which the fungi are destroyed. It is sufficiently evident, however, that during this process all openings must be closed, so as to prevent any escape of the gas, and the greatest care exercised not to enter the cellar after the operation until it has been thoroughly ventilated.—6 *C*, *November* 16, 1871, 458.

RUST IN WHEAT.

It is at present well established that rust in grain is produced from the spores of a microscopical fungus growing upon the barberry and various rough-leaved plants, alder, etc. These, falling upon the leaves of the cereals and other grasses, develop very rapidly, and in turn yield the summer spores of a similar character, by which the affection is propagated with inconceivable quickness. The winter spores, which are produced last, form on the first-named plants other fungus growths the next year, and thereby secure the continuance of the rust from season to season.

The proper methods of preventing grain from taking this affection consist, first, in extirpating the barberry and other trees mentioned from the vicinity of the grain-fields; next, the grain should be cleaned with the utmost care, so that no seeds of the fungus-bearing plants may be introduced into the field in the sowing, and thus aid in the development of the disease; and, finally, no manure should be applied to the grain-fields in which any straws are mixed that have come from rusted plants, and, in fact, straw of this character should be burned, as the most effectual method of protection against the spreading of the disease. If used at all as manure, however, it should be kept for grass-lands or fields in which grain is not raised.—10 *C, November* 1, 1871, 157.

INTRODUCTION OF USEFUL PALMS INTO FLORIDA.

A memorial has been presented to Congress by Mr. Louis Baker praying that the necessary steps be taken to introduce into the Southern States certain palms yielding sugar and fruit. Many years ago, Dr. Perrine, of Florida, memorialized Congress, urging the importance of taking measures to initiate the cultivation of various tropical plants, of the success of which he felt assured by the results of his own experiments. The untimely death of the doctor, not long after, prevented any further action in this matter, though it is not unlikely that, had he lived, Florida and other Southern States would be enjoying a variety of important vegetable products not now included in their industrial resources. Mr. Baker thinks the palms especially important, particularly those furnishing sugar and oil in large quantities. He presents statements showing the ease with which such trees can be planted and kept up, and vast returns obtained with very little expenditure of labor. Other species of palm, considered by him important, are the date-palm, the cocoa-nut, the sago, etc. He also urges the planting of indigo, ginger, gunny, safflower, the centennial hemp-plant of China, the camphor tree, etc.—*Memorial to Congress.*

CULTIVATION OF ESPARTO GRASS.

Considerable attention is now being paid in Europe and Algiers to the cultivation of a fibrous plant, which is called *alfa* in Africa, *atocha* in Spain, but in commerce is usually known as the *esparto* grass (*Macrochloa tenacissima*). This plant thrives throughout the entire coast of the Mediterranean, both in Europe and in Africa, and its cultivation is extending very rapidly, in consequence of the demand for it as a material for paper-making. It grows in very sterile regions, even in the sands of the Sahara, and thrives under excessive heat, and in a dry, arid soil. It is peculiarly valuable on account of its great tenacity and its resistance to fermentation, for which reason it is used for sail-ropes and the rigging of vessels. The demand for this substance may be estimated from the fact that it was first brought into notice in 1862, when a cargo was transported from Oran to England, and that the amount sent out has risen from 10,000 quintals in 1863 to 370,000 in 1870. The value of this export from the Province of Oran, in Algiers, alone amounted to $1,500,000. —*Bull. Soc. d'Acclimatation*, VIII., 1871, 488.

SPECIFIC-GRAVITY TEST FOR POTATOES.

A simple test adopted in Germany for determining the comparative value of different samples of potatoes as food consists in the use of a saline solution of a certain strength, in which the potatoes are placed, and observing the depth to which they sink. Those which sink the deeper, and especially those that settle to the bottom, are the more valuable varieties, while the poorer qualities float at the top. As this method depends for its principle upon the fact that the amount of the starch in the potato is in the ratio of its specific gravity, a much simpler method of getting the absolute value consists in subjecting the potato directly to the ordinary specific-gravity test, and making the comparisons accordingly.

PROPER METHOD OF STORING POTATOES.

According to the *English Mechanic*, potatoes should always be stored in as dry a state as possible, and should any disease be discovered among them, small quantities only should be pitted together; certainly not more than thirty bushels in each pit. In the centre of this pit should be placed a lump of lime about the size of a man's head, and before covering them in they should receive a good dusting of quick-lime. The lime absorbs the moisture during the time the potatoes sweat, and by so doing prevents the tubers from overheating, while its application also greatly improves the quality of the potatoes, no doubt absorbing much of the water from the tubers, and consequently making them more mealy than if pitted without lime. After the potatoes have been lying in the pit for at least a month, they should be carefully looked over, and may be placed together in one or more large pits, in the centre of which should be placed a large basket of hard lumps of lime, or, should the pits be in the form of long trenches, it will be well to place other baskets at about twelve feet apart. The whole heap should also be well sprinkled with lime before covering it. The pits should be made low and narrow, as they are thus less liable to heat than if made wide and high.—18 *A*, *Oct.* 20, 1871, 126.

PREVENTING THE GERMINATION OF POTATOES IN CELLARS.

Much trouble is experienced by farmers and others who have occasion to store potatoes for a considerable length of time, in preventing their germination, and consequent depreciation in value as food; and our readers may be interested to know that experiments, prosecuted in Germany, have shown how this may be measurably prevented. This is accomplished by exposing the potatoes to the vapor of sulphurous acid, by any of the various well-known modes, and a large mass of potatoes can be treated at one time. This process, if not entirely effective in accomplishing the object, will retard or modify the sprouting of the potato to such an extent as to render the injury caused thereby very slight. The flavor of the potato is not affected in the least by this treatment, nor is its vitality diminished; the action being simply to retard or prevent the formation and growth of the eyes.—8 *C*, *October* 19, 1871, XLII., 335.

WILTING SEED POTATOES.

Experiments in Schleswig-Holstein are reported as having shown the advantage of wilting seed potatoes. It is said that seed potatoes taken up in February, and spread in a pretty warm kitchen, germinated and grew much more quickly, giving a greater yield by twenty-five to thirty per cent., and were much less subject to the rot. The favorable result is believed to be produced by the greater energy resulting from the concentration of the sap in the cells.—28 *C*, 1872, IV., 237.

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.—21 *A*, *November*, 1871, 1082.

PREPARATION OF BEET-LEAVES FOR FODDER.

Méhay maintains the entire success of his method of so preparing the leaves of the beet as to render them capable of preservation for several months as fodder, and at the same time greatly improving their qualities as food for cattle. The method consists simply in placing them in baskets, and immersing them in a tank containing diluted hydrochloric acid of four degrees of Beaumé. The result of this is to greatly condense the volume of the leaves, and to render it necessary to add more fresh ones to fill up the basket, which has to be again immersed, and finally allowed to drain off. The leaves may then be placed in beds, in dry earth, and kept until needed for use. According to a report of a committee who examined the results of this process, domestic animals become extremely fond of the leaves thus prepared; and, indeed, milch cows fed with them are said to give a large increase of milk, with a decided improvement in the quality of the butter. The tendency to diarrhœa in cattle produced by the fresh beet-leaves seems not to be developed by this prepared fodder, and for this and many other reasons it is strongly recommended to agriculturists.—3 *B*, *Dec.* 21, 1871, 672.

HUANO MANURE.

An important improvement in the manufacture of artificial guanos, the discovery of which affords for many cases a practical solution of the difficulty of disposing of sewage, has just been announced in Great Britain, having reference to a substance called Huano manure. This material, it is claimed, is as rich as Peruvian guano, and its manufacturers furnish a guarantee to that effect. It is worth, according to the scale of fertilizers, from $40 to $45 per ton, although its first cost, as manufactured, is less than $13 per ton. In the course of inquiries leading to the invention in question, it was first ascertained that Portland cement transforms night-soil into stone, which, upon being crushed, gives eighteen per cent. of phosphate of lime; and when applied as a manure for growing turnips, has produced twenty-six tons to the acre. Owing to the insoluble nature of the phosphates, however, the action was slow, and the next step in the process was to utilize this property of cementation in the superphosphate manufacture, in which night-soil is substituted for water in the decomposition of the phosphates. During this process the phosphates part with the two portions of their lime, uniting with sulphuric acid to form sulphate of lime (plaster of Paris), from which is derived the valuable property of cementing night-soil from a liquid into a solid mass. This solidification produces simultaneous deodorization, removing all offensive and foul effluvia, as well as any capability of giving out deleterious gases, and such powers of destruction are transformed into fertilizing endowments. It will thus be seen that cementation lawfully usurps the place hitherto occupied by fermentation and evaporation, and hydrates all the moisture—which, being chiefly urine, possesses manurial value to the last drop—together with the incorporation of the whole of the ammonia, alkaline salts, and other valuable constituents existing in the night-soil.

The inventor, Mr. Hughan, has made arrangements with an extensive manufacturer of superphosphates to carry on the process, and great expectations are expressed as to the value of the results to be anticipated. The advantages of working the new patent, in connection with such a manufacture, are: 1. The night-soil gives that pasty condition to phosphates essential to the reception and dilution of the acid employed in superphosphate manufacture. 2. The phosphates are increased one fourth in quantity from the alkaline phosphates and phosphoric acid of the soil; thus, if seventy-five units of phosphate of lime are introduced, one hundred are withdrawn. 3. The phosphates receive a new supply of nitrogen equal to from two to four per cent. of ammonia from the soil. 4. The phosphates obtain five to eight per cent. of alkaline salts, containing one per cent. each of magnesia and potash, from the soil. 5. The phosphates receive, in addition, sixteen per cent. of organic matter intermixed with the urea and uric acid, possessing the latent quality of evolving ammonia to the last atom, and inducing nitrification, as well as the ammonia and nitrates as returned in the analyses. On the other hand, night-soil receives from phosphates the following advantages: (*a*) Cementation; (*b*) solidification; (*c*) deodorization; (*d*) portability by rail or sea in the service of agriculture; (*e*) the bringing within the pale of sanitary laws, contributing to health and to municipal revenues. It is even suggested that the present superphosphate manufacture must ultimately pass over into night-soil utilization, either voluntarily or by legislative enactment.—17 *A*, *December* 1, 1871, 214.

PREVENTING HEATING IN GRAIN-STACKS.

A simple instrument has lately been devised, under the name of the hay-stack ventilator, for the purpose of ascertaining and counteracting the heating in the interior of stacks of hay or grain. This consists of a wrought-iron tube, about three inches in diameter, which is long enough to reach into the middle of the stack, and, like the Norton well-tube, is provided with a conical point at the tip, and pierced for about two thirds its length with numerous holes. A screw arrangement is affixed to the posterior extremity by which it can be connected with an accompanying discharge-pipe.

For use, this apparatus is to be driven horizontally into the stack to be investigated, either by means of a mallet or by a screw arrangement, and the temperature ascertained, after a short interval, by introducing a self-registering thermometer. Should the temperature be too high at any point in the stack, a tin tube is to be affixed vertically to the outer end of the iron tube, and an outward current of air from the interior of the stack produced, by means of which the heat is speedily carried off without any injury to the stack. Hooks may be attached to the tip of the instrument by which small samples of the central part of the stack can be brought out.—9 *C*, *February*, 1872, 19.

SOURCE OF NITROGEN IN THE SOIL.

According to Deherain, the sources of the nitrogen of the soil, as at present recognized, are insufficient to account for the amount of nitrogen which the soils contain, and he tries to prove, by certain experiments, that the free nitrogen of the atmosphere is brought into combination during the oxidation of the organic matter of the soil.—21 *A*, *February*, 1872, 164.

FUNCTION OF POTASSIUM IN SOILS.

According to Nobbé, the presence of potassium in soils is necessary in order to enable the chlorophyll grains of the leaves to form starch; sodium and lithium being unable to replace potassium in this function—the latter, indeed, being actually injurious. He has also ascertained that the different combinations of potassium vary very much in their value, the chloride being by far the most efficacious.—21 *A*, *February*, 1872, 167.

GRAFTING WAX.

The gardeners of Metz use a grafting wax which is considered of very excellent quality. It is prepared by melting together two parts of white and one of black pitch, and stirring the mixture thoroughly during the operation. Close by the vessel filled with the melted wax is placed a basin containing cold water, into which the hands are immersed, and then as much of the wax taken from the melted mass as is necessary for each particular application in grafting.—6 *C*, I., 1872, 87.

PHYSIOLOGY OF GRAFTING.

Mr. Gœppert, in Silesia, gives results of some observations in reference to tree-grafting substantially as follows: Upon the vertical surface of the stock a tissue of parenchyma is developed, proceeding from the medullary rays, which enters into intimate connection with that of the scion. At the same time, the cambium of the scion unites perfectly with that of the stock. The place of this union remains visible, and is named by Mr. Gœppert the line of demarkation. All development above this line belongs to the scion, all below to the stock. The stock, entirely deprived of leaves, furnishes, as it were, the crude sap to the scion, which, by its organs of vegetation, assimilates it. But as soon as the descending sap has passed the line of demarkation it assumes again all the peculiarities due to the nature of the stock, and as no leaves are allowed on the stock to elaborate the sap, it appears that the thin stratum of tissue formed at the connection is the only means of producing this change, and thus retaining the characteristic distinctions of scion and stock. Such mutual independence is also often seen in the difference in growth, the stock frequently surpassing the scion, and inversely.—19 *C*, VII., 1872, 112.

ACTION OF SALT OF POTASH ON VEGETABLES.

Considerable interest was excited some months ago by the detail of experiments prosecuted by Dr. George B. Wood upon the action of salts of potassa on vegetation. In a subsequent communication to the American Philosophical Society, he states that, in a field of grain devoted to these experiments, the soil of which was previously exhausted by bad culture, one half was enriched by barn manure, and the other half with similar manure with the addition of a certain quantity of wood ashes. The effect of the latter application was especially marked, the yield being much greater than with the former. The most striking results were obtained by the use of ashes of the poke-berry (*Phytolacca decandra*).—*Pr. Am. Ph. Soc., February* 2, 1872.

POWDERED COAL FOR UNHEALTHY PLANTS.

In a communication addressed to the *Revue Horticole*, the writer states that he purchased a very fine rose-bush, full of buds, and, after anxiously awaiting their maturing, was greatly disappointed, when this took place, to find the flowers small, insignificant in appearance, and of a dull, faded color. Incited by the suggestion of a friend, he then tried the experiment of filling in the top of the pot around the bush, to the depth of half an inch, with finely-pulverized stone-coal.

In the course of a few days he was astonished at seeing the roses assume a beautiful red hue, as brilliant and lively as he could desire.

He tried the same experiment upon a pot of petunias, and soon after all the pale and indefinite colored ones became of a bright red or lilac, and the white petunias were variegated with beautiful red stripes. Some of the lilac petunias became a fine dark blue. Other flowers experienced similar alterations; those of a yellow color alone remained insensible to the influence of the coal.—9 *C*, *November*, 1871, 81.

LIMING FRUIT TREES.

The periodical liming of fruit trees is generally considered as serviceable, especially in keeping down the ravages of the insects which find their home in the fissures of the bark. It is also important that the operation should be likewise extended to the main branches. For the purpose in question, whitewash has generally been used, causing a decided whiteness of the tree, which is objected to by many persons on the score of the unsightly appearance and the readiness with which the lime becomes detached. It has been shown, however, by experience, that the same beneficial effect results from the use of colorless lime-water, which every one knows how to prepare with unslacked lime, and which, when settled and become clear, can be poured off and used as above indicated. In this way repeated applications can be made without affecting the appearance of the tree.—9 *C*, VIII., *August*, 1871, 59.

CAUSES OF THE ROTTING OF FRUIT.

According to Decaisne, the rotting of fruit is produced by two microscopic fungi, which develop in moist, confined air, namely, *Mucor mucedo* and *Penicillium glaucum*, infinitely minute germs of which are continually floating in the atmosphere, and which attack more especially any injured or abraded portion of the surface. If, now, the fruit be wrapped up in cotton, or with soft tissue paper, or, still better, with waxed paper or tin-foil, the introduction of these germs will be prevented, and the fruit can be kept for a long time without any appreciable change.—9 *C*, VIII., *August*, 1871, 62.

NEW VARIETY OF CUCUMBER.

In "Land and Water" we have a figure and description of what is called the new white-spine cucumber. This, when raised on a trellis, grows to an enormous size, one vine having three specimens, each of them three feet in length, besides many others over two feet long. The flesh is said to be very solid, with but few seeds, and the flavor very fine. This method of growing cucumbers is recommended as furnishing a much superior result to that of allowing them to trail on the ground, as they thus grow finer, straighter, and with a larger yield. This new cucumber has the skin perfectly smooth. It is very short in the neck, and it is considered a decided gain to the resources of the vegetable gardener.—2 *A*, *December* 23, 1871, 444.

DESTROYING CATERPILLARS.

According to Schmidt, an excellent remedy against caterpillars consists in a dilute solution (1 part in 500) of sulphide of potassium, the infested tree being sprinkled with this substance by means of a small hand-syringe. This method has been used on a large scale in Southern France, and, it is said, without any injury to vegetation.—28 *C*, *February*, 1872, 123.

REMEDY FOR THE RAVAGES OF THE GRAPE-VINE SCOURGE.

The alarm created in France by the increasing ravages of the grape-vine louse, *Phylloxera vastatrix*, continues unabated, and grave fears are entertained and expressed in regard to the future of the wine-producing interests. Numerous remedies have been proposed; few, if any of them, however, of much apparent value. Among those most relied upon have been, first, the collection and destruction by fire of the vine-leaves bearing the special galls of the *Phylloxera;* second, tearing up the diseased plants by the roots; third, the employment of various poisonous substances, among which those most in favor are carbolic acid, certain essential oils, and bisulphide of calcium; fourth, the reconstruction of the vineyard by grafting the vine on the American *Vitis labrusca.*

There is one difficulty in regard to the first remedy. The galls, which are abundant in America and about Bordeaux, do not exist in the vineyards of the south of France. There the insect is born, lives, multiplies, and dies, exclusively upon the roots of the vine. The second method is also of little account, since a vine may be seriously affected without showing any external symptoms, these manifesting themselves simultaneously over the entire vineyard, and involving the destruction of the whole. The use of poisonous substances, also, has given few results of any value, especially as it is only the superficial rootlets that can be reached, while the more deeply seated can not be influenced. The fourth method, of grafting on the American grape, is one the success of which is problematical; and although, so far, there seems to be a greater power of resistance in this species than in others, there is no telling how soon this variety may cease to possess comparative immunity.

In view of all these circumstances, M. Faucon has recommended very urgently the propriety of so planting the vineyards as to permit them to be inundated during the winter season, just as is done in the case of cranberry patches. He has tried this experiment on a very large scale during the past winter of 1870–'71, and has found the most gratifying result. Plants which had been seriously attacked, and which were on the point of being torn up and burned, were found in the ensuing spring to have recovered their vigor, and a careful examination failed to reveal the slightest traces of the destructive enemy. This application can only be made, however, to vineyards having a level surface and suitably arranged for the purpose. But M. Faucon is of the opinion that only such vineyards as can be treated in this manner can be maintained, and that all which are situated on the slopes of hills must be given up, unless some special arrangements can be made for the purpose of overflowing the roots of the vines.—*Revue Horticole, November* 1, 1871, 553.

DISTINGUISHING EDIBLE MUSHROOMS.

A writer in the *English Mechanic* gives what he considers to be an invaluable rule for distinguishing the true mushrooms from the poisonous species. He remarks, in the first place, that the true mushroom is invariably found in rich, open pastures, and never on or about stumps or in woods; and, although a wholesome species sometimes occurs in the latter localities, the writer considers it best to avoid their products. A very good point, in the second place, is the peculiar intense purple-brown color of the spore-dust, from which the ripe mushroom derives this same color (almost black) in the gills. To see these spores, it is only necessary to remove the stem from the mushroom, and lay the upper portion, with the gills downward, on a sheet of writing-paper, when the spores will be deposited, in a dark, impalpable powder, in a short time. Several dangerous species, sometimes mistaken for the true, have the spore umber-brown, or pale umber-brown.

In the true mushroom, again, there is a distinct and perfect collar, quite encircling the stem, a little above the middle, and the edge of the cap overlaps the gills. In some poisonous species this collar is reduced to a mere fringe, and the overlapping margin is absent, or reduced to a few white scales. Lastly, the gills never reach to nor touch the stem, there being a space all around the top of the stem where the gills are free from the stalk.

There are numerous varieties of true mushrooms, all of them equally good for the table. Sometimes the top is white and soft like kid leather; at other times it is dark brown and scaly. Sometimes, on being cut or broken, the mushroom changes color to yellow, or even blood-red; at other times no change whatever takes place. To sum up, it is to be observed that the mushroom always grows in pastures; always has dark, purple-brown spores; always has a perfect encircling collar; and always has gills which do not touch the stem, and has a top with an overlapping edge.

In addition to the method just indicated for testing the genuineness of mushrooms, we are informed that, however much any particular fungus may resemble the eatable mushroom, none are genuine nor safe the skin of which can not be easily removed. When taken by the thumb and finger at the overlapping edge, this skin will peel upwards to the centre all around, leaving only a small portion of the centre of the crown to be pared off by the knife.—18 *A*, *December* 8, 1871, 297, *and December* 22, 1871, 353.

MEETING OF NEW YORK STATE AGRICULTURAL SOCIETY.

The New York State Agricultural Society, at its annual meeting to be held during the present winter, proposes to discuss especially the subject of forestry, and expresses a desire to receive communications on the following subjects from any one having information to impart, to be addressed to the secretary of the society at Albany:

1. What proportion of the area of New York is covered by forest? 2. What is the average number of acres of timber annually cleared or destroyed? 3. To what extent are the forests annually renewed by nature or by planting? 4. What kinds of timber yield the greatest profit to the forester? 5. What length of time elapses between the planting of the seed and the maturity of the tree *for cord wood?* and 6. How long between the planting of the seed and the maturity of the tree *for timber?* This information is desired for every species of forest tree grown in the state, as hickory, chestnut, ash, elm, etc. 7. Should trees be trimmed or left untrimmed in plantations? If they should be trimmed, what is the best method? 8. Is it more profitable to renew woodlands by planting or to let them grow up naturally by sprouting or otherwise? 9. Is it better management to clear all the wood from a piece of ground at once, or to cut only the most valuable trees, leaving the smaller ones to grow?—*Circular.*

WATER-GLASS FOR BUDDING TREES.

An important use of water-glass is made in budding trees, for which purpose it is to be mixed with finely-powdered whiting or finely-sifted chalk into a paste, and the wounded parts of the tree covered with it. In this way the exposed surfaces will be completely protected against the action of the weather, and by timely application and proper manipulation all injurious results from the operation may be avoided. —9 *C*, VIII., *August*, 1871, 62.

PREVENTING IRON GARDEN-TOOLS FROM RUSTING.

It is said that if iron garden-tools are laid for a few minutes in a solution of soda, they will be protected from rusting for a long time, even if exposed continuously to a moist atmosphere.—9 *C*, *September*, 1871, 71.

USE OF SEWER-WATER AS A MANURE.

According to the *Revue Horticole*, experiments with the sewer-water of Paris, in the cultivation of certain lands below the level of the city, commenced three years ago, have been of the most satisfactory character, and the eagerness that the farmers now exhibit to obtain permission to use these waters on their lands, wherever it is practicable, is justified by the great increase in their value, many of them having previously been of little worth. Thus certain lands now rent for six and seven times as much per annum as formerly. —*Revue Horticole, January* 15, 1872, 22.

KEEPING GRAIN IN VACUO.

Some time ago Dr. Louvel suggested the idea of keeping grain in a partial vacuum, by introducing it into air-tight vessels and exhausting the air, this being intended to prevent injury from dampness, and to secure it from the attacks of insects as well as vermin. We now learn that this idea has been brought to a practical test, and that it bids fair to enter largely into the operations of grain-dealers. For the purpose in question, vessels are made of boiler-iron, to contain about twenty-seven bushels; and after the grain is introduced and the cover applied, a vacuum is effected, which, for this purpose, need not involve a reduction of pressure of over one sixth to one seventh of the ordinary atmosphere. Any number of these receptacles can, of course, be made, and can be used over and over again indefinitely.—1 *A*, *March* 8, 1872, 118.

RATIO OF NITROUS TO NITRIC ACID IN RAIN-WATER.

As the result both of recent and of earlier observation, it has been found that the ratio of nitrous to nitric acid in rain-water depends upon the degree of heat, moisture, and electricity of the atmosphere. The conditions favorable to the production of nitrous acid are calm and cloudy weather, a mean temperature, and an elevated hygrometric condition; while, on the other hand, the production of nitric acid is favored by a high temperature, a dry atmosphere, high winds, and thunder-storms.—21 *A*, *April*, 1872, 281.

RELATION OF THE NITROGEN OF THE ATMOSPHERE TO VEGETATION.

Deherain has been conducting certain experiments upon the influence of the nitrogen of the atmosphere on vegetation, and arrives at these conclusions: First, that in the course of the slow combustion of organic matter, the nitrogen of the atmosphere enters into combination, probably to form nitric acid, which, in contact with an excess of carbonized matter, is reduced, and then gives up nitrogen to the organic matter; second, that every plant which throws off refuse matter upon the soil which sustains it furnishes the occasion of a greater or less fixation of nitrogen. This reaction, continued for many years, ultimately produces the accumulation, in soils left to themselves, of a quantity of nitrogen sufficient to maintain a large crop of cereals; third, it is not only by the slight percentage of nitrogen which it contains that dung exercises an action upon vegetation, but, in addition, by the carbon matter in decomposition, which constitutes its entire mass. Buried under the soil, and exposed by the process of cultivation to the influence of the air, this organic matter becomes burned, giving rise to notable quantities of carbonic acid, and its combustion determines the union of elements of the air, with the nitrogen of the dung, and with the nitrogen which, previously floating in the atmosphere, is henceforth drawn into the series of metamorphoses which lead from the soil to the plant and from the plant to the animal.—3 *B*, *December* 21, 1871, 644.

ACTION OF SOILS IN ABSORBING GASES.

Prof. Reichardt, of Jena, has instituted a series of experiments, with the aid of Herr Scheermesser, upon the capacity of the constituents of the earth to absorb gases, and has been led to the following conclusions: 1. The power of absorbing carbonic acid gas exhibited by clay purified with hydrochloric acid, as well as that dried at a temperature of 212° Fahrenheit, or even brought to a red heat, and also that of purified kaolin, is very slight, compared with that which contains hydrated oxide of iron. 2. Sand, purified with hydrochloric acid, and brought to a red heat, absorbs very slowly traces only of carbonic acid. 3. Mixtures of clay and sand, in a dry condition, absorb traces only of carbonic acid, but notably larger quantities in a moist condition. Exposed to the rays of the sun when moist, they lose the carbonic acid absorbed, but in the shade again take it up gradually. The absorption of carbonic acid by the pure mixture is, nevertheless, quite inconsiderable compared with that containing hydrated oxide of iron. 4. The percentage of carbonic acid in hydrated oxide of iron is constantly very considerable, even if variable; the difference depending upon the density of the deposit, the temperature at which this is dried, and upon its degree of moisture. 5. The amount of carbonic acid in the soils increases in proportion to their percentage of hydrated oxide of iron. 6. The action of the sun's heat upon dry mixtures of earth is to drive out a large part of all the carbonic acid absorbed. 7. Moist mixtures of earth lose all their carbonic acid under the action of the sun's rays much easier than dry. 8. The relation of oxygen to the nitrogen is altered by moisture in favor of the latter. 9. By heating to 212° Fahrenheit nearly all the carbonic acid is driven out from mixtures of earth. 10. According to all the experiments, mixtures of earth give off carbonic acid under the influence of an elevated diurnal temperature, but the supply is again renewed during the night; the percentage also is greater in the morning than toward evening. 11. Direct experiments upon the action of hydrated oxide of iron and water upon carbonate of lime prove in the most striking manner the solvent action under its influence in giving off carbonic acid.—19 *C, November* 25, 1871, 384.

ABSORBENT POWER OF SOILS.

We hear more or less nowadays of the "absorbing power of the soil;" this referring to that peculiarity by which the various soluble substances, particularly, however, inorganic, and among them a series of plant nutrients, are so deposited or held that their solution, filtered through the earth, emerges much poorer in these substances, in consequence of this filtration, than when entering. A proof of this property in the soil is shown by a simple experiment, which consists in filling a bottle (having a small hole at the bottom) with fine river sand, or dug and sifted garden earth. If, now, dung-water, quite offensive in smell, be poured into this gradually, until the whole mass is saturated with the liquid, this, on emerging from the lower opening, will appear colorless and odorless, the peculiarities of the water being entirely changed. It is certain that this property, possessed by soils, of attracting soluble substances from their solutions, has a very important influence upon the practice of agriculture, although much remains to be done in order to utilize it. This much is certain, that the finer constituents of the soil, especially the clay and humus, possess the property, partly by capillary attraction and partly by chemical transmission and exchange, of attracting definite quantities of soluble plant-nutrients, especially ammonia, potash, phosphoric acid, and sulphuric acid, and other salts, and from dilute watery solutions to make them so much less soluble that they can only be extracted again, very slowly, by the long-continued action of water. It is to this that we owe the fact that the substances most important for the nutrition of plants are not continually removed from the soil by the rain, and that putrescent or offensive liquids undergo a purification by striking through the earth; that, with insufficient manuring, clay soils lose their fertility more slowly than sandy soils, etc.

The absorbing power of the soil appears to be in direct proportion to its adhesiveness; and as sandy soils possess this peculiarity in a less degree, the manures applied to them pass off more readily, to the injury of vegetation. This fact has been acted upon for a long time, since it is the practice to apply a slight but oft-repeated manuring to sandy soils, while with the heavier soils the reverse may be the case.—*Mitth. Landwirth. Central-Verein, Kassel*, 1871, XII., 114.

PACKARD'S REPORT ON MASSACHUSETTS INSECTS FOR 1871.

Dr. Packard presents his annual report (for 1871) upon the beneficial and injurious insects of the state to the Massachusetts Board of Agriculture, under whose auspices he has been engaged, and remarks that the past year has been made noteworthy by the unusual abundance of two insects, comparatively strangers in the state, and which have made their appearance in sufficient numbers to produce very serious injury to crops. These are the onion thrips and the cabbage-web moth, which, with other species, are described at length in the pamphlet.

REPORT OF C. V. RILEY, STATE ENTOMOLOGIST OF MISSOURI, FOR 1871.

Mr. Charles V. Riley, State Entomologist of Missouri, vindicates his right to the office by the timely publication of an annual report for 1871 (the fourth of the series) upon the noxious, beneficial, and other insects of the State of Missouri. The report, which occupies 150 pages, is filled with valuable memoirs upon various species of insects, in which the peculiarities of the past season are indicated in the exceptional abundance or rarity of certain well-known forms, and in the appearance of species that had not been previously detected. An article on the grape-vine louse, which had already appeared in the *Rural New-Yorker*, is reproduced with additions, and constitutes a valuable contribution to the history of this destructive pest. His practical suggestions as to remedies will be well considered by horticulturists.

As might be expected, the Colorado potato beetle, which has already done so much mischief, receives prominent attention, and the new territory invaded by it during the year is recorded, and points are indicated as likely to fall within its march during the present season. A considerable portion of the report is occupied by a paper upon silk-worms, of which the different species are mentioned, and their special applicabilities under different circumstances.

HATCHING SILK-WORM EGGS AT WILL.

M. Duclaux has presented to the Academy of Sciences of Paris an article upon the method of producing at will the hatching of the eggs of the silk-worm, in which he remarks that shortly after their discharge, and as soon as a change of color takes place, the egg enters upon a kind of rest, or sleep, which usually lasts until winter, and from which it can only emerge under the action of cold, in consequence of which the evolution of the embryo—stationary until that time—has a beginning. The impulse once given, this evolution must go on, and sometimes is interfered with very materially by continued cold, so as to cause the death of the eggs, or else results in a feeble progeny, that becomes involved in disease. The duration of this second period in the history of the egg, occupying from 3 to 3½ months, can not be materially modified when once begun without danger, but the first, lasting 5 or 6 months, is more manageable, and the period can be reduced to 20 days or extended to 18 months at will. To prevent an egg from developing at the ordinary period, it is necessary to keep it, from the moment of laying, at a temperature between 59° and 68° Fahrenheit, and to expose it to cold during a period of 15 days, at least 3 months before the appointed time for hatching. On the other hand, to cause the egg to hatch before the ordinary time, it is necessary to expose it to cold 20 days after laying, and to leave it at that temperature for 2 months, and then to remove it. Six weeks after it will be found to be in the same condition as the normal eggs, and may be treated in the same manner. In this way it is possible to have the eggs ready to hatch out at any time of the year.—3 *B*, XXVI., *October* 26, 1871, 266.

DELPRINO'S MODE OF TREATING SILK-WORMS.

The attention of visitors to the Italian section of the French Exposition of 1867 was attracted to certain small wooden pigeon-holes, each of which contained a silk-worm, where it was occupied in constructing its cocoon without disturbance from its neighbors. This was an invention of Dr. Delprino, of Vesime, in Piedmont, and which, although very simple in itself, formed an important innovation in the art of raising silk-worms. Since that time this and other peculiar inventions of the same gentleman have been widely adopted, and have done much toward protecting the silk interest from the losses which the recent multiplication of diseases and other casualties have brought about.

The difficulty in the ordinary magnaneries, or worm-houses, is that the worms are mixed together, the strong oppressing the weak, and also heaped upon each other in a mass, as to produce greater or less injury. In Delprino's system a life in common is interdicted as much as possible, although during the feeding of the worms it is impossible to isolate them entirely. During that period they are kept together, but allowed ample room for moving about, being placed on small movable hurdles which can easily be changed. This produces constant ventilation, and prevents the danger of a great agglomeration, in consequence of which the transformations marking the different ages involve much less loss. When they have attained the proper period for transformation to chrysalids, the worms are placed in what Delprino calls the cocoonry, the pigeon-holes (large enough to receive them) being placed vertically on each side on tables, in which the worm is able to move about with sufficient freedom, and yet suitably protected from any injury. It is believed that a saving of silk is thus secured, as there is no attachment of the cocoon to a branch, as in the ordinary method, involving a loss, according to the inventor of this new method, of twenty per cent.

Another of Dr. Delprino's methods consists in securing a perfect union of the two sexes, and a more certain fertilization of the eggs. This is done by placing the fly in a cell covered with a board, and keeping it there in darkness and solitude for half an hour, at the expiration of which, to each male is given a female, and the board replaced until the nuptial operations have been accomplished. By another arrangement, every female lays her eggs separately, so that those of two individuals are not mixed, and so that the imperfectly-matured eggs (such as can easily be detected by examination) can be readily removed and destroyed, thereby improving the general quality of the grains. The general idea of Dr. Delprino's system consists in the isolation of the insects; and, although this may require a special arrangement, and be somewhat troublesome, yet it is maintained that the result sufficiently vindicates the propriety of the process, and that in the greater perfection of the eggs, and the improved health of the worms, and better quality and quantity of the silk, there is a decided superiority in the new system.—*Jour. Soc. Franç. Statist. Universelle*, 1871, 199.

ORIGIN OF BREEDS OF BRITISH CATTLE.

In a communication to the Literary and Philosophical Society of Manchester, by Mr. William Boyd Dawkins, on the "Origin of our Domestic Breeds of Cattle," he remarks that at the present time there are three well-marked forms inhabiting Great Britain. These consist of the hornless cattle, which have lost the horns which their ancestors possessed through the selection of the breeder. The polled Galloway cattle, for instance, are the result of the care taken by the grandfather of the present Earl of Selkirk, in only breeding from bulls with the shortest horns. The hornless is altogether an artificial form, and may be developed in any breed. Second, the *Bos longifrons*, or the small black or brown Welsh and Scotch cattle, which are remarkable for their short horns and the delicacy of their build. Third, the red and white variegated cattle descended from the *urus*, and which have, on the whole, far larger horns. The large domestic cattle of the *urus* type are represented in their ancient purity by the Chillingham wild oxen (as generally called), which were probably introduced by the English invaders of Roman Britain, being unknown to that country during the Roman occupation. The *Bos longifrons* (long-horns), on the other hand, were the sole oxen which were domesticated in Great Britain during the Roman occupation, and, in remote times, were kept in herds by the users of bronze, and before that by the users of polished stone. The present distribution of the two breeds agrees almost exactly with the areas occupied by the Celtic population and the German or Teutonic invaders. Both the *Bos longifrons* and the *urus* were probably derived from some country to the south and east of Europe, and were introduced by the herdsmen and farmers of the polished-stone period, at a very remote antiquity.—12 *A*, *Dec.* 21, 1871, 155.

REPORT OF THE UNITED STATES AGRICULTURAL DEPARTMENT ON CATTLE DISEASES.

A document which has been for some years in preparation, and toward which much expectation has been directed by agriculturists, has just appeared from the government press, namely, the Report of the Commissioner of Agriculture upon the Diseases of Cattle in the United States. About the middle of June, 1868, a disease broke out at Cairo, Illinois, among a number of Texas cattle, known as the *Spanish* fever, or the Texas cattle disease. In consequence of the rapid extension of this disease, very serious alarm was excited, and the services of Professor John Gamgee, a distinguished English veterinarian, then in the United States, were secured by General Capron, the Commissioner of Agriculture, for the purpose of instituting a careful inquiry as to its cause, course, and methods of treatment. The professor immediately visited the infected districts in Illinois, and in the spring of 1869 examined that part of Texas on or near the Gulf coast, where the transportation of the native cattle begins. In this last journey he was accompanied by Professor Ravenel, of South Carolina, a specialist among the fungi, and whose particular object was to determine what part such plants played in the infection.

Dr. J. S. Billings and Dr. Curtis, of the army, were also associated in the inquiry, having special reference to the microscopic investigations. A second investigation by Professor Gamgee, under the authority of the Commissioner of Agriculture, had reference to the subject of pleuro-pneumonia, in the course of which numerous microscopic observations were made by Dr. Woodward, of the Army Medical Museum. Full reports on these various subjects made by the different gentlemen are embodied in the volume referred to, which appears in quarto form, with numerous well-executed plates in chromo-lithography. It is also accompanied by a report by Mr. Dodge, the statistician of the Agricultural Department, upon the history of this Texas cattle disease, also known as splenic fever, in which the devastations of this peculiar native malady are traced back into the eighteenth century.

This report was considered by General Capron as simply preliminary, and further investigations are indicated as important. Among those especially mentioned are inquiries as to the best mode of arresting the contagion, and the proper way of transportation of the cattle northward. He thinks that a general law of the United States, in the interest of public health, of an enlightened humanity, and of the cattle trade, should regulate this traffic, not only throughout the Gulf States, but on the great routes throughout the country.

INOCULATION FOR RINDERPEST.

In an article upon inoculation for rinderpest, detailing the result of several experiments instituted in Russia on this subject, the following conclusions are arrived at: 1. Rinderpest must be considered as a typhus of a peculiar character, which, while having some resemblance to the epidemical typhus in man, differs from it in its permanent course, and the persistent occurrence of a cattarhal condition in general, and a mucous coating of the intestines in particular. 2. The rinderpest is disseminated principally from the steppes of Asia and other provinces of Russia. The region, however, where it first arose, and the causes of its origin, are unknown. 3. The contagion of rinderpest is transmitted, in part, by direct contact with diseased animals, and partly by the emanations from living and dead animals, affected, although not to any great distance at any one time. 4. In the south of Russia rinderpest is, comparatively, less contagious and dangerous than in other portions of the empire. 5. In summer and winter the rinderpest is generally less violent than in spring and autumn. Autumn is the most unfavorable time for inoculation of rinderpest, the most favorable time being that in which a moderate temperature predominates. 6. All races of cattle are not equally sensitive to contagion of rinderpest. Those less liable are the Kirgus and Kalmuck races, belonging to the steppes. 7. The alleged mitigation and weakening of the virus by repeated inoculation, and in the succeeding generations, does not prove to be substantially true, according to the experiments of Robichew, as even in the fifteenth generation it did not seem to have lost its activity. Professor Jessen considers, however, that the question of the weakening of the virus can not be regarded as closed until a special series of experiments has been instituted, in which the contagion has been inoculated from the first generation, on gradually, to complete inactivity. 8. It has not been determined, positively, by the experiments how long the pest contagion maintains its aggressive activity. In many cases the virus loses its infecting power after the course of a few days; in others it remains many months. It must, nevertheless, not be overlooked that the aggressive power of the contagion may be dependent upon its preservation or other influences. Single cases of inactivity of the virus may be explained under the supposition that this has lost its activity in consequence of the milder nature of the epizootic, or the animals inoculated with the virus did not become ill, or only in a slight degree, on account of their want of sensitiveness to the contagion, or because they had already experienced the natural disease. 9. In regard to the action of fresh and old virus, experiments have shown that the former generally produces more, and the latter less violent sickness, and, in many cases, the latter is even inactive. 10. Animals which become violently ill under inoculation, and show the characteristic indications of rinderpest, are not sensitive to further infection. Such animals, however, as are but slightly ill after infection are not always spared when exposed to a repeated attack. 11. It is impossible to say how many years such animals as have survived the inoculation of rinderpest remain protected against a new infection; possibly during their whole lives. An immunity has been shown for a period of at least six years, this being the extent to which the inquiries of the committee have carried them. 12. The question whether inoculation has any influence upon the course of the rinderpest when the natural disease has attacked the same herd can not now be definitely answered. 13. Dysentery is no protection against rinderpest, as animals attacked with this disease do not lose their susceptibility to the infection of rinderpest when exposed to its influence. 14. The discharges from the eyes and nose are the most efficient of all means of propagating the disease. The result of the inoculation was the same, whether applied on the neck, the ears, or the tail; whether it was communicated by drawing through a thread saturated with virus, or by inserting a strip of the skin cut from an animal which had died of the disease. The characteristic features of rinderpest present themselves generally between the fourth and eighth day after inoculation; and those animals in which the disease becomes fatal generally died on the sixth day after the outbreak.

Experiments with reference to the power of infection residing in the skin of diseased animals resulted as follows: *a.* Sound cattle can be affected by fresh or by imperfectly dried and cleaned skins of affected ones. *b.* The skins of diseased animals which have been simply cleaned by washing with lye and ashes or lime-water, or which have been dried at a considerable degree of heat, or thoroughly dried in the open air, do not communicate the infection. The drying of the skins, however, should be conducted, if in the air, at a distance from stables or meadows, and in winter artificial heat must be employed.

In conclusion, the committee make the following remarks: Although the result of the experiments prosecuted to the present time upon inoculation do not entitle the committee to present inoculation as a preservative against the propagation of the rinderpest, they believe that land proprietors should be authorized to establish inoculating institutions at their own expense, the application to be made with the consent of the neighboring owners of the cattle; and that these establishments should be widely removed from the roads upon which cattle are transported, and that they should be presided over by thoroughly educated veterinary surgeons.—22 *C*, *October*, 1871, 273.

MURRAIN IN CATTLE.

The subject of murrain in cattle has of late years received a good deal of attention, and, little by little, we are acquiring more definite ideas in regard to this disease, as well as to its influence upon the healthfulness of the milk and flesh of the animal. The experiments of Chauveau have shown that tuberculosis of cattle is transmissible; that is to say, by bringing sound cattle in communication with those that are diseased, similar tubercles become developed in the former, or, in other words, they become afflicted with murrain, which is only another name for tuberculosis.

The investigations of Professor Klebs, in Berne, have shown still further that the transmissibility of the disease is not limited to cattle, but may also extend to other animals; indeed, he has been convinced that the human tubercles are equally transmissible with those of cattle, and that murrain in cattle owes its origin to the same infectious material as the human tuberculosis. Thus, certain Guinea-pigs, having been fed with the murrainous matter, were infected with it, and others, treated with the tuberculous matter from man, exhibited the same result.

Again, murrain has been produced in cattle from feeding or inoculating with the human tuberculous matter, and hence it follows that the tuberculosis is transferable from cattle to man, and it appears highly important that murrainous animals should be carefully watched, and that inspection of their meat should be very strictly attended to.

Professor Gerlach, of Hanover, has lately prosecuted additional experiments upon murrain, and has established not only its transmissibility by inoculation, but also has shown, by numerous experiments, that tuberculosis can be transferred by feeding with the milk of murrainous cattle. As conclusions from the facts ascertained by him, Professor Gerlach remarks that, up to this time, murrain has been looked upon, in a sanitary aspect, as an innocent disease, but that it must hereafter be considered as quite the contrary. In former times, or toward the end of the last century, the murrain of cattle was considered as a kind of venereal disease, and, while this view lasted, great caution was observed in regard to the flesh and the milk. Since it has been ascertained, however, that this is not a syphilitic condition, the meat has been considered as wholesome. This is now known to be an entirely erroneous assumption, and the greatest possible care should be taken to avoid using the meat or the milk in any way.—9 *C, February*, 1872, 23.

PREVENTION AND CURE OF TYPHUS IN CATTLE.

Dr. Déclat has published a report of certain experiments instituted by him for the prevention and cure of typhus in horned cattle, taking the occasion of a severe outbreak of the disease in France in the early part of February, 1871. In the first stable he visited he found eight animals, of which number one was dying with the fever, a second was badly attacked, and a third had fallen and could not get up; all the others being more or less under the influence of the disease. They had all been officially condemned to destruction as incurable. He first proceeded to administer a draught, consisting of 80 grains of carbolic acid in 5 to 6 quarts of water, to which was added a hypodermic injection of 125 grains of carbolic acid, with the addition of a new substance, the precise nature of which he does not disclose at present. Two other animals were treated by a veterinary surgeon who was in attendance upon the herd. Out of these seven animals, three died and four were cured; while of another series similarly affected, six were cured out of ten; and, in the opinion of Dr. Déclat, none of them could have survived without this treatment.

A similar treatment of animals not actually under the influence of the disease was followed with the happiest results. Of twenty-five to which the above-mentioned application was made, not one contracted the disease; the doctor, therefore, thinks himself entitled to urge the prophylactic treatment as of the utmost importance in similar cases. As the result of his researches in this direction, he contends that, by means of his method, generally applied, typhus may always be prevented; can almost always be cured while in a state of incubation; is very often cured in its first period, and is sometimes cured at a more advanced stage.—4 *B*, 1871, 827.

CURE OF ENTERITIS IN HORSES.

Dr. Mooer, a veterinary surgeon in London, has, it is said, been very successful in curing enteritis in the horse by administering morphia in conjunction with chloroform. He first introduces a full dose of morphia subcutaneously, and if the severe and violent pain is not relieved in a few hours, he casts the horse and administers chloroform by inhalation. He has succeeded in producing profound, unbroken sleep in seven or eight hours by the use of one ounce of chloroform, the patient waking at the end of that time quite convalescent.—20 *A*, *March* 30, 1872, 383.

ENZOOTIC MISCARRIAGE IN CATTLE.

M. Bouley, well known for his researches into the subject of the diseases of cattle, such as carbuncle, etc., has lately made a communication to the Academy of Sciences of Paris, based upon some investigations of M. Zundel upon epidemic, or what he calls enzootic miscarriage in cattle. He states that it has long been known that when a cow undergoes a miscarriage in a stable occupied by other cows in a condition of gestation, this accident does not remain isolated, but, on the contrary, and in fact very commonly, the remaining animals miscarry successively, as though a contagious principle had been disengaged from the first case and communicated to all the others. It has already been shown by experiment that if the liquids discharged by a cow that has just miscarried be introduced into the vagina of another cow nearly at full term, the miscarriage will take place in the second case.

According to Franck, this is produced by the micrococci or bacterias, which exist in an extraordinary quantity upon the fœtal envelopes, and conduce to their decomposition. These, being introduced into the vagina, multiply with great rapidity, penetrate to the uterus, and there initiate that decomposition of which abortion is the consequence.

M. Roloff, on his part, has stated his belief that this enzootic miscarriage results from the introduction into the vagina of substances which have been tainted by the vaginal discharges of the cattle in which abortion has already taken place, and which are taken up in the liquids of the stable, and in the littering, these exhibiting their action upon the vaginal mucous membrane by a reddening and tumefaction which always precede the manifestation of the accident. If these views be in any way correct, it is probable that the remedy for the disease consists in purifying the stable and disinfecting the cattle, which may be done by vaginal injections of very dilute carbolic acid, or of permanganate of potash, so as to destroy any infection germs that may have penetrated therein.—3 *B*, XXVI., *October* 26, 1871, 257.

PREVENTING SOWS FROM DEVOURING THEIR YOUNG.

It is well known that sows not unfrequently attack and devour their own young; or, if prevented from this, will not let down their milk, so that the young pigs necessarily die for want of nourishment. When this state of things is not caused by a diseased condition of the uterus, it is said that the sow can be brought to terms by pouring a mixture of ten to twenty grains of spirits of camphor, with one to three of tincture of opium, into the ear. The sow will immediately lie down on the side of the ear to which the application was made, and remain quiet for several hours in this position without interfering with her pigs, and, on recovery from the stupor, will have lost her irritability in regard to them. The experiment has been tried in Germany hundreds of times, according to one of the agricultural journals, without any injurious effects. It is also said that the eating of pigs by the parent sow can be readily prevented by rubbing them all over with brandy, and making the same application about the nose of the sow herself.—10 *C*, *March*, 1872, 44.

THE NUMBER OF EGGS FROM A HEN.

A German naturalist answers the question how many eggs a hen can possibly lay as follows: The ovary of a hen contains about six hundred embryo eggs, of which, in the first year, not more than twenty are matured. The second year produces one hundred and twenty; the third, one hundred and thirty-five; the fourth, one hundred and fourteen; and in the following four years the number decreases by twenty yearly. In the ninth year only ten eggs can be expected, and thus it appears that after the first four years hens cease to be profitable as layers.—8 *C, April* 11, 1872, 119.

INTERNATIONAL COUNCIL ON THE CATTLE-PLAGUE.

Dr. Bouley, an eminent physiologist and veterinarian, who has given special attention to the cattle-plague, has lately made a very important report to the Academy of Sciences of Paris of the proceedings of the International Sanitary Convention, held March 16 of the present year at Vienna. This had for its special object the determination of the best methods of preventing the cattle-plague, and the taking into consideration the question of establishing proper sanitary regulations in regard to the cattle traffic between the countries represented in the convention. Delegates were present from eleven states at the convention, namely, Germany, Austro-Hungary, Belgium, France, Great Britain, Italy, the Roumanian Principalities, Russia, Servia, Switzerland, and Turkey.

The delegates included in their number some of the best veterinarians of their respective countries, as also various officers specially charged with the enforcement of sanitary regulations. The questions before the convention, which, by previous notification, they were expected to discuss, were sixty-five, to which a few were added after the sessions commenced. It is a remarkable circumstance, however, that the conclusions arrived at in regard to the regulation of the cattle disease met with almost unanimous approval. This accord was largely due to the fact that there is at present but little contrariety of opinion as to the exotic nature of the disease (at least in regard to Western and Central Europe) and as to its mode of propagation. It was well established in the convention that, outside of Russia, it never develops spontaneously upon any race of cattle, not even that of the steppes; and consequently that, whenever it shows itself outside of its native home, it may be considered as imported.

It is also well established that, even after it has continued for a longer or shorter time in any given country, it is only transmitted by contagion, and that it always becomes extinct when the conditions favorable to its propagation cease to exist. The idea, therefore, that the cattle-plague is an epidemic may as well be at once dismissed from every mind.

If, however, it is certain that this disease never develops itself spontaneously beyond the frontiers of Russia, the question still arises as to which of the provinces of that country it properly belongs. This question also occupied, to a great extent, the attention of the convention, as influencing very largely the rules that were to be adopted.

It is probably in the neighborhood of the Asiatic dependencies of Russia that the evil has its home; but as the precise district has not yet been satisfactorily ascertained, and as the movements of cattle from the Ural Mountains toward the western portion of the empire very frequently disseminated the contagion in the countries they traversed, it was considered expedient by the convention to leave Russia entirely out of the sanitary agreement, and not to permit the exportation of its cattle except upon certain well-established guarantees.

The subject of inoculation, as a preventive, in Russia, was carefully discussed by the convention; but finally it was concluded that the experiments hitherto made were scarcely sufficient to show a definite measure of beneficial results, and it was agreed that, whatever individual cattle-owners in Russia might prefer to do in the matter, it was not expedient to press upon the governments the enactment of laws on the subject. As to the application of the method to animals of Central and Western Europe, the convention repudiated the idea entirely. The numerous experiments showed that very little impression is made upon the mortality that would naturally have ensued from the disease without such treatment.

As to the general question of absolutely preventing the importation of cattle from Russia, it was found very easy so far as Germany was concerned, but very difficult for Austria and Hungary, owing to the great extent of the coterminous boundaries of the two countries, and the dependence of Austria upon Russia for this source of food. It was therefore recommended that a careful supervision should be exercised, and that cattle, after crossing the frontier, should be subjected to quarantine of ten days before resuming their journey.

The question being thus settled in regard to the importation of animals from Russia into Austria, the next point that came up for consideration was the nature of the conditions that the several governments should impose upon themselves toward doing their share to prevent the introduction or spread of the disease; and the measures concluded on as most essential were, first, the immediate slaughtering of all animals that had come in contact with the plague, as also of those which might be considered as under suspicion of having the disease, in consequence of the influences to which they had been exposed, this being accompanied by a proper compensation to the owners; secondly, the burial of the dead bodies of all animals affected with the plague, without attempting to utilize them in any way whatever; thirdly, the utilization of the flesh of sound animals killed under suspicion, but proved after death to have been healthy, this to be permitted only under special conditions rigorously determined; fourthly, the destruction of the germs of the contagion wherever they can be found, in the slaughter-houses, on harness, in pastures, in railway trains, etc., as also the disinfection of all objects with which they have been brought in contact; fifthly, isolation, as complete as possible, of the places where the plague has been found to exist, so that no animal believed to be capable of carrying the contagion or of receiving it shall be allowed to enter the infected districts, this isolation to be put in practice on farms and all other localities, and to be of greater or less extent, according to the extension of the disease; sixthly, the establishment around the places in which the isolation has been ordered, and which have been declared infected, of a zone where the movements of cattle are forbidden, as well as all commerce in any thing that may serve as a vehicle of the contagion, such as fodder, dung, and animal products and materials of every kind; seventhly, the suspension of fairs and movements of cattle in the infected locality and the suspected zone, so that the authorities may have a guarantee that animals have not been moved by clandestine traffic from the place which they originally occupied; eighthly, as soon as a case of plague has been officially established in any locality, an immediate declaration is to be made of every new case, as soon as known, by the keepers of animals; ninthly, after the disappearance of the disease from the localities, suitable precautions and methods of disinfection are to be prescribed preliminary to the restocking of the stables and pastures, and the re-establishment of the liberty of trade in cattle.

In all these various measures there is really nothing new.

They have heretofore commended themselves to the judgment of those who have had to deal with the subject. Another, however, of great importance in a commercial and sanitary point of view, was added, namely, the requirement that every state in which the cattle disease manifests itself shall make announcement of the fact immediately, by telegraph, first to the neighboring governments, and ultimately to those more distant. A careful inquiry is to be made as to the route of introduction and propagation of the disease, and the results are to be, with the least possible delay, brought to the knowledge of the authorities of all the countries menaced by the invasion of the plague. Wherever the disease has actually broken out in a country, it is to publish in an official journal a weekly bulletin showing the stage of the disease, the measures adopted for its prevention, the successive modifications of regulations which are to be introduced according to circumstances, and, finally, the day in which they cease to be in operation; this bulletin to be sent to the editors of official journals of other states when they desire it.

The convention found that, among the various countries that had had occasion to take measures for the proper disinfection of cattle-cars and other vehicles of transportation, Germany had the most satisfactory arrangements. Here, after a train has been emptied of its contents, the cars are immediately deluged with warm water of at least 160° Fahr. The shock and strength of the current, falling from a considerable elevation, detaches all organic material adhering to the wood-work, and, by the elevation of temperature, annihilates all virulent activity.

The principal point established by the convention, according to Bouley, was the necessity of an obligation to slaughter all animals as soon as the disease made itself manifest, or as soon as there seemed a probability that an animal would be attacked. In this way the plague will be arrested by sacrifice of the smallest number of animals.—6 *B, April* 29, 1872, 1154.

NEW INSECTICIDE.

A formula, recently introduced in Great Britain, for destroying caterpillars, consists of a mixture of coal dust, common salt, and flour of sulphur, to be scattered just before a rain over freshly-plowed land. To exterminate caterpillars on trees, they may be sprinkled with a solution of one part of sulphide of potassium in 500 parts of water. This, it is said, will kill the insects and do no harm to the trees.—2 *C*, *April*, 1872, 50.

REMEDIES AGAINST GRAPE-VINE INSECTS.

Among the various remedies which have been proposed in France for the protection of grape-vines from the ravages of the vine insect or *Phylloxera*, one of the latest consists in the application of soot. For this purpose the stump of the vine is first laid bare, and about a pound of soot placed around it, covered with a shovelful of earth, the object of the latter application being to keep the soot in its place. At the end of some days a penetrating empyreumatic odor becomes perceptible at a considerable distance, the result of an extensive impregnation of the soil. Should it rain, the water passing through the soot carries various soluble portions to the roots, where they exercise their peculiar effects. The application is very persistent, as after the lapse of a year the sooty smell will still be appreciable. This continuance of the action has an important bearing, since, if one stage of the insect escapes injury, its succeeding transformations will probably be made to suffer in a corresponding degree. Apart from its action upon the grape-vine insect, the soot itself exercises an excellent influence upon the vegetation of the vine, in stimulating its growth and imparting to it fresh vigor.—3 *B*, *May* 2, 1872, 17.

SULPHATE OF IRON AS A MANURE.

According to Gris, sulphate of iron is one of the most important mineral manures known to agriculturists, involving no danger in its intelligent use, and exhibiting its agency more particularly upon the coloring matter of the leaves. It is to be applied by dissolving it in water, in the proportion of one quarter of an ounce to the quart, and the plant is to be sprinkled with a dilution of this solution to suit the occasion. This application, it is maintained by Gris, will not only restore a drooping plant, but will impart to it a high degree of vigor and brilliant greenness of leaf, and at the same time will destroy the aphides and other insect enemies by which it may have been attacked.—4 *B*, *August*, 1872, 704.

ALBUMINOUS FOOD FOR RUMINANTS.

Professor F. Stohmann fed three goats alternately, first with hay alone, and then with hay combined with gluten from wheat. The latter substance was in thin, brittle cakes of a yellowish color, and contained 80.6 per cent. of albuminous matter. The amount of milk produced was always greatly increased by the use of the albuminous food, and decreased by its omission; the exact amount of the increase, however, was not ascertained, an increased secretion not being appreciable for about a week. It was observed that the effect of the gluten was not immediately shown.—28 *C*, v., *May*, 1872, 289.

CHINESE WHITE CABBAGE.

According to the *Food Journal*, the great national vegetable of the Chinese is the white cabbage of Shatung, which is grown all over the northern part of the empire, and which is eaten raw as a salad, said to be equal to the best lettuce, or boiled, in which condition the flavor reminds one of the finest asparagus. It is both hardy and prolific, surviving the severe winters of the North. Specimens are occasionally met with weighing as much as twenty pounds.—22 *A*, *May* 4, 1872, 430.

APPARATUS TO PREVENT MILDEW IN GRAIN.

The *Scientific Review* contains a description with figures of an apparatus invented by Mr. Joannides, for the preservation of corn, grain, and seed from mildew, heating, etc. This consists of a perpendicular cylinder of metal, wood, or other suitable material, with about eight horizontal cylinders or pipes, connected with and branching from it, the entire apparatus being perforated with small holes for the circulation of the air, but not large enough to allow the grain to pass through. A series of small tubes is placed inside the larger one for the return of the confined air, and for keeping up a circulation. The apparatus thus formed is placed in a ship, granary, etc.; the perpendicular cylinder projecting above into the open air having attached to it a funnel-mouthed ventilator, which can be so arranged as to turn toward the current of the air or from it. When arranged like the ventilating hood of a chimney, the current of air will be upward and outward;

while, if facing the direction of the wind, the air will be blown through the tube into the grain. In this way the air, instead of remaining in the interstices of the grain and becoming saturated with moisture, causing a tendency to mildew or mustiness, will be continually changed. It is asserted that the trial of the apparatus has proved very satisfactory in its results.—8 *A*, *May* 1, 1872, 72.

COMPARATIVE VALUE OF DIFFERENT GUANOS.

As the deposit of guano upon the Chincha Islands is nearly exhausted, the importance of other nitrogenous fertilizers now in the market has greatly increased. A number of prominent German chemists have analyzed several of these, and we give in the following summary some of the results obtained by them. *Guanape guano* is found in the rainless region of Western South America, along the coast of Peru. Its composition is very variable, but it is recommended as a fit material for the manufacture of superphosphates to secure a more uniform action. *Saldanha Bay guano*, from the Western coast of Africa, contains more than 27 per cent. of insoluble mineral ingredients. *Whale guano*, from Norway, contains 3.6 per cent. of nitrogen and 17.6 of phosphoric acid, and is a very rapid fertilizer. The gelatinous matter, containing over 8 per cent. of nitrogen and 3 per cent. of phosphoric acid, is also sold for the same purpose. The production of the *Norwegian fish guano*, mainly from the offal of codfish at the Loffoden Island, is constantly increasing. *Malden and Starbuck guano*, both from the group of Phœnix Islands, in the Pacific, and the *Mejillones guano*, from Mejillones Bay, on the boundary of Bolivia and Chile, as also the *Baker guano*, and perhaps the *Sombrero* and other West Indian guano, are varieties which have lost nearly all their nitrogen by the influence of rain, but are extremely rich in phosphoric acid, and thus especially adapted for the manufacture of highly-concentrated superphosphates. In one sample of Mejillones guano there were found 1 per cent. of nitrogen and 75 per cent. of phosphoric acid. *Malden guano* contains a considerable quantity of alkaline carbonates. The *La Plata*, or *Carno guano*, is made from the residuum left in the preparation of the South American meat extract.

In Austria a fertilizer has lately been introduced by the name of *Artificial Guano of Stummer*, which has found much favor with the agriculturists. It is manufactured from human excrements, in four modifications, so as to best supply the different wants of different crops—as grass, grain, potatoes, etc. In Italy the dung of fowls is highly valued, and an article of commerce. Dealers mix it with feathers, by which the amount of nitrogen is greatly increased. In most countries it is not to be had in sufficient quantities for the trade, but it is well worth collecting when there is an opportunity. The escape of ammonia can be prevented by the application of an occasional sprinkling of sulphate of iron.—28 *A*, *March*, 1872.

J. PISCICULTURE AND THE FISHERIES.

R. D. CUTTS ON SEA FISHERIES.

A valuable report, prepared by Mr. R. D. Cutts, of the United States Coast Survey, upon commerce in the products of the sea, has just been published by the Senate, and is considered a valuable contribution to the statistics of the fisheries of our own country and of the rest of the world. In this the different marketable products are described in detail, and the relative rank which they occupy in commerce indicated. In addition to this, there is given the area, population, most important ports, and commercial tonnage of the principal nations of the world; the imports and exports of the products of the sea; showing the capacity of the markets and the countries supplied; and also the catch, consumption, and balance of trade, from official statistics.

This report was prepared in 1869 by request of the Secretary of State, and transmitted in February of that year, but the order to print was not made until a few weeks ago.

FRENCH FISHERIES FOR 1870.

It is well known that the statistics published by the French government in regard to the fisheries of the country are very detailed and extremely accurate, in this respect far exceeding those of any other nation. Both the English and Americans are very much behind them in this matter, rendering it extremely difficult to obtain the necessary data for judging of the actual importance and absolute value of the trade carried on in this connection. From a recent number of the *Revue Maritime et Coloniale* we find a report of the maritime fisheries of the French for 1870, from which we learn that about 12,000 men were engaged in the cod-fisheries during the year, of whom 7000 were in Newfoundland and 5000 in Iceland. The shore fisheries employed over 57,000 men and 31,000 women and children, making the total number of persons occupied 101,594. During the same period 188 vessels were employed in the Newfoundland fisheries, and 299 in those of Iceland, while the shore fisheries required 17,110, or a total of 17,597. The tonnage of the vessels engaged in the cod-fisheries amounted to about 56,000 tons, and that of all of them together to 150,127 tons. These figures exhibit a slight reduction from those of 1869, due, of course, to the disturbance of popular industries caused by the Franco-German War. The total value of the products of the sea for 1870 was estimated at about $12,000,000.—*Revue Maritime et Coloniale*, 1871, 1052.

COMPARISON OF AMERICAN AND FRENCH FISHERIES.

In an article upon the fisheries of Iceland and Newfoundland, by Mr. William Stowe, of Boston, a reference is made to the productiveness of this business in Massachusetts as compared with France; and a table is quoted on the subject, giving the number of vessels employed and the value of the catch of the French fisheries of Iceland and Newfoundland in 1870. He finds that the average yield to each person employed in the French fisheries is $120, and states that the value of the products obtained by the inhabitants of Cape Ann from the sea, in 1871, amounted to $3,000,000, thus requiring the industry of about 8000 men, including crews, merchants, and assistants, coopers, teamsters, etc.; making an average, therefore, of about $375 to each hand, as compared with $120, as above stated.

GERMAN FISHERY ASSOCIATION.

Among the various organizations established for the promotion of national industry and welfare, one of the most important is the German Fishery Association, recently organized, with its head-quarters at Berlin. This is directed by some of the most eminent naturalists in the country, assisted by men of practical experience in fish-culture and other allied pursuits; and it has already done a great deal toward accomplishing the mission for which it was established. Many inquiries have been initiated in reference to the proper mode of the culture of oysters, mussels, crabs, and other marine invertebrates, as also in regard to the hatching and rearing of edible fish, both fresh-water and marine. Their transactions embrace original memoirs, and translations from Scandinavian authorities whose experience is considered of value to other parts of Europe.

We have no association precisely similar to this in the United States, although the harmonious co-operation of the Fishery Commissioners of the several states of the Union, which has been so frequently exhibited, perhaps answers the purpose to a certain degree. We have, however, nothing in the way of official reports in America that at all correspond in thoroughness and extent to those of the German association—documents emanating from the Department of Fisheries in Canada coming nearest to them. In view of the fact that the United States has so vast interests in this direction, covering such an extended field of operations, with so great a variety of resources, we trust that some similar effort may be made to give completeness and thoroughness to the inquiries connected with this subject.—*Circular.*

FISHERIES OF THE GULF OF NAPLES.

An important addition has been made to the list of works devoted to inquiries and instructions in regard to the great fisheries, in the form of a paper by Mr. Achille Costa upon the fisheries of the Gulf of Naples, published by the Royal Institute for the Encouragement of Natural Science, etc., of Naples. The subject is treated under four heads: first, a description of the various modes by which fishing is prosecuted in the Gulf of Naples, whether commendable or otherwise, with engravings of the nets and other apparatus used; second, the consideration of the various modes of fishing, and their relationship to the present and prospective supply; third, memoranda in regard to the localities in which the different kinds of fish and other marine animals are to be found, and the favorite places for depositing their spawn; and, fourth, a systematic catalogue of the different species of marine animals found in the Gulf of Naples, and gathered for the purpose of serving as food.—*Atti R. I. d'incorragiamento Scienze Naturali, etc.; Napoli. 2d Series,* VII., 1870.

FRENCH FISH-BREEDING ESTABLISHMENT.

It is well known to many of our readers that the French government erected a very extensive establishment at Hüningen, on the Rhine, for the purpose of collecting and hatching eggs of various choice varieties of fish, to be used in stocking the rivers and lakes of the country. This has passed, by the acquisition of Alsace, into the hands of the Germans, and a project is now on foot, on the part of the French government, to make the necessary arrangements for a similar breeding-house at Montbéliard. There already exist several establishments of the kind in France—one at La Buisse, and another at Clermont-Ferrand, the latter furnishing 30,000 ova of trout annually for replenishing the various streams in the department.—12 *A*, *May* 2, 1872, 13.

FISHERY EXPOSITION AT GOTHENBURG.

A Swedish and Norwegian fishery exhibition was held during the past summer at Gothenburg, the articles offered for competition filling a building one hundred and thirty feet long and fifty-three feet wide. There were two classes of these articles—the products of the fisheries, and the apparatus used for prosecuting them. Among the articles presented were various forms of fish manures, prepared mainly from the refuse of the cod-fishery, as gathered and treated on the Loffoden Islands. There was also a great variety of fish prepared in different ways, not only by drying, salting, pickling, etc., but put up in more pretentious forms, like anchovies, sardines, and the like. Among these was a preparation of fresh herring, which was considered extremely delicious, the recipe for which may be of interest to our readers.

The freshly-caught herrings are laid immediately in vinegar diluted with about one fourth water, and with the addition of a little salt. They are left in this solution twenty-four hours, after which they are taken out and the liquid allowed to drain off. They are then to be placed in kegs or jars, and a mixture of the following ingredients sprinkled in among them. For each lot of eighty fish, one pound of dry, fine, soluble salt, one pound of common sugar, half an ounce of coarse pepper, half an ounce of bay leaves, half an ounce of saltpetre, one fourth of an ounce of red sanders (to impart a handsome red color), one eighth of an ounce of ginger, and one eighth of an ounce of cloves.—8 *C*, *February* 1, 1872, 35.

FISH-CULTURISTS' ASSOCIATION AT ALBANY.

The second annual meeting of the American Fish-culturists' Association was held at Albany on the 7th of February last, and was attended by a large number of gentlemen interested in the subject of breeding and rearing fish. The opportunity afforded of a mutual exchange of experiences among the leading professional fish-breeders of the country will doubtless be productive of very useful results, as enabling each to become familiar with the details of practice introduced by his colleagues, thus preparing all to start under better auspices for the future campaign.

Papers were read on spawning races and the impregnation of eggs, in which what is called the dry process of impregnation was illustrated.

Mr. Clift read a paper on the culture of shad, and Dr. Edmunds, of Vermont, one on the introduction of salmon into American rivers, these appearing to be the principal communications of the session. Measures were taken to impress Congress with the importance of extending national aid to the fish-breeding interest by making an appropriation to start one or more establishments where salmon, trout, whitefish, and shad, more especially, could be raised and used in stocking waters not at present supplied with them. In support of this proposition, it was argued that most of the great waters, whether of lake or river, are connected with several states, and that, if the matter be left to the states themselves, improper legislation by one, or failure to legislate by another, might produce such contradictory results as to render almost nugatory any efforts in the direction indicated; whereas, if left to the government, the action would be homogeneous and uniform, being based upon the best-known methods.

The officers of the association for the ensuing year are Rev. W. Clift, president; B. F. Bowles, treasurer; and Livingston Stone, secretary; and the counting-house of Mr. George Sheppard Page, No. 10 Warren Street, New York, was fixed upon as head-quarters of the association in that city.

U. S. APPROPRIATION FOR THE PROPAGATION OF FISH.

At the last session of Congress, just closed, an appropriation of $15,000 was made for the introduction of salmon, shad, and other useful food fishes into such suitable rivers of the United States as are at present without them; and the work was placed under the direction of the United States Commissioner of Fish and Fisheries, Professor Spencer F. Baird, of the Smithsonian Institution. As the first suggestion of this matter was made to Congress by the American Fish-culturists' Association, a meeting of that body was held, at the request of Professor Baird, for the purpose of considering the best method of carrying out the intention of Congress. This took place in Boston on the 13th of June, and was attended by the following State Commissioners: Dr. Fletcher, of New Hampshire; Messrs. Reed and Dexter, of Rhode Island; and Mr. Brackett, of Massachusetts; and by Dr. Slack, of New Jersey; Mr. Bowles, of Massachusetts; Mr. George Sheppard Page, of New York; and Mr. Livingston Stone, of New Hampshire—members of the Fish-culturists' Association.

Reference was made during the meeting to the enterprise of Mr. Charles G. Atkins, of Maine, who is at present engaged in obtaining living salmon on the Penobscot River, and placing them in a large pond of one hundred and fifty acres, under his control, near Bucksport. Here they will be penned up until the end of October or the beginning of November, when their spawn will be ripe, and when the eggs will be collected and impregnated by what is called the dry process. After this the adults will be let loose to find their way to the sea, and probably back again next year. The United States Commissioner was advised to furnish means to Mr. Atkins to enable him to extend his operations on the largest possible scale, so as to make sure of obtaining all the eggs that can be procured at short notice on the Eastern coast.

It was also thought expedient that some one should go to the Western coast, there to make arrangements for establishing a hatching-house on a large scale, so as to procure eggs of the Western varieties.

In regard to shad, it was considered too late to do much in the southern waters of the Mississippi Valley, but that there was still time to commence the experiment in the northern tributaries of the Mississippi River, as the eggs of the shad in the Hudson and Connecticut were then about ripening, and could be obtained in great quantity. It was proposed, therefore, to place many millions of these in a large number of the streams in question, and also to try the experiment of their introduction into the waters of the great lakes. It is, of course, not certain that the shad will be able to live in fresh water the whole year round, but it is thought not improbable that they may find sustenance and protection in the deeper waters of the lakes during the winter, and may run up the rivers in the spring, as if from the ocean.

REPORT OF MAINE FISH COMMISSIONERS FOR 1871.

The fifth report of Mr. Charles G. Atkins, Commissioner of Fisheries for the State of Maine, has just made its appearance, and, like its predecessors, embraces matter of much importance in the interest of pisciculture. For various reasons, the labors of the commissioner during the past year were directed mainly to the question of salmon breeding, less attention having been paid to the construction of fish-ways than in former years, and nothing at all done in regard to the cultivation of species other than the salmon.

For some time past the commissioners and the fish-culturists of the New England States and of New York have been dependent for a supply of salmon eggs upon the establishment of Mr. Wilmot, of Newcastle, Ontario, now under the official direction of the Fishery Department of Canada; but the prices charged are so enormous—namely, $40 in gold per one thousand—that it was considered best to attempt to secure them from other sources, especially in view of the suggestion that the Lake Ontario salmon are not true sea salmon, but pass all their life in the fresh waters of that lake. For this purpose the Penobscot River was selected, and, the States of Massachusetts and Connecticut having expressed a readiness to co-operate, the operations were commenced on the 7th day of June, 1871. The fish were taken in the weirs in the vicinity of Bucksport, and transported to Craig's Pond Brook, in Orland, which was supposed to be peculiarly fitted for the purposes of breeding the fish.

After various experiences, for which we must refer to the report of the commissioner, about 72,000 eggs were obtained and divided among the states mentioned, at an actual cost of about $18 per thousand. It is thought by Mr. Atkins that another season, with the experience of the past, they can be obtained in any desirable quantity at $8 a thousand.

Among the more important results of this experiment may be stated that salmon can be kept in confinement in a small inclosure from June to November, and that they will develop their spawn and milt to perfect maturity. It was found that they can live in any pond, river, or brook water, provided there be a sufficient change to prevent stagnation, with the depth not less than four feet, that they be not too much crowded, that the bottom be not newly submerged, that the water be not too transparent, and, in the case of a brook, that there be not a large percentage of water from springs in the immediate vicinity.

A most important fact ascertained was the possibility of what is known as the dry process of fertilizing the eggs. The usual practice has been to squeeze out the eggs and milt into a dish of water, and to secure contact by stirring the water; but it has been ascertained that the less water there is with the eggs, the more effectual is the application of the milt, and the nearest approach to perfect success is in the entire absence of water.

In these experiments the eggs were squeezed from the belly of the living female into a dry tin pan, and, when all had been obtained, a living male was taken, and, being held over the pan, his milt was forced into it. Being of the consistency of cream, this milt does not immediately spread over all the eggs, and it is necessary to give this a motion over the bottom of the pan until contact has been effected. After this, and not sooner, water is to be added. The theory of this process lies in the alleged fact that the milt loses all its potency within two minutes, at the longest, after it is put into the water; so that, unless discharged in a perfectly fresh condition, so that it will be carried immediately in contact with the eggs, the latter will fail of fecundation. When not mingled with water, the milt, it is said, can be kept in a bottle for days and still retain its power of fertilization—a fact of which important application will doubtless be made hereafter in fish-breeding.

This process of dry fecundation, as it is called, is the discovery of a Russian gentleman, Mr. Vrasski, and was, we understand, first introduced to the notice of American fish-culturists by Mr. G. Sheppard Page; and it is said that while by the old method only 65 per cent. of eggs are fecundated, by the new one the average is 96 per cent. These facts were prominently brought before the convention of fish-culturists held at Albany in February last, and will doubtless be taken into proper account in all future experiments.

FISH CULTURE IN NEW HAMPSHIRE.

The Report of the Commissioners of Fisheries of New Hampshire, as presented to the Legislature in June of the present year, has just been published, and contains an account of the movements of Messrs. Hatch & Fletcher in reference to stocking the waters of the state with food fishes. Their efforts were principally directed to the introduction of black bass into the ponds and lakes of the state, this being the application of the means placed at their disposal which they considered most likely to be productive of important results. Nothing had been done, at the date of the report, in regard to shad, although it was intended to place a number of fry in Lake Winnipesaukee. Some 5000 young salmon, bred by the Massachusetts Commissioners of Fisheries, and placed in the hands of Dr. Fletcher and his associate for that purpose, were transferred to the head waters of the Merrimac, and it is hoped that the fish-way at Lawrence will be completed before these fish will have occasion to come up the river for the purpose of spawning.

The most interesting labor of the commissioners has been in reference to the smelt, of which 2000 adults were placed in Massabesic Lake, 1000 in Sunapee, and 2000 in Newfound Lake, the object being to furnish food to the trout and pickerel, thereby, in a measure, preventing the young trout from being devoured by their associates. It is also thought that they will furnish excellent food for the black bass.

Eggs of the smelt were placed two years ago in Massabesic Lake, and it is said that full-grown smelt have made their appearance in one of the brooks for the purpose of spawning. If this is the case, it would appear that the smelt mature in two years. It was found by actual experiment that the eggs hatched in from ten to fourteen days after impregnation, the time varying with the temperature of the water.

The commissioners have evidently hit upon an important feature in connection with breeding fish for the carnivorous food fishes, as, unless some provision of this kind be made, it will be impossible to breed more than a limited number in a given body of water. The smelt and the alewife furnish admirable material for supplying food to the fishes referred to, as they require no care beyond placing the mature fish in the water, and their fecundity is so great that the supply of food furnished by them can be rendered almost unlimited. The New England States especially abound in ponds admirably suited for hatching and sustaining these fishes, which, indeed, are themselves quite valuable articles of food.

That the smelt will live and thrive in fresh water throughout the year has been repeatedly shown both in the United States and Europe; but whether the alewife will do this or not, the young can be penned up, for the greater part of the year at least, in fresh waters; and even if they will not survive to attain maturity, the expense of introducing a fresh supply of spawning fish every spring would be but trifling. In this way ponds far removed from the sea, or into which there is no practicable passage by water from the ocean, may be stocked for the purpose in question.—*Report.*

PRIZES OF THE MASSACHUSETTS AGRICULTURAL SOCIETY FOR FISH CULTURE.

The Massachusetts Society for Promoting Agriculture will award on the 1st of March next two prizes of $300 and $200 respectively to the two best establishments in the state for the culture of fishes for food, all competitors for which must send in their names and addresses to the secretary of the society, Edward N. Perkins, 42 Court Street, Boston. The committee of award will consider the number of species of fishes cultivated; the number of individuals, and their size and condition; the number of eggs hatched in the establishment, and of young reared from them; the neatness and economy of the establishment, and the excellence of the fixtures.—*Springfield Republican, November* 24, 1871.

ALABAMA FISH COMMISSIONERS.

The interest in the subject of pisciculture continues to grow in the United States, and we take great pleasure in chronicling the appointment by the Governor of Alabama of three commissioners, whose duty it is to report to the Legislature upon the best methods of increasing the fish supply. In the preliminary report before us reference is made to the efforts of Colonel William Penn Yonge in the raising of fish since 1854, his pond at the present time being stocked with the finest varieties, including "trout, suckers, and perch," some of the first named weighing as much as ten pounds. Under the name of "trout" we presume reference is made to the black bass, which, we believe, in most of the Southern States bears that appellation. A brook trout of ten pounds' weight in Alabama would be a greater curiosity even than one reaching that size in the head waters of the Androscoggin, in the region controlled by the Oquassa Fishing Association.—*Letter of William Penn Yonge.*

FISH CULTURE IN CALIFORNIA.

The Biennial Report of the Commissioners of Fisheries of the State of California, for the years 1870 and 1871, is a document of unusual interest, as showing the appreciation by that state of the importance of taking early and timely precautions in regard to its food fishes. Accustomed as we have been to hear of the abundance of salmon, trout, and other valuable fishes on the California coast, we are hardly prepared to learn, as we do from this document, that many of the more important interior fisheries of the state have been almost entirely destroyed by reckless methods of capture and other causes.

As far as salmon are concerned, the commissioners are in doubt whether the number is decreasing or not, although they are in sufficient abundance to render it comparatively easy to keep up the supply. The principal difficulty anticipated in this connection is in consequence of the mining operations, which load the streams with mud, that is deposited, particularly on the eggs, in quantity sufficient to prevent their hatching. The remedy for this will, of course, be to collect the eggs, by the method of Mr. Atkins or otherwise, and, after hatching them in a state hatching-house, turn them loose when properly matured.

It is well known that salmon will make their way through muddy waters to reach their spawning beds, and that the young fish are not very sensitive to this evil, provided the temperature of the water be suitable; but if the gravel beds used as spawning places by the fish be covered with soft mud, even with the water clear above, the difficulty of reproduction is almost equally great.

According to the California report, salmon are caught in the small tributaries of the Sacramento on the sides of Mount

Shasta, at an elevation of over 4000 feet above the sea, to reach which they must have passed through nearly fifty miles of almost continuous rapids; while the same fish, in order to reach the Snake River, make a journey of over 1000 miles.

We regret that there is no satisfactory information as to the precise intervals between the time when the salmon reach the rivers of California and the period of spawning and hatching respectively, as this would be of much practical importance in reference to the question of the best method of obtaining the ova for stocking the Eastern waters.

The commissioners point with commendable pride to the success of the enterprise of transporting young shad from the Hudson, and placing them in the Sacramento, during the past year, the operation having been successfully performed by Mr. Seth Green. There is every reason to hope that at a proper period—say at the expiration of about three years from the date of the experiment—shad will be found making their appearance in the lower Sacramento, and moving upward to their spawning ground. They propose to continue the experiment during the present season, but we have not learned whether this has been actually accomplished. Embraced in their plans for the future is the introduction of whitefish into lake Tahoe, and black bass, eels, and lobsters into suitable localities.—*Biennial Report of California Commissioners*, 1870–71.

REPORT OF CALIFORNIA FISH COMMISSIONERS.

An abstract of the Report of the State Commissioners of Fisheries of California has just appeared in the San Francisco papers, and exhibits a commendable degree of zeal and enterprise on the part of these gentlemen. We have been so much impressed with the extraordinary abundance of the salmon, trout, and other fish in the waters of the Pacific slope and Pacific Ocean, that it is hard to realize that any scarcity is possible; but we learn that the trout and salmon especially have suffered very materially, and that the most stringent measures are necessary to prevent their comparative extermination, at least in California.

The efforts of the commissioners appear to be directed not merely to renewing the stock of native fish, but also toward securing new varieties from the Eastern waters. Among these shad are very prominent; and the experiment of Mr. Seth Green, instituted under their direction, of stocking the Sacramento, has been quite successful so far as the initial steps are concerned. It is proposed during the present year to intróduce the whitefish of the great lakes, black bass, and eels for the Sacramento, and lobsters for the Bay.

The decrease of the salmon in the Sacramento and San Joaquin is quite marked, although less so than in the Truckee, in which the fish are taken while on their way to the spawning beds in such numbers as to have almost become exterminated. Pyramid Lake was also found to require attention, and the importance of keeping a passage open, so that fish can enter it from the sea, was strongly urged. The total expense of securing Mr. Seth Green's services in planting a stock of young shad in the Sacramento amounted to less than \$600; and if the anticipations of this veteran pisciculturist are realized, will bear a small proportion to the value of the whole in a very few years.—*San Francisco Bulletin.*

STOCKING CALIFORNIA WATERS WITH TROUT.

A bill has been introduced in the Legislature of California appropriating \$2000 for the purpose of stocking the waters of Clear Lake, in Yolo County, with mountain trout, to be obtained from the waters of Lake Bigler, or some other stream in the Sierra Nevada Mountains having a corresponding altitude.—*San Francisco Bulletin.*

TRANSPORTING BLACK BASS TO CALIFORNIA.

Mr. Seth Green has lately transmitted a number of living black bass to Mr. Newell, president of the Society for the Acclimation of Fish in California. They were placed in tin cans, the water of which was changed every six hours by the agents of the express company to whom they were committed, and more than half survived, reaching their destination in good condition, where they will probably be the progenitors of an extensive population.—*Letter.*

REPORT OF CONNECTICUT FISH COMMISSIONERS FOR 1871.

The report of the Fish Commissioners of Connecticut for the year 1871 has been presented to the May session of the

Legislature, and contains an account of the proceedings during the year on the part of the commissioners, Messrs. William M. Hudson, Robert G. Pike, and James A. Bill. The report contains valuable information in regard to the breeding of shad in the Connecticut River; and the opinion is expressed that the extraordinary yield in 1871 was the legitimate result of the immense numbers bred in the upper waters of the river since 1867.

The most important portion of their work during the year was that in reference to stocking the rivers with salmon. For this purpose the commissioners joined the authorities of Massachusetts and Maine in prosecuting experiments, under the direction of Mr. Atkins, Fish Commissioner of Maine, for the purpose of obtaining salmon spawn in the Penobscot River. The result was quite successful. The eggs being divided among the three states mentioned, nearly 22,000 of them came to the share of Connecticut. These were placed in hatching-boxes in the Poquonnock, and have been hatched out with the loss of only about twenty per cent. The commissioners soon expect to have about 24,000 salmon fry in good health, to be distributed in Farm River, Little River, and the Saugatuck.—*Report.*

PLANTING OF SHAD IN THE VALLEY OF THE MISSISSIPPI AND THE LAKES.

During the closing hours of the last Congress an appropriation of $15,000 was made for the purpose of introducing salmon, shad, and other valuable food fishes into the rivers and lakes of the United States, and its expenditure was placed in the hands of Professor Baird, the United States Commissioner of Fish and Fisheries. The late period at which this appropriation was made rendered it difficult to accomplish much in reference to shad, as the season for their hatching was very nearly over; but, notwithstanding this, we are gratified at being able to record a very satisfactory beginning to the enterprise, the aid of Seth Green, of Rochester, and Rev. William Clift, of Mystic Bridge, Connecticut, having been secured by the commissioner.

Mr. Green, as is well known, has been engaged for several years in behalf of the Fish Commissioners of the State of New York in hatching shad in the Hudson, and during the present season has turned out no less than 7,500,000 fry. Of these he placed 200,000 above the Troy dam in the Hudson, 50,000 in Oneida Lake, 70,000 in Lake Champlain, 50,000 in the Genesee River, and the remainder in the Hudson, at Castleton, the scene of his operations. Fifty thousand young fish were also obtained from him by Dr. Edmunds, the Fish Commissioner of Vermont, and placed in Lake Champlain, at Burlington.

The work done by Mr. Green for the United States consisted in introducing 30,000 young fish into the Alleghany River at Salamanca, and 25,000 into the Mississippi River a few miles above St. Paul. Last year Mr. Green placed 15,000 young shad in the Genesee River, and it is said that at the present time young shad over seven inches in length can be caught at the mouth of that river in Lake Ontario, thus rendering it quite probable that they will not attempt to return to the sea, but will spend the period of immaturity in the lake, and will return to the river at the proper season for spawning.

A larger number of shad would have been planted by Mr. Green on account of the United States but for the fact that the heat of the water of the river, shortly after the commission was intrusted to him, reached 83° (on the 2d of July), thus stopping all further operations.

The later period at which the shad are hatched in the Connecticut River enabled Mr. Clift to carry on the work on a considerably larger scale, and to better advantage. The Commissioners of Fisheries of Connecticut, represented by Dr. Hudson as chairman, kindly permitted Mr. Clift to use their establishment at Hadley Falls for obtaining and hatching the necessary number of eggs; and Mr. Clift and his assistants started with a large supply of young on the 2d of July. The fry filled nine eight-gallon tin cans, and an extra can of ice was taken along to keep the water of proper temperature. Young shad are much more delicate than salmon, and the limits of temperature between which they can be safely exposed during transportation are much closer: these, according to Mr. Clift, ranging from 80° as a maximum to 60° as a minimum.

At Salamanca 400,000 young fish in good condition were placed in the Alleghany, which, in addition to the 30,000 introduced there by Mr. Green, will furnish a very satisfactory basis for the experiment in the Ohio. Proceeding on his journey, Mr. Clift placed 400,000 fish in White River at Indianapolis on the 4th of July, leaving, from the mortality consequent upon the excessive heat, but a single can. He now determined to try the experiment as to the possibility of carrying the fish a considerable distance, and proceeded directly to Denver, in Colorado, where he arrived on the 7th of July, five days and five hours from Hadley Falls. Here, to his gratification, he was enabled to place the surviving fish, 2000 in number, in the Platte, where they seemed to find themselves perfectly at home.

Next year it is proposed to carry on these experiments on a much larger scale, and to introduce the fish at numerous points throughout the Mississippi Valley; and it is hoped that by continuing to do this for several years, the entire waters of that valley will be as well stocked with shad as are those of the Atlantic slope.

The labors of Mr. Clift were greatly facilitated by the assistance of the Adams, and the American and Merchants' Union express companies.

REPORT OF NEW YORK FISH COMMISSIONERS FOR 1871.

The fourth annual report of the Commissioner of Fisheries of the State of New York has just been published, containing the detail of their proceedings during the year 1871. The principal efforts of the commission have been directed toward the stocking of the Hudson River with shad; and although they experienced much difficulty in obtaining a satisfactory number of mature fish having ripe spawn, they actually hatched out and turned into the river over 8,000,000 young fish. This aggregate, though less than they considered desirable, is much greater than that of previous years, and will go very far toward renewing the supply in the river. They estimated that if they could introduce 500,000,000 eggs annually, which could be done at a moderate expense, it would be entirely impossible for any mode of fishing in the lower waters to prevent an abundant yield that would afford a supply of shad at very low prices.

A state hatching-house has been constructed at Caledonia, which is claimed to be the most efficient and largest affair of the kind in the world. In this great numbers of trout, salmon-trout, whitefish, and other species have been hatched and distributed very generally throughout the state. About three thousand young salmon were hatched at the state establishment, and offered to any parties who would take charge of them, but no application was made for them. As the period for which the Fish Commission was established lapsed with the year 1871, it is very much to be desired that it should be renewed, with funds sufficient to enable them to continue their well-directed labors in the interest of the people of the state.

SECOND REPORT OF NEW JERSEY FISH COMMISSIONERS.

The second annual report of the Commissioners of Fisheries for the State of New Jersey has just appeared, and exhibits evidence of much care and research on the part of these officers. The history of the shad and herring season is detailed, and important suggestions for the future improvement of the fisheries indicated.

From this report it appears that the action of New Jersey in regard to establishing suitable regulations is very much impeded by the refusal of Pennsylvania to concur in reference to the Delaware River; and until something of this kind can be done, it is almost impossible to expect that full measure of restoration of the fishery interest that has attended the labors of the fishery commissioners of Massachusetts and Connecticut. The shad and herring season of 1871 in both the Delaware and Raritan is stated in the report to have been even less remunerative than that of 1870, the catch of herring being especially limited. One of the principal causes of injury to the young fry of the shad is stated by the New Jersey commissioners, and by Colonel Worrall, the commissioner of Pennsylvania, to be the practice of setting fish-baskets in the streams. As the fish return in the summer or autumn to the salt-water during the low stage of the rivers, the fish are obliged to pass over these baskets or through their slats; and as it is well known that the loss of only a few scales will cause the ultimate death of the shad, we can readily understand how much injury they experience, in view of the fact that their scales become detached at a slight touch.—*Report.*

TRANSPORTATION OF BLACK BASS TO ENGLAND.

Mr. Parnaby, of the fish-breeding establishment at Keswick, England, lately visited the United States for the purpose of obtaining living fish, and especially black bass, to be used in stocking ponds in Great Britain. He left for home by one of the British steamers of the latter part of June, carrying with him large numbers of fish, which we trust he will succeed in transporting safely to their destination.

TRANSFER OF BLACK BASS TO ENGLAND.

Mr. Parnaby, of the Keswick Fish-breeding Establishment, in England, whose visit to America, for the purpose of obtaining the fry of the black bass, we have already recorded, succeeded in carrying his fish with but little loss across the Atlantic, but they began to die as soon as he reached Liverpool. About sixty, however, survived, and appeared to be in good health and condition, feeding freely. It is not improbable that Mr. Parnaby will return immediately to America in order to secure an additional supply.—2 *A*, *July* 20, 1872, 40.

FISHERIES OF THE NORTH CAROLINA COAST.

Very few persons are aware of the magnitude and importance of the fisheries upon the coast of North Carolina. We learn that upward of 15,000 persons are now actively engaged in the above business. The largest fisheries are in the Albemarle Sound and the vicinity of Roanoke Island, where the business is reduced to a perfect system, steam-power being arranged for the purpose of hauling the nets, etc.—*Newspaper.*

CONSUMPTION OF BLUEFISH IN NEW YORK.

Some idea of the immense numbers of bluefish consumed in a single season in New York may be gathered from the fact, which we learn from Messrs. Middleton, Carman, & Co., the well-known fish-dealers of Fulton Market, that during the year 1871 about 1,250,000 fish were brought to the city and disposed of. One hundred and fifty thousand of these were probably brought from the Vineyard Sound and Buzzard's Bay, and about 8000 from the coast of Virginia and North Carolina, this latter number being considerably less than in previous years.—*Letter of Middleton, Carman, & Co.*

BREEDING SALMON AND TROUT IN INCLOSURES.

An interesting experiment in fish culture has lately been made in the North Sea by Professor Rasch, of the University of Christiania. The locality is a deep "fiord," or narrow gulf, running up into the land, over a mile in length, and at the end narrowing to the width of a large trench, which then opens out into a fine natural basin of salt water of about 300 acres in extent, nearly as broad as long, with an average depth of 40 feet. There is a free and continual flow of water from the sea through this narrow trench, or inlet, with a regular ebb and flow, the difference between high and low water being only one foot, except in spring floods, and the water is quite as salt, or even salter, than in the sea outside. In 1869, having acquired the exclusive right to the waters in this basin and its tributaries for three years, Professor Rasch constructed a fence in this inlet, composed of strong posts driven firmly in the bottom, with twelve movable frames of galvanized wire netting stretched between. This does not prevent the ebb and flow of the tide, but effectually stops the outward passage of the fish. In the inclosure a hatching apparatus for salmon and sea-trout spawn was erected, connected with two small fresh-water ponds, the whole supplied with water from the same spring. After the proper time the young are turned into the basin. They are, however, fed in the fresh-water ponds, before being discharged, with fine-chopped mussels (*Mytilus edulis*), of which there is an immense supply in the salt-water basin. Fresh-water gasteropods have also been introduced for a similar purpose. On account of this rich supply of food, the fry soon become strong, and grow with unusual rapidity.

The question as to salmon and sea-trout living and thriving without entering into the deep sea may be considered as answered in the affirmative as far as regards the trout, since last autumn sea-trout ascended one of the brooks from the salt-water basin, which had been closed nearly three years. These were in very fine condition, full of ova, and weighing from two pounds to four pounds. Professor Rasch has succeeded in producing a bastard variety of salmon and fresh-water trout (*Salmo fario*), which, being unfruitful, like all hybrids, is in fine condition, and grows to a large size, having at the same time a delicate flavor. He is now endeavoring to produce a hybrid of the salmon and sea-trout, and is very sanguine of success. The object is to have a new food fish which will be in fine condition and seasonable just at the time when the salmon and sea-trout are out of season and uneatable.

Supposing the problem to be solved in regard to the retention of salmon and sea-trout in inclosed salt-water basins, the question still remains as to the extent to which either will thrive if permanently penned up in large fresh-water lakes, and cut off from communication with the sea. It is not at all improbable, however, that in the great lakes of our Northern border this feat may be accomplished, especially as many experienced fishermen are of the opinion that the Lake Ontario salmon, such as are bred at Mr. Wilmot's establishment at Newcastle, are exclusively lacustrine. Should it be possible to stock Lake Superior, Lake Michigan, Lake Huron, and Lake Erie with salmon in addition to other food fishes, a very great benefit will be conferred upon the adjacent states.—2 *A*, *April* 20, 1872, 271.

CAPTURE OF RHINE SALMON IN HOLLAND.

The German fish-culturists resident upon the upper waters of the Rhine have lately been greatly aggrieved by the action of the Dutch in catching the salmon bred by them while in the lower waters of that river, and on their way from the ocean to their spawning beds. This has been the subject of a memorial on the part of the German Fischerei-Verein to the society for promoting fresh-water fisheries in Holland, and a rejoinder on the part of the latter body has lately made its appearance. In this it is remarked that the matter in question can not be judged except after due examination on the spot, and that no importance should be attached to the impressions of the gentlemen of the Fischerei-Verein, as they have not themselves examined the method of fishing in Holland, and the difficulties that this interest has to struggle with. It is also maintained by the Dutch society that a residence on the border gives the right to the inhabitants to appropriate such a gift of nature; and the fact that parties living on the higher waters might secure a larger supply if those lower down did not exercise their rights has nothing whatever to do with the question. They furthermore state that the Dutch authorities are not, indeed, averse to a restriction, and are willing to meet the Verein on reasonable grounds, especially because they contend that, should the concession be mutual, a restriction of the fisheries in the upper waters would tend to increase the stock of fish toward the mouth of the river.

While admitting, however, that the hatching of salmon in the upper Rhine will increase the stock of fish in the river generally, they maintain that it is not certain that all the salmon passing up the Rhine have been born in its upper waters, and that quite possibly they may come from Norway, England, or Scotland; and the fact that millions of salmon eggs have been taken from the Rhine for the establishment at Hüningen, and that millions of young salmon have been sold at Strasburg, is to be considered as evidence that, if the hypothesis of the Germans be true, they themselves have contributed more largely to the decrease of this fish than the Dutch.

The general reasoning in this document must be considered by dispassionate fish-culturists as very specious, and an impartial jury would probably decide against the Dutch side of the question. There can be no doubt but that the propagation of salmon in the upper waters must have had a very important bearing upon the supply, and that but for this, with the amount of fishing in that river, they would have been reduced to a very small number. Few specialists will admit the suggestion of the Dutch society that the river is in any degree stocked from England or Norway, or other than from fish that had been born in the upper beds.

This difficulty, it will be observed, is very similar to that which has arisen on the Connecticut River in regard to stocking that stream with shad and salmon, the efforts of Massachusetts having been, in a measure, rendered nugatory by the absence of protection in Connecticut. It is hoped, however, that under the new laws of this latter state, which went into operation on the 1st of January last, Vermont and Massachusetts will be encouraged to take the steps necessary to place in that river the proper supply of young fish of different species, and that the entire length of the Connecticut may have a proper share of the harvest.—*Circular of Holland Fish Society.*

COST OF SALMON EGGS IN EUROPE.

It may interest some of our readers who have heard of the enormous prices paid in this country for impregnated salmon eggs ($40 a thousand) to know the prices at which articles of this kind are sold at the great national German fish establishment at Hüningen. From a price-list before us we notice that the eggs of the salmon, and of several other species of the trout family, with the embryo developed, can be supplied at from a dollar to a dollar and ten cents per thousand. The eggs of the grayling cost only thirty cents per thousand; those of the coregonus, the genus to which the whitefish of our lakes belong, are sold at about six cents per thousand; and those of the pike at five cents. Young fish are offered also at somewhat advanced prices; thus, a thousand young salmon will be furnished at from three to six dollars, in proportion to the extent of their development.—*Circular Fischerei-Verein*, 1871, VI., 2.

ARTIFICIAL BREEDING OF SALMON.

Frank Buckland, who is a high authority on the subject, criticises certain proposed arrangements for salmon-breeding on the Aberdeenshire Dee. Referring to the estimate of £2500 as the probable cost of the breeding establishment, he insists that, if the object be to raise the salmon artificially after they are hatched, the expense will be thrown away; that the much better plan is to introduce the young fish into the streams after the yolk-bag has been dissolved, and it is considered safe to allow them to shift for themselves, and not to attempt to carry them forward over a period of months or longer, feeding them with butcher's meat.

He thinks that they should be taken, a few at a time, and introduced to the small brooks, as high up on the tributaries as possible, by means of small hand-nets, placing half a dozen or a dozen at a time in the stream, and taking care that there are piles of stone and gravel to which they can betake themselves as soon as possible.—2 *A*, *June* 15, 1872, 399.

DO SALMON NEED TO RESIDE IN SALT WATER?

A correspondent of *The Field* takes strong ground in favor of the assumption that salmon will thrive and breed in fresh water, excluded permanently from access to the sea, and quotes the impressions of the Marquis of Breadalbane and others that the salmon in Loch Tay, a well-known fresh-water lake of Scotland, never leave it except when they ascend its tributaries to spawn, and that they return to the lake, and there become clean without going down through the outlet of the Tay to the sea. This is a decided encouragement to those who propose to try the experiment of introducing the salmon into the great North American lakes, as it is well known that in these bodies of water are to be found the temperature and kind of food required by salmon, and for which, in part, they probably visit the ocean.

It is an interesting fact, substantiated within a few years, that a small crustacean of the genus *Mysis*, which is believed to constitute in great part the food of the salmon in the ocean, occurs also in these lakes in immense numbers at certain depths, and that consequently their necessities in this respect can be met without leaving the fresh water. The writer in *The Field* also remarks that the British sea-trout (*Salmo trutta*) will thrive and breed perfectly well in fresh water, and advises that it be used in stocking ponds and lakes rather than the common trout, as being a much better fish for the table, and remaining much longer in good condition.—19 *A*, *August* 3, 1872, 124.

PROFITABLE RESULT OF SALMON-PLANTING IN GERMANY.

The practical result of the introduction of salmon into suitable rivers is well shown by the report, lately published, of experiments made in the German river Weser, by Schieber (the Inspector of Fisheries at Hameln) about 120 miles from where the river empties into the German Ocean. In April, 1858, 80,000 eggs, ten weeks old, were deposited; in 1859, 31,000; and in 1860, 29,000. As the result, at the expiration of four years, the number of salmon taken at Hameln had increased fivefold, and in 1863 eightfold. Up to 1862 the catch at Hameln had amounted to from 400 to 500 fish annually, while in 1862, 2600 were taken; in 1863, 4000; in 1864, 5000.

In 1862 and 1863 no young were introduced, and consequently, in 1865, only 1500 fish were taken; in 1866, 1100; and in 1867, 900. Mr. Schieber concludes, from his investigations, that the period of four years elapses between the hatching of the eggs and the return of the fish to the breeding-ground, at which time it has attained a weight of from five to eight pounds. The number actually taken at Hameln, however, is no criterion of the yield, since scarcely more than one third ascend as high as that point, the remainder finding satisfactory breeding-places in the shallow gravel beds below.

When the temperature of the water exceeded 60°, the salmon appeared to be exhausted, and unable to continue their active efforts at ascending the river, and waited for the cooling of the water either by a change of external temperature or by a rise from the upper springs.—*D. Fischerei-Verein*, 1872; *Circular* 8, 192.

TROUT-BREEDING IN FRANCE.

In the London *Field* is a suggestive article upon fish-culture, in the form of an account of the trout-breeding establishment, near Rouen, of the Marquis De Folleville, a gentleman whose success in raising this excellent fish has long been well known. He bears testimony to the importance in fish culture of not attempting to keep the fry confined in small spaces for a long time. It took him five years to reach this conclusion. Finally, having become discouraged in his efforts, he undertook to let out the fish into the stream shortly before the time for the absorption of the yolk-bag, and obliged them to seek food for themselves. The result was a complete success, the weeds furnishing protection for the fish, and supplying them with such a number of minute insects that they attained the length of four or five inches the first year.

At the present time, streams on his estate which ten years ago produced nothing, now yield a return of from $900 to $1200 per annum, which is double the production from the same acreage of the most fertile land in France. In the establishment of the marquis, the eggs, after having been fertilized, are deposited for the first three weeks in a runlet, or trench, twenty feet long, two feet wide, and half a foot deep, through which a flow of fresh spring water is directed. They are then placed in a close hatching-box, in which they are kept until the yolk-bag is absorbed, after which they are turned out into the stream, and thenceforward require no special care.

The total outlay for the appliances requisite for the fertilization and hatching of the eggs and rearing of the young fish scarcely amounted to $100, the heaviest item being a pump, which could have been dispensed with had the natural fall of the water been fully appropriated. The entire supervision of the establishment is performed by one person, who is occupied for five months in the year, and for a few hours only of the day.—19 *A*, *July* 20, 1872, 55.

MENOBRANCHUS DESTRUCTIVE TO THE SPAWN OF THE WHITEFISH.

One cause of the diminution of the number of whitefish (*Coregonus*) in the great lakes is attributed to the destruction of their spawn by the *Menobranchus lateralis*, which, according to Mr. George Clarke, of Ecorse, congregate on the spawning-beds at the rate almost of one to the square yard. When captured their stomachs are usually gorged with the ova. According to this accurate observer, the eggs of the *Menobranchus* are attached to the under side of pieces of wood lying on the bottom of the river, and in clusters of about one hundred each. They are hatched out in about thirty days, more or less, according to the temperature of the water.—*George Clarke.*

RENEWAL OF SALMON-PLANTING IN THE DELAWARE.

During the year 1871 the experiment was tried, by some public-spirited gentlemen of Philadelphia, of introducing salmon into the Delaware River, and, although great anticipations of a successful result were formed, the effort came to an untimely end by the death of the greater portion of the young salmon in their transportation from the hatching-house on the Hudson to the river itself. Not discouraged by the failure of the first attempt, the experiment has been repeated this year under the direction of Mr. Thaddeus Norris, and 12,000 eggs, purchased from Mr. Samuel Wilmot and received on the 1st of April, have now been hatched out with a loss of only about ten per cent., and have been placed in the Bushkill, a tributary of the Delaware, near Easton. Two thousand fish were saved of the last year's venture, and introduced into the river, where, it is hoped, they still survive.

This year, instead of hatching the eggs at a considerable distance from the water into which they were to be introduced, the work was done about two miles from Easton, with the successful result indicated. Mr. Norris is quite confident that, whether salmon have ever lived in the Delaware or not, there is every probability of their finding a suitable home there, and of becoming abundant in future years. In his communication to the Germantown *Telegraph*, from which we have quoted, Mr. Norris remarks also that the black bass experiment in the same river promises to be a complete success. Large numbers of young fish have been seen all along the river shore in the neighborhood of Easton, and the old fish have been found in many places on their spawning beds.—*Letter.*

SALMON AND TROUT IN AUSTRALIA.

The question of the occurrence of salmon in Australia still seems to lack the evidence of actual capture, although large numbers of fish have been seen in the Derwent and other rivers, which by their movements could scarcely be assigned to any other species. Mr. Yaul, however, in a communication to *Land and Water*, remarks that the eggs of the brown trout (*Salmo fario*), placed by him in the Derwent, have produced thousands of fish, and that they are now frequently taken weighing from three to five pounds each. He adds that both salmon and salmon-trout (*S. salar* and *S. trutta*) have bred in the ponds in fresh water, never having a chance to migrate to the sea, and that they have suffered no inconvenience from this restriction.—2 *A*, *March* 2, 1872, 152.

SPAWNING OF HERRING.

Mr. Matthews Dunn, whose contributions to *Land and Water*, in regard to sea-fish and their reproduction, have contained much of interest, writes in reference to the spawning of herring, and remarks that during the past winter he took occasion to impregnate some herring eggs, and found that on placing them in water they sank immediately to the bottom, or became attached to the sides of the vessel by a tenacious viscid coating. He thinks that the roe discharged on the British coast in January and February are usually hatched out by the 20th of May.

The sea-fisheries of Great Britain appear to have been unusually productive during the past winter, as, in addition to the large catch of herring already referred to, codfish have been taken in very great numbers. At a single station on the British coast 20,000 fine cod, besides numbers of turbot, halibut, etc., were landed in the course of a few days. The price received for a full-sized cod by the fishermen is about thirty-five cents. These are sent to London by steamer and railway. A single week's catch netted to the fishermen over $7500.

The spawn of the cod is said to ripen about the beginning of March; and Mr. Buckland thinks that the 15th of March should be the first day of a close time for cod, which should last eight or ten weeks, during which time their capture should not be permitted.—2 *A*, *March* 2, 1872, 150.

BREEDING OF SMELT IN EUROPE.

According to an article in *Land and Water*, the European smelt, so closely allied to our own, is found abundantly in the mouths of the rivers of Holland, about August, meeting then the descending fry; and after spending the winter there, it spawns in the following spring. It is, however, stated that smelts will flourish well in fresh-water ponds, and that they have actually been propagated where they were entirely cut off from the sea, no difference from the others being appreciable in their taste.—2 *A*, *March* 2, 1872, 151

RAISING OTSEGO BASS.

One of the recent enterprises of Mr. Seth Green, the well-known fish-breeder of Rochester, is his effort to renew the supply of bass in Otsego Lake. The name of this fish is another instance of the indefiniteness of the common names of fish, since the true bass belong to the perch family, while the one in question is allied to the whitefish of the lakes, a species of *Coregonus*. A hatching-house, capable of developing at least half a million of eggs, has been erected at Otsego Lake expressly for the purpose, and is already partially filled. —*Rochester Democrat.*

FISHERIES ON THE COAST OF NORWAY.

The fishing season on the coast of Norway has been unusually good during the past winter, no less than 500,000 casks, principally codfish, having been filled with cured fish. Few persons realize the fact that the cod-fisheries of Norway are very much more important than those of the United States. Such is, however, the case. In 1868, according to the report of Colonel Cutts, the total number of vessels, large and small, engaged in the sea-fisheries of the United States were scarcely 2000, manned by crews amounting to 28,000. Norway, on the other hand, had 8500 vessels and boats, and 38,000 men engaged in the same season. The value of the products gathered, in one season, amounted to about nine millions of dollars; in the other, to over thirteen millions.—*Letter of Dr. Bœck.*

LOFFODEN COD-FISHERY.

According to a report from the Loffoden Islands, the great cod-fishing ground of Norway, 17,000,000 fish were taken during the past winter, this number being rather below the average. Twenty thousand men were engaged in the capture of the fish, and in their preparation, and that of the oil and manure made from the offal.—2 *A, May*, 25, 1872, 350.

NAMES OF THE CODFISH.

Mr. J. Carson Brevoort, of Brooklyn, who has devoted much time and attention to historical researches in regard to fishes, as well as other subjects of natural history, has lately written an interesting essay upon the names which have been applied to the codfish in different parts of the world. In this he remarks that wherever dried codfish, split and stretched on a stick, are known throughout the civilized world, the name that it bears in different regions can be traced, in most cases, directly to this mode of preparation for the market.

Thus, among the Greeks, the large codfish were called *bacchi*, from *bacchus*, a rod. The Latins named the fish *gadus*, from a Sanscrit root, *cad* or *gad*, a rod. This root is found in English in goad, and perhaps in *cat-o'-nine-tails.* In Gælic *gad* and *gadan* signify a small rod. Among the Iberians the dried codfish was called *bacalaos*, from *baculeum*, a small stick. This points to the root of the French *baquette*, or rod; *bilboquet*, the toy known as cup and ball, really *stick* and ball, and other words. By the Anglo-Saxons the fish was called the *cod*, from the word *gad* or *goad*, a rod; and by the

Germans it was known as the *stockfish*, from *stock*, a stick. Among the Netherlanders the word varies a little, in having been called as far back as 1400 the cabbeljauw, which seems to be from the Dutch *gabel*, a fork. They also called it the bakkeljauw. The French *morrhue* is not from the above root, and is probably from the Celtic *mor*, the sea. The French, however, never prepared the cod by drying it on a stick, but salted it as the *morue verte*, or *green cod*. The French *molue* is merely a change in the liquid consonants.

When the cod is dried on the downs it is called *dunfish*, from the Gælic root *duin*, a hill. If dried on the rocks, it becomes *rock-cod*, or the *klippfish* of the Norwegians. Among these the cod is called *dorsck* or *torsk*, in English *tusk*, from the Gothic *dürren*, to dry. The English *aberdeen* fish, or French *laberdan*, is from the Gælic *abar*, the mouth, *dan*, a river, or fish caught near the river mouth.—*J. C. Brevoort*.

SPAWNING OF MENHADEN.

According to Captain Treat, the menhaden spawn in winter on the southern coast of the United States, specimens containing mature spawn having been taken by him in the Chesapeake Bay and the Lower Potomac in January and February. He found them extremely abundant throughout the winter off the coast of North Carolina, where they are netted in great numbers.

In the Chesapeake Bay they are called whitefish, while in Connecticut and Long Island they are occasionally called pig-fish, and on the Potomac they sometimes bear the name of gizzard fish.

HERRING FISHERY IN GREAT BRITAIN.

The winter herring fishery at Yarmouth, in England, which closed at the end of January, is said to have been one of the largest ever known in that part of the world, 240,000,000 having been landed at the fish wharf in the town. Estimating that four herrings weigh one pound, we have 60,000,000 pounds, or about 30,000 tons of flesh, and equivalent to over 70,000 bullocks, taking these at their average weight. The value of this amount of food, so cheaply obtained, is, of course, almost incalculable, as it was sold at one fourth the price of beef, and is in some respects superior to it as an article of diet; as, while beef has more carbon to the pound, the herring has more nitrogen, and is, therefore, more valuable as a producer of bone, muscle, and brain.—19 *A, February* 24, 1872, 165.

REAPPEARANCE OF A PECULIAR HERRING ON THE NORWAY COAST.

According to a quotation in *Land and Water*, a kind of herring, which had disappeared from the coast of Norway since the beginning of the present century, has within the last few days again made its appearance in such numbers in the waters between the Swedish continent and the Norwegian Whale Islands that the fish are described as being, in some places, packed together like a wall. The previous scarcity of this fish is ascribed to the fact that the fishermen formerly used nets of too small mesh, so that the young brood were captured together with the older fish.—2 *A, Jan.* 6, 1872, 7.

USE OF FISH AS MANURE IN ENGLAND.

The complaint that fish which should be used as food are wasted by being converted into manure for worn-out lands is made in England as well as the United States, attention being called in *Land and Water* to the fact that, in the late herring season, the catch was so great that the country for miles and miles in extent was supplied with fish sold for manure at the rate of twelve to fifteen cents a bushel.—2 *A, March* 9, 1872, 167.

FOOD OF SHAD.

The nature of the food of the shad has long been a problem, as, when ascending rivers in the spring, their stomachs are generally found entirely empty. A communication by Professor Leidy, published in the Proceedings of the Academy of Natural Sciences in Philadelphia in 1868, may tend to throw some light on this subject. In this paper, which bears date October 20, he states that he has just examined specimens recently caught in Delaware and off the New Jersey coast, and found the stomachs full of small fishes from two to four inches in length, belonging to the species known as sand-lances (*Ammodytes Americanus*), of which as many as thirty were found in a single stomach.—2 *D*, 1868, 228.

BRYAN ON THE DECREASE OF SHAD.

Mr. Bryan, of Maryland, in an article upon the decrease of the shad, published in the Richmond *State Journal*, takes the ground that it is not to overfishing that the decrease of shad and other river fish is due, but to the spring floods, which in their course bring down quantities of mud and refuse that injure the spawning beds and destroy the eggs and young fish, besides being extremely obnoxious to the old fishes by getting into their gills and otherwise incommoding them. He also thinks that the action of the steamers in traversing the flats and stirring up the mud exercises a special influence in the same direction.—*Richmond State Journal.*

SHAD IN ALABAMA.

We learn from a correspondent that shad have been taken during the present season in a tributary of the Conecuh River, in Butler County, Alabama. The Conecuh is itself a tributary of the Escambia, which empties into the Gulf at Pensacola. The occurrence of these fish in this stream is an earnest of the possibility of stocking all the tributaries of the Gulf of Mexico with this valuable food fish. We have not learned whether shad had been previously planted in the Conecuh, or whether they ascended it spontaneously from the Gulf, but presume, however, that the fact, as stated, is the result of some experimental effort of persons in Alabama interested in pisciculture. There is good reason to believe that a well-directed effort would result in stocking most of the rivers of the Gulf with shad, and thereby adding greatly to the food production.—*Letter.*

SHAD IN ALABAMA WATERS.

We have already referred to the occurrence of the true shad in the Escambia River of Florida and Alabama, and we learn that they are also met with in the Choctawhatchee River, a stream to the eastward of that mentioned. It is said they were first noticed in these waters about the year 1864, and that they have increased in size and quantity ever since that time. They were caught during the present season, from the 15th of March to the 1st of May, in considerable number. This fact is encouraging to those who are advocates of the propriety and feasibility of stocking the tributaries of the Gulf of Mexico with shad.—*Letter to Mr. Handley.*

SHAD IN RED RIVER, ARKANSAS.

A correspondent of the *Weekly*, writing from Hot Springs, Arkansas, on the 6th of May last, communicates the very interesting intelligence that for two seasons past shad have been captured in the Washita River in such abundance as to furnish an important article of food to the people of the neighborhood. No statement is given as to whether these fish are from shad purposely introduced into the river, or whether they made their way there spontaneously from the Gulf. The Washita, as our readers may be aware, is a tributary of Red River, and is navigable within forty miles of Hot Springs, a locality about fifty-five miles southwest from Little Rock.

SHAD-HATCHING IN THE HUDSON RIVER.

According to the *Albany Argus*, the shad-hatching operations of Mr. Seth Green on the Hudson River during the present season have been extremely successful, an immense number of eggs having been hatched out and placed in the river, besides those that have been supplied directly by himself or through others to Lake Champlain, the Genesee River, and other localities.

The principal scene of his operations was at what is called Camp Green, about ten miles below Albany, on the western shore of the Hudson. This consisted of three tents, one a dormitory, one a sitting-room, and the third a kitchen. Five men have been employed by Mr. Green in the various operations connected with this business—first, in the capture of the shad, which is done by means of a seine about four hundred feet long, about a mile below the camp, on the same side of the river. They are usually taken between eight and ten o'clock at night, and, if properly matured, the eggs are stripped from the female into a pan of water, and the milt subsequently expressed into the same, and the whole stirred together. When this operation is concluded, the eggs are carried to the hatching ground and placed in the hatching boxes, where they are left seven or eight days, according to temperature.

The hatching boxes constitute an essential feature of the operation, and are constructed according to a plan patented by Mr. Green. These are made of wood, are nineteen inches long, thirteen inches wide, and ten inches deep, open at the top, and the bottom composed of tarred wire-cloth of twenty meshes to the square inch. Each box has fastened to its sides two wooden floats, holding it in the water at an angle of forty degrees, so as to subject the eggs to the action of a slight tidal current, it being necessary that the eggs should be kept in a gentle and continuous motion until hatched. These boxes are fastened together, one behind another, in rows of five or six, with an anchor at one end of each gang, in order that the boxes may adjust themselves to the tide.

In twenty-four hours after impregnation, with a temperature of 75°, a small yellowish speck is visible in the circumference of the yolk within the egg. Forty-eight hours later, at the same temperature, the young fish is visible in active movement within the egg, and from which, in a short time, it succeeds in escaping. The fish, on leaving the egg, is half an inch long, with an umbilical sac attached, which is absorbed in from six to eight days, during which period it is kept in the boxes; after this it is liberated into the stream to find subsistence for itself.—*Albany Argus, June* 25, 1872.

PLANTING OF SHAD IN THE GENESEE RIVER.

Mr. Seth Green, of New York, continues to be indefatigable, under the direction of the New York Fish Commissioners, in his efforts to stock the waters of that state with useful food fishes. Last year he introduced about 15,000 young shad into the Genesee River, and finds that they have already attained a considerable length. During the present year he proposes to transport 100,000 young shad from the Hudson into Lake Champlain, and hopes in this instance for an equally satisfactory result of his experiment. Lake Champlain now possesses a fish known along its shores as the shad, but which really is a whitefish, and not the species bearing the first-mentioned name on the Atlantic coast.

PLANTING OF SHAD IN LAKE CHAMPLAIN.

Dr. Edmonds, Commissioner of Fisheries of the State of Vermont, on the 20th of June deposited in Lake Champlain, at Burlington, Vermont, 50,000 young shad obtained at Seth Green's shad-hatching establishment at Castleton. Mr. Green himself has also just introduced another 50,000 shad into Lake Champlain, at Whitehall, and the two lots will make a very fair beginning of the experiment as to whether shad can subsist in this lake. It is by no means certain that shad as well as salmon will not thrive and multiply in large inland lakes cut off from the ocean; but if a journey to the sea be necessary, there will be no difficulty in the shad making their way down to the Gulf of St. Lawrence. Their return, however, may perhaps be impeded by at least one dam on the Sorel River, the outlet of the lake.

STOCKING CALIFORNIA WITH SHAD.

The Fish Commissioners of California, Messrs. Throckmorton, Farwell, and Redding, lately determined to send East to obtain 50,000 shad spawn for planting in the San Joaquin River. The experiment of introducing these fish into the Sacramento last year was considered sufficiently successful to warrant the effort. In addition to shad, they also propose this season to place eels and black bass in the lakes in the vicinity of San Francisco, and lobsters in San Francisco Bay. —*San Francisco Bulletin, June* 7, 1872.

TRANSFERRING SHAD TO THE SACRAMENTO RIVER.

We find in the New York *Citizen* a report by Mr. Seth Green of his experiences in attempting to transfer young shad from the Hudson River to the Sacramento, a brief notice of which we have already given to our readers. The experiment was initiated on the 19th of June, 1871, by starting with 12,000 young fish placed in four eight-gallon milk-cans. These had been hatched the night before at the New York State establishment. At Cleveland Mr. Green placed 200 shad in Lake Erie, and the same number in Lake Michigan, at Chicago.

In crossing the continent Mr. Green experienced great difficulty in procuring water of a proper temperature and quality, but succeeded in reaching Sacramento with his charge in fair condition, having placed 200 fish in the river at Ogden. From Sacramento he proceeded 275 miles up the river, where he found the physical conditions to be suitable, and in the presence of the Commissioners of the State of California he deposited 10,000 fish, in good condition, on the 26th of June.

From an examination of the Sacramento River, and of the Pacific Ocean near its mouth, Mr. Green was of the opinion that all the conditions necessary for the growth and persistence of these fish in the Sacramento River were found there, and that it was more than probable that in the course of three years their presence would be made manifest up to the head waters of the stream.—*New York Citizen, Dec.* 16, 1871.

CYPRINUS ORFUS AS AN ORNAMENTAL AND FOOD FISH.

Dr. Kiersch, of Wiesbaden, presents very strongly the claims of the *Cyprinus orfus*, of Linnæus, as particularly adapted for cultivation in the fresh-water streams of Europe. This species the writer considers one of the most beautiful of its kind, closely resembling the trout in its form, and possessing every qualification necessary to give it a preference over all fishes of its family. The fish is very rare in Europe, and, indeed, but for some effort in the line of artificial culture, it is in great danger of dying out—a catastrophe which, in view of its many excellent qualities, would be very deplorable. Unlike the carp and some other kinds of fish, this species does not retire into holes and concealed places in the winter, but remains throughout the entire season at the surface and in plain sight of the spectators. In point of beauty this fish is claimed to possess equal merit with the goldfish; in fact, it has this superiority, that while the latter is black when young and only assumes the red color at the expiration of the second year, the orph from its earliest period is an object challenging the admiration of the beholder. As an article of food, this fish is said to possess many excellencies far beyond those of the majority of its class, and only inferior to the trout in this respect. It has one advantage also, that of being very tenacious of life, and being capable of being carried to a great distance without injury.

The orph will thrive in almost any water, and especially in ponds and pools where trout could not exist; and it is capable of resisting the influence of injurious substances which sometimes unavoidably pollute streams. One reason for its comparative immunity against destructive agencies lies in the fact of its keeping almost entirely on the surface of the water, which is generally much purer than the lower portions. As a herbivorous fish, the orph has the advantage of not interfering with trout or salmon in a stream; and, indeed, as it multiplies with great rapidity, would be an excellent associate for such species, in furnishing to them an important article of food.—*D. Fischerei-Verein Circular*, 1872, IV., 102.

GREEN COLOR OF OYSTERS IN CHESAPEAKE BAY.

A dealer in Washington not long since found a large number of the oysters from a certain region in Chesapeake Bay with the gills of a decidedly green color, and on this account they were considered unmarketable. Specimens of these were sent for examination to the Army Medical Museum, where they were examined microscopically by Dr. J. J. Woodward, who found nothing abnormal whatever in the way of fungus growth, or as indicating the presence of parasites, or any form of disease.

They were then submitted to the chemical investigation of Dr. Craig, the chemist of the establishment, and, on testing them by means of the spectroscope, minute traces of copper were detected, but not in sufficient quantity to account for the color, nor to indicate danger from this source. The green color of oysters is by no means unusual in other parts of the world, especially in Europe, and there it is not considered as suggesting a condition of the animal injurious to the health of those who eat them. Indeed, the Marennes oysters owe their reputation to this particular quality.

VIRGINIA OYSTER FISHERY IN 1871.

The chief of the Virginia oyster police has just made his report for 1871 to the state Legislature, in which it is stated that only the sounds of Tangier and Pocomoke are subject to dredging, and that these, exclusive of the river and creeks, cover an area of 9740 acres. It is now recommended that dredging in them be prohibited for a certain period. The rest of the Chesapeake, exclusive of rivers and creeks, covers an area of nearly 435,000 acres, averaging some six fathoms in depth. On this dredging is interdicted, the oystering being done only with tongs. The commodore advises that dredging be allowed in the Chesapeake, except Tangier and Pocomoke Sounds, especially as this operation in proper amount is beneficial to the fisheries instead of injurious, as maintained also by Mr. Davidson, the commissioner of Maryland. The close season, as suggested, should be the 15th of May till the 1st of October.—*Newspaper Abstract.*

REPORT OF MARYLAND COMMISSIONER OF FISHERIES.

The report of Mr. Hunter Davidson, commissioner of the fishing force of the State of Maryland, has just been published, and contains much important information, and many valuable suggestions in regard to the fisheries of the state. Mr. Davidson's duties are more especially in connection with the oyster fisheries, and in his report he discusses the comparative advantages and results of dredging oysters and of taking them with tongs. As to dredging, he advises very earnestly that this be confined to those months of the year when the oysters are not spawning, and that only dredges of a certain size and weight shall be used. He also insists that the dredgers shall be required to cull the oysters while at the beds, and throw back all oysters under a certain size and all separate shells, and at the same time to destroy the star-fishes and other noxious animals taken that prey upon the oysters. He thinks only half of the dredging grounds of the state should be disturbed in each year, which, taking the close time into consideration, would give a period of rest of about seventeen months. These regulations, he thinks, will preserve the beds, and greatly increase the value of their product.

He considers the actual operation of dredging itself, when not carried to excess, to be as important to the interest of the business as plowing and harrowing are to the cultivation of the soil, as preventing the oysters from accumulating unduly in particular localities and forming oyster rocks. These, he states, occur in the James River, like immense cones, frequently rising to the surface from a depth of from ten to sixty feet.—*Report for* 1871.

OYSTER TRADE OF BALTIMORE.

An account of the oyster trade of Baltimore, as published in the New York *Journal of Commerce*, has been sent to Mr. Frank Buckland, the eminent pisciculturist, who republishes the article in his journal, *Land and Water*, and takes occasion to comment upon the reckless waste exhibited by the Americans in their practice of burning oyster-shells. He states that it is upon old shells that the oyster spat, or the young oysters, are best able to fix themselves, and that in the absence of such a help a great portion of the young fry must necessarily go to destruction. He thinks also that greater care should be taken to throw back into the water the young oysters, instead of destroying them by steaming, as is done so generally when oysters are prepared for canning.

He states that in England large sums of money are expended for empty oyster-shells, to be laid in the mouths of the rivers for the purposes referred to, and he thinks that in a little while we shall begin to feel the result of the short-sighted policy adopted in the management of our oyster fisheries.—2 *A*, *February* 10, 1872, 97.

PRIZE ESSAY ON THE REPRODUCTION OF EELS.

Among the prizes offered by the Belgium Academy of Sciences for the year 1873–4 we find mentioned one for a dissertation on the reproduction of eels. It may seem somewhat singular in this era of scientific research that we are not yet acquainted with the true method in which the spawning and reproduction of the eel is accomplished. The present hypothesis is that the young are hatched in salt water, and make their way up the rivers as far as they can go for the purpose of spending their period of immaturity, returning, after the expiration of a year or more, to the salt water to lay their eggs, and never again quitting the sea. This movement is the reverse of that which occurs in the case of the salmon and shad, these ascending to the fresh water to deposit their spawn, and then going down to the sea. The assertion is not unfrequently made that eels are viviparous, and that the young can be seen at times in the oviducts of the parent. This is a misapprehension, due to the fact that this species is frequently very much infested with intestinal worms like *Ascarides*, which occur in great number, and appear on dissection like embryonic fish. We can only hope that the prize offered by the Belgian Academy may be successful in securing a memoir that shall solve what may now truly be called the "opprobrium" of modern naturalists.—3 *A*, *March* 2, 1872, 188.

CATCH OF FUR SEALS IN 1872.

Very gratifying reports have been furnished by Captain Bryant, the United States officer in charge of the fur-seal islands in the Behring Sea, of the number and condition of the seals during the present season. Shortly after the cession of these islands by Russia to the United States, fears were entertained that these animals would leave the islands on account of the indiscriminate slaughter to which they were subjected. But the enactment of wholesome laws by the United States on this subject, and the vigilant care exercised by Captain Bryant over the operations of the fur companies, have resulted not only in bringing the number back to the normal average, but in carrying it higher than was ever known before. Of the 100,000 authorized to be taken, 95,000 had been secured before the 25th of July without materially affecting the number; and there are so many pups of twelve months old, which will be fit to kill in another season, that it is thought probable the extension of the limitation of capture may be necessary to prevent an overweening increase.

MARKING WHITEFISH.

Mr. George Clark, of Ecorse, Michigan, on the 14th of May, 1872, marked a number of whitefish by inserting a brass ring into the adipose dorsal (the small fleshy fin just in front of the tail), and connecting this by means of a second ring with a piece of brass about the size of a ten-cent piece, the object in view being to identify them if again caught. The weight of each fish was about a pound and a half when they were set free; and Mr. Clark now has issued a printed request to fishermen who may recapture any of the fish thus marked, to send them, with the tags, to Crowell & Co., or St. John & Buck, Toledo; Messrs. Paxton, of Monroe; James Craig, A. M. Camfau, C. Hurlburt, or J. P. Clark, of Detroit; B. Reaume, of Springwells; George Clark, of Ecorse; or Mr. Reaume, of Grosse Isle, stating when and where caught; or, if this can not be done, to send the exact length and weight of the fish, with the tags, by mail. The object of this is to ascertain the rate of growth of the fish during any interval which may elapse between the time of marking and the date of recapture.

OIL WORKS ON UNALASCHKA.

It is stated that try-works for extracting and refining the oil of the sea-lion, seal, and walrus are about to be established on Unalaschka, one of the Aleutian Islands. This will probably result in the marketing of a large amount of oil which would otherwise be wasted, thus adding largely to the products of Alaska. The important paper of Mr. Dall, published in the January number of *Harper's Magazine*, upon Alaska and its profit to the country, has shown what rate of interest is being paid upon the debt incurred in the acquisition of the Territory; and if fourteen per cent. were returned up to the beginning of 1871, it is quite likely that by 1873 the profits will be very greatly increased.—*Alaska Herald, January* 19, 1872.

SPAWNING OF COD-FISH IN ALASKA.

Mr. W. H. Dall, who has been engaged for more than a year in making surveys among the Aleutian Islands for the Coast Survey, has made some important observations with reference to the breeding of the Alaskan cod-fish. He states that they arrive in March and April, full of spawn, and immediately repair to places with sandy bottom, defended from the wind and current by beds of kelp off shore. Here they remain a few weeks, and when they go outside they have no spawn in them. He does not think that the spawn is laid on the bottom, but rather that it floats below the surface in the water. If a heavy storm occurs, blowing on the shore, the sandy beaches inside the kelp are strewn with spawn. In May and June the young fish, from one and a half to two inches long, are plenty in the shallows, but go into deep water by July. He has collected a large number of the fry, and finds them to be exactly like the adults except in size.

COD-FISHING IN THE SHUMAGIN ISLANDS.

A correspondent of the Alaska *Herald* writes from the Shumagin Islands, giving some account of the cod-fishery of the present season. He reports a great deal of rough weather during the summer in consequence of the prevalence of strong south and southeasterly winds. The atmosphere was thick with fog, and the rains heavy in consequence. The sun had been seen only twice during the preceding three months. The principal business carried on at the islands is the capture of cod-fish, numerous vessels being there diligently engaged in this work. The fish are taken in small boats by means of lines armed with eleven and twelve inch hooks. The best bait consists of halibut and cuttle-fish. Each fisherman takes from three to four hundred fish in a day. As soon as the catch is brought on board the vessel the fish are salted and packed away, and not again touched until the cargo reaches its destination. Much of the work is done by Aleuts, who are admirable fishermen, although somewhat difficult to train in methods different from those to which they have been accustomed. One of the vessels at the islands expected to leave a portion of her crew at a point on Falmouth Harbor for the purpose of hunting during the winter.—*Alaska Herald, August* 24, 1872.

MACKEREL CATCH OF 1872.

According to the late papers, the catch of mackerel for 1872 appears to have been at least one third less than that of the preceding season. The principal reason for this is supposed to be the disinclination of the American fishermen to visit the Gulf of St. Lawrence, where the best summer fisheries are to be had, in view of the failure of the Dominion authorities to ratify the late fishery treaty, and the fear on the part of the fishermen of arbitrary exactions and interference by the coast-guards.

A material change has taken place, also, in the mode of capture, the use of the hand-line having been to a very considerable extent superseded by the seine. This is a much more efficient manner of taking them, but is said to be one involving great waste; as, wherever a very large number are taken, a considerable percentage die and become worthless before they can be properly cared for.

AMERICAN WHALE FISHERY IN 1871.

According to the New Bedford *Standard*, as quoted in the *American Chemist*, the whale fishery for 1871 was not by any means profitable. The prices for oil were reduced in consequence of the competition of the cotton-seed oil, lard-oil, petroleum, etc., while the expenses of constructing and fitting out vessels, as well as the wages of seamen, have considerably increased. Furthermore, the disaster of last fall to the arctic fleet, which destroyed all but seven out of the forty vessels fishing there, has been a serious drawback to success, especially in view of the fact that the remaining seven were obliged to leave in the busiest season to carry the shipwrecked crews to Honolulu. Thus there were brought in only 3070 barrels of oil and 27,981 pounds of whalebone, against 57,285 barrels of oil and 756,550 pounds of whalebone obtained by the fleet in the previous year.

The decline in this business is shown by the fact that while in 1852 the arctic fleet consisted of 278 vessels, in 1871 there were but 40 vessels, seven of which only, as already stated, escaped destruction. The whaling fleet of Hudson's Bay and Cumberland Inlet consisted of nine vessels, while there were scattering vessels in other parts of the ocean. The total catch of the year was about 41,000 barrels of sperm-oil, 76,000 of whale-oil, and 594,811 pounds of whalebone. In all there were 223 vessels engaged in the fishery, of which 144 belonged to New Bedford. It is estimated that only about 132 vessels will be employed in 1872. — *American Chemist, June*, 1872, 476.

TREATMENT OF YOUNG SALMON.

The inexpediency of keeping young salmon for some time after the yolk-bag is absorbed, and then letting them out in a body, is shown by the experiments of Professor A. D. Hager, when Commissioner of Fisheries for the State of Vermont. In December, 1869, this gentleman received 50,000 salmon eggs, and succeeded in hatching fully four fifths of the entire number. After the yolk-bag was absorbed they were fed for about a month, and then placed in certain streams in Vermont. They were very active and healthy in the hatching-boxes, and bade fair, when transferred to their proper abode, to answer the objects for which they were reared. They were placed in such localities as seemed most likely to secure them against attacks from other fishes; but it was found that, very shortly after they were planted, fish of all kinds, even the cyprinidæ, gathered from all quarters and fed voraciously upon them. A single dace of two inches in length was taken, in two minutes after the salmon were introduced, with four of them in its stomach.

The planting took place in June of 1870, and Professor Hager doubts whether five hundred survived to the month of August. The young fish seemed entirely incapable of any action in the way of self-preservation, remaining huddled stupidly together, and making no effort, by hiding or otherwise, to escape.

It is more than probable that if the fish had been placed in the water as soon as the yolk-bag was absorbed they would have hid themselves in the gravel, according to their natural instincts, and measurably escaped the attacks of their enemies.

PERIOD OF MATURITY IN AMERICAN SALMON.

According to the drift of observations upon the European salmon, about one half of the young, after being hatched, remain in the rivers one year before they go to the sea, the other half staying two years. They are then believed to pass down in the early spring, weighing from three to five ounces, and to return in the fall as grilse of as many pounds. After sojourning for a short time in the fresh water, they return again to the sea before winter sets in, and come back the next spring as breeding fish of nine pounds and upward. Such is the most generally accepted hypothesis on the subject.

Several intelligent observers in this country are inclined to disbelieve in a continued stay in the fresh water, and maintain that the young fish actually go to sea in the autumn of the same year in which they are born. Whether they come back the next year as grilse, or remain longer, they are unprepared to say. Indeed, in the waters of Maine it is said that grilse are very seldom seen, and that it is only the mature fish that make their appearance.

Recent examinations on the Miramachi are thought by Mr. Stilwell, of Bangor, to be strongly in favor of the assumption just referred to. He ascertained that the smolt spend the summer in the small brooks, where they remain until the autumn rains, after which they disappear, and are not seen any where after the month of October. Although trout were abundant, and could easily be captured, there was no evidence whatever that the young salmon remained in the waters.

DO SALMON FEED IN FRESH WATERS?

The question has frequently been started as to whether the salmon feeds in fresh waters, and careful examination of many specimens in England has failed to reveal any thing in their stomachs. During the past summer Mr. Charles G. Atkins, who has penned up six hundred salmon at Bucksport, Maine, with a view of keeping them until their spawning season, was careful to save the stomachs of all the fish that died in his charge, amounting to twenty or thirty in all. They were principally taken below Bucksport, in Penobscot Bay, in weirs, and brought alive to his establishment. The stomachs of these fish were submitted to Professor Sidney J. Smith, of New Haven, our leading carcinologist, in order that he might ascertain whether they contained remains of crustacea or other marine animals, and after diligent investigation he reports that nothing of the kind can be found. In the intestines of one specimen two small bits of wood were met with.

SALMON FISHERIES IN THE COLUMBIA RIVER.

Some idea of the economical value of streams abounding in salmon may be gathered from the statistics of the salmon fishery of the Columbia River during the past season, which lasted from April 1 to the end of July. The number of fish consumed fresh, on the river, and even exported to other parts along the coast, can not be ascertained with perfect correctness; but the San Francisco *Bulletin* gives the amount of the catch of salmon by six establishments for the purpose of canning and salting. From this paper we learn that during the above-named period 170,000 salmon were canned, weighing, when dressed, 2,700,000 pounds, and filling 26,250 boxes of 48 pounds each, their wholesale value amounting to $242,000. The pickled salmon amounted to 162,000, weighing, when dressed, 2,600,000 pounds, and filling 13,000 barrels of 200 pounds each, and worth $117,000. The total number of salmon taken in four months on the Lower Columbia, for canning and curing purposes, thus amounted to 332,000, weighing 5,300,000 pounds, and worth $359,000. The canned salmon of the Columbia River are rapidly finding their way to, and a ready market in, all parts of the world in consequence of their deep-red color, great richness, and fine flavor.—*San Francisco Bulletin, August* 15, 1872.

CAPTURE OF SACRAMENTO SALMON WITH THE HOOK.

Under the act of Congress authorizing the introduction of useful food fishes into the rivers and lakes of the United States, extensive arrangements have been made, as already announced, in reference to salmon, among other species; and while the large stock of eggs expected of the true *Salmo salar* is to be distributed in the waters of the Eastern States and of the great lakes, those of the Sacramento River species are to be placed in the Susquehanna River, and in streams to the south and west of it.

A serious objection has been raised to the introduction of the Sacramento fish, on the score of its furnishing no sport to the angler, on account of its supposed indifference to any tempting bait. We learn, however, from Mr. Livingston Stone, the gentleman in charge of the United States salmon-breeding establishment on the Sacramento, that this is entirely a mistake. We have received his own assurances, and through him those of others, that these fish are readily caught with a hook baited with salmon roe. Mr. Stone has himself seen fish weighing from fifteen to twenty-two pounds taken in this way, and he informs us that Mr. Isaac Frye, the proprietor of the hotel at Soda Springs, near Mount Shasta, has frequently taken in the Sacramento River as many as ten salmon in a day, averaging fifteen pounds each; and in one instance this summer he captured one of twenty-four pounds-weight.

BREEDING OF LEECHES.

According to Dr. Hessel, of Baden, the medicinal leeches shipped to the United States from Bremen, Hamburg, and Havre under the name of Swedish leeches have nothing whatever to do with that country, none occurring within its borders. They are obtained in Hungary, Wallachia, Turkey, and Southern Russia. Dr. Hessel, himself a highly esteemed and very successful fish-culturist, has been lately occupied in raising leeches for the market; and by making his selections with great care he has in stock a very superior quality that is highly prized. He succeeded in raising 400,000 in a period of two and a half years, and was only deterred from continuing the business on account of the very low price that they brought at wholesale—namely, fifty cents per hundred. He thinks that the physical conditions in the United States are especially favorable to the growth and culture of the medicinal leech, and that any one entering upon the business could readily command the market here, independently of foreign importations.

SPAWNING OF THE STERLET.

According to Professor Owsjannikow, the sterlet spawns in the Volga early in May, on rocky bottoms, the temperature of the water being at 54.5° Fahr. The eggs are readily fecundated by the artificial method. After they have been in the water a few minutes they adhere to any object which they touch. The development of the embryo can be observed in progress at the end of one hour. On the seventh day they hatch. At first the young fish are about one quarter of an inch long. At the age of ten weeks they are nearly two inches long. They feed on larvæ of insects, taking them from the bottom. Both in the egg, and when newly hatched, the sterlet has been taken a five days' journey from the Volga to Western Russia, and in 1870 a lot of eggs was carried to England to stock the river Leith. This species, like many other of the sturgeons, passes its whole life in fresh water.—3 *A*, *August* 3, 1872, 72.

TUNNY FISHERIES ON THE SOUTH SHORE OF THE MEDITERRANEAN.

Very extensive fisheries of the tunny are carried on on the coast of Tunis, especially that of Sidi Daud, or a small island separated from the main-land by a few yards of water. Upon this island, about a mile in circumference, are the stores, boiling and curing houses, oil-tanks, and all the necessary buildings. The fishing season commences in April and ends about the middle of July, and when in full force is managed by about 200 persons. The entire outfit required for this fishery is valued at $80,000, and the cost of running the establishment amounts to about $30,000 per annum, which will give some idea of the extensive scale upon which the work is prosecuted.

The tunnies, in their spring migration from the ocean to the archipelago and Black Sea, follow the shores of the Mediterranean in all their windings; and the traps are placed off the headlands, so as to intercept the fish in their movement. The arrangement for their capture is in some respects similar to that of the fish pounds on the coast of New England, the fish entering a bowl, and, when there, they are raised near the surface and killed by means of harpoons and boat-hooks. As many as 700 fish are sometimes taken at a time; more usually, however, not more than 400 or 500. They vary in number considerably with the season, and not unfrequently measure eight and half feet in length and four feet in diameter at the neck.

It is believed by the fishermen in the Mediterranean that the sword-fish precede the tunny for their protection against sharks. The small tunny, called pelamid, is also taken in considerable numbers. The nets are made of very strong rope to prevent the escape of these powerful fish. The flesh of the tunny is prepared as food in various ways, one method consisting in boiling it, and, when cooled and dried, packing it in barrels, and filling up the cavities with oil. A finer quality is also put up in tin cans. The larger part of the fish, however, are simply salted. A great deal of oil is obtained from the heads and other refuse of the fish, immense caldrons being used, capable of holding 800 heads and 400 skeletons at a time. After boiling, the mass is subjected to compression in powerful presses. While two to three thousand fish will pay the expenses of a season, the number actually captured sometimes amounts to from eight to fourteen thousand. The production of this establishment in 1871 was worth nearly £30,000. The demand for the fish is at present limited to the countries bordering on the Mediterranean; but it is becoming better known elsewhere, especially in Germany.—17 *A*, *September* 1, 1872, 326.

FISHING STATISTICS OF GREAT BRITAIN FOR 1869.

According to a return of a recent order of Parliament, the following are the statistics of the fisheries of the United Kingdom of Great Britain and Ireland in 1869. The number of boats employed was 42,960, with an aggregate tonnage of 242,179 tons. The total number of persons engaged in fishing was 160,748. Of the boats in use 4856 belonged to what is called the first class, 27,001 to the second, and 11,003 to the third.—*Proc. Roy. Inst., Cornwall, May*, 1872, 7.

FISHERIES OF THE SHUMAGIN ISLANDS.

A correspondent of the Alaska *Herald* writes from the Shumagin Islands in reference to the cod-fisheries carried on in that vicinity, and estimates the number of large fish taken during the season at 1,200,000. These will be sufficient to supply the California market, and leave something over for other points on the Pacific coast. The cod-fishing season commences in April and lasts until September, and the product from this source is rapidly increasing.

The cod-fish are generally taken by means of small boats whose crews go out from the shore or from vessels. Eleven and twelve inch hooks, baited with halibut or cuttle-fish, are generally used. A good fisherman will readily take four hundred fish in a day, although three hundred is a fair average. The fish are salted and packed away as soon as they are brought on board.—*Alaska Herald, October* 9, 1872.

UTILIZATION OF REFUSE FISH.

An important branch of industry has lately sprung up on the lakes, having for its object the utilization of certain fish formerly considered as worthless, and among them more particularly the sturgeon. It is not many years since that the sturgeon was regarded as of no value, and, although taken in great numbers in the pounds and traps, was always thrown away.

Messrs. Schacht Brothers, of Sandusky, Ohio, have, however, undertaken to utilize this fish, and opened an establishment for the purpose on a large scale. They now purchase all the sturgeon that are taken in the vicinity, and others sent from a distance; and after cleaning them they cut the meat into small pieces, which they salt and smoke. Whatever is not to be prepared immediately is frozen, and kept in that condition until it can be worked up. From the eggs they make caviar, while the bladder is converted into isinglass of the best quality. The offal of the head and other parts is boiled, and the oil extracted, and every part of the fish is converted to some useful purpose, a good price being obtained for the different products.

In 1872 there were worked up at this establishment 13,800 sturgeon, averaging fifty pounds each, at a cost of a little over a dollar apiece, ten or twelve men being employed during the fishing season. The smoked meat is sent to the South and Southwest, where there is a large demand for it. The oil is used in tanning; the greater portion of the isinglass is employed by brewers and wine manufacturers for purposes of clarification; and the caviar is shipped to Germany, where it competes well with the genuine Russian article. In addition to the smoked sturgeon, they also put up a very excellent quality of smoked whitefish and lake herring.

PECULIARITIES OF REPRODUCTION OF CALIFORNIA SALMON.

The inquiries of Mr. Livingston Stone, made under the direction of Professor Baird, United States Commissioner of Fish and Fisheries, in relation to the salmon of California, have revealed a very remarkable difference in the eggs of that species as compared with those of the true *Salmo salar* of the Eastern States. The most noticeable fact is their relatively small number, the former having 700 to the pound instead of 1000. The eggs are, however, appreciably larger than those of the Atlantic coast, being almost equal in size to a common whortleberry. Owing probably to the higher temperature of the water, or to other causes, the development is much more rapid, since the eye spots are visible in the eggs within nineteen days after impregnation, and they begin to hatch in twenty-four days afterward, making a total of only forty-three days as the period of incubation.

The hatching water varied in temperature from 55° to 65° and even 70° every day, so that it is difficult to say what is the average temperature for the hatching period; but Mr. Stone estimates this at 58° to 60°. Fourteen hours out of the twenty-four—namely, from 6 o'clock P.M. to 8 o'clock A.M.—the water averaged nearly 55°.

The eggs after spawning were treated according to the dry method of impregnation, and the experiments were successful in nearly every instance.

Another curious fact noticed by Mr. Stone was the entire absence of female grilse, all of the great number observed on the M'Cloud River being males; and, indeed, he remarks that he has never seen a female grilse elsewhere, although persons assured him that they had had a different experience.

WINTER QUARTERS OF NOVA SCOTIA SALMON.

Dr. Gilpin, of Halifax, communicates a very interesting and remarkable fact in regard to the natural history of the salmon and sea-trout of the Atlantic coast of Newfoundland. He is quite satisfied from his own observations that these fish, after running up the rivers in the spring to spawn, pass on up to the lakes that form the head waters to spend the winter, or else run up specially from the sea for the purpose. He suggests that this may possibly be due to the limited extent of the salmon streams on that coast, the fish spawning only five, ten, fifteen, or thirty miles from the sea, their movements being between the months of March and November, some going up and others coming down, in different broods or ages.

GROWTH OF SALMON.

According to observations at Hameln, on the Weser, the young salmon, as generally supposed, usually return about the expiration of their second year to the ocean, and remain there, not one year only, but two, before going back to the river from which they had previously descended. It has been shown by numerous observations at Hameln that between the birth of the salmon and its first return from the ocean an interval of four years commonly elapses. Thus, the newly-born salmon, which were put into the water in the spring of 1868, in Silesia, ascended the Upper Oder in March, 1872. Of these several weighed from nine to twelve pounds, but the majority from five to eight.—*Circular of Deutsche Fischerei-Verein*, x., 1872, 263.

BEST KIND OF WATER FOR SALMON-HATCHING.

A controversy has arisen between Dr. Hetting, Norwegian inspector of fish at Christiania, and Von der Wengen, in reference to the most desirable water for hatching out the eggs of salmon; the former recommending that this be taken from a point as near to the origin of the spring as possible, while the latter insists that by so doing there will be a scarcity of air in the water, which will have a pernicious effect upon the health of the young fish. He thinks that it is of the utmost importance that the water should previously traverse a considerable distance, and be more or less disturbed by falls and obstructions, so as to absorb a large amount of atmospheric air.—*Circular of Deutsche Fischerei-Verein*, x., 1872, 265.

ALLEGED DISCOVERY OF YOUNG SHAD IN THE SACRAMENTO RIVER.

The Sacramento *Record* contains a paragraph to the effect that during the past summer some Indians, while fishing in the Upper Sacramento, near the mouth of Pitt River, caught several fish of a kind entirely unknown to them. These on being exhibited to Mr. Esmore, residing on the river near that point, were pronounced by him to be genuine shad. It is well known that in June, 1871, Seth Green succeeded in transferring about 10,000 young shad from the Hudson River to the Upper Sacramento, and strong hopes were entertained that these might be the beginning of a supply of that fish in the Sacramento. They were not looked for, however, until the expiration of at least three years from the time of birth, which would be in 1874.

The Indians will doubtless regret as much as we do that the question was not placed beyond any doubt, as Seth Green offered $50 reward for the first shad caught in the river. We shall be glad to have any additional facts on this subject that may come to the knowledge of any of our correspondents in California, as the subject is of great interest and importance. —*Sacramento Record.*

REPORT OF FISH COMMISSIONERS OF VERMONT.

The report of Dr. M. C. Edmunds and Dr. M. Goldsmith, Fish Commissioners of the State of Vermont, of their operations for the years 1871 and 1872, has just been presented to the Legislature, and published by its order. They state that the previous Commissioner, Professor Hager, having left the state in 1870, there has been no report since 1869. Professor Hager's experiments, however, succeeded in placing some 40,000 salmon in the waters of the state, most of them in the Williams River, near Chester, the locality of his hatching-house.

Some misgivings are expressed by the Commissioners as to the probable fate of these fish, which we fear will be confirmed by future experience, as the young fish were retained and fed in the hatching-house too long after the yolk-bag was absorbed to give them that shyness which their safety required, while they were not kept long enough to pass through the period when any cyprinoid could readily devour them.

The present Commissioners are, however, of the opinion that all the streams heretofore inhabited by salmon can be restocked by this fish, especially if suitable fish-ways are constructed in the dams upon the rivers. A portion of the report is occupied by a statement connected with the construction of fish-ways at the dams on the Connecticut River, which at present prevent the upward passage of the fish to Vermont. They express the hope that, before long, legal action will be taken which will result in the removal of the obstructions.

They also report an experiment of introducing shad into the waters of Lake Champlain, fifty thousand young ones from Seth Green's establishment on the Hudson having been placed in Burlington Bay. As the same number had been deposited by Mr. Green, on behalf of New York, at Whitehall, near the head of the lake, about the same time, it is thought that these 100,000 young fish may serve as a satisfactory basis for this experiment.

In conclusion, the Commissioners recommend to the Legislature—first, the passage of laws for preventing the capture of any kind of fish during the spawning season, with the exception (and that under proper restrictions) of such fish as shad and salmon, which come into the waters of the state at the spawning season only; second, that the possessor of fish taken in the prohibited season be subject to the same penalty as the person capturing them; third, that fish-wardens be appointed, with proper authority; fourth, that the Legislature shall properly define and guard the rights of private property in fish and fisheries; fifth, that laws shall be enacted to compel all persons who build dams to provide them with suitable fish-ways. These, the most important of the recommendations, are supplemented by others looking to the same object—namely, the increase and maintenance in proper number of the more valuable food fishes of the state.

K. DOMESTIC ECONOMY.

SAFETY MATCHES.

Casualties are continually occurring from fires caused by ignition from the still burning ends of lighted matches thrown carelessly aside; and it may be of interest to learn that a mode of preparation has lately been devised by which such a result may be entirely prevented. The principle of the new match consists in impregnating the wood of which it is made with a chemical solution which prevents the carbon from remaining a fiery mass for a single instant, as in the case of ordinary matches, so that as soon as it is blown out it may be thrown with perfect safety upon inflammable or explosive substances. The manufacture is said to be no more expensive than of those now in use.—3 *A*, *November* 4, 1871, 354.

SUBSTANCE FOR EXTINGUISHING FLAME.

A composition for extinguishing flame, claimed to be extremely efficient, has recently been introduced. It consists of the following preparation: Two hundred pounds of hydrochloric acid, saturated with lime, are placed in a wooden vessel lined with lead; to this eighty-eight pounds of a saturated solution of ammonia salt and the same weight of a saturated solution of borate of soda are added. The mixture is then stirred and allowed to settle, and when clear is decanted and concentrated to crystallization. The substance thus prepared is now introduced in liquid form, or in a powder, into the water used to extinguish the fire. About one pound per gallon for the first five hundred gallons should be used, and afterwards half this amount will be sufficient.—18 *A*, *December* 15, 1871, 319.

PROPER MODE OF EXTINGUISHING KEROSENE LAMPS.

Explosions of kerosene lamps are frequently produced in the attempt to extinguish them by blowing down the chimney. This is a very dangerous practice, and should always be avoided. The desired result will be accompanied much more certainly and safely by giving a sharp and rather prolonged puff exactly at right angles to the top of the chimney. The draft thus created draws the flame away from the wick, when the carbonic acid immediately below the departing flame also extinguishes the red-hot charred end of the wick. —18 *A*, *January* 5, 1872, 402.

REPORT ON KEROSENE.

The services of Professor Chandler, in his official connection with the Board of Health of New York, in the investigation of the chemistry of adulterations, in the past, are well known and appreciated. He has now added to the series of researches in this direction by the publication of a report upon petroleum as an illuminator, in which he shows the advantages and perils which attend its use, with special reference to the prevention of the traffic in dangerous kerosene and naphtha. We commend this valuable memoir, which belongs to the report of the Board of Health of New York for 1870, to the attention of all persons interested in the subject. He thinks that the only way to protect the public against these dangers is to educate it as to the properties of petroleum, this being done most effectually through the newspapers, which are published in every city and village, and by the issue of clear statements in regard to it in the form of circulars. The experiment has been successfully tried in New Orleans and some other places; and when the people are fully informed in regard to the dangers connected with the use of the compounds of naphtha, dealers in them will go out of business for want of purchasers. He also thinks that the Legislature of each state should pass stringent laws, with severe penalties, for the regulation of petroleum products.

IMPROVED STOVE.

When the last German arctic expedition was about preparing for its voyage to the north pole, Captain Koldewey asked the aid of scientific men in devising a stove that would answer the double purpose of supplying a sufficient amount of heat and of economizing the fuel. Various responses were made to this appeal, and among the patterns furnished that of Professor Meidinger, of Carlsruhe, was considered the best. This is simply an iron stove having a double wall, with a space about two inches wide between the outer and the inner one, to which the air has free access above and below. The cold air being always at the bottom, and the warm air ascending, it follows that all the air in the room is being constantly forced through the space between the outer and inner covering of the stove; or, what is the same, is being constantly heated. Connected with this is another ingenious device. The coal is put in from the top, and fills the whole inside of the stove, which is about six feet high, more or less. It is then lighted at the top, and kept burning by the draught created by valves inserted both in the side walls and at the bottom of the stove. The more valves that are open the greater the heat, so that the temperature of the room can be regulated to a nicety. At the same time, the outer wall, being a distance from the inner one, never reaches the excessive heat which is so great an objection in ordinany iron stoves. The expense of fuel to produce a sufficient amount of heat is very much less than that for ordinary stoves, and the new invention is rapidly coming into use in Germany.—*Bull. Soc. d'Encouragement pour l'Industrie Nationale.*

TEMPERATURE FOR COOKING.

Dr. Jeannel, in a memoir presented to the Academy of Medicine of Paris, recommends the cooking of food at a temperature below that of 212° Fahr., and says that the heat of boiling is in many, if not in most, cases beyond that which is actually required, and, if continued during the whole process of cooking, has two inconveniences; first, that of dissipating the aromatic principles of the food to the detriment of its flavor; and, second, that it involves a great waste of fuel and an inferior result. Thus meat and leguminous vegetables (pease, beans, etc.), fresh or dried, are best treated at 200° F. At this temperature a little more time is required than at the boiling point under the ordinary pressure—the proportion being 16 to 15 or 14 for meat, and 5 to 4 for potatoes or dried legumes. The consumption of fuel is as about 40 to 100, or even less, this being determined by very careful experiments with an automatic regulator in a gas stove, by which it was ascertained that to maintain water at a temperature of 200° Fahr., instead of at the boiling-point (212°), required the consumption of fuel in a ratio of 35 to 100.

Bouillon and beef are much more savory when cooked at

200° F., and without any ebullition other than what is necessary for skimming, the duration of which should not exceed fifteen minutes. In boiling at 200° the yield of cooked meat is increased from three to six per cent.; the yield of bouillon is increased ten per cent. Thus we can obtain a quantity of bouillon equal to that which we had at 212°, and nevertheless diminish by ten in the hundred the portion of water placed in the pot. To maintain the cooking at the degree of heat mentioned, it would, of course, be necessary to make use of some kind of thermometer properly secured against danger of breaking by the ordinary carelessness of cooks. These, however, have been manufactured, and can be obtained at the house-furnishing establishments in Paris.—4 *B*, *November* 15, 1871, 838.

SUBSTITUTE FOR CREAM.

Some German experts maintain that cream can be dispensed with in the manufacture of ice cream without appreciably affecting the quality of the product. They consider cream as milk rich in butter, and contend that milk changed into an emulsion by boiling with butter and some saccharine substance will absolutely replace cream. The butter, of course, must be perfectly sweet. They give the following recipe for vanilla ice cream as furnishing a very satisfactory result. The ingredients are, fifteen ounces of sugar, two eggs, two ounces of good sweet butter, one quart of milk, one gill of water, and a small piece of vanilla for flavoring. Here the cream is represented by milk and butter. The yolk of the egg is essentially a fatty albumen, and housekeepers are advised, wherever economy is desirable, to make use of the above substitutes. In reference to fruit ices, it is to be observed that concentrated sirups do not freeze at all, and when too much diluted they are hard and watery; as to strawberries, ladies are reminded that boiling entirely destroys their peculiar flavor.—4 *C*, V., VI., 41.

FISH AND SAUCE.

A dish known in Scotland as "fish and sauce" is said to be very palatable when properly prepared. Fresh haddock are to be cleaned, and the heads, tails, and fins to be cut off. All of these latter are to be thoroughly boiled, to make stock.

This, when done, is to be strained, and the liquid part, with the addition of a little flour mixed with cold water, butter, salt, and some chopped parsley, to be poured over the fish, which has been previously cut in pieces, and the whole boiled till sufficiently cooked. The result is said to be much more savory than if the fish were simply boiled in water.—18 *A*, *March* 1, 1872, 625.

PREPARATION OF FRUIT JUICES.

It is well known that the juices of many kinds of fruit are so extremely delicate that they can not be preserved by the ordinary methods of heating so as to retain the flavor, this being especially the case with the raspberry. To meet this difficulty, Mr. Greger advises us to take perfectly ripe, dry, and clean berries, and to mash them in an earthen jar with a wooden pestle, so as to obtain a homogeneous mass. To this five to ten per cent. of grape or cane sugar is to be added, and the whole then allowed to stand, being stirred occasionally. An alcoholic fermentation will before long take place, in the course of which the pectine will separate completely, leaving the perfectly clear juice, which will be found to retain all the peculiar aroma of the raspberry.

For preparing strawberries, two pounds of berries are to be selected, as directed for raspberries, and placed in a large-mouthed bottle without mashing, so as to fill the bottle one half to two thirds; two and a half pounds of finely pulverized sugar are to be added, and the whole shaken up frequently, at the ordinary temperature, without heating. The sugar will extract the moisture from the berries, and form a clear sirup possessing all their flavor and odor, which may be separated by straining. This juice will keep perfectly by the addition of one fifth of its bulk of alcohol.—4 *B*, *November* 15, 1871, 837.

PRESERVING FRUIT IN RUSSIA.

A method of preserving fruit, in extensive use in Russia, consists in moistening quick-lime with water containing a little creosote, so as to cause it to fall into powder. The fruit is to be packed in a wooden box, the bottom of which is filled in to the depth of an inch with the lime. This stratum is to be covered with a sheet of paper, and the fruit laid upon this, each piece by itself, so that no one touches another. A sheet of paper is to be placed on the top of this layer of fruit, and then a second layer of lime sifted in. In this way, lime, paper, and fruit are to alternate until the box is filled. The corners are then to be filled with finely powdered charcoal. By covering the box with a tightly fitting top, the fruit can, it is said, be kept fresh for at least a year.—10 *C*, *March*, 1872, 43.

DECOLORIZATION OF FRUIT SIRUPS.

Carbonate of iron, it is reported, furnishes an excellent material for decolorizing sirups, fruit juices, oils, and even gases. —15 *C*, VII., 112.

USE OF AMMONIA IN MAKING PRESERVES.

We learn that very satisfactory experiments have been made in using ammonia to lessen the amount of sugar required in preserving acid fruits. In the course of the operation a small quantity of ammonia is to be stirred in, and its effect carefully noted. The alkali of the ammonia, combining with the acid of the fruit, produces a neutral reaction, which permits the sugar to have its full effect. An excess of ammonia can be remedied by the introduction of a little vinegar.—5 *C*, XLII., 336.

IMPROVEMENT OF POTATOES.

A German writer remarks that the first early potatoes contain proportionally a great deal of water and but little mealy matter, which renders them less palatable than when ripe. He mentions, however, that by a more careful treatment during boiling they can be considerably improved. This may be accomplished by heating a second kettle of water at the same time with that containing the potatoes, so that, after the latter have been boiled for some time, the water is to be poured off, and that from the other kettle substituted, and the cooking completed. A great improvement in the potatoes will be found to be the result. Indeed, it is not early potatoes alone that are benefited by this process, but those of any age, and whether peeled or not.—*Landwirthschaftliche Mitth. Cassel*, VIII., 1871.

TREATMENT OF FRESH VEGETABLES.

Those who value fresh vegetables and sweet salads will never have them washed in the garden. Neither the one nor the other should be washed, says the *Gardeners' Chronicle*, until they are just about to be cooked or eaten. Even potatoes lose flavor quickly after being washed; so do carrots and turnips; while water will speedily become tainted in summer in contact with cauliflowers and cabbages, and thus destroy their freshness and flavor. The case is still worse with salads. If washed at all, it should be only just before they are dressed, and they should be dried and dressed immediately. Nothing ruins the flavor of vegetables and renders good salads uneatable sooner than water hanging about them. If lettuces are quite clean, they make the best salad unwashed; but, if washed, the operation should be done quickly, the water instantly shaken out, and the leaves dried with a clean cloth.

The best practice is simply to remove all superfluous earth by scraping or rubbing, and all rough tops or leaves by cutting. Enough tender leaves may still be left on cauliflowers and broccoli to overlap the flowers. Salad should be sent in from the garden with most of the outside leaves and main root on. The tender leaves are easily tainted and injured by exposure, and if the chief root is cut off sharp, much of the juice oozes out at the wound. Where vegetables and salads have to be bought from a green-grocer, the conditions are altogether different. Not only washing, but soaking, often becomes requisite to restore something like pristine crispness. —18 *A*, *May* 31, 1872, 268.

USE OF ANÆSTHETICS IN BUTCHERING.

Dr. Richardson has lately urged, in a paper before the Medical Society of London, the employment of anæsthetics in killing animals for the table, as banishing the pain, and removing the distressing features attendant upon the methods at present adopted by the butchers. He proposes, as a preliminary to the blow of the poleaxe or the knife of the slaughter-house, the use of a combination of coal gas with bichloride of methylene or chloromethyl. The apparatus for applying this consists of a tin reservoir, which is hung to a nail in the wall of the slaughter-house, and is intended to contain the bichloride of methylene. To this reservoir two India-rubber tubes are attached, one terminating in a common gas jet, the other in a tin funnel, large enough to receive the nose of a sheep or other animal, and furnished with a strap and buckle for fixing it to the head. The muzzle being fixed, the tap is turned, and the gas suffered to bubble through the bichloride and pass on to be breathed by the animal. In a minute complete insensibility to pain is produced, the animal breathing the gas without struggling or apparent pain. For large animals it is proposed to construct chambers filled with the mixed vapor, the mere passage of the animal through which would render it insensible.—2 *A*, *November* 11, 1871, 331.

PREPARED MEAT-JUICE.

A new form of prepared meat-juice is now in the market, extracted by pressure, and solidified by gentle evaporation. This prepared meat contains the juice of the muscular tissue, together with an amount of albuminous matter. When the extract is submitted to the action of boiling water the albuminous matter coagulates, leaving the meat-juice in the form of a clear, light amber soup, from which the coagulated albumen can be strained off if desired.—20 *A*, *March* 30, 1872, 387.

USE OF ASEPTIN IN DOMESTIC ECONOMY.

We have already referred to the introduction into the arts of a substance called aseptin, and used for the preservation of milk and meat in hot weather. The use of this has been greatly extended during the past year in Northern and Central Europe, and is considered an important feature in domestic economy. What is called simple aseptin consists merely of borax or boracic acid, while the double aseptin contains two parts of borax and one part of ordinary alum, the former being used for the preservation of milk, and the latter for meats. The rationale of its action is believed to consist in its influence upon the microscopic organisms which produce rancidity, acidity, and putrefaction, killing them entirely, or at least preventing their development. The mould plant, however, seems to be an exception to this action, as, in fact, it appears to thrive under the influence rather than otherwise. Reliable experiments with this aseptin seem to show a positive virtue in the application, and to indicate that, during the warm weather of midsummer, where other preservatives have been unsuccessful, this answered the purpose perfectly.—9 *C*, *September*, 1871, 67.

NEW MODE OF PRESERVING MEAT.

A new plan for meat-preserving, according to the *Quarterly Journal of Science*, has been introduced by an engineer whose experience in sugar refineries and other extensive works, in hot climates, has given him a practical and economical solution of one of the most important problems of the day. This gentleman, Mr. T. F. Henley, does away with steeping meat in water, and otherwise treating it in the most costly way. He simply squeezes a definite amount of juice out of the fibre, and by mechanical desiccation preserves the latter intact. The pressed meat thus obtained contains ten per cent. of alcoholic extract and salt, and over fifty per cent. of fibrine and other albuminoid constituents. It is exceedingly rich, and so is the meat-juice, which Mr. Henley evaporates in vacuum pans. The juice contains about fifteen per cent. of alcoholic extract, and over fifty per cent. of albumen. The ancient method of abstracting water only from the animal matter is relied on as a preservative, and the low temperature at which the evaporation is carried on prevents any loss of flavor or other deterioration. It is perhaps strange that so cheap and simple a process should not have been suggested before. Mr. Henley has experimented upon it for some time, and so perfected it as to insure its immediate adoption. The first works, on an extensive scale, are to be opened on the River Plate, on the Estancia Nueva Alemania, where cattle have been reared and fattened for the European markets. Not the least merit of the new process is the great diminution in bulk of the preparation.—16 *A*, *October*, 1871, 548.

DISINFECTING WASHING POWDER.

A new disinfectant, to be used in washing, has been described. For its preparation, 100 parts of white clay, 1000 parts of distilled water, and 35 parts of ordinary nitric acid are to be mixed together. The mass thus obtained is allowed to stand for a few days, being stirred frequently. The supernatant fluid is then poured off, and the clayey mass thoroughly washed with distilled water. Five parts of permanganate of potash are now added, and the composition, when dried, is made up into tablets, and wrapped in paper saturated with paraffine.—18 *A*, *January* 12, 1872, 429.

COMPOUND FOR WASHING LINEN.

According to the *Moniteur Scientifique*, an excellent substance for washing linen, and one not possessing the destructive effect of soda and other washing powders, is prepared as follows: Two pounds of soap are dissolved in five and a half gallons of nearly boiling water, and to this is added three large table-spoonfuls of ammonia and one of spirits of turpentine. In this the linen is to be soaked for three hours, when it is readily cleansed, requiring but little rubbing. Ammonia does not affect linen nor woolen fibre as soda does.—15 *A*, *April* 20, 1872, 501.

CHLORIDE OF LIME FOR NOXIOUS VERMIN.

Chloride of lime, it is stated, furnishes the best means for driving away noxious insects and rodents. It appears to be especially obnoxious to rats and mice, so much so, indeed, that they are said to leave at once when chloride of lime is scattered about. The same substance is also said to aid in freeing fields, farms, gardens, etc., from fleas, caterpillars, etc., the only requirement being the sprinkling of the infected places, during dry weather, with finely pulverized chloride of lime, and to continue it occasionally as necessity may require.—10 *C*, *January*, 1872, 14.

LABELS ON BOTTLES.

It often happens that written labels on bottles are wetted by the contained liquid, and the ink is thus caused to run, rendering the inscription illegible, and producing an unsightly appearance. It is stated that if, after the label is completely dry, it be rubbed over with a piece of paraffine, so as to impart a slight coating of this material to it, it will resist the action of acids, alkalies, water, and other substances. The paraffine should be well laid on, and when applied, the surface of the paper may be smoothed by rubbing with an ivory paper-cutter.—6 *C*, 1871, 468.

IMPROVED STARCH.

A beautiful finish can, it is said, be given to articles to be starched by taking one fourth of a pound of starch, and working it over, and kneading it with a little water, then placing five or six pints of water in a pan, and adding to this a very small quantity of powdered borax, a small piece of sugar, and a fragment of white wax about the size of a hazelnut, and heating the whole sufficiently. This water is then to be added to the starch, stirring it continually, and mixing the two together until the whole is as thick as is convenient for application. If the articles are to be made quite stiff, the strength of the starch may be increased two or three fold.—9 *C*, *November*, 1871, 86.

RAT CATCHING.

We borrow from the Philadelphia *Ledger* an account of the methods used by the professional rat-catchers of Paris to destroy the rats which infest the sewers, slaughter-houses, and other localities in that city: "They take a deep tub, with water on the bottom, and a little elevation in the middle like an island, on which is only place for just one rat to sit. The top is covered, and has a large balanced valve, opening downward; on the middle of this valve a piece of fried pork or cheese is fixed, and when the rat walks on it to get the cheese the valve goes down, drops the rat in the water, and moves back in position. A road is made from a rat-hole to the top of the tub by means of a piece of board rubbed with cheese, so as to make the walk attractive for the rats. In the course of a single night some ten or twenty, or even more, rats may go down, and if the island was not there they would be found almost all alive in the morning, quietly swimming around; but the provision of the little island saves the trouble of killing them, because their egotistic instinct of self-preservation causes them to fight for the exclusive possession of the island, of which, in the morning, the strongest rat is found in solitary possession, all the others being killed or drowned around him."

Hearth and Home, for the 6th of July, contains directions for making traps of the kind referred to in considerable variety, which may be consulted to advantage by those who wish to experiment upon the subject.

DETECTING ADULTERATION OF GROUND COFFEE.

The method of detecting the adulteration of ground coffee is stated to be as follows: If, on opening the package, the contents are caked, or show a disposition to cake, chicory is present. If, on adding a few drops of cold water to a grain or two of the suspected article, the water becomes almost immediately of a brown color, chicory is surely contained in it. Further, on touching with the point of a needle the particles which have been wetted with water and spread out on a slip of glass, if some are found which are non-resisting, soft and yielding, the sample is adulterated. Lastly, the presence of chicory is immediately revealed by the great difference in the forms of the cells, as seen under the microscope. In the case of coffee the cells being coherent and angular, and in that of chicory rounded and composed of smaller cells, the differences are so marked that, once seen, they can never be forgotten.—20 *A, December* 9, 1871, 727.

SEA-WATER IN BREAD-MAKING.

It was stated at a meeting of the Academy of Sciences of Paris that while excellent bread can be made with sea-water, and that this forms a good tonic, soup or broth made with sea-water is entirely uneatable. It would appear that the chloride of magnesium in the sea-water is raised to a temperature, during the process of baking, sufficiently high to effect its destruction, and thereby cause its peculiar taste to disappear, which is not the case when merely boiled, as for soup. If, however, cane-sugar be added to the soup, a compound is said to be formed of the sugar with the chlorides which has not the disagreeable taste of the latter.—6 *A, December* 23, 1871, 814.

IMPROVED MODE OF BREAD-MAKING.

Les Mondes gives an account, by Dr. Sezille, of an improved method of bread-making from entire wheat. This consists in first removing the husk of the grain by means of properly constructed machinery, and then acting upon it several times with tepid water, at about 176° Fahr. for the first bath, and 104° for the second, by which the cover of resinous gum of the grain is dissolved and removed. This removal is necessary, on account of the fact that this substance becomes very deep brown—almost blackish colored by the fermentation of the dough. The grain, during the treatment in question, absorbs from 65 to 70 per cent. of water, and is then reduced to a paste by means of machinery very similar to that used in chocolate mills. This perfectly white paste is next leavened, and, after fermentation, is ready for baking. By this process, from the same quantity of grain which, by the usual method, furnishes 235 to 240 pounds of bread, the yield is increased to 320 pounds, of very superior quality, and far greater nutritive power. In addition to this, a very considerable saving of labor and expense is the result of the application of this new process, which has been thoroughly tested by competent and independent scientific, as well as practical men.—1 *A, December* 1, 1871, 264.

VIENNA YEAST.

The good qualities of Vienna beer and bread are celebrated all over Germany, and are due to the excellence of the yeast used in preparing them. According to Dr. Vogel, the formula for preparing this substance is as follows: Previously malted barley, maize, and rye are ground up and mixed; next, put into water at a temperature of from 150° to 170° Fahr.; after a few hours, the saccharine liquid is decanted from the dregs, and the clear liquid brought into a state of fermentation by the aid of some yeast. The fermentation becomes very strong, and, by the force of the carbonic acid which is evolved, the yeast globules (the size of which averages from 10 to 12 millimeters) are carried to the surface of the liquid, and there form a thick scum, which is to be removed by a skimmer, placed on cloth filters, drained, washed with a little distilled water, and next pressed into any desired shape by means of hydraulic pressure, and covered with a strong and stoutly woven canvas. This kind of yeast keeps from eight to fourteen days, according to the season, and is, both for bakers and brewers, very superior to that ordinarily used.—1 *A, December* 8, 1871, 276.

KEEPING FLOWERS FRESH.

Dr. Piesse, the celebrated perfumer, has lately suggested a method of preserving flowers, which has been found to give excellent results, and consists simply in immersing them for a moment in melted paraffine, drawing them out quickly, and shaking them gently, so as to remove the excess. For this treatment it is necessary that the flowers be fresh plucked, and entirely free from drops of rain or dew. The paraffine must be heated only enough to be liquid, as a greater degree of temperature would injure the flowers. The flowers are to be immersed one by one, and shaken about somewhat, so as to prevent the adhesion of bubbles of air to the surface. Such portions of the flowers as can not be easily preserved are to be trimmed away, before immersion, with scissors.—6 *B, January* 18, 1872, 28.

PREVENTION OF "WIGGLERS" IN WATER.

A writer in the "Scientific American," who has been much troubled by the occurrence of what he calls "wigglers" in his rain-water casks, states that by pouring a thin film of kerosene oil on the surface, and stirring it a little, so as to make the film of oil entirely continuous, the difficulty will be entirely cured.

These animals consist principally of the larvæ of the musquito and other diptera, which are developed from eggs laid by the parent on the surface of the water. Contact with the oil kills the egg at once; and the larvæ, on arriving at the surface for the purpose of completing their transformation, are also killed. It is necessary to draw the water off from below through a spigot, in order to prevent any disagreeable taste or odor.—6 *D, August* 10, 1872, 84.

TEST OF ALUM, ETC., IN BREAD.

A test for the presence of alum in flour used for bread consists in applying a drop of alcoholic extract of logwood. This, upon pure bread or flour, produces, according to Büchner, a yellowish-brown color; while, if alum be present to the extent of one or two per cent., a gray blue or gray violet is observed. With one half per cent. of alum the spot is a reddish yellow, surrounded with a blue-gray border, and minute specks of blue can be observed in the dish on examination with a lens. With one fourth per cent. the blue border is no longer visible, but the specks can still be detected.—3 *A, July* 20, 1872, 29.

BORAX AS A PRESERVATIVE OF MILK.

The use of borax as a preservative for milk and meat has lately become very extensive in Sweden and elsewhere in the northern part of Europe, the application being made under the name of aseptin. In a recent experiment, a dram of borax was dissolved in a quart of new milk, and a faint acid reaction was appreciable only after the lapse of 96 hours. After 120 hours only a film of cream had separated.—22 *A*, *August* 31, 1872, 210.

NEW PICKLE FOR MEAT.

A new saline solution for pickling meat, invented by Mr. Newton, is prepared by mixing 84 parts of the bisulphate of magnesia with 92 parts of bisulphate of lime. The former salt is obtained by saturating bisulphate of lime with the carbonate of magnesia, and the latter by treating bisulphate of magnesia with carbonate of lime. The specific gravity of the solution to be made should vary between 1.020 and 1.080, or thereabout.—4 *B*, *July*, 1872, 565.

MEIDINGER FREEZING APPARATUS.

Dr. Meidinger of Baden has constructed a little apparatus for freezing cream or cooling wine, etc., which has been very favorably received, as being simple, elegant, and automatic. The freezing mixture consists of finely pounded ice and a saturated solution of table salt. Since, however, the melting ice necessarily dilutes this solution, a reservoir containing dry salt is introduced in such a manner as to constantly supply the deficiency of salt and keep the solution unaltered upon the point of saturation. For this purpose Dr. Meidinger advises the following arrangement: In an external cylindrical vessel, a bad conductor of heat and very much like our common water cooler, an annular perforated vessel is suspended, to contain the dry salt above mentioned. A slightly conical metallic cup receives the material to be acted upon, and fits into the circular opening left for the purpose. The mush of pounded ice and brine is poured into the outer vessel, up to a certain mark, just enough to make it rise to the very rim, as soon as the cup containing the cream, etc., is slowly pressed down. This rising ice mixture enters the reservoir of dry salt, and, as long as ice is melting, salt will be dissolved, and the cooling action will thus be kept uninterrupted. No turning is required; the freezing compound, however, should be stirred occasionally, as the portion in immediate contact with the freezing mixture will congeal first. The temperature attained is about 6–7° below zero of Fahrenheit.—8 C, *May*, 1872, 192.

ABNORMAL COLORATION OF RYE-BREAD.

It has been frequently observed that rye-bread is discolored from the seeds of several species of weeds gathered with the grain. In most cases such bread is not absolutely injurious, but neither the taste nor the looks are improved by an extraordinary blue, reddish, or black tinge. Lately blue-violet rye-bread was submitted to Professor Ludwig, of Jena, for examination. He found the cause of the coloration to be the seed of the *Crotalaria juncea*, which in comparatively small quantities injures the appearance of good and healthy bread. Prof. Ludwig succeeded in separating the coloring principle, and named it *Rhinantin*. It consists of colorless crystals, and it has not yet been ascertained how the process of baking develops the peculiar blue-violet shade.—8 C, *May*, 1872, 195.

PASTEUR PROCESS FOR WINES.

Pasteur, some years ago, published the result of experiments tending to show that if wine, beer, and other fermented liquids were thoroughly sealed up, and then subjected to a temperature of 130° to 150° Fahr., any subsequent change by fermentation would be avoided, and the liquid could be kept indefinitely in the same condition. This, in his opinion, was due to the fact that fermentation is produced by a yeast fungus, the spores of which are contained in all liquids exposed, even momentarily, to the atmosphere. By heating the liquid, after being hermetically sealed, to a sufficient degree to destroy the vitality of these spores, germination is prevented, and further alteration stopped.

This announcement was one of immense practical importance, and its value has now become well established. Not only wine, beer, cider, etc., are protected in this way, but fruit, preserves, and the like. In a recent communication to the Academy of Sciences in Paris, Pasteur gives the result of the experiments which he has made, as to whether this process alters in any way the flavor of the wine—the test being made with twenty-four varieties of wine, a portion of each kept in its original condition, and another portion subjected to the Pasteur process. As a general result, he finds that in every instance, besides the preservation of the heated wine from the deteriorating changes generally experienced by other samples, the flavor was actually improved, the usual effect of age being manifest in a much shorter period than usual.—6 *B, August* 5, 1872, 303.

RECOVERY OF WASTE CAFFEIN.

Mr. Thomson suggests the propriety of collecting the large percentage of caffein exhaled in the process of roasting. He says that 75 grains can be obtained from one pound of coffee, which would amount to 140 tons of caffein from the coffee consumed in Great Britain. Caffein being absolutely insoluble in a concentrated solution of carbonate of soda, the latter is quite convenient for its separation.—8 *C, May*, 1872, 202.

POISONOUS VANILLA CREAM.

It has been occasionally observed that the eating of vanilla ice-cream proves injurious, and produces symptoms of actual poisoning. A careful examination in such instances has failed to bring to light any deleterious substance, as traces of tin and iron from the vessels used are entirely harmless when in combination with lactic acid. Mr. Schroff advances the opinion that the oil of acajou, with which the vanilla beans are impregnated in Mexico and South America, contains an acrid ingredient somewhat like cantharides, and that this may be considered the active principle. This opinion derives some probability from the fact that evil effects from the consumption of fruit-ices have never been observed. —15 *C, May*, 1872, 155.

ARTIFICIAL BUTTER.

A method of making artificial butter, announced in a French journal, consists in placing beef suet cut small in water of about 113° Fahr., together with carbonate of potassa and fresh sheeps' stomachs shredded into small slices. The fatty matter which separates and floats on the water is subjected to hydraulic pressure; this, mixed with some milk and water, is churned, and the butter obtained is washed, and, if necessary, melted. The authorities of the victualing department of the French navy pronounce this an excellent substitute for butter.—15 *A*, *September* 7, 1872, 309.

FIRES CAUSED BY IRON RUST.

A possible cause of fires is suggested by Colonel Angus Croll in 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, the gas 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 circulation 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.—18 *A*, *January* 12, 1872, 429.

PAPER AND FIRE.

The examinations of the books in the safes rescued from the recent great fire in Boston have produced curious results. Paper considerably "clayed" stood the fire best. Parchment paper used for legal documents was shriveled up, and the printed and engraved lettering was so blistered that it could be read when the writing was illegible. Books packed tightly into a safe suffered less than those that were set in loosely. In treating charred papers which could not be made transparent by any kind of strong light, it was found that the employment of sulphuric acid, oxalic acid, or glycerine, caused the lines, words, and figures to become legible under a magnifying glass. Universal experience proved that lead-pencil writing was legible in cases where ink marks could not be deciphered.—*Philadelphia Ledger.*

CLEANING KID GLOVES.

The best method of cleaning gloves is to immerse them in benzine in a well-stoppered bottle, leaving them there for a short time. They are then to be taken out, and, after squeezing them to remove the excess of the liquid, they must be hung over a cord in a strong draught to dry. The smell of the benzine can be got rid of by laying the gloves upon a plate placed over a pot filled with boiling water, over which a second pot is to be inverted to secure a sufficiently high temperature. The heat of the boiling water will drive out the residue of the benzine and carry off all its odor. The gloves are then to be brought to their original shape by means of an ordinary stretcher.

It should, of course, be borne in mind that this operation must be performed at a distance from any fire or flame, where there can be no danger of the benzine igniting.—12 *C*, *August* 1, 1872, 62.

DRY METHOD OF CLEANING SOILED FABRICS.

Great progress has been made of late years in the method of cleaning soiled articles of dress, by removing tar, grease, etc., from wool and other raw material, this, as it appears, being accomplished best by the so-called dry method rather than by the use of a watery solution of soap or other alkaline substance. This originally consisted in subjecting the articles in a proper apparatus to immersion in benzine, gasoline, bisulphide of carbon, etc., with continued rotation of the apparatus. More recently, however, it has been ascertained that the vapor of these substances, caused by distillation, is more efficient than the liquid substances themselves, the articles thus treated being much more thoroughly penetrated, and more rapidly, than in the old way.

The articles are placed upon a grating over the liquid, the vapor from which permeates them completely as it is carried over into the reservoir, where it is condensed and is collected. In this form it contains grease in solution, which may be removed by a second distillation, while the hydrocarbon is obtained in a form for further use.—5 *C*, XLIV., 1872, 350.

INSTRUCTIONS FOR REMOVING SPOTS.

We give below a table of the mode of treating the principal kinds of stains on clothing, copied from Rigter's *Manual of Domestic Economy:*

Nature of the Spots or Stains.	On White Goods.	On Colored Cotton Goods.	On Colored Woolen Goods.	On Silk Goods.
Mechanically attached particles	Beating, brushing, and allowing water to fall from an elevation upon the wrong side of the goods.			
Mucilage, mucus, sugar, jelly	Washing out with lukewarm water.			
Fats	Washing out with soap or lye.	Washing out with lukewarm soap and water.	Washing out with lukewarm water and soap or spirits of hartshorn.	Benzine, ether, spirits of hartshorn, magnesia, chalk, clay, yolk of eggs.
Oil colors, varnish, resin	Oil of turpentine, alcohol, benzine, and then soap.			Benzine, ether, and soap, very carefully, and in a very weak solution.
Stearine	Strong, pure alcohol.			
Vegetable colors, red wine, fruits, red ink	Sulphurous vapor or hot chlorine water.	Washing out with lukewarm water and soap, or spirits of hartshorn.		As with the preceding articles, but very cautiously.
Alizarine inks	Tartaric acid—the older the spot the more concentrated.	If the color permits, dilute tartaric acid.		As before, but with great precaution.

Blood and albuminous spots	Simply washing out with lukewarm water.			
Rust, and spots of ink made of nut-galls	Hot oxalic acid, dilute hydrochloric acid, and then tin filings.	In genuine colored goods citric acid to be tried.	Citric acid to be tried; or, in non-colored woolen goods, dilute hydrochloric acid.	Nothing can be done without increasing the evil.
Lime, lye, and alkalies in general	Simply washing.	Much-diluted citric acid, drop for drop upon the moistened spot, to be spread around by the finger.		
Acids, vinegar, sour wine, must, acid fruits, etc.	Simply washing; in the case of fruit, also with hot chlorine water.	According to the delicacy of the material and the color, more or less diluted spirits of hartshorn, to be spread around on the spot, moistened, drop for drop, with the tip of the finger.		
Tannin substances, fruit or green nut-shells, leather	Bleaching lye, hot chlorine water, concentrated tartaric acid.	Chlorine water, diluted according to the delicacy and color of the material, applied with a rag, and drop for drop on the spot moistened, alternately applied and then rinsed off.		
Tar, wagon grease, as also fat, resin, carbonaceous particles, and wood vinegar	Soap, with oil of turpentine, varied with the action of falling water.	Hog's lard to be rubbed on, then soaped and allowed to remain quietly, then washed alternately with water and oil of turpentine.		As in the preceding, but more carefully, and, instead of turpentine, benzine and a continued current of water falling from a height, and only upon the reversed side of the spot.
Superficial loss of substance by scorching	Rub over thoroughly with a pad dipped in hot chlorine water.	Whenever possible, coloring over, or raising up the nap.		Nothing can be done.

—6 *C*, XLIX., *December*, 1872, 486.

DRY CLEANING.

To obviate many inconveniences connected with the use of soap and the usual process of washing, a German chemist proposes for woolen or silk goods what he calls dry cleaning; that is, the removal of the dirt by means of benzine or naphtha, which, unlike soap, injures neither the finest fabric nor the most delicate color. In addition, it is claimed, as the greatest advantage, that no ripping apart of garments is necessary, the most complicated construction of ruffles remaining intact. As the greater portion of the benzine used can be recovered by redistillation, the process is comparatively inexpensive. The machine used for larger cleaning establishments is essentially as follows: A drum of open lattice-work receives the goods to be washed. It fits into a larger, absolutely tight vessel, containing the benzine, and is turned by a steam-engine while dipping into the cleaning liquid. Fifteen to thirty minutes of time are sufficient, according to the greater or lesser fineness of the fabric operated on. After rinsing in clean naphtha and slightly wringing, the cloth is placed in a centrifugal machine, and then dried at a rather high temperature. As long as the benzine is in motion, it retains its cleaning properties, even when it appears quite turbid; but, as soon as a sediment is allowed to form, the more delicate fabrics will become soiled. It is, consequently, better to sort the goods, and commence with white silk or wool, etc., and to use the same liquid afterward for darker cloth. Rapid manipulation and good tight vessels prevent evaporation, and thus decrease the quantity of benzine necessary for the process. Such parts of dresses as are much soiled by grease or perspiration are to be brushed or rubbed with naphtha previous to placing them in the rotating drum. —6 *C*, XIV., 1872, 135.

NEW WASHING PROCESS.

The injurious action of soda upon linen has given rise to a new method of washing, which has been extensively adopted in Germany, and has been introduced into Belgium. The operation consists in dissolving two pounds of soap in about three gallons of water, as hot as the hand can bear, and adding to this one tablespoonful of turpentine and three of liquid ammonia; the mixture must then be well stirred, and the linen steeped in it for two or three hours, taking care to cover up the vessel which contains it as nearly hermetically as possible. The clothes are afterward washed out and rinsed in the usual way. The soap and water may be reheated and used a second time, but in that case half a tablespoonful of turpentine and a tablespoonful of ammonia are to be added. The process is said to cause a great economy of time, labor, and fuel. The linen scarcely suffers at all, as there is little necessity for rubbing, and its cleanliness and color are perfect. The ammonia and turpentine, although their detersive action is great, have no injurious effect upon the linen; and while the former evaporates immediately, the smell of the latter is said to disappear entirely during the drying of the clothes.—18 *A*, *April* 26, 1872, 143.

REMOVAL OF PERSPIRATION.

Woolen undergarments when saturated with perspiration do not wash well in soap-suds, the lactic and acetic acid of the perspiration decomposing the soap, and an unpleasant fatty odor remaining in the fibre. To obviate this inconvenience, Professor Artus recommends the use of warm soda lye for soaking, and a subsequent washing in warm water, to which some ammonia has been added.—6 *C*, *June*, 1872, 192.

METHOD OF REPRODUCING DRAWINGS.

Mr. Renault announces a new process for reproducing drawings, which consists in tracing a design upon a stout and rather polished sheet of paper with a gummy ink, over which is to be shaken a metallic powder like the bronze powder of the arts. In this way a kind of plate is obtained, by means of which the drawing can be transferred to sensitized paper, this being colored black by the pulverulent metal.—6 *B*, *May* 27, 1872, 1412.

METHOD OF EMPTYING A BOTTLE RAPIDLY.

According to the *Chemical News*, an inverted bottle can be emptied very rapidly by imparting a motion of rotation to its contents, the liquid issuing in the form of a tube, and the air entering up the centre without impeding the passage of the fluid. The discharge can be made in this way in about half the usual time.—3 *A*, *July* 27, 1872, 52.

NIGHT-VIOLET—A NEW COLOR.

A new coloring matter, called night-violet, is prepared by digesting fuchsine for twelve hours with iodide of methyl, alcohol, and caustic soda in an apparatus furnished with an inverted condenser. The mass, taken from the apparatus, is boiled for a long time with strong soda lye, which removes all the iodine, leaving the violet as a cake, which is to be dissolved in a mixture of sulphuric acid and water, and then precipitated by addition of a small quantity of soda. The cake so obtained is washed with a little cold water, dissolved in boiling water, filtered, and the color precipitated with salt. The violet so prepared appears of its proper color by artificial light.—21 *A*, *June* 20, 1872, 531.

BRILLIANT AND ECONOMICAL STARCH.

A brilliant and economical starch finish is made by taking one pound of wheat starch and stirring it up carefully in six pounds of cold water until it is reduced to a homogeneous paste. One ounce of aqua ammonia is then to be added by constant stirring, after which the paste becomes slightly yellow and swells considerably. It is next to be diluted with five pounds of cold water, and then brought nearly to the boiling-point, stirring continually. After a quarter of an hour at this temperature all the surplus ammonia will have become volatilized, and the mixture will be found to furnish an economical size, useful for a great many purposes. Linen starched with this not only becomes stiffer, but much more lustrous. It may also be used for coating wood to be polished, as it completely closes the pores.—9 *B*, *March* 14, 1872, 350.

SAFETY WRITING-INK.

A patent has been taken out in London for the preparation of an improved safety writing-ink, which consists in the addition, to any ink, of a solution of yellow prussiate of potash. Any attempt to remove this ink by means of oxalic acid or other substances changes it to a Berlin blue.—14 *C*, CCV., 176.

L. MECHANICS AND ENGINEERING.

CANAL BETWEEN THE RHINE AND THE WESER.

A new canal has been projected for connecting the Rhine and the Weser. It is to be about $8\frac{1}{2}$ feet deep, 44 feet wide, and over 100 miles in length. The cost is estimated at about \$7,500,000.—3 *A*, *March* 9, 1872, 212.

CANAL BETWEEN THE BLACK SEA AND THE CASPIAN.

It is said that the Emperor of Russia proposes to effect the junction of the Black Sea with the Caspian, which is the lower by about $83\frac{1}{2}$ feet (or that much below the level of the sea), by digging a canal only about four miles long, connecting the Manuteh, one of the eastern tributaries of the Don, with the Kerma. The total length of the route will be 460 miles, and the principal engineering labor will be in piercing the mountain which separates these rivers. This will require 32,000 workmen for a period of six years.—12 *A*, *June* 20, 1872, 150.

TUNNEL UNDER THE GUT OF CANSO.

A proposition has been entertained to tunnel under the Strait of Canso, between Nova Scotia and Cape Breton, where the strait is only two and a half miles wide, for the purpose of connecting the island of Cape Breton with the main land. The cost is estimated at \$2,500,000. This idea is connected with a proposition to run a line of steamers from Glasgow, or other British port, to Louisburg, the most easterly point of Cape Breton.—*Shippers' Monthly Circular*, *May*, 1872.

THAWING FROZEN GROUND.

The *Scientific American* contains a notice in regard to thawing frozen ground in winter for purposes of excavation. The writer claims to have ascertained that a small jet of steam, applied underground, will remove the frost in a short time from a very large extent of earth. This is done by forcing steam, under pressure from a boiler, under the earth in a suitable pipe; and as the fluid escapes it penetrates the soil, is condensed, and, parting with its latent heat, thaws out the ground as indicated.—*Scientific American, March* 9, 1872.

NON-CONDUCTING COMPOSITION FOR ROOFS.

A non-conducting substance, known as Le Roy's Non-conducting Composition, has been used with great success in coating steam-boilers to prevent the loss of heat, and has been applied to another useful purpose in India. In that country corrugated iron is employed as a building material for roofs of houses, on account of its cheapness and freedom from vermin; but it becomes very intensely heated in summer, so as to be insupportable, and often injurious to health. This composition, however, applied to the under surface of these corrugated roofs, prevents the radiation of the heat from the iron to the space below, and the house can be kept eight degrees cooler than when the iron is not covered. The heat in buildings not protected by the composition during the month of December ranged from 74° to 101°, while in the protected sheds it ranged from 72° to 94°. In one instance the difference between the two was 11°.—18 *A, March* 1, 1872, 625.

EXHAUSTION OF THE BRITISH COAL SUPPLY.

Several years ago a royal commission was appointed in Great Britain to inquire into the probable duration of the supply of coal in the British Islands. In view of the depth to which the coal-beds extend, it was, of course, necessary to fix an estimated limit to which mining operations could be profitably carried, and, after due inquiry, this was taken to be 4000 feet, since, although, in some cases, mining is prevented by excess of water, yet in Great Britain the deepest collieries are generally the dryest.

Another point for consideration was the waste in working the mines; but it was assumed that, under a favorable system, the loss should only be about ten per cent., although in many cases it amounts to as much as forty per cent. Taking 4000 feet, therefore, as the maximum depth to which work might be expected to extend, and excluding all seams less than one foot in thickness, it is estimated by the committee that there exist in the several coal-fields of Great Britain upward of 90,207,000,000 tons, in addition to which there are vast tracts of coal lying beneath the Permian, New Red, and more recent strata. These are estimated at not less than 56,273,000,000, making an aggregate of 146,480,000,000 tons as the amount available in the British Islands. Assuming that the present rate of consumption—115,000,000 tons—remain constant, this amount of coal will last 1273 years. But should the rate of consumption increase as predicted by Professor Jevons, the supply will be exhausted in 110 years. Applying, however, a reasonable correction to Professor Jevons's estimate, it is thought that the quantity mentioned will last for 276 years.—16 *A*, *October*, 1871, 538.

FURNACE SLAG FOR ROAD BALLAST.

The journal of the Franklin Institute mentions a method of utilizing slag, as used at the blast furnaces at Osnabrück, which consists in allowing it to fall into a stream of water from a height of about eight feet. By this means it becomes granulated into particles of the size of beans, and it is then used as ballast for roads and railways.—1 *D*, *March*, 1872, 160.

TOMMASI'S FLUX MOTOR.

We have already noticed in a previous article the invention by Tommasi of what he calls the flux motor, being a system of machinery for utilizing the ebb and flow of the tide as a mechanical agent. As at first constructed, it could only be brought into play in quite a limited number of localities; but we now learn that, by a recent modification, the apparatus has been made of a more practical character, and that, whether with a rising or an ebbing sea, the piston of the machine will always work under a pressure equal to the weight represented by a column of sea-water the height of which is the same as the total depth of the sea at that place. As a depth of sea of about thirty feet represents nearly the weight of one atmosphere, this amount of pressure can now be obtained at almost any part of the sea-coast without difficulty, so as to have the flux motor act without any interruption.—3 *B*, *November* 9, 1871, XXVIII., 341.

RUPTURE OF IRON WIRE BY A BLOW.

As the result of a series of investigations upon the rupture of iron wire by a blow, Mr. John Hopkinson comes to the following conclusions:

1. That if any physical cause increase the tenacity of wire, but increase the product of its elasticity and linear density in a more than duplicate ratio, it will render it more liable to break under a blow.

2. That the fracture of a wire depends on the length, its support, and the method of applying the blow.

3. That in cases such as surges on chains, etc., the effect depends more on the velocity than on the momentum, or *vis viva* of the surge.—3 *A*, *December* 23, 1871, 492.

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 *Mechanics' 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 5 o'clock, the gauges generally showed twenty-five pounds of steam, or a loss of only ten pounds during the night as the result of radiation.—3 *A*, *January* 13, 1872, 31.

ASBESTOS FOR PISTON-RODS.

The use of asbestos as a piston-rod packing is now engaging the attention of engineers. It is stated that friction has no appreciable effect on this substance, and, however great the pressure of steam, or however high the temperature may be, such packing seems to be unaffected.—15 *A*, *December* 30, 1871, 890.

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. —13 *A*, *February* 1, 1872, 55.

PREPARATION OF RUSSIA SHEET IRON.

An eminent London metallurgist has published a pamphlet upon the method of manufacturing Russia sheet iron, which, as is well known, differs from common sheet iron in having a smooth, glossy surface, of a dark metallic gray, and not a bluish-gray. When bent backwards and forwards by the hand no scale is separated, as happens with sheet iron manufactured by rolling in the usual manner; but in folding it over and unfolding, it simply scales from the line of folding. The method of preparing this sheet iron has been kept a profound secret by the Russian manufacturers for a long period of time; but, by a careful collation of information given by various correspondents, the general theory of the manufacture has been ascertained, and placed in such form as to be capable of practical application. One point in the preparation of the iron is said to be that, after the completion of the rolling, the sheets are made up into packages with charcoal dust interposed, and then well hammered, the outer sheets being afterwards thrown away as waste.—8 *A*, *Sept.* 1, 1871, 159.

SUGGESTION FOR DISPENSING WITH SMOKE-STACKS.

Rev. Mr. Gibsone proposes a method for dispensing with smoke-stacks, namely, by having a downward flue terminating in the water-drains. He maintains that if the drains of any district are connected with a ventilating furnace having a lofty ornamental shaft, there would be at once obtained the motive current of air, and a means of destroying the noxious gases of our underground system, while the central furnace would supply warm air or water, or even gas, to all the contiguous dwellings, and the heavy fuliginous matters would be condensed chiefly in the sewers. The result would be, first, absence of smoke; second, diminution of cost in construction of various chimney-stacks; third, absence of architectural disfigurements, such as zinc cowls and red cylindric pots; fourth, saving of fuel by total consumption of the smoke in the grate, the fire burning downward instead of upward; fifth, greater ease in cleansing the flues from soot, and in the removal of ashes; sixth, steadiness and irreversibility of air draughts, and power of thoroughly ventilating a room even when unfurnished with a fire.

To this the editor of the *Chemical News* rejoins that the idea is not a novel one, the same thing having occurred many years ago to Mr. Spence, of Manchester, but the difficulty of getting sufficient draught was so great that it could not be carried out. A tower of an impracticable diameter would have to be erected, and the leakages into the sewers would be so numerous that, at a distance of one hundred yards from the tower, no appreciable effect would be produced.—1 *A*, *December* 8, 1871, 275.

INFLUENCE OF INCREASED HEIGHT OF BLAST FURNACES.

In a paper by Mr. Plumb upon the effect of increasing the height of blast furnaces in England, he remarks that in the midland districts there were four old furnaces, built half a century ago, each of them forty-five feet high. A new furnace had recently been built, sixty feet high, in the place of one of these, while there had been an addition of fifteen feet to the height of another, so that there are now two furnaces of sixty feet each, and two of forty-five feet, working side by side. A comparison of the results of the two series shows that a considerably increased amount of iron has been the consequence of the elevation in height of the furnaces, and that in districts where tender cokes were used, a height of sixty feet might be safely obtained, but perhaps not exceeded.—16 *A*, *January*, 1872, 100.

PREPARATION OF FUEL FROM FINE COAL.

Mr. E. Loiseau, of Philadelphia, lately submitted to the Franklin Institute specimens to illustrate his proposed new method of utilizing coal-dust. This consists in thoroughly mixing about seven per cent. of clay with the fine coal, and forming the mass into balls, and then dipping these into a bath of benzine containing some resin in solution—the object of this operation being to render them impervious to moisture. The solution penetrates the lumps to the extent of about one fourth of an inch, and, after the evaporation of the benzine, which takes place rapidly upon exposure to a current of air, a film of resin is left behind, which so effectually stops up all crevices that, in the experiments made by the Franklin Institute Committee on Science and Arts, while investigating the process, masses which had lain in water for twelve hours were found to have lost none of their compactness, and to be still dry in the interior. The consumption of the artificial fuel took place very satisfactorily, all the specimens burning till completely ashed.

The committee found that the heating power of the material was somewhat below the average of solid coal, but that the compactness of the substance will probably allow its transportation with as little loss from breakage as is suffered by many kinds of coal now brought to market. The conclusion arrived at was that the plan is one of the most practicable yet submitted to the public for utilizing this waste product, the slight cost of its production being one great point in its favor.—1 *D*, *January*, 1872, 5.

DANK'S PUDDLING FURNACE.

Iron manufacturers in Great Britain are congratulating themselves upon the introduction into Great Britain of the invention of Mr. Dank, of Cincinnati, by which machine puddling has become practicable. Heretofore the operation of puddling, or the conversion of ores or cast iron into wrought iron, has been one so severe and trying as to make it extremely difficult to find hands to engage in the work, and the rapid increase in the demand for wrought iron has rendered it impossible to find competent men in sufficient number for the purpose.

Numerous efforts had been made to relieve iron manufacturers from this dependence upon manual labor, but without success; and the announcement made last autumn by Mr. Dank, before the iron and steel workers, that he had successfully solved the problem, was received at first with incredulity. A committee was, however, appointed to proceed to Cincinnati to examine Mr. Dank's furnaces, which was done; and on their return they reported that every thing promised could be accomplished, and that the interest of the trade was closely connected with the acceptance of Mr. Dank's offers.

It is now stated that two hundred furnaces on Mr. Dank's plan are to be shortly put up in various districts, and that he is to receive the sum of £50,000 as his premium, whether the furnaces are in operation or not.—12 *A*, *March* 28, 1872, 417.

DANK'S IRON PUDDLING FURNACES.

Much interest continues to be attracted in Great Britain by the successful performances of Dank's iron puddling furnaces, which promise to be very useful to the iron manufacturers there. This furnace is substantially an iron barrel lined with fire-brick, rotating horizontally, with the flame of a furnace passing in at one end from the grate, and out at the other end to the chimney. Within this barrel the iron to be puddled is placed, and, as it slowly revolves, the iron keeps rolling over and over to the bottom, and so presents constantly a new surface to the flame. This continual turning over supersedes the necessity of stirring by the puddler, and labor is thus saved, and larger charges can be worked than when the stirring has to be effected by manual labor.—22 *A*, 1272, 309.

INDICATIONS OF STOPPING-PLACES IN RAILWAY TRAINS.

The need is continually felt in railway trains of some systematic indication in all the cars of the name of the station at which the train is next to stop; and although numerous attempts have been made to meet this desideratum, none have proved satisfactory. We now learn from the *Mechanics' Magazine* that a patent has lately been taken out in England by Mr. Hodson by which this information is given through indicators in each car, which are worked by compressed air contained in a reservoir forward, in such a manner that the indication of a particular name may be reproduced simultaneously and invariably in every car of the train. —3 *A*, *November* 4, 1871, 353.

REGISTERING APPARATUS FOR PASSENGER CARS.

Numerous attempts have been made to devise a self-registering apparatus to number the passengers entering omnibuses or street railway cars, some of them very complicated, and few answering the purpose. One recently invented, which may perhaps be better than its predecessors, consists in having each seat in the car supported on springs, so that it is depressed when sat upon. By this depression a spiked wheel attached to it is made to bear against and impress a traveling sheet of paper, led over elastic covered rollers, and caused to travel past the spiked wheel, whenever the carriage is moving, by means of a wheel running on the ground, which may be either one of the ordinary bearing wheels of the vehicle or another provided for the purpose, the revolution, in either case, regulating the speed of the traveling sheet of paper to an approximate measure of the distance. A separate spiked wheel is connected with each seat (inside and outside), so that the perforation on the paper shows the specific number of seats, and distance each has been occupied on the journey. The adoption of this system by railway companies would have one good effect by making it necessary to furnish a seat for each passenger, since no record could be kept of those obliged to stand from inability to secure a separate seat.—6 *A*, *November* 25, 1871, 685.

MANAGEABLE BALLOON.

The advocates of the possibility of utilizing the balloon for the every-day purposes of life have been greatly encouraged by the result of a series of experiments lately made in Paris by M. Dupuy de Lome, and recently communicated to the Academy of Sciences. This gentleman is an eminent French engineer, and well acquainted with both the theory and practice of his profession; and his attention was especially called, during the siege of Paris, to the importance of having a balloon which possessed some power of steerage.

He has completed the first construction according to his new plan, and made, as he claims, entirely successful experiments with it. The balloon is in the shape of an enormous egg, the longer axis horizontal, with an oblong car suspended from it. The total length is 118 feet, and its diameter at the point of greatest circumference 49 feet. The rudder by which the balloon is steered is a plain triangular surface, made of unvarnished calico, and constructed so as to turn easily on its forward extremity. The car is of wicker-work, containing a windlass for the screw, eight men to manage it, and is capable of carrying fourteen persons.

The rudder is fixed to the balloon itself, and the screw is below it and immediately attached to the car, and having only two blades, so that when the ground is touched they can be placed horizontally to escape injury. The windlass which turns the screw is worked by four to eight men. The envelope of the balloon is composed of white silk.

The constructor does not pretend to be able to make a direct movement against the wind, but only to deviate from its direct set when running before it. He expects to be able to tack to the right or left, but does not hope to be able to beat to the windward. There is a second balloon attachment to the bottom of the main balloon, forming a kind of compartment, occupying about one tenth of the cubic space of the balloon, and serving to keep it stiff and of the required shape.

In the experimental trip of M. De Lome a half gale was blowing, and the result answered entirely to his expectations. The screw drove the balloon about five miles an hour quicker than the wind was blowing, and by the use of the rudder the course of the balloon could be altered eleven degrees, either way, from the set of the wind.—12 *A*, *Feb.* 22, 1872, 334.

NEW DETONATING MIXTURE.

A new detonating mixture is made by bringing together equal parts of nitrate of potash and of acetate of soda; these substances, when exposed to heat, enter into new combinations, in which the salts are converted into gases, with a violent explosion.—19 *C*, *February* 24, 1872, 64.

NEW COMBINATION OF NITRO-GLYCERINE.

Nobel, the well-known inventor of nitro-glycerine and of dynamites, has patented a new mixture which is of greater or less power according to the variation of the proportion of the constituents. The strongest mixture consists of 68 parts of nitrate of barytes and 12 parts of some coal rich in hydro-carbons, the whole saturated with 12 parts of nitro-glycerine. Nearly equal to this mixture is one consisting of 70 parts of nitrate of barytes, 10 of resin, and 12 of nitro-glycerine. An addition of 5 to 8 parts of sulphur considerably increases the action of both. The ignition takes place by means of fulminating silver and a fuse.—18 *C, March* 9, 1872, 159.

EXPERIMENTS WITH LITHOFRACTEUR.

The explosive called lithofracteur, which has been brought into notice within a comparatively recent period, bids fair to be an extremely valuable addition to the resources of military and civil engineers—a series of experiments, prosecuted under the British government, having been highly satisfactory in that respect. This substance is manufactured in Germany, and put up in thin, water-proof paper cartridges, about one inch in diameter, and weighing ½ an ounce, 1 ounce, 1½ ounces, and 2 ounces. These are packed in a stout card-board box, containing altogether 5 pounds, the box being tied up in a stout paper envelope. Ten of these are then packed in a strong wooden case, the lid of which is nailed on with zinc nails, each case thus containing 50 pounds.

The experiments with this substance were varied, representing almost all the instances in which the application of such an explosive might be made. Among these was one intended to show that ordinary percussion did not explode this substance, an important consideration with reference to safety in its transportation.

In another experiment a double stockade of 9-inch railway sleepers was sunk 18 inches in the ground, with an interval of 7 feet between the rows, each row consisting of 14 sleepers. Against the foot of the front row were laid two thin sheet zinc tubes, containing 150 pounds of the lithofracteur. These were fired by a fuse, and resulted in an explosion audible 14 miles away. The stockades were all torn into match-wood, and the hill was strewn with splinters for 150 yards around; a trench 24 feet long, nine feet wide, and three feet deep, was made, in which a large number of soldiers might have found a lodgment.

The success of these experiments has suggested the application of the lithofracteur in clearing openings through shoals for the passage of ships, and it is said that a tubing for a length of 1500 yards, filled with ten tons of this explosive, is to be touched off near Rotterdam for this purpose.—3 *A, March* 2, 1872, 181.

STOWMARKET GUN-COTTON EXPLOSION.

The jury appointed to inquire into the causes of the gun-cotton explosion at Stowmarket, England, by which several lives were lost, have come to the conclusion that the prepared cotton must have been tampered with, by the addition of sulphuric acid, after it had passed the government test. The evidence proved that, after the explosion, impure gun-cotton was found in the factory, sulphuric acid being present in quantity sufficient to lead to decomposition and explosion. The jury added to their verdict that, from the evidence adduced, there appears to be no danger in the manufacture of gun-cotton by the wet process, but were of the opinion that the drying and storing of gun-cotton should not be allowed near a town.—20 *A, September* 16, 1871, 351.

FULMINITINE, A NEW EXPLOSIVE.

A new explosive, named fulminitine, has been invented, differing from dynamite in having a much larger percentage of nitro-glycerine. The 25 per cent. of infusorial earth contained in dynamite is here replaced by 15 per cent. of a chemical substance, which not only possesses a very much greater affinity for the nitro-glycerine than the infusorial earth, but differs from it in being entirely converted into gas by the explosion. In the combustion of the dynamite the silicious earth remains as a wet powder; while, after the burning of the fulminitine, the only residuum is a black, carbonaceous coating. The fulminitine, it is asserted, can be supplied at as reasonable a price as the dynamite.—6 *C, February* 1, 1872, 48.

PRESERVATION OF TELEGRAPH POLES IN NORWAY.

Telegraph poles in Norway are preserved from immediate decay by introducing a solution of sulphate of copper into holes bored into the freshly felled timber to a depth of five or six inches, and plugged up with corks coated with tar or varnish. The circulation of the sap, which goes on for some time after the tree is cut down, tends to carry the solution throughout the length of the pole, and impregnate the wood thereby with it. The application is repeated two or three times a year for several years, and the absorption of sulphate in the course of this time is so great as to have a very appreciable effect in increasing the durability of the timber.—1 *A*, *June* 7, 1872, 275.

DEPARTMENT REPORT ON THE PREPARATION OF TIMBER.

A valuable report has just been published by the Engineer Department at Washington, as prepared by Captain T. J. Cram, upon the decay of timber, and the methods for its preservation for military and engineering purposes. The experiments of Captain Cram have tended to show that, for a limited period at least, creosoting the timber before immersing it in sea-water is practically a preservation against the attack of boring mollusks or crustaceans as well as ordinary decay, the trial having now lasted, in some instances, for as many as twenty years, without any apparent change in the wood.

This is in confirmation of the special report of the Academy of Sciences of Amsterdam, upon experiments made by the direction of the Netherlands government. Similar experiences seem to have resulted from the creosoting of wood for railroad purposes, as well as for gun-carriages and other engines of warfare.

The report of Captain Cram discusses the general theory of the application, and the methods of subjecting wood to the desired treatment; and it is maintained by him that its application to breakwaters, government wharves, piers, and other government constructions on the lakes, and on the seacoast, will result in an enormous saving of expense. General Gilmore, in an appendix to the report, expresses his opinion that the Bethell process, with its American modification of the Seeley & Robbins processes, is cheaper and more effective than any other, this consisting essentially in impregnating the timber by boiling it in coal-tar with carbolic acid.—*Report.*

IMITATION MARBLE.

Mr. J. Terwer, of Trier, announces that he has succeeded in making a most perfect imitation of marble in a new and very simple manner. He uses carbonate of lime, without any cement or high pressure, and the product is as hard and easily polished as the best marble, and is readily colored in any shade, even to the most intense black. As the mass, while in a plastic state, is readily worked into any shape and form, its applicability for ornamental walls, floors, furniture, etc., is very great; but the inventor especially directs attention to its value in furnishing material for the finer mosaics, which often consist of 150 pieces to the square inch. Convenient forms, brilliant colors in all shades, greatest durability, even in the thinnest stratum of inlaid work, etc., are promised.—5 *C*, XVI., 126.

FIRE-PROOFING COMPOSITIONS.

A Vienna chemist enumerates and criticises several methods recommended and employed for rendering woven fabrics less inflammable. He considers tunsgate of soda, as proposed by other chemists, as quite efficient, but entirely too expensive; and he assures us that most satisfactory results are obtained by the simple solution of four parts of borax and three parts of Epsom salt. The only precaution necessary is, that the solution (which is easily made by adding three or four parts of warm water to one of the mixture) be used immediately, since the active principle, the insoluble borate of magnesia, soon precipitates.—14 *C*, *March*, 1872.

NEW FIRE-ENGINE.

The *English Mechanic* publishes the description and figure of a fire-engine on an entirely new principle. This consists in charging the water used with carbonic acid and nitrogen. A special merit is in the remarkably cheap method of obtaining the carbonic acid, which is made by drawing atmospheric air through a charcoal fire, and forcing it into a tank containing water. A claim is made—and practical experiments seem to substantiate it—that one cubic foot of this solution, discharged upon any burning pile, is capable of doing as much execution in extinguishing a fire as fifty cubic feet of water from an ordinary fire-engine, and in one twentieth part of the time.

Another important point is the capability of the invention to instantly depolarize vast quantities of sulphurous vapors, carbonic acid gas, carbureted hydrogen, and sulphureted carbureted hydrogen. A delivery jet one quarter of an inch in diameter is said to be capable of instantly extinguishing and depolarizing carbureted hydrogen from a two-foot main, working at three-inch pressure from the gasometer. By this method the air in coal-pits, mines, caverns, etc., can, it is claimed, be rendered pure and healthy. This apparatus also may be used for softening water for brewing and dyeing, and for preventing incrustations in steam-boilers.—18 *A*, *March* 29, 1871, 31.

THE CALORIGEN—A NEW HEATING APPARATUS.

In a heating apparatus lately exhibited at the International Exhibition in London, and called the Calorigen by Mr. George, its inventor, the London *Mechanics' Magazine* finds what it considers to be a new principle in heating and ventilation, of very great merit. This arrangement claims not only to economize the combustion of gas or fuel in the utmost possible degree, but also to combine with this a thorough system of ventilation, by which all noxious products are removed as fast as formed, and the air left perfectly pure. It has been adapted by the inventor especially as a gas stove, although it is also used with coal and wood. The gas stove arrangement consists of a cylinder of rolled iron, closed at the top and bottom, so that the interior of the burner is entirely shut off from the atmosphere of the room. This cylinder is furnished with two pipes: one placed near the top to carry off the products of combustion, the other near the bottom to supply the air necessary for the combustion going on within it. These two pipes pass through the wall into a second vertical cylinder, parallel to the large cylinder inside. This chamber is open only at the top, causing the air entering the stove to come in contact with the heated air leaving it, acting as a natural regulator of the flow, and saving much waste of heat. It may at first sight appear impossible to maintain combustion under such circumstances; but we shall find a solution of the difficulty in the fact that a light and heavy gas being poured into a vessel at the same time, the light gas will rise to the top while the heavy will sink to the bottom. Thus, in the calorigen, the fumes of the gas are carried out of the room without conveying away any of the air, and also without employing the principle called draught, as there is no communication between the furnace and the air of the room. The door of the stove, when shut, completely cuts it off, although it allows the light to be seen.

The next important feature in this invention is the introduction of a coil of wrought-iron tubing, which communicates with the external atmosphere. This tube can be open to the apartment; and the air, entering and following the course of the tubes, provides a plentiful ventilation, already raised to a pleasant and healthful temperature. By this arrangement the usual course of procedure is reversed; those nuisances in an ordinary room, the spaces about the doors and windows, instead of being fertile sources of draught and discomfort, are the means by which the air passes out of the apartment. —3 *A*, *October* 14, 1871, 286.

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.—8 *C*, 1871, LII., 416.

PURIFICATION OF COAL GAS.

A method has been suggested by which coal gas can be readily freed from sulphur, namely, by heating the impure gas to redness, when the sulphur will combine with hydrogen to form sulphureted hydrogen, which can be easily removed by passing through a purifier containing the oxide of iron. When coal gas, containing 30 grains of sulphur in 100 cubic feet, was passed, first, through a red-hot tube, and then through an iron purifier, the sulphur was reduced to about 5 or 6 grains. The heat did not injure the quality of the coal gas, as, by passing gas of 14.91 candles rapidly through a tube heated to dull redness, the illuminating power was found to be 15.1 candles, and when the gas was passed through a tube heated to bright redness, the illuminating power was increased to 16.66 candles.—16 *A*, *July*, 1872, 396.

INSTANTANEOUS GALVANIC LAMP-LIGHTER.

Dr. Klinkerfues, of Göttingen, Hanover, has invented what he calls a hydrostatic instantaneous galvanic lamp-lighter, and tried it on about forty street lamps. The experiment was entirely successful, and a general introduction of the apparatus is confidently anticipated.—14 *C*, vol. cciv.

OXYGEN ILLUMINATION.

According to the *Philadelphia Ledger*, a committee of the Paris Society of Civil Engineers has reported that, theoretically, the combustion in a receiver filled with oxygen dces not increase the illuminating power of a given volume of gas, but that, practically, it enables a burner to consume four times the quantity of ordinary gas that can be burned in air, and also develops the entire luminous capacity of common gases. The increased beauty of the light—the only advantage—it is reported, is more than counterbalanced by the cost of the complicated apparatus.—*Philadelphia Ledger*.

MANUFACTURE OF PURE WROUGHT IRON.

It has generally been considered impossible to make pure wrought iron; but the *Mechanics' Magazine* informs us that this has been in fact accomplished at the Bowling Iron Works, Bradford, by the Henderson process. The wrought iron obtained by direct analysis shows 99.5 per cent. of pure iron, the barest trace of sulphur, and 0.27 of carbon; and not the slightest indication of silicon, phosphorus, or manganese, though all these substances were found in the pig iron employed.

DORMOY'S PUDDLING APPARATUS.

The apparatus for puddling by machinery, invented by Mr. Dank, has attracted a great deal of attention in England, and numerous forges have been fitted up with his apparatus. Less expensive arrangements have, however, been lately devised for improving the method of manual puddling without materially altering the existing machinery. One of these is Dormoy's process of puddling with a rotating rabble, which is thrown into rapid revolution by steam-power, while its direction is readily controlled by the hand of the puddler.

A revolving shaft above the furnace carries a belt which is connected with another pulley below. This pulley is secured to the outer end of the rabble, which is thus caused to rotate somewhat in the fashion of the well-known revolving brush used by the hair-dresser. By means of a handle jointed to the lower pulley, the puddler readily directs the movements of the rabble. From 300 to 500 revolutions per minute are made by the tool when white pig iron is treated, and from 800 to 1000 for gray pig. The point of the rabble in the furnace carries a disk which agitates the molten metal, and effectually renews the surface exposed to the air.

When the iron "comes to nature" another rabble is used, having, in place of the disk, a short twisted point. Dormoy's method has been successfully employed in Austria and France. It is said that the yield of wrought iron is increased by at least 30 per cent., while the consumption of fuel is proportionately diminished; that the puddler is relieved of much of his fatigue, although the number of heats in a given time is considerably increased; and, finally, that the phosphorus and sulphur are removed from the metal to such an extent that excellent iron may be obtained from inferior brands of pig.

IMPROVED STEAM BOILER.

Messrs. Warsop & Eaton, of Nottingham, in England, have lately constructed steam-boilers which, it is claimed, are not liable to incrustation or explosion. It is asserted that water, from which the air has been expelled, may acquire a temperature far above 212° without boiling, and that it is then liable to burst suddenly into steam with explosive violence. This danger is prevented by the process of these gentlemen, which consists in injecting heated air at a temperature of 650° near the bottom of the water-space in the boiler, thus also aiding in keeping up the supply of steam. All incrustation is said to be prevented, and an economy of 15 per cent. of fuel effected.—15 *A*, *August* 10, 183.

DEEPEST KNOWN WELL.

The deepest well in the world is said to be that at Sperenberg, near Berlin, which was excavated in the attempt to obtain a supply of rock-salt. This was reached at a depth of 280 feet from the surface, and the boring was continued to a maximum depth of 4194 feet, the stratum of salt having been followed to a depth of 3907 feet without being pierced through, and the boring then discontinued in consequence of the mechanical difficulties of the operation.—18 *A*, *June* 28, 1872, 379.

WATER SUPPLY OF NISMES, ON THE RHONE.

In 1866 M. Dumont presented to the Academy of Sciences of Paris a sketch of a project for supplying the city of Nismes with drinking-water from the Rhone, filtered naturally. In 1872 he announces to the same body a satisfactory completion of his labor, by means of which there is a daily supply of over 37,000 cubic yards, or 130 gallons to each inhabitant. In an industrial and scientific point of view, the importance of the work just completed presents three classes of interesting facts. First, the natural filtration of the waters of the Rhone by a subterranean and lateral gallery of 555 yards in length, and 33 feet wide inside, the largest known at the present time. Second, the throwing up of this water by two steam-engines of 200 horse-power each to a distance of 11,000 yards, by a single discharge-pipe of a little over three inches interior diameter. This conduit, which presents numerous inflections in its course, is commanded by a great reservoir 46 feet in height, upon which the pumps act, not directly, but after having worked on small reservoirs joined to the latter. The intervention of these manifold reservoirs, and the establishment of numerous emptiers of the air, at all projecting points, have had the effect of rendering very manageable the immense column of water, the weight of which is nearly 5000 tons, the elevation at this distance amounting to 240 feet.

The amount of fuel required for these engines, which are vertical, with direct movement, is 2.21 pounds of coal an hour for each horse-power. The entire initial expense of this hydraulic arrangement, including the necessary machinery, was about $1,200,000.

The hypothesis upon which M. Dumont proceeded in undertaking his labors, so satisfactorily accomplished, was that there exists under the gravel and sands of the Rhone, and under the course of all waters of an analogous nature, a volume of water perfectly clarified (really an inferior and subterranean river), and that these gravels, etc., are genuine filters, which cleanse themselves by a double process, their product being always the same. The labors executed by the author at Lyons and elsewhere have proved to him the correctness of these views, and enabled him to establish the true principles which should be taken into consideration in the execution of similar labors. These are, first, to give the preference to lateral galleries instead of filtering basins; second, to bring these galleries as near as possible to the principal current of the river; third, to give these galleries the largest interior diameter possible; and fourth, to build the abutments up to the level of the low water-mark only, and make the layer of the filtering frame-work in the form of a cradle. —6 *B, June* 3, 1872, 1451.

INDICATION OF HEATING BY FRICTION.

The history of science is filled with illustrations of the fact that abstract discoveries, apparently of little practical bearing, are often turned to very important economical account. A new instance of this is shown in the recent discovery, by Mensel, that certain double iodides, in a strong degree, and other substances to a less marked extent, possess the property of readily changing color upon the application of a comparatively slight degree of heat.

One of these applications is by Professor Mayer, who employs a double iodide of copper and mercury for obtaining a precise method of tracing the progress and of determining the boundary of a wave of conducted heat; and the same gentleman suggests that this and other sensitive compounds be painted upon the *pillow blocks*, and other parts of a machine liable to injurious heating from friction. It will enable the engineer to determine the temperature of the moving parts of his apparatus, and to be on the watch for any injurious effect of heating by friction.

The iodide referred to, within the limits of the freezing and boiling points of water, changes from a brilliant carmine red to a brown black, becoming regularly darker with the increasing heat, so that, besides learning the general effect of the dangerous change, a little observation will serve to establish the standards of correspondence of the temperature and the color.—1 *D*, *August*, 1872, 88.

FLORIDA SHIP-CANAL.

A company has been organized, under the authority of the State of Florida, for the purpose of digging a ship-canal across the peninsula, to extend from St. John River, through Lake Kerr and the Ocklawaha River, to Silver Spring, which is the summit, and where there is an abundant supply of water; thence westerly twenty-four miles to Blue Spring; thence nine miles to Fort Clinch, on the Withlacoochee; and thence down this river nine miles to the Gulf—a total distance of fifty-two miles. It is stated that any required depth of water can be obtained, with a small lockage and moderate expense of construction. If this idea be carried out, and also that of constructing a canal across Delaware, New Jersey, and Cape Cod, vessels will be able to pass readily during the stormy season from one part of the Union to the other with very slight exposure to the ordinary perils of navigation.—6 *D*, *October* 5, 1872, 215.

LIGHT-HOUSES IN THE UNITED STATES.

The Light-house Board reports that there are now 573 light-houses along the coast and shores of the United States, and 22 light-ships. Estimates have been made for new first-order sea-coast lights at Cape Elizabeth, Maine, and Monomoy Point, Massachusetts; for two steam fog-signals at Cape Cod, one at the Highlands, and one at Race Point; for light-houses for signals at the mouth of Massachusetts Bay; for a steam fog-signal at New London, Connecticut; and for a light-house foundation on Southwest Ledge, New Haven Harbor.—*Boston Transcript*, *September* 6, 1872.

NEW LIGHT-HOUSES ON SABLE ISLAND.

The department of Marine and Fisheries of the Canadian government is now erecting two large light-houses, one on either end of Sable Island. This, as is well known, is a large island composed almost entirely of sand, situated about 150 miles from Halifax, and one which is directly in the track of a large number of vessels passing between Europe and America, and upon which numerous disastrous shipwrecks have occurred. The lights are to be very powerful, one of them a revolving white light, and the other fixed. Fog-whistles are also to be connected with each light-house so as to indicate its vicinity in foggy weather.—*St. John's Weekly Telegraph, October* 20, 1872.

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.—3 *A, January* 27, 1872, 84.

IMPROVING THE QUALITY OF POOR COAL.

According to the *Journal of Applied Sciences*, the qualities of the best anthracite or cannel coal may be given to poor tertiary coals by soaking them in a mixture of naphtha and bitumen. A similar treatment of peat, by means of the residuum of kerosene refineries, has lately been adopted in the United States, as furnishing a fuel far superior in heating power, in freedom from foreign substances, and in availability to the best qualities of true coal.—3 *A, July* 20, 1872, 27.

M. TECHNOLOGY.

SILVERED STEEL CUTLERY.

According to the London *Mechanics' Magazine*, Mr. Neil, of London, has devised a process for so thoroughly uniting silver with cutlery as to produce an article of great practical value. It has long been the custom to electroplate silver on steel; but whenever the external coating is ground off the steel is exposed, and thereby rendered liable to rust. In the present instance the knives are finished in the finest style, and chemically cleaned by a special process. They are then treated with perfectly pure silver, and the two are pressed together by processes which are not made known by the inventor. It is asserted that the silver is driven into the pores of the steel, and that heat and moisture have no perceptible effect on the metals. The result is a knife that will not rust, is not stained by acids, and only requires washing after use. It may be sharpened any number of times, with the result of always showing a silver surface.—3 *A*, *March* 9, 1871, 217.

MUSHET'S SPECIAL STEEL.

"Special steel" is the name of an article manufactured by Mushet with particular reference to the working of cast steel, and for other purposes where the hardness of the material manipulated rapidly blunts the tools. This steel does not require hardening, but acquires the necessary hardness by gentle hammering. It is manufactured by the Titanic Steel and Iron Company, at Coleford, in Gloucestershire, England. —14 *C*, CCIII., IV., 322.

SILVERING OF GLASS PLATES AND GLOBES.

According to Krippendorf, the silvering of glass plates may be readily accomplished by the use of the following; 1. Sodio-potassic tartrate; 2. A two per cent. solution of this salt; 3. Caustic ammonia; 4. Solution of silver nitrate, 1:8 (old silver bath will serve). From these the silvering and reducing liquids are prepared.

The reducing liquid is prepared by taking 900 cubic centimeters of distilled water, and 90 cubic centimeters of the solution of the tartrate, and, after mixing, boiling strongly together, and while the steam is issuing violently from the flask, dropping in 20 cubic centimeters of the silver solution, and boiling for another ten minutes. This solution not only keeps, but seems to improve by age. The liquid is to be filtered from the precipitated silver as it is wanted.

The silvering solution is prepared by taking 900 cubic centimeters of distilled water, and adding 80 cubic centimeters of the silver solution and 100 drops of the ammonia solution, and filtering if necessary.

For silvering, equal volumes of the two solutions are to be carefully and separately filtered, and poured together into a flat glass dish to such a depth that the thoroughly cleansed plate shall be covered by a layer of at least one tenth of an inch. Decomposition of the mixture takes place in ten minutes, and pure metallic silver is deposited on the plate, which is then washed, dried, and varnished. For the purpose of silvering the interior of glass globes, etc., it is sufficient to pour in successive small quantities of the mixture, turning the vessel continually, so as to keep the whole surface wet uniformly.—21 *A*, IX., *July*, 1871.

MINERAL COTTON.

The Journal of the Franklin Institute reports the exhibition at one of its meetings, by Mr. Coleman Sellers, of a material which it is thought may be capable of useful applications in the arts. The substance possesses a general resemblance to cotton, for which it may in some cases probably be used to advantage. It is really, however, a form of spun glass, produced by allowing a jet of steam to escape through a stream of liquid slag, by which it is blown into the finest threads, sometimes two or three feet in length. These threads, though somewhat elastic, readily break up into much smaller ones, and the color of the substance being white, the appearance of a compacted mass of it makes the name of mineral cotton, under which it has been described, a very appropriate one. The admirable non-conducting property of the material for heat, as well as the great quantity of air it retains in its interstices, would seem to fit it very well for a non-conducting casing to steam boilers and pipes, an application for which it is being tested.—1 *D*, *December*, 1871, 361.

ABYSSINIAN GOLD.

A new metallic compound, which bears the somewhat fanciful name of Abyssinian, or Talmi gold, has lately been manufactured in large quantity in Germany, for the purpose of fabricating imitation gold jewelry and other objects. This is a brass composed of about 91 parts of copper and 8 of zinc. The appearance of gold is obtained by causing a very thin sheet of gold to adhere by passing it through rollers. This gilded sheet is then cut and formed into ornamental articles by means of ingeniously constructed steel instruments.—18 *A*, *April* 19, 1872, 133.

METHOD OF WELDING COPPER.

According to a quotation in the Journal of the Franklin Institute, Mr. Rust has invented a method by which he accomplishes the most perfect welding of copper. This consists of a mixture composed of 358 parts of phosphate of soda and 124 parts of boracic acid. The powder is to be applied when the metal is at a dull red heat, which is then brought to a cherry-red and at once hammered. As the metal is very apt to soften when exposed to a high degree of heat, a wooden hammer is recommended. All carbonaceous matters are to be carefully removed from the surfaces to be joined, since the principle of the operation depends on the formation of a very fusible phosphate of copper, which will be reduced by the carbon to the state of a phosphide. The phosphate of copper dissolves a thin film of oxide on the surfaces of the metal, keeping these clean and in a condition to weld.—1 *D*, *January*, 1872, 8.

IMPROVED MANUFACTURE OF RED-LEAD.

The ordinary process of the manufacture of red-lead consists in exposing oxide of lead, or litharge, in trays in the same furnace that serves for its production; but this method is very tedious and uncertain in its yield, owing to the changes of temperature to which the substance is exposed in the furnaces. The most important element for a successful result, next to the access of sufficient air, is said to be constancy of the proper temperature, as the temperature at which litharge takes up oxygen and that at which the red-lead loses it lie very near each other. The most favorable temperature for the formation of red-lead is that approaching a dull red heat, without, however, reaching it. Mercier has lately constructed a furnace, for use on a large scale, for the manufacture of red-lead, which takes into account these considerations. It is essentially a large muffle, around which the fire plays in a great number of small channels, and by means of dampers the heat is easily regulated. By this furnace, in full action and continuously worked, about four tons of red-lead may be produced in twenty-four hours.—21 *A*, *February*, 1872, 182.

PROTECTING ZINC AGAINST ACID.

The action of dilute sulphuric acid upon zinc, resulting in the production of bubbles of hydrogen, can, it is said, be immediately stopped by introducing a small quantity of etherial oil, such as lavender, turpentine, etc. The evolution of hydrogen begins again, however, if a certain quantity of alcohol is added to the liquids. The action of the oil consists, probably, in forming a thin protecting film upon the zinc.—8 *C*, *February* 1, 1872, 39.

BUTTONS, ETC., FROM SOAP-STONE.

Buttons, dominoes, and other small objects requiring great hardness are now manufactured in Germany from soap-stone by grinding refuse chips and fragments to powder, mixing this with water-glass in a tub, and, after allowing it to stand for some hours, drying it upon a plate and then grinding it again to a fine powder. When thus prepared, this powder is to be brought under a powerful press, where the desired shape is given, and the objects are then to be baked in fire-proof crucibles, kept air-tight, and after burning, immersed again in water-glass until they are completely saturated; after this they are again dried and again heated in a closed crucible. By repeating this operation several times the objects can be made to possess any required degree of hardness. They are then to be cleaned off by placing them in water in a rapidly rotating tub, and afterward dried and introduced into a second rotating tub, with soap-stone powder, which will give them the proper degree of finish.—*Bayerisches Industrie- und Gewerbe-Blatt*, *December*, 1871, 340.

IMPROVED SIPHON.

An improved siphon recently introduced consists of an ordinary siphon, having a globe at the bend furnished with a short vertical tube. The latter serves the purpose of starting the siphon, whilst the globe retains any gas that might be given off by the liquid, and which in an ordinary siphon would fill the bend and stop its action. A filter, consisting of an inverted funnel furnished with a perforated disk, and covered with a layer of cotton, wool, or other suitable material, can be attached to the shorter leg of the siphon. This form, however, is not entirely new, having been employed heretofore to maintain a constant flow in the still of a distilled water apparatus, by supplying it with warm water from the worm-tub of the condenser.—18 *A*, *December* 1, 1871, 266.

GLAZING OF EARTHENWARE.

Workmen exposed to the dust or vapor of lead combinations are liable to the very painful disease known by the name of lead or painters' colic. This is especially the case in common potteries, where, for glazing, litharge has to be ground and otherwise manipulated. A German potter has succeeded not only in improving his earthenware in other respects, but also to entirely remove the subtle poison from his establishment. He takes two parts of common fusible brick clay and one part of ochery clay (strongly impregnated with iron), and works it with twenty-four parts of lye from wood ashes to the consistency of cream. A thin layer of this liquid serves for glazing. The heat required for its fusion is greater, but as the manipulation is considerably simplified, and the vessels resist perfectly the action of acids, the results obtained are quite satisfactory, in addition to the great benefit conferred upon the operatives.—15 *C*, 1872, VIII., 119.

NEW NETTING MACHINE.

A Saxon weaver has, it is said, lately invented machinery by which nets of all kinds, from the finest silk veil to the stoutest seine, can be constructed with great regularity and rapidity. The instrument, worked by one man, will furnish in a day's labor fine netting from seventy to eighty feet long and five feet wide, and coarser mesh in proportion.—6 *C*, *January* 4, 1872, 8.

LIQUID GLUE.

An excellent liquid glue is made by dissolving glue in nitric ether. The ether will only dissolve a certain amount of glue, consequently the solution can not be made too thick. The glue thus made is about the consistency of molasses, and is doubly as tenacious as that made with hot water. If a few bits of India-rubber, cut into scraps the size of a buck-shot, be added, and the solution allowed to stand for a few days, being stirred frequently, it will be all the better, and will resist the dampness twice as well as glue made with water.—1 *A*, *June* 7, 1872, 275.

IMPROVED LIQUID GLUE.

An excellent liquid glue can, it is said, be made by the following method: Take gum shellac three parts, India-rubber one part, by weight. Dissolve the two substances in separate vessels, in ether, free from alcohol, applying a gentle heat. When thoroughly dissolved, mix the two solutions, and keep in a bottle tightly stoppered. This glue resists the action of water, both hot and cold, and most of the acids and alkalies. Pieces of wood, leather, or other substances joined together tight, will part at any other point than that at which the joint is made. If the glue be thinned by the admixture of ether, and applied as a varnish to leather, it renders the joint or seam water-tight, and almost impossible to separate.—18 *A*, *July* 12, 1872, 425.

PREPARATION OF LIQUID INDIA INK.

A convenient method of preparing liquid India ink for the use of artists and draughtsmen consists in pounding a cake into fine particles and dissolving it in hot water. When the solution has become perfectly black and uniform, the tenth part, by volume, of glycerine is to be added, and thoroughly united by shaking the mixture. This may be kept in a corked bottle for a long time, and will remain completely liquid. When cold, this forms a black jelly, which, however, can be readily softened and liquefied by the heat of the hands. The ink can be diluted to any necessary degree, and will be found to run freely from the point and to give a fine stroke. A solution of gum arabic may also be kept fluid by the addition of half its bulk of glycerine.—18 *C*, *March* 6, 1872, 155.

PRINTING ON GLASS.

Type made of an elastic material is used, and printing-ink, with which is mixed fluoride of calcium. The glass thus printed on is then heated to a suitable temperature with sulphuric acid, and, after having been washed with water, it exhibits in indelible engraving the figures of the type.—16 *A*, *January*, 1872, 110.

USES OF CUPRO-AMMONIUM.

It was announced, not long ago, that when copper scraps are immersed in concentrated liquid ammonia, a deep blue fluid is produced, called, provisionally, cupro-ammonium, possessing a remarkable solvent power for paper, linen, silk, and bone, and various practical suggestions have been made for its utilization. We now learn that among the articles exhibited at the London International Exposition of 1872 is a model of a house, built entirely of paper, rendered water-proof by this process, a simple immersion being sufficient to accomplish the object. To show the water-proof character of this paper, a stream of water is made to flow over the model continually. Two sheets of paper, moistened with this substance and pressed together, become indissolubly united; and this application has already been utilized for making paper bags, where no danger is likely to arise from the poisonous nature of the copper.—16 *A*, *July*, 1872, 412.

GELATINE MOULDING.

The introduction of a process of casting known as gelatine moulding, which has come into vogue within a few years, has proved to be of great value in taking casts of delicate and intricate objects without showing any seam. For this purpose, the object to be copied, whether in plaster or of other material, is properly coated with oil and soap, to prevent adhesion, and then covered with canvas for protection. Rolls of modeling clay are then laid on over the canvas, until the whole surface is covered to a suitable thickness, say from four to six inches, and against this a plaster coating or wall is built up, in two or more parts, to form a backing for the mould. The two parts are then opened, and the canvas and clay taken out and thrown away, the two parts are replaced, and a hollow interval of the thickness of the clay will exist, into which hot liquid gelatine is poured. After twelve hours the gelatine will have attained a semi-solid consistency, which will allow of the mould being opened and the gelatine impression peeled from the face of the model.—17 *A, May* 1, 1872, 264.

NEW STUFFING FOR CUSHIONS.

A material which has come quite extensively into use in Germany as a substitute for hair in the stuffing of saddles, etc., consists of a mixture of flaxseed and tallow. The advantage of this substitute consists primarily in the fact that the mobility of the seeds, one upon the other, prevents the packing or settling in any particular place, as often happens in saddles stuffed with hair, thus causing any given pressure to be readily and uniformly distributed over any given surface. The tallow serves the purpose, too, of keeping the leather flexible, and of preventing the absorption of perspiration, protects the article itself, and prevents the back of the animal from becoming galled. Animals with sores or galled spots on the back can be ridden with saddles stuffed with this material without any great inconvenience. The tallow also has the effect of preventing the rotting of the flaxseed, and is to be added in sufficient quantity to give the requisite softness to the entire mass. An aromatic odor can be imparted by introducing oil of turpentine, or camphor powder, and the durability considerably increased thereby. One part of tallow to from six to ten parts of flaxseed may be used, according to the temperature.—8 *C, November* 23, 1871, 375.

GLAZING FOR FRESCOES.

It is stated that paraffine dissolved in benzole or Canada balsam affords a glazing for frescoes much superior to soluble glass.—18 *A, March* 8, 1872, 631.

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.—21 *A*, *December*, 1871, 1221.

TRANSPARENT STEREOSCOPIC PICTURES.

A method of making transparent stereoscopic pictures upon paper is thus described by its discoverer, Mr. A. von Constant, of Lausanne. Well-sized and not too thick albumen paper is made sensitive in the usual way, and the negative placed upon its back—*i. e.*, the side not chemically treated. The printing is done rather strongly, and the tone observed by looking through the paper toward the light. The picture can be conveniently colored with water-colors, and is well adapted for lamp-shades, etc.—14 *C*, vol. cciv., *April*, 1872.

GASOLINE FOR EXTRACTING FATS.

Dr. Vohl, of Cologne, continues to discuss the virtues of a form of petroleum which he calls Canadol, Canada oil, or gasoline of United States manufacturers, which he considers especially adapted to the extraction of fats of any kind from their original sources, and their conversion into articles for the table or for industrial purposes. The advantages of his method over that of cold and warm pressure he finds to consist both in the much greater yield and in the vastly improved quality, the residuum not being at all injured for use in other ways. The sulphide of carbon has frequently been employed by perfumers and others for extracting oily substances; but Vohl considers its use so greatly inferior to that of Canada oil as not really to come in competition with it. The butter can be extracted from the cacao-bean by this substance, thereby greatly improving the quality of the prepared cocoa.

Another application of the Canada oil is to the removal of the fat from bones, leaving them as white as if bleached for a long time, and perfectly adapted for use. Even the ivory of the elephant, the narwhal, and the walrus can be greatly improved in quality by this application. Glue made from bones thus prepared is also a very superior article. An important application of this substance, if all that is claimed for it by Dr. Vohl be true, will be in the hands of the anatomist in preparing bones for skeletons. This, as is well known, generally involves the use of ether or other expensive agencies in removing the grease. The special application of the process, and the method of extracting oil from seeds, with the apparatus required, is given at length in a recent number of Dingler's *Polytechnic Journal.*—13 *C*, *September* 15, 1871, 1165.

BRANDY FROM SAWDUST.

The fact has long since been known that if cellulose is boiled with dilute acids grape-sugar is produced, and a similar treatment of lichens, according to a process devised by Professor Stenberg, is the initial step to the preparation of a very fair brandy. We now learn that quite a good brandy can be made from sawdust, generally from a mixture of the sawdust of pine and of fir timber. For this purpose 9 parts of very moist sawdust, 0.7 of a part of hydrochloric acid, and 33.7 parts of water, making 43.4 parts in all, are to be boiled together, under steam pressure, for eight hours and a half, after which the mass is found to contain 3.33 parts of grape-sugar; and after eleven hours 4.38 parts, in all over 19 per cent. of the entire mass. The acid is now to be neutralized with lime, so that the mash, cooled and ready for fermentation, is to contain one half a degree of acid (according to the acetometer), and a suitable amount of yeast is to be added. After ninety-six hours of fermentation the mash is distilled, and sixty-one quarts of brandy of 50 per cent. of strength will be obtained, perfectly free from any smell of turpentine, and of extreme excellence of flavor. The experiment has not been conducted in a practical way on a sufficiently large scale to determine positively the merits of this process, but it is not at all unlikely that the success may equal that with the lichens, and that a large industry in this direction may be developed. It is not improbable, too, that experiments will show that other kinds of wood than those mentioned may be found better adapted to the purpose in question.—8 *C*, *December* 14, 1871, 393.

IMPROVEMENT IN THE MANUFACTURE OF SUGAR.

The Abbé Moigno, in *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!—3 *B*, *January* 11, 1872, 46.

USE OF CAUSTIC BARYTES IN SUGAR-REFINING.

Dr. George Lunge publishes in Dingler's *Polytechnic Journal* an account of his method of using caustic barytes for the separation of the sugar from molasses in the sugar refinery; this, in his view, being one of the best methods known, since it forms an insoluble combination with the sugar, which can be again decomposed, by means of carbonic acid, into insoluble carbonate of barytes and soluble sugar. The details of the process are too technical for our columns, but this reference to the article may be of service to some of our readers. —14 *C*, CCII., 172.

COATING METALS WITH COAL VARNISH.

The following method is described by which metallic objects may be coated with a durable black-brown varnish: On the bottom of a cylindrical cast-iron vessel, eighteen inches high, is placed a layer of coal-dust, half an inch thick, upon which is placed an iron grating, and thereon are placed the objects intended to be coated with varnish. The vessel, having been first closed with a well-fitting lid, is next placed on a bright coke fire, and heated for about a quarter of an hour, just to incipient red heat. The vessel is then removed from the fire, and, on the lid being taken off after about ten minutes, the metallic objects will be found coated very uniformly with a good and durable varnish, which resists bending, as well as a high temperature, without cracking or coming off. Very small objects, such as hooks and eyes for instance, are better placed along with some coal-dust in a coffee-roasting apparatus, and this turned, as is usual in the roasting of coffee, until the objects have obtained the desired depth of color, and are uniformly coated with the varnish.—16 *A*, *January*, 1872, 110.

FASTENING RUBBER TO METAL.

As rubber plates and rings are now used almost exclusively for making connections between steam and other pipes and apparatus, much annoyance is often experienced by the impossibility or imperfection of an air-tight connection. This is obviated entirely by employing a cement which fastens alike well to the rubber and to the metal or wood. Such cement is prepared by a solution of shellac in ammonia. This is best made by soaking pulverized gum shellac in ten times its weight of strong ammonia, when a shining mass is obtained, which in three or four weeks will become liquid without the use of hot water. This softens the rubber, and becomes, after volatilization of the ammonia, hard and impermeable to gases and fluids.—1 *A*, *May* 3, 1872, 213.

PAINT AND VARNISH DRYER.

A rapid dryer for oil paints and varnishes, it is stated, is prepared by dissolving twelve parts of best shellac and four parts borax in one hundred parts of water by the aid of heat. This solution, after heating, is poured into bottles, and should be well corked. If mixed with some oil of turpentine and then added to the oil paints, it will cause them to dry very rapidly.—1 *A*, *June* 21, 1872, 300.

BORATE OF MANGANESE

is coming into use as an oil dryer, and has attracted the attention of varnish makers, but the manner in which it is employed is kept a secret. It is said to be cheaper than other chemicals used as dryers, and preserves the oil, does not discolor, and leaves no sediment. The cost, wholesale, is eighty-five cents a pound, and three quarters of a pound, when properly used, it is stated, is equal to two pounds of other compositions. Borate of manganese was brought into use as a dryer, in England, about six months ago, and has recently been introduced into this country.

GLYCERINE FOR LEATHER.

It is stated that glycerine adds greatly to the elasticity and strength of leather, and that hides, especially those to be cut into leather bands for machinery, may be greatly improved by being soaked for some time in this substance.—1 *A*, *June* 21, 1872, 300.

PETROLEUM FOR PEGGED SHOES.

If pegged boots are occasionally dressed with petroleum between the soles and upper leather they will not rip. If the soles of boots and shoes are dressed with petroleum they will resist wet and wear well. The pegs, it is said, are not affected by dryness after being well saturated with the liquid. —18 *A*, *June* 14, 1872, 336.

IMPROVED COMPOSITION FOR PAINT.

The peeling off of paint from surfaces, it is stated, may be prevented by using a solution of wax and turpentine with the paint, as well as linseed oil. Five pounds of yellow wax are to be dissolved in five pounds of linseed oil, and two and a half pounds of resin are to be dissolved in four pounds of turpentine, and the two solutions are then mixed. This is thinned by means of a little oil of turpentine, and about one third part of any given color is to be stirred in. Even without any coloring matter the mixture can be used for various purposes, as it is almost entirely colorless, and well replaces the priming in wax and fresco painting.—*Mitth. für den Gewerbeverein für Nassau*, 1871, 28.

CARBOLATE OF SODA.

The best substance for preserving paste, starch-finish, etc., from putrefaction or change, is stated to be carbolate of soda, this having many advantages over carbolic acid in the way of efficiency and permanence. This salt is easily prepared by dissolving the common carbolic acid in caustic soda lye until the acid is no longer taken up, but swims in the form of oily drops upon the surface of the liquid. Of this solution enough is to be added to the paste, etc., to give it a decided, strong smell. The paste, it is reported, will never mould nor become sour, and the addition of the carbolate produces no inconvenience nor injury to the workmen.—5 *C*, VII., 56.

PREVENTING MOULD IN WEAVERS' SIZE.

To prevent the moulding and souring of the size used in weaving, the addition of carbolate of natron is recommended. For this purpose common carbolic acid is dissolved in caustic soda (soap-boilers' lye), and just enough mixed with the sizing paste to make its odor distinctly perceptible. It is asserted that neither the fibre of the fabric nor the health of the workmen are in the least injured by the preparation.—9 *C*, 1872, IV., 56.

ACTION OF STARCH UPON ANILINE COLORS.

A German chemist informs us that starch possesses the peculiar power of absorbing the coloring matter from solutions of aniline colors and fixing it upon itself. If a thin paste be made of wheat or potato starch, and cotton wool be soaked therein, and the wool thus treated be worked in some aniline color bath, a tint is obtained of the required shade. It is advisable to use a certain proportion of size, as the shades were found to be obtained by its use more readily than when it is not employed.—21 *A*, *April* 1, 1872, 320.

NEW BLEACHING PROCESS.

A new bleaching process, announced by Pubetz, of Prague, consists in first dissolving about nine pounds of permanganate of potash or soda in water, and then adding about one fourth this amount of sulphate of magnesia dissolved in water. The color of the liquid is then a very fine violet, and, thus prepared, will suffice for about 220 pounds of wool. A sulphurous acid bath is also prepared, containing about thirty volumes of the gas to each volume of water. This bath must be heated to 77 degrees Fahr. when used. The materials to be bleached are first thoroughly cleansed, and then kept in the permanganate bath for a quarter of an hour, on withdrawal from which they will be found covered with a deposit of peroxide of manganese. They are next introduced into the sulphurous acid bath, which reduces the peroxide of manganese to the protoxide, the salts of which are readily removed by subsequent washing. If the yarns or fabrics resist the bleaching process they should be treated with hydrochloric acid containing one part of commercial acid to twenty parts of water. One advantage of this process is that it affords a means by which even indigo may be discharged by a series of successive bleachings, leaving the stuff fit for redyeing.—3 *A*, *December* 16, 1871, 473.

BLEACHING BY PERMANGANATE OF POTASH.

The German *Dyers' Gazette* highly recommends the bleaching of cotton fabrics with permanganate of potassa. It asserts that the process is simple and speedy, and much less injurious to the fibre than the chlorine bleaching, and that whoever has given it a fair trial will never return to the old method. The yarn is boiled in caustic lye for from four to five hours, well rinsed, and for a quarter of an hour moved about in a bath containing three per cent. of the permanganate. It is then wrung and introduced into water to which from four to five per cent. of sulphurous acid has been added. Light rinsing, bluing, and drying finish the process.—26 *C*, 1872, VII.

USE OF CHROMATE OF POTASH IN DISCHARGING COLORS.

It often happens that when a mixture of gum dextrine with chromate of potash is used for discharging colors, washing will not leave the pattern white. This arises from the fact that such a mixture, when exposed to light, becomes partly insoluble, and, consequently, can not be entirely removed from the cloth. The remedy is to work in rooms having yellow glass windows, which prevent the action of the chemical rays of light, and allow the desired effect to be accomplished. —21 *A*, *December*, 1871, 1223.

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 Alexander 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 vermilion 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.—16 *A, January*, 1872, 111.

DYEING ALPACA WITH IODINE GREEN.

This is effected as follows: The material is first placed moist in a bath of iodine green (a quarter of a pound of the powder to ten pounds of the cloth), spirits of hartshorn (about a quarter of a pound), a little sulphuric acid, and a quarter of a pound of soda water-glass or silicate of soda. They are to be kept in this a short time, and then drawn quickly through a hot solution of tannin, brought back again into the first bath, and then placed in a tolerably strong acid bath.—13 *C, November* 1, 1871, 1390.

NEW COLORIMETER.

A new form of colorimeter is made by bringing two stout, square, well-polished plates of glass in contact with each other along one of the edges, the opposite edge being separated by a piece of platinum wire, of determinate thickness, leaving a very narrow wedge-shaped space between the two plates. On the under side of the lower plate there is to be a graduation, which is to be examined through the upper plate after the liquid to be tested is introduced between the two. To test milk with this instrument, a few drops are to be introduced in the wedge-shaped interval, and the scale observed through it. The last graduation, still legible, furnishes a scale for the richness of the milk. Should the liquid be strongly colored, we shall have every intensity of shade from entire want of color to the opposite. With this instrument, therefore, assuming any given solution as a standard, and noting the last degree which can be read through it, it is easy to determine whether any second fluid has a greater or less percentage of coloring matter.—18 *C*, XLI., *October* 11, 1871, 647.

INDULIN BLUE.

It is reported that Indulin blue has, by improved methods of preparation, become tolerably cheap, and may be recommended as a genuine color. It is first to be dissolved by rubbing up in some water, and then boiling in from 50 to 100 pints of water. For use, the bath is to be rendered alkaline with borax or soda; the coloring matter and the wool must be heated to 212° Fahrenheit; and the boiling must be continued until a sample, taken out and boiled in water acidulated in sulphuric acid, exhibits the desired shade. The entire mass of wool is then to be taken from the alkaline bath, and drained off, washed, and treated in a boiling-water bath with sulphuric acid and chloride of tin, in which the blue color, as shown in the sample, will become quickly developed. After some further boiling the operation will be completed.—23 *C*, *November* 15, 1871, 318.

INDIGOLINE.

Indigoline is a new dye-stuff, soluble in boiling water, which is used to produce shades of indigo blue, although it is not likely to displace the indigo bath when solidity of coloring is required. Alum is to be used with it, as a mordant, upon wool, with a little cream of tartar and sulphuric acid, or sulphate of soda and sulphuric acid. If the blue produced by this dye is passed through a bath of ordinary soluble violet it will take a beautiful violet tinge. For dark green, Russian green, etc., indigoline is well adapted as a coloring for the background.—25 *C*, 1872, IX., 72.

NON-POISONOUS GREEN COLOR.

A new green has been discovered which is said to be brilliant enough to replace the poisonous shades produced by arsenic. It is composed of twenty parts of oxide of zinc and one of sulphate of cobalt, mixed into a paste with water, and exposed to a red heat.—18 *A, June* 18, 1872, 336.

USE OF THE HULL OF THE WALNUT IN DYEING BLACK.

The green hull of the European walnut (*Juglans regia*) is turned to account in Greece, and elsewhere in the East, in a way which may, perhaps, suggest a similar application of the hull of our own black walnut. This is used for dyeing black the fur of various kinds of small animals, such as rabbits, cats, and the like. For this purpose the walnut hulls are first crushed, and then the juice squeezed out from the pulp, with the addition of a little water. A small quantity of lime is added, and the dye is then ready. The color is extremely difficult of extraction, and attaches itself very readily to any kind of hair, and is used extensively as a regular hair dye. The coloring matter consists essentially of a soluble alkaloid lately investigated, and known as *Regianine.*—14 *C*, CCIV., 260.

NEW ANILINE BLACK.

A new form of aniline black is described by Reimann, which only needs rubbing up with albumen, and thickening, to be ready for immediate use as a printing color. This, after steaming, becomes permanent, and of a beautiful and deep black. The coloring matter is furnished as a thick black mass, and the intensity of the tint depends somewhat upon the quantity of albumen. This has the same effect in fastening the color as with ultramarine and other body colors; that is, it incloses the color and keeps it, after its coagulation by steam, permanently fixed to the fibre.

A mixture of aniline black and albumen can also be used to great advantage as a stamping ink, and applied to the marking of linen and other objects. To render this ineffaceable, it is only necessary to subject it either to dry heat or to steam, by which the albumen becomes coagulated.—24 *C*, 1871, 49.

CAMPO-BELLO YELLOW.

A new color, called campo-bello yellow, is referred to by Reimann in a recent number of the *Färber-Zeitung* as being prepared near Leipsic. The cost of this is quite moderate, and the dye will furnish any shade of good, clear yellow. So far, it has been used chiefly in dyeing wool, its applicability to cotton and silk not having yet been tested. The color washes well, and has been exposed to hot soda solution of two degrees B. without being altered. With other dyes, such as fuchsin, indigo, carmine, perse, etc., it furnishes excellent combinations.—24 *C*, 1871, 18.

WHITE COLOR FOR WOOLENS.

Reimann's Journal gives a formula for the preparation of what is claimed to be the most beautiful of all known white colors. To prepare this, for each hundred pounds of wool are to be taken three pounds of alum, two pounds of sulphuric acid, one pound of cream of tartar, and three eighths of an ounce of anhydrous iodine violet. In this the wool is to be immersed for an hour at a temperature of 104° Fahr. The iodine violet must be bluish, and the quantity to be used will vary slightly in amount with the tone of the desired white. A fresh bath of three pounds of chloride of barium is also to be made, and into this the blued wool is to be introduced and left for two hours, at a temperature of 104° Fahr. The result is a deposit of sulphate of barytes in the wool, which retained a quantity of sulphuric acid from the first bath. This gives to the wool a beautiful white, and increases its weight about 18 per cent. The use of the chloride of barium is, it is said, preferable to the chalking of white goods, and for whitening the wools in question.—24 *C*, 1871, 210.

DYEING WOOL AND SILK A SCARLET RED.

A fine scarlet red can be fixed upon wool and silk by means of a process which depends upon the simultaneous application of naphthaline yellow and fuchsin; the less the amount of the latter, however, the finer are the shades. A dilute aqueous solution of naphthaline yellow is first to be heated nearly to the boiling-point, and then as much of the solution of fuchsin must be added as amounts to two per cent. of the naphthaline yellow, and the ordinary processes of dyeing are then followed. The two solutions must not be mixed in the cold, as the fuchsin would be precipitated in amorphous flocks; and if the liquid, with its precipitate, is then heated to boiling, a part only of the fuchsin will be dissolved, one portion becoming like a resin, and balling together into greenish bumps of a metallic lustre, in which condition the liquid is entirely unfit for dyeing.—29 *C, February*, 1872, 51.

ACTION OF SALINE WATERS IN DYEING.

It has generally been assumed that water containing saline matters is unsuited for dyeing and bleaching; but a correspondent of Reimann's *Färber-Zeitung* writes to say that the water of his village, which contains a little salt and some lime, is so far from being injurious to the process that it furthers it in a decided degree. In cotton dyeing an inequality of color in the yarn is often met with; but the correspondent in question maintains that this is never the case in his neighborhood. In boiling out the cotton, whether in the yarn or in the piece, it comes out from the kettle already half white, thus far lighter than when boiled in ordinary non-saline water. The theory of this process is found in the suggestion that saline water boils at a higher temperature than pure water. Aniline colors, when used with saline waters, according to his experience, are more beautiful, and light blue is never as fine as when saline water is employed. Should this communication prove to be founded in fact, it would be a question as to what extent common salt is to be hereafter added to the water for dyeing purposes.—24 *C*, 1872, IX., 66.

SUBSTITUTE FOR LITHOGRAPHIC STONE.

A substitute for lithographic stone has been introduced. For the purpose in question, the inventor takes a block or slab of slate, or other material, which is to be made perfectly smooth and true, and then coated with glue or other gelatinous matter. In some instances he adds a solution of silicate of soda and bichromate of potash, or uses this solution alone. The coated block is exposed to the sunlight, and then washed to remove the superfluous coating, and, after being dried, it is ready for drawing or writing upon. The ink, or pigment, is prepared with albumen, or other gelatinous matter, dissolved in a saturated solution of bichromate of potash, either with or without chrome alum, and with a small quantity of ivory-black to render the ink visible. The picture is drawn upon the prepared block with this ink, and exposed to sunlight, and afterwards the surface is covered with gum or glycerine. The block is then ready for the printer. Another method consists in using as a substitute metallic substances, as tin, brass, or zinc, preparing them first by rubbing with a solution formed of one ounce of hydrochloric acid, one fourth of an ounce of zinc, and one drachm of glacial acetic acid. After the plate has received the impression from the stone or wood in an ordinary lithographic press, or by means of a "transfer," the ink thereon is dried by heating the plate, which is afterwards plunged while still hot into cold water —this latter operation being supposed to confer permanency upon the impression. The ordinary ink is used in this process, which appears to consist, in reality, of "soldering" the design on the plate and burning it in.—18 *A*, *December* 1, 1871, 266.

WINDOW PHOTOGRAPHIC PROCESS.

A new and quite peculiar photo-lithographic process, lately announced by Window, bids fair to become of much practical value. For this, white paper is coated with a mixture of gelatine and birchromate of potash, and, after drying, illuminated under a negative. The soluble chrome salt is then washed out with water. If the wet picture is now touched with printers' ink, the portions corresponding to the light lines of the negative take up the black. This is based upon the peculiarity of gelatine of resisting the fatty blacks, even in thin sheets, and also the fact that these blacks are readily taken up by the lithographic stone. A piece of gelatine paper is rendered sensitive in the ordinary manner in a bath of bichromate of potash, and illuminated under a positive matrix of the object to be lithographed. After a sufficient illumination the paper is immersed some seconds in water, and laid with the gelatine side down upon a clean, polished lithographic stone, and then rubbed several times with a rubber pad to press out the superfluous water. A few minutes after warm water is poured on, of the temperature of about 97°, and the picture developed exactly like a carbon print. The paper becomes gradually loosened, and with a little action of the warm water can be completely removed. Warm water is then poured carefully over the side to separate all the remaining soluble gelatine.

The picture thus obtained is naturally a negative, because the matrix was a diapositive. After the picture has been developed so that the lights are entirely pure, the stone is to be moistened with alum water, and then allowed to dry. If the experiment has been successful, the negative picture will appear clear and sharp after drying. The edges of the stone are now to be gummed in the ordinary way, and the stone rolled with lithographic black, after which it is to be well rubbed down with a folded flannel cloth dipped in gum water; the gelatine of which the negative picture was composed is removed, and the fat color remains on the originally clear spaces. If the experiment has succeeded, a positive of great delicacy will be produced, which can then be printed from. —18 *C, March* 6, 1872, 155.

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.—25 *C*, 1871, 363.

WATER-PROOFING CLOTH.

Cloth and other fabrics can, it is said, be made water-proof, and at the same time secure against the attack of moths, by the following preparation: Ten pounds of sulphate of aluminium, or alum, and ten pounds of acetate of lead are to be dissolved in the necessary quantity of warm water, and the mixture allowed to stand until a deposit of sulphate of lead has taken place. The clear liquid, which consists of acetate of alumina, is to be poured off and mixed with five hundred parts of water, in which dissolved isinglass is to be stirred. The objects to be rendered water-proof are now to be immersed in this mixture, and allowed to remain twelve hours, until they become saturated; they are then dried and finished.—6 *C, January* 4, 1872, 8.

NEW WOODBURY PHOTOGRAPHIC PROCESS.

Woodbury, the author of the well-known photographic process which bears his name, has devised a new mode of printing, which begins by rubbing a glass plate with wax, and then coating it with a thin layer of collodion. A solution of gelatine and bichromate of potash, containing a certain amount of finely pulverized glass, emery, etc., is then poured on. After drying, this sheet is removed from the glass and laid upon the negative, with the collodion side downward, and then exposed to the light. After sufficient illumination it is cemented by a solution of India-rubber to a glass plate and washed with warm water, and after development the relief picture is again removed from the glass plate. The hydraulic press is next used to transfer this fine grain to a plate of metal, the minutest detail of the dry image being pressed into the soft metallic plate. A galvano-plastic counter-form is taken from this soft plate, and a cliché again taken from this, which is immediately coated with steel or iridium.

Another method of producing the relief granular picture consists in preparing the different mixtures of chrome gelatine as above, differing only in the greater or less degree of fineness of the granular substance. A sheet of thin paper is allowed to swim upon the mixture which contains the coarsest grains. After drying it is allowed to swim upon a second mixture, with the medium-sized grains, and then again, after drying, upon that with the finest. The gelatine sheet is now illuminated under a negative, then fastened under water to a finely polished steel plate, developed in warm water, and dried. The image thus obtained is transferred to a soft metallic plate, and a galvano-plastic copy taken. The finest grains in this way furnish the finest tones, while the half tones are supplied by those of medium size. This paper can be prepared like carbon paper, without chrome salt, and rendered sensitive before use.—18 *C*, *March* 6, 1872, 154.

NEW PHOTO-LITHOGRAPHIC PROCESS.

According to the *London News*, a new system of photographic lithography has been introduced in Berlin, based upon the fact that caoutchouc, like Jew's pitch and some other hydrocarbons, is capable of receiving a photographic impression. A thin film of caoutchouc dissolved in benzole is first spread upon paper, and exposed in the camera in the usual manner. The portions which have been subjected to the action of light are rendered insoluble, and the other portions are then washed away, as in Mr. Pouncey's process. The caoutchouc, wherever it remains on the paper, will receive a greasy ink from a roller which is now passed over the sheet, and the impression thus obtained may be transferred to the lithographic stone, and printed from in the usual manner. The plan is virtually a reproduction of Pouncey's process, with the substitution of caoutchouc for the bitumen of Judæa. —22 *A*, *March* 9, 1872, 247.

MODE OF REPRODUCING MANUSCRIPT.

An ingenious application of science to commercial purposes has been made by an Italian gentleman, M. Eugenio de Zuccato, of Padua. By means of the invention, any number of copies of a manuscript or design, traced upon a varnished metal plate, may be produced in an ordinary copying-press. The *modus operandi* is very simple. To the bed and upper plate of a press are attached wires leading from a small battery, so that when the top of the instrument is screwed down the two metal surfaces come into contact, and an electric current passes. An iron plate resting upon the bed of the press is coated with varnish, and upon this surface is written with a steel point any communication it is desired to copy. The letters having thus been formed in bare metal, a few sheets of copying-paper are impregnated with an acid solution of prussiate of potash and placed upon the scratched plate, which is then subjected to pressure in the copying-press. An electric current passes wherever the metal has been left bare (where the writing is, therefore), and the prussiate solution acting upon the iron, there is found prussiate of iron or Prussian blue characters corresponding to those scratched upon the plate. The number of copies that may be produced by this electro-chemical action is almost unlimited, and the formation of the Prussian blue lines is, of course, instantaneous.—12 *A*, *February* 8, 1872, 292.

IMITATION OF MAHOGANY.

A method is now in use in Paris by which almost any kind of wood of close grain can be made to imitate mahogany so closely as to render it almost impossible to distinguish between the real and false article. The wood is first planed so as to render it perfectly smooth, and is then rubbed with dilute sulphuric acid. Afterward an ounce and a half of dragon's-blood dissolved in a pint of alcohol, and half that quantity of carbonate of soda, are mixed together and filtered, and this liquid is then rubbed, or rather laid, on to the wood with a soft brush. This process is repeated until in a short time the wood will be found to have the appearance of mahogany. A little cold-drawn linseed oil will restore the polish, which becomes dimmed. It is said that this substitute is now applied with success in Paris to all purposes for which mahogany was formerly used.—17 *A*, *March* 1, 1872, 236.

LONG LEATHER BELTS FOR MACHINERY.

A manufacturer of Munich, to obtain belts of great length from the hides of oxen, skins them as hunters do fur-bearing animals, namely, by making a comparatively small opening behind, and stripping the hide off entire. After removing the feet, a kind of bag is left, which is tanned, and then cut round in a continuous strip of the desired width.—5 *C*, 1872, XIX., 152.

UTILIZATION OF SUINT.

In nothing is the spirit of the age more clearly shown than in the efforts made to utilize waste substances. This is being done with such effect that what was formerly got rid of with great difficulty and at considerable expense may become one of the most important objects of manufacture. We need only point to such matters as sewage, the slag of furnaces, the fine coal of commerce, the waste of pyrites used in the manufacture of sulphuric acid, etc., as illustrations. Quite a recent instance of this improved economy is found in the treatment of the wool of sheep. It has been ascertained that sheep derive from the soil upon which they pasture a considerable amount of potash, which, after it has circulated in the blood, is excreted from the skin with the sweat, and remains, generally in connection with this, attached to the wool. Chevreuil discovered, some time ago, that this peculiar mixture, known by the French as suint, constitutes not less than one third the weight of the raw merino fleece, from which it is easily removed by immersion in cold water. In ordinary wools the suint is less, the amount being about 15 per cent. of the raw fleece. Formerly it was considered as a kind of soap, mainly for the reason that the wool, besides this, sometimes contained about 8 per cent., or a not inconsiderable quantity of fat. This fat, however, is usually combined with earthy matters, mostly with lime, and consequently forms a soap which is very insoluble. The soluble suint is a neutral salt arising from the combination of potash with a peculiar animal acid, of which little more is known than that it contains saltpetre. Special effort has lately been directed to suint, in order to obtain as much as possible of the potash eliminated from the animal, and a special industry has been established at various portions of the great French wool district, such as Rheims, El Bœuf, etc.

A company purchases from the wool-raisers the solution of the suint obtained by rinsing the wool in cold water, the price paid for it being higher in proportion as it is more concentrated. As a general thing, it is maintained that a fleece weighing nine pounds contains about twenty ounces of suint, which should contain about one third part, or six to seven ounces of potash, although not more than five and one half ounces are perhaps directly available.

In the wool manufactories of the towns just referred to there are nearly 60,000,000 pounds of wool washed annually, the yield of about 6,750,000 sheep. This quantity should contain over 3,000,000 pounds of pure potash. Thus the water in which the wool is washed, and which has been heretofore thrown away, is made to yield a product, adding appreciably to the value of the wool itself, and more than covering the cost of its treatment. It is, of course, not an easy matter to utilize this solution of suint on a small scale; but wherever the work is carried on by the wholesale, as it is in connection with all great manufacturing establishments, it will undoubtedly become a regular part of the process of manufacture.—9 *C*, *January* 8, *February* 18, 1872.

CLEANING SEWING-MACHINES.

A writer in the Leipsic *Polytechnic Journal* has an extended article upon the proper method of cleaning sewing-machines that require such treatment, and begins by cautioning the owners against carelessly submitting them to the manipulation of even professional machinists for this purpose. The parts of the sewing-machine are so carefully adjusted to each other that any abrasion of the bearings will necessarily involve irregularity of motion, which will increase in time, until the whole machine becomes worthless. For this reason it is desirable to oil the different parts of the machine without taking them apart, even although this should be superintended by a careful artificer. According to the writer, the principal cause of injury to the machine consists in the accumulation of dust from the fabrics upon which it is used, this being so minute as to be inappreciable by the naked eye, but nevertheless accumulating and becoming fixed in the working-gear, and attracting the dust of the atmosphere. The best substance for the purpose of cleaning the machine is said to be fat from sheeps' feet, which is to be placed in tolerable abundance upon the bearing surfaces of the machine to be oiled, which is then to be set in rapid motion. This fat acts on the bearings, and when melted by the heat of friction is driven out again, mixed with the dirt and blackish matter from the machine. This is to be wiped off with a soft cloth, and a quantity of fat again applied, to be again treated in the same way, and this operation is to be continued until the fat, as it comes from the joint, is clear and free from dirt, after which the machine may be considered as entirely clean.

When the machine has become rusty in any of its bearings, this is to be removed very carefully by fine emery paper, although, if the trouble is not very serious, the application of fat as described will probably answer every purpose, and this is to be applied as already indicated until there is no further rusty tinge to the escaping oily matter.

Should the sewing-machine have become very much clogged through long disuse by dust and hardened oil, after a preliminary treatment with the fat referred to, spirits of turpentine or benzine may be applied to good advantage.—16 *C*, V., 1871, 189.

COLORING TIN-FOIL WITH ANILINE.

Tinted tin-foil is much used by confectioners and others as an ornamental wrapper for their goods. Springmühl recommends aniline colors, soluble in water, as best adapted to preparing this material of the desired hue. The tin-foil is placed upon moistened plate-glass and carefully smoothed by means of a polishing stone. A limpid solution of white gelatine, colored to the desired shade, is then poured over the metal so as to cover it evenly, the surplus being drained off by lifting one edge of the glass. The drying is to be done rather rapidly. To render the colors water-proof, they must be covered by a resinous lacquer.—25 *C*, XIX., 1872, 149.

COLLODION LACQUER.

Solutions of resins and gums, colored with aniline, are now extensively used as varnishes, though they do not always give entire satisfaction; and Springmühl has lately ascertained that collodion in many cases is better adapted for producing a transparent, firm, and water-proof coat, especially upon glass, mica, metal, etc. His process is as follows: Gun-cotton, specially prepared for the purpose, is dissolved in a mixture of two parts by volume of ether and one of alcohol of 95 per cent. The thick, clear mass thus obtained is further diluted with ether, and the aniline color, dissolved in pure alcohol, added, and thoroughly incorporated by shaking together. The proper degree of dilution is essential for success; otherwise there will be no difficulty, the manipulation being simply that of the photographer when preparing his plates, viz., pouring the collodion over the surface to be coated, which has previously been well cleaned. The drying proceeds rapidly, and the thin, transparent film adheres firmly, so as to recommend the process especially for the manufacture of colored tin-foils.—25 *C*, XX., 187.

BARYTES FOR WEIGHTING GOODS.

A French technical journal recommends the application of salts of barium for weighting light woven fabrics, the carbonate of baryta being considered the best for the purpose. The goods are to be passed through a solution of this salt, and, when partially dry, transferred to a water-bath slightly acidulated with sulphuric acid. A decomposition ensues, and sulphuret of barium is deposited upon the fibre as a light white powder. The softness and thickness of the fabric are greatly improved thereby, and the usual sizing with starch, albumen, or dextrine is not at all interfered with. Silk or woolen goods can also be impregnated with the sulphuret of barium in a similar manner.—25 *C*, xx., 1872, 160.

WATER-PROOF GELATINE SIZING.

Glue has many advantages as a size for woolen and cotton fabrics, especially those of dark color. At a high temperature, however, it dries too much, and causes the goods to wrinkle or curl. Furthermore, water dissolves the sizing and produces stains. To obviate these inconveniences, Reimann recommends the addition of glycerine and bichromate of potash. The former, being hygroscopic, prevents the rapid and thorough drying of the fabric, while the bichromate, under the influence of the light, renders the glue insoluble. The mixture will remain serviceable for some time if kept in the dark.—13 *C*, viii., 1872, 543.

NEW APPLICATION OF NEW ZEALAND FLAX.

The action of chlorine as a bleaching agent upon the fibre of *Phormium tenax*, the so-called New Zealand flax, has been found to be very slight and insufficient, and Mr. Skey, the analytical chemist of the government of New Zealand, undertook to ascertain, if possible, the cause of this peculiarity. After numerous experiments, he came to the conclusion that in *Phormium*, as well as in some other fibrous plants, there is a peculiar yet undescribed substance, which is insoluble in cold and hot water, in alcohol, ether, chloroform, diluted muriatic acid, etc., and which, in fact, can not be chemically removed without destroying the tenacity of the fibre. Mr. Skey, however, believes that one observation on his part may become of some practical value, viz., in regard to the product resulting from the action of strong alkalies upon the fibre of the New Zealand flax as well as of the Manilla hemp. By boiling either of these fibres for four hours in a strong solution of caustic potash, a pulp is obtained similar to that used in paper-making, with the difference, however, that, when dry, it shows considerable strength, so that an untwisted thread will support a weight of several pounds. Yet, while one single drop of water immediately destroys the cohesion, neither alcohol nor ether have any such effect. Mr. Skey suggests that this pulp may serve as a suitable material for an entirely new class of fabrics on account of the ease of manufacture, the length of fibre, the clear color, the beautiful lustre, etc. The pulp is easily moulded into any desired shape, and Mr. Skey thinks that, in drying, some substance could be added by which the absorption of moisture will be prevented and the desired durability thus obtained.—13 *C*, VIII., 1872, 546.

MERCURIAL PHOTOGRAPHIC PRINTS.

Professor Merget, of Lyons, submits a new process of printing from photographs without the agency of light. He spreads a few drops of mercury upon a copper plate, covers it with blotting-paper, and places upon this a common positive photograph. The latter is slightly heated, and its collodion side brought in contact with the paper. The mercury evaporates, and, after penetrating the blotting-paper, is precipitated upon the picture in accordance with the shades of its silver deposit. Half an hour is sufficient for this operation. The photograph thus prepared is pressed in a common copying-press upon paper impregnated with a salt of any of the noble metals, such as gold, silver, iridium, platinum, etc., and its mercury immediately reduces the metallic salts in the paper and gives a sufficiently good copy. The printing, however, must be done in the dark when nitrate of silver is used in the paper.—13 *C*, IX., 1872, 614.

ENAMEL FOR COOKING VESSELS.

In order to prevent oxidation in cooking vessels of copper, a German polytechnic journal recommends an enamel which is said to fully resist the action of vegetable acids. It consists of twelve parts of white fluor spar, twelve parts of gypsum (uncalcined), and one part of borax, which are finely powdered, thoroughly mixed together, and fused in a crucible, and, when cold, again reduced to fine powder. A paste, made by mixing this with water, is spread upon the copper with a brush, and dried with gentle heat, after which sufficient heat is to be applied to bring the compound into fusion, when a white and firmly adhering enamel will, it is said, result from the operation.—13 *C*, IX., 1872, 616.

INDESTRUCTIBLE WRITING-INK.

The following receipt is given as furnishing an indestructible writing-ink. One drachm of aniline black is dissolved in three quarters of an ounce of alcohol, to which sixty drops of concentrated muriatic acid are to be added. This solution is of a deep blue color, and is to be diluted with three ounces of water in which three quarters of an ounce of gum arabic has been dissolved. It is asserted that such ink does not corrode steel pens, and can not be destroyed, either by acids or by alkalies.—9 *C*, 1872, 73.

LINOLEUM, A NEW FABRIC.

A new fabric, by the name of linoleum, has lately been introduced in England, where it has met with great favor. It consists essentially of water-proof sail-cloth upon which a mixture of pulverized cork-wood and oxidized linseed oil is thoroughly fastened by rollers. It is made quite ornamental by tasteful prints in lively colors, and is used for carpeting stairs and corridors, for rugs before sofas and tables, for all kinds of matting, etc. It is considered quite valuable on account of its softness, durability, and indifference to moisture, heat, or cold, and is said to deaden the sound of footsteps or other noise more completely than kamptulicon.—18 *C*, XX., 317.

FIRE-PROOFING WOOD.

According to Sieburger, the following application will render wood measurably fire-proof. The surface to be protected is to be painted twice with a hot solution of three parts of alum and one part of copperas. When perfectly dry, a third coat is given with a diluted solution of copperas, to which just enough white fuller's earth is added to bring it to the consistency of a good paint. The alum and copperas penetrate deeply and combine partly with the constituents of the wood to form insoluble compounds. The clay serves as an external protection, and its occasional renewal is desirable.—8 *C*, *May*, 1872, 173.

CEMENT FOR MASONRY.

Professor Artus states that the following composition furnishes a very serviceable cement for masonry in aqueducts and for other purposes. Two parts of fresh slacked lime are made into a paste with two parts of sand and one part of finely pulverized brick-dust. The mixture should be thorough and homogeneous.—6 *C*, 1872, 176.

MANUFACTURE OF SUGAR COLOR.

The consumption of the so-called sugar color is constantly increasing, and it is estimated that Berlin, in Prussia, alone supplies the trade with over 5000 tons a year. It is used to give color to spirituous liquors, to beer, wine, vinegar, and even to coffee, while it imparts neither taste nor flavor, and is chemically a neutral body. In its preparation sugar is first dissolved in a very little water, and then heated, during continued stirring, almost to burning, giving rise to disagreeable vapors, which affect the eyes and the lungs. At this stage of the process about two per cent. of carbonate of ammonia are added, and the heating continued a little longer without any cessation of the stirring. Sugar from potato starch is just as good as any other for the purpose, besides being much cheaper. The burnt sugar, or caramel, must dissolve easily, and its solution must remain limpid and without any sediment.—6 *C*, xxii., 1872, 215.

NEW SIZE FOR FABRICS.

Mr. Depouilly proposes an alkaline solution of gum lac as a substitute for the several materials (flour, starch, dextrine, gelatine, etc.) now in use for sizing and finishing woven fabrics. The alkali is carbonized by the action of the air, and separates from the gum, which remains insoluble in the fibre. This size is said to be especially adapted to light fabrics, such as laces, thin muslin, etc., and may be applied either before or after the dyeing, or even in combination with the dye-stuff. For light colors bleached gum is to be used, to which, for white goods, a blue tinge is given. It is mentioned, as an additional advantage, that this solution does not ferment, and that it acts as a good mordant for vegetable fibres.

The idea of Mr. Müller to animalize cotton fibre by precipitating a solution of silk upon it is considered theoretically correct, but practically inapplicable.—25 *C*, XXII., 1872, 176.

IMPROVEMENT IN SIZING FABRICS.

In sizing and finishing muslin or other loosely woven fabrics, it frequently happens that the interstices become filled with the sizing material. Messrs. Courand & Moissonier obviate this by directing a current of finely divided steam against the fabric when passing from the sizing machine. It is probable that a current of air would serve the same purpose, as it would blow off the thin film closing the interstices.—13 *C*, X., 1872, 686.

ARTIFICIAL LEATHER.

Messrs. Harrington & Richards have taken a patent in England for the manufacture of what they call artificial leather. They mix one part of glycerine with three parts of glue, add boiled linseed oil to make it more pliable, or caoutchouc to make it elastic, spread it, while hot, upon some fabric, and subject it to a high pressure. When cold, the surface is coated with a solution of chrome alum, common alum, or sulphate of iron. Finally, they apply some water-proof composition to prevent the injurious action of moisture.—6 *C*, XXIV., 1872, 238.

DYEING WITH GLYCERINE SOLUTIONS OF ANILINE.

Glycerine is a better solvent of aniline colors than either alcohol or water, and Mr. F. Springmühl has lately made some satisfactory experiments in dyeing wool, cotton, and silk with glycerine solutions. The colors were fast, clear, and lively, and in most cases no mordant was required. The high boiling-point of the glycerine appeared to be very favorable, and Mr. Springmühl thinks even the addition of a small quantity of glycerine solution to the common bath advisable whenever the high price of the glycerine forbids its more extended application.—13 *C*, X., 1872, 686.

PARAFFINE FOR PRESERVING WOOD.

Paraffine, as a simple, cheap, and effective material, is recommended for the preservation of wood. The principal difficulty is in the drying of the wood, which ought to be perfect. A solution of paraffine in benzine, under a pressure of from five to eight atmospheres, penetrates the wood, when packed in a wrought-iron cylinder and heated by steam. The greatest portion of the paraffine can be recovered by redistillation. The process is inexpensive. Furthermore, the wood may be worked into the required shape before subjecting it to impregnation, which is not the case with metallic solutions. —5 *C*, XIX., 140.

PREVENTING INJURY FROM MERCURIAL VAPORS.

In order to lessen the injurious effects of the vapors of mercury, to which workmen in looking-glass factories and other establishments are exposed, Professor A. Merget, of Lyons, advises the introduction of chlorine gas, which combines with the mercurial vapor, and forms the relatively innocuous calomel. There is, however, one objection, viz., that this fine calomel dust may prove injurious to the organs of respiration. Still, the use of chlorine need not be entirely excluded on account of this, as it certainly will act beneficially when applied as chlorine water for washing the most exposed parts of the body, and as a disinfectant for the cloth worn in the workshop.—8 *C*, XXV., 1872, 203.

JAPANESE FELT.

Mr. E. Pavy, of Chilworth, England, has lately introduced the manufacture of a very tough and pliable paper, which is called "Japanese felt." It is easily colored, and by suitable stamping, pressing, or printing, can be made to assume the appearance of leather or other more expensive fabrics.—6 *C*, 1872, 245.

APPARATUS FOR FILING.

Mr. Von Kalatschoff, in Moscow, has introduced an apparatus for filing which is highly recommended as equally simple and effective. It consists of a cast-iron disk rotating around a steel axis, with a handle on either end. This disk is turned by an elastic belt, and directed by means of the handles of its axis. A ring of steel, the outer edge of which is cut more or less finely, according to the purpose, serves as the file proper, and is fastened upon the rim of the cast-iron disk, from which it derives a rapid rotary motion, while it is directed by means of the handles, the elastic belt allowing the necessary play.—5 *C*, xxv., 1872, 198.

BLEACHING WITH SULPHUROUS ACID.

In bleaching woolen goods with sulphurous acid, Mr. Bastaërt proposes, as an essential improvement, to burn the sulphur upon a separate hearth, so as to conduct the vapor upwards, and then drive it, mixed with steam, through a horizontal tube into the chamber. If the goods are on rollers the action may be kept up continuously. There should, however, never be more steam than is necessary for carrying the sulphurous gas along, as its condensation in the chamber would be injurious. It has also been suggested to make the chamber itself of plate-glass, so that the action of light may be added to that of the sulphur.—5 *C*, 1872, 207.

PLATINUM-BRONZE, A NEW ALLOY FOR COOKING UTENSILS.

It is proposed to manufacture cooking utensils out of a new and entirely unoxidizable alloy (bearing the name of platinum-bronze), as a substitute for the ordinary copper alloys, so readily acted upon by acids, and consequently involving so much danger in their use. The bronze is prepared from nickel, made thoroughly pure by various processes, and by maceration in concentrated nitric acid. The proportions employed are 100 parts of nickel, 10 of tin, and 1 of platinum; the latter two metals being added to the fused nickel in the proportion of 4 of tin to 1 of platinum, and the remaining 6 parts of tin added subsequently. For bells and sonorous articles the proportions are slightly varied, viz., nickel, 100 parts; tin, 20; silver, 2; and platinum, 1.—3 *A*, *August*, 83.

COATING ZINC WITH IRON.

Zinc may, it is said, be coated with a brilliant and solid layer of iron by means of the following process. A solution is made of 15 parts of sulphate of iron, and 9 of sal ammoniac, in 250 parts of boiling water, and in this the zinc articles to be coated are placed. The sulphate of iron must be entirely free from copper. At the end of one or two minutes the objects must be withdrawn, and the black coating of the iron already deposited removed by brushing under water. The articles are then to be again placed in the hot bath, and, after they have acquired a second black coating, held over a vessel filled with burning charcoal until the ammoniacal vapors caused by the heat cease to be disengaged. This operation is to be repeated three or four times, the articles being washed off before each immersion. The black layer fixed by heat is said to adhere firmly to the zinc, and to assume a permanent polish under a brush.—1 *B*, *July* 28, 1872, 296.

ANTIMONY BLUE.

A new blue color has lately been made from antimony, which is pronounced very beautiful and durable, but not applicable to plastered surfaces. The metallic antimony is dissolved in aqua regia, filtered through granulated glass, and mixed with a weak solution of prussiate of potash until precipitation ceases. It can scarcely be distinguished from ultramarine, and is said to be very effective in coloring artificial flowers. Mixed with chrome yellow it gives a green color, almost as brilliant as the dangerous arsenious compounds, which thereby may be superseded.—15 *C*, VII., 112.

NEW BLUE.

A new blue has lately been obtained by a special treatment of phenol and stannate of soda. When cotton cloth is placed in this solution it first becomes a beautiful orange color. It is then to be washed, first in an alkaline solution, which turns it green, and afterwards with water, which leaves it a celestial blue. The blue dye thus produced is almost unaffected by chlorine and hypochlorites, and does not fade by exposure to sunlight.—3 *A*, *July*, 1872, 33.

DYEING WOOL AND SILK SCARLET.

A mixture of dinitro-naphthal and fuchsine has been recommended for dyeing wool and silk scarlet. An aqueous solution of dinitro-naphthal is heated to nearly its boiling point, and about two per cent. of fuchsine, in solution, added. It is absolutely necessary to mix the two ingredients at a high temperature, because fuchsine, when cold, precipitates in amorphous insoluble flakes, which melt, when heated, into lumps of a greenish metallic lustre. Filtering does not restore the efficiency of the dye thus spoiled.—5 *C*, xx., 160.

PALE NANKIN YELLOW.

To obtain a pale Nankin yellow color on cotton or woolen cloth, the fabric is to be boiled in water for half an hour, and allowed to drain, and then immersed in a bath of permanganate of soda of one degree Baumé, heated to 86° Fahr. It is to be removed at the end of half an hour, and, after allowing it to drain, it is to be immersed in a bath of sulphate of iron, to fix the color. This latter bath should contain ten per cent. of the amount of water employed in the first bath. The cloth is then to be washed, next introduced into a bath of sulphurous acid of one degree Baumé, and finally washed and dried.—4 *B*, *July*, 570.

NEW MODE OF DECORATIVE PAINTING.

A new process of decorative painting has lately been announced to the Paris Academy. This consists in the use of a sheet of tin-foil, as thin as possible, and, consequently, of great flexibility. The tin-foil is stretched upon a hard and smooth ground, such as glass, and upon the foil a painting is made of any kind, whether of uniform tint or decorated. The painting is to be allowed to dry, and it is then varnished and the tin-foil removed from the glass, when it is ready for further application. Before being applied to any surface, a water-proof coating is to be given to the latter. The tin is then applied by means of some kind of cement, and made to accommodate itself to any curvatures of the surface that may exist. The tin-foil can be used upon wood, plaster, or stone. —6 *B*, *May* 6, 1229.

GOLD POWDER FOR GILDING.

Gold powder, for gilding, may be prepared by putting into an earthen mortar some gold leaf, with a little honey or thick gum water, and grinding the mixture till the gold is reduced to extremely fine particles. When this is done, a little warm water will wash out the honey or gum, leaving the gold behind in a pulverulent state. Another way is to dissolve pure gold, or the leaf, in nitro-muriatic acid, and then to precipitate it by a piece of copper, or by a solution of sulphate of iron. The precipitate (if by copper) must be digested in distilled vinegar, and then washed (by pouring water over it repeatedly) and dried. This precipitate will be in the form of a very fine powder. It works better, and is more easily burnished than gold leaf, ground in honey, as above.—3 *A*, *August*, 74.

UTILIZING REFUSE TAN.

An attempt has been made by Mr. De Wild to utilize the refuse tan from tanneries, a substance the disposal of which is frequently very difficult. By distilling it, however, in an ordinary wood distilling apparatus among other products, Mr. De Wild obtained 8 per cent. of tar, a quantity of pyroligneous acid and wood spirit, and a residue of 33 per cent. of charcoal.—4 *B*, *July*, 571.

PALATINE-ORANGE, A NEW DYE.

A new dye-stuff for silk, wool, and cotton, named palatine-orange, is highly spoken of, as furnishing a brilliant and fast color of easy treatment. The solution is made in hot water, and the dyeing finished in one boiling bath slightly acidulated. Acetic or tartaric acid is preferable to sulphuric. As the color is purer and faster than that produced by curcuma or quercitron, a second dye with fuchsine, indigo-carmine, orseille, etc., yields the peculiar shades of the so-called fashion colors in great beauty and permanence. For printing upon wool, a concentrated aqueous solution of palatine-orange may be used without any acid.—23 *C*, *April* 1, 1872, 111.

PREPARATION OF CHLORINE ON A LARGE SCALE.

A method is announced for the preparation of chlorine on a large scale, by the decomposition of manganite of magnesium. A compound of magnesium and manganese chlorides is obtained by neutralizing carefully the ordinary chloride of manganese liquor by Greek stone, heating up this solution until its temperature is about 300° Fahr., and evaporating to dryness in a blind furnace, in which the residue, piled up in thin cakes, is treated in a current of air. A mixture of chlorine and hydrochloric acid is thus obtained, and manganite of magnesium is formed anew. By the reaction of the hydrochloric acid upon this compound, chlorine and the double chlorides are reproduced, and these double chlorides may again be shut up, and thus the process rendered continuous—a definite quantity of manganese and magnesium being able to eliminate an indefinite amount of chlorine from hydrochloric acid.—15 *A*, *August* 24, 1872, 238.

ZUCCATOR COPYING-MACHINE.

The electro-chemical copying-press devised by Signor Eugenio de Zuccator, of Padua, has been materially improved since its first announcement, and now bids fair to realize measurably the object of a simple and ready method of multiplying any writing, printing, or drawing, by electro-chemical action, for the use of editors, telegraphers, reporters, etc. The copying-press itself differs but little from the screw-press in ordinary use, the difference being mainly in having the upper bed composed of a plate of copper, and the lower of a plate of copper tinned, both on mahogany beds, the upper being attached to the solid iron press by clips, and the lower being made to slide out. These two plates are placed in the ordinary way in the circuit of a battery, so that when brought into close proximity by the action of a screw the circuit is completed, and the current established over the whole surfaces.

A steel plate is coated with an insulating varnish, and upon this the writing or drawing is traced. When this plate is interposed in the circuit, the current of electricity is confined to those portions deprived of the insulating surface, and leaves a record of its passage by its continued action on the steel plate and on sheets of copying-paper, especially prepared and dampened with a solution of prussiate of potash. The electrolytic action causes the formation of the ferro-prussiate, or "Prussian blue," producing a perfect fac-simile of the original manuscript or design upon the varnished surface of the plate.

The movable steel plates on which the writing or drawing to be copied is made must be thoroughly cleaned, and well and evenly varnished, care also being taken, by a firm and steady pressure on the style, to remove the varnish, leaving the writing, printing, or other pattern, in bright steel on a raised ground of varnish, affording perfect insulation every where on the surface. Any number of sheets, from one to six, can be placed one upon the other, after being dampened with the solution, and by interposing these in the circuit, screwing the press down so as to secure a proper contact, and by establishing the circuit, one wire being connected with the upper bed and the other with the lower, the desired result is accomplished in a few seconds.—3 *A*, *April* 20, 1872, 335.

DENDRITIC MARKS ON PAPER.

According to Mr. Liversedge, the minute dendritic marks frequently noticed on paper, to which various observers have assigned a vegetable origin, are actually inorganic; blow-pipe examinations, supplemented by special tests, showing that they consist mainly of sulphide of copper. These usually have a nucleus, which consists of a minute particle of copper or brass, and probably derived from some part of the machinery used in the manufacture of the paper.—1 *A*, *June* 14, 1872, 284.

ABSORPTION OF METALLIC SALTS BY WOOL.

A memoir on the absorption of metallic salts by wool when mordanted, submitted by Professor M. P. Havrez, was very favorably received by the Royal Society in Brussels. The action of the mordants — which usually have alum as a basis —is not confined to making the coloring principle insoluble and thus fixing it upon the tissue, but also imparts to the tint purity and intensity of color. The way of proceeding has always been empirical, as the influence of the many possible modifications has never been fully ascertained. Mr. Havrez, in experimenting with tepid and boiling solutions of alum of different strength, used the salt in eleven different proportions, gradually increasing the amount from one twentieth of one per cent. of the quantity of wool to 100 per cent. The feeble solutions had an alkaline reaction; those more impregnated were acid. The cause of this difference Mr. Havrez at first attributed to traces of soda retained in the wool, to lime in the water used for washing, and finally to the presence of ammonia, resulting from the alteration of the gelatinous principle of the wool. Mr. Stas then pointed out, as the true cause, the dissociation of the alum, and the extended experiments of Mr. Havrez have confirmed this supposition. Diluted solutions of sulphate of iron and copper give entirely analogous results. As to the influence of the different conditions in which the solution of the mordant is applied, Mr. Havrez found, first, that lime dissolved in the water acts like a diminution of the mordant; second, that the presence of free acid in small quantity does not prevent dissociation, but reduces the amount of alumina absorbed by the wool; third, that most diluted solutions of alum, at the highest temperature, and by their long-continued action, produce the most extended dissociation and fix the most alumina. Besides, the ratio of the quantity of wool operated on to that of the alum applied is of greater influence than the proportion of the solvent to the alum.

In summing up, Mr. Havrez maintains that the elements of the mordants, separated by dissociation, are gradually and very unequally absorbed by the wool, so that the whole process appears as a kind of dialysis, in which the wool acts the part of the porous body.—*Bull. Acad. Royale des Sciences, Bruxelles, March*, 1872.

NEW MODE OF PRINTING GOODS.

Mr. Vial presented to the Academy of Sciences, in Paris, a new method of printing upon fabrics by means of metallic precipitation. An illustration of the process is seen if we take a piece of linen, cotton, or silk fabric, and soak it for a time in a solution of nitrate of silver. After exposing this to the air for a short time for the purpose of partially drying, if we place above it a coin, or a casting of zinc, lead, or copper, the nitrate will be decomposed in places where contact has been effected and the silver immediately precipitated in the form of a black powder, representing the image upon the coin in its minutest details, and in a faithful, distinct, and indelible manner. Every time the coin is placed upon the moist cloth the impression will be repeated instantaneously and perfectly, this not being the result of the application of color, but a chemical phenomenon exhibited by the simple contact of the salt and the metal, whatever be the delicacy or extent of the point of contact, and the deposition of the silver is made with such intensity as to strike almost entirely through the material.

Simple washing with water will remove from the cloth the undecomposed salt. The tint of the impression may be varied at will, from pale gray to intense black, according to the proportions of the silver and the material used as a precipitant. In general it is black, in proportion to the affinity it has for oxygen, and the degree to which it is removed from the silver. The process of Mr. Vial is presented by him to the consideration of scientific and practical men for their experiments, and he feels quite sure that it will take a place of great importance in the arts of printing and dyeing.—6 *B*, *June* 10, 1872, 1486.

MINERAL SPERM-OIL.

Mr. Hayes calls the attention of American chemists to the value, for illuminating purposes, of a heavy oil obtained from petroleum, and known in the trade as Morrill's mineral sperm-oil. This, it is claimed, has the advantage of being as safe as sperm-oil in combustion. It is sufficiently thin to fill the wicks perfectly, but is so far from being a volatile oil that it is comparatively inodorous, and will not take fire at any temperature below 300° Fahr. Flames of considerable size, such as a large ball of wicking-yarn, saturated with oil and ignited, when plunged beneath the surface of this oil, previously heated to the temperature of boiling water, are extinguished at once. It burns freely in the German student lamps, and with great brilliancy from the "dual burner." The patentee of this oil estimates that 60,000 gallons can be manufactured per day, or about one fourth of the whole product of petroleum. This is more than twice the whole product of the sperm and whale oils in the best days of the fishery in this country.—*American Chemist*, *May*, 1872, 404.

INDIA-RUBBER CORKS.

It is announced that India-rubber corks may be cut or bored with as much facility as true cork, if the knife or cork-borer be dipped in a solution of caustic potash or soda. The strength of the solution is of little consequence, but should not be weaker than the ordinary reagent solution. Alcohol and water both answer a good purpose, but are much less efficacious than the soda lye; and if a tolerably sharp knife be moistened with this substance it acts upon the rubber quite as easily as it would upon cork. In boring holes in rubber corks, to avoid the contraction of the diameter at the bottom, the stopper should be held firmly against a flat surface of common cork until the rubber is completely perforated.—1 *A*, *August* 20, 1872, 104..

UTILIZATION OF SCRAPS OF TINNED IRON.

The method of utilizing scraps of tinned iron, devised by Dr. Adolph Ott, is said to answer an excellent purpose, and to be in successful operation in various German tin-plate establishments in New York. For the purpose in question the scraps are placed in large perforated copper vessels, and rotated from thirty to forty minutes in a tank containing warm hydrochloric acid, when the tin, lead, and about five per cent. of iron will be dissolved. The copper drum is then lifted from the acid into a vessel of water, then into one of alkali, and again into water, when the scrap will be found free from tin, and may be sent to the puddling furnace.

The lead may be separated from the solution by the addition of sulphuric acid, and the tin may be obtained in the metallic state by immersing plates of zinc in the liquid. Thus regained, it requires only washing in water to be ready for melting and casting into blocks.

The solution left behind after the separation of the tin, containing chiefly chloride of zinc and iron, is said to be serviceable in preserving timber by impregnation.—1 *D*, *August*, 1872, 82.

IMPROVED MODE OF NICKEL PLATING.

Mr. Keith announces an improved method of nickel plating, by which he obtains a flexible and tenacious deposit, the ordinary coatings of this metal being so brittle that the articles will not admit of the least bending. The invention consists in adding to the various solutions of nickel, whether formed of single or double salts, materials which, by their presence, prevent the decomposition of the solution of the plating bath, and the deposition of oxide of nickel and other impurities upon the articles receiving the coating of nickel. There is added to the solution of nickel one or more salts, either single or double, acid or neutral, or associate, formed by the union of organic acids, acetic, citric, and tartaric, with the alkalies and alkaline earths, ammonia, soda, potash, magnesia, or alumina. These additions will, it is asserted, counteract the tendency to decomposition of the solution by action of the electric current. These various organic acid salts may be added interchangeably and collectively, though the inventor prefers to use, in case of the double salts of nickel and alkalies and alkaline earths, the organic acid salts which have for their bases the alkali or alkaline earth which is associated with the nickel in its double salt. Thus when using a solution of nickel and ammonia, an organic acid salt of ammonia is preferred, though the similar salts of soda and potash will answer very well. In case of using a solution of a double salt of nickel and potash, or a double salt of nickel and soda, an organic acid salt of soda and potash is selected. Of the salts which can be used to accomplish the effect the tartrates are preferable. A comparatively small quantity of the organic salts is necessary to be added, though it will not change the character of the deposit.

The following bath is said to work well: To twenty gallons of a solution in water of the double sulphate of nickel and ammonia, of 7° Baumé, add one gallon of a solution, of an equal gravity, of neutral tartrate of ammonia in water. Mix well, and the bath will be ready after standing a few hours.—16 *A*, *July*, 1872, 402.

OBJECTION TO USING GLYCERINE AS A PRESERVATIVE.

The use of glycerine as a preservative of anatomical objects, or specimens of natural history, has been strongly recommended; but it appears from experiments that it has an unfavorable action upon certain tissues. Thus, teeth kept for some time in glycerine lose their original hardness, and can be cut with a knife like horn, and oxalate of lime crystals appear to be completely broken up. These hints will be of importance to those who are in the habit of making wet preparations with this substance.—3 *A*, *January* 13, 1872, 26.

EMBALMING AMONG THE EGYPTIANS.

Dr. Benjamin W. Richardson, in a lecture upon the science and art of embalming the dead, remarks that three different methods were practiced among the Egyptians. First, embalming proper, by the introduction into the body of certain odorous essences or antiseptics, aided by after-immersion in saline solutions; second, preservation by simple extraction of water from the tissues; third, by the injection of preservative solutions into the blood-vessels. He remarks that the first of these methods includes the true Egyptian and Greco-Egyptian process of preservation, as detailed at full length by Herodotus, and consisted essentially in eviscerating the body and employing aromatic preservatives, and in exposure to a solution of common salt, possibly with the addition of some soda.—20 *A*, *December* 23, 1871, 761.

MANUFACTURE OF WOOD PULP FOR PAPER.

Among the more interesting articles at the International Exhibition in London, in the summer of 1872, was a series of illustrations of the process devised by Mr. Houghton for converting wood into pulp for paper. It is said that the difficulty hitherto in using this material for the purpose mentioned has been the necessity of using such large quantities of alkali as to make the cost of the operation too great to be generally employed, at least abroad. This difficulty has been overcome by Mr. Houghton's process, and it is expected that large quantities of wood, heretofore wasted, will be made available. Every saw-mill in the United States has an immense amount of refuse material, which it is extremely difficult to get rid of, and in many instances large fires are kept burning night and day in order to destroy it. There will be nothing in the way, it is said, of treating this refuse so as to have it rendered available for paper-making, and thus, while utilizing an immense amount of waste material, to cheapen the cost of books and newspapers.

In the process of Mr. Houghton, in the first place, the wood is cut diagonally by a series of knives, so that the fibre easily separates by the splitting of the grain. These slices are again broken in smaller pieces, furnishing the raw material for the next manipulation. This consists in introducing them into a patent boiler calculated to endure great pressure, and heated by hot water circulating in pipes which traverse it in sections throughout its length, the heat being capable of most accurate regulation.

The pressure employed in the process of treating the fibre is 180 degrees, and the wood is introduced into the boiler in wire cages running upon a set of rails, the small pieces after boiling being quite soft and of a dingy color. This is next treated by means of chlorine in a vat, and the bleaching finished by the use of permanganate of potash. The material is now a soft, pulpy, and highly fibrous substance, which is next subjected to the action of a hydro-extractor, a kind of wringer, which leaves it in the shape of a damp, fleecy mass.

The liquid with which the fibre has been treated is then pumped into a vat, and subjected to the action of carbonic acid gas, which solidifies to some extent the resinous particles. It is next placed in a copper boiler, and heated exactly to the boiling-point. This produces a complete coagulation of the resin, which falls to the bottom in large flakes. No use has been, so far, found for this resin, but it is expected that before long it may become of commercial value. There are many other details in the manipulation of the fibre, for which reference must be made to the technical journals.—18 *A*, *June* 28, 1872, 372.

A NEW INDUSTRY.

Under this title, a French contemporary brings to our notice the account of a process for manufacturing mirrors that has infinite advantages of every kind over those constructed of mercurial amalgam. Many of our readers are well aware of the difficulties attendant upon the construction of a really good and perfect mirror, such as is in ordinary use. The necessity of having glass of a certain quality and perfect uniformity, of having the two surfaces entirely plane and exactly parallel to each other, free from scratches and other defects; the injury to the health of the workmen employed in manufacturing them, as exhibited in colic, salivation, vertigo, trembling of the limbs, and paralysis, and the comparatively great cost of production, are all obviated by the new process, as it is claimed. The attention of humanitarians has for years been directed toward the discovery and application of some method of remedying the ills caused by the use of mercury, by calling into use improved modes of ventilation, adding sodium to the mercury to render it less liable to volatilize, wearing of masks connected with breathing tubes leading to the outside atmosphere, etc., none of them, however, resulting in any important gain in a hygienic point of view.

Failing to improve sufficiently the mercurial process, attention was directed to the use of other metals, and various methods were devised and brought into practice, among the most successful of which was that of Professor Liebig, consisting in the employment of the ammoniacal nitrate of silver combined with aldehyde. Others made use of a solution of nitrate of silver mixed with tartaric acid, and ammonia in slight excess. This liquid extends over the surface of the glass, and is finally decomposed by the action of heat, the silver separating in a metallic form and attaching itself to the surface of the glass, after which it is coated by means of a brush with a red-lead paint, to protect it from injury and against surface emanations. This process was the most satisfactory of all, yet left much to be wished for. The manipulations were very uncertain, requiring the greatest care, and often failing without any assignable cause.

At this time the labors of a practical chemist in France, M. Dodé, were brought into successful application. He had been experimenting for many years; and, after trying every method that had been suggested, both with mercury and silver in all their modifications, he finally fixed upon platinum as the metal which met every requirement, in its indestructibility and immunity from alteration or injury by sulphurous acids and other vapors; and he soon presented specimens of his workmanship that were universally admired. At first he followed the old process of applying the platinum to the back of the glass, and, although the results were very satisfactory, he found an advantage in changing his method and affixing his material to the surface of the glass, so that the reflection should be precisely as in a metallic mirror—from the outside surface, and not from the inner, after passing through the thickness of the glass. In this way he was enabled to effect a great economy in the nature and cost of the preparation of the glass base of the mirror, as, with a single surface properly smoothed and polished off, it was a matter of no consequence what was the nature of the opposite side, nor what the character of the material and texture of the mass of glass itself. And the reflection being from the upper surface, the image was much sharper and clearer, and more perfect, and gave but a single image instead of the double one, which can almost always be appreciated in the ordinary glass mirror.

At the present time this branch of industry has developed to a vast extent, and is conducted on a very large scale at the establishment of the inventor. The process of manipulation, without entering into too minute detail, is as follows, premising that the time required for the completion of the operation is less than one tenth of that by the old method.

The platinum solution is prepared by taking 100 grammes of this metal in thin sheets (a gramme being equal to about $15\frac{1}{2}$ grains), which are first wiped off and washed to remove the grease which may have become attached during the process of lamination, and then dissolved in aqua regia, formed by a mixture of 400 grammes of nitric acid and 1000 grammes of pure hydrochloric acid. The solution is heated in a sand bath and evaporated to dryness, and then reduced to powder, upon which rectified essence of lavender is then to be poured, little by little. When about 1400 parts of essence of lavender have been added, the mixture is to be removed and placed in a porcelain capsule, and allowed to remain eight days in absolute rest. It is then to be poured off, and the filtered liquid decanted anew six days afterward, and then again after another period of six days. As a flux for the quantity of platinum above given, 25 grammes of litharge and 25 grammes of borate of lead are to be pounded up in eight or ten grammes of essence of lavender. This combination to be added to the platinum liquid, which is now to be applied to the surface of the glass, held vertically, by means of a brush. The brush is to be applied thoroughly in all directions, from the top to the bottom, from the bottom to the top, and then from right to left and left to right, so as to equalize, as much as possible, the oily coating, which contains a large percentage of lavender, so that it may dry without wrinkling.

In this operation dust and moisture must be carefully avoided, as the former will render the surface uneven and dot it with circular spots, having no coating, while the other causes it to wrinkle and crack. When the glass which is to be platinized has been thus covered with the preparation, and is sufficiently dry, it is placed with others in a muffle furnace, and exposed to a heat almost sufficient to melt the glass. This produces the necessary decomposition of the platinum, the foreign substances are driven off, leaving the metal burned into the surface of the glass and highly polished, thus completing the operation.

The advantages of this new method of constructing mirrors are manifold, as has already been stated. They are much more durable than the mercurial mirrors, as the coating can not be rubbed off; they are not affected by heat, and do not readily crack. There is no double reflection from the surface, nor is the quality of the glass of any importance. Curved surfaces, whether cylindrical or spherical, can be coated as readily as plain, and no injury can accrue to the health of the workmen. The time required to produce a given surface of mirror is very much less than by the old process, the establishment where this new manufacture is prosecuted turning out ten thousand square feet of mirror daily with a very small force, each man being capable of coating fifty square feet in an hour. The expense is very much less than by the old method, as, while the mercurial amalgam costs about nine cents to the square foot, the platinum costs only about two and a half cents. A finished mirror can be sold at the rate of fifty cents per square foot, and of the very best quality. By an improved but secret process, the grinding and polishing of the surface of the glass is accomplished in three hours' time, instead of the twenty-four usually required in other establishments.

A curious application of this new mirror is based upon a property of metals, to which we called the attention of our readers some months ago; namely, that gold, silver, platinum, and other metals, in very thin layers, applied to glass, are transparent when looked through toward the light, while they form an opaque reflecting surface under other circumstances. Screens are now made of platinized glass, inclosing the back part of offices and stores, which to persons entering the front part of the room have the appearance of highly-polished mirrors and of being entirely opaque. To one standing behind them, however, they are almost as transparent as pure glass, permitting every movement of those outside to be observed without the slightest difficulty. Placed as panes in the windows of houses, though what is behind them is entirely invisible to the passer-by, external objects are perfectly visible to persons in the room.

The same article is used in the construction of what is called "Surprise Mirrors," which consists in placing a picture behind the platinum mirror and in front of a window, with a dark curtain interposed. So long as the curtain remains in its position the mirror is opaque, and reflects light; removing it, however, it becomes immediately transparent, and the picture is seen behind it.—4 *D*, No. 301, 1869, 609.

AMERICAN STERLING, A NEW ALLOY.

A very valuable alloy, termed American sterling, has within a few years been introduced in New York, where it is now manufactured on a large scale by a company organized for the purpose. It has not been patented, the inventors, perhaps wisely, considering it best to keep to themselves the secret of its composition. The crude alloy resembles nickel, but when worked up, according to the *Scientific American*, can scarcely be distinguished from silver, unlike which, however, it does not tarnish, nor is it affected by sulphurous vapors. Articles of food do not act upon it, and it is readily cleaned by a slight rubbing.

In the form of cutlery it takes a keen cutting edge, requires little or no cleaning, and its lustre is seldom dimmed. As compared with britannia metal, it is harder and one third lighter, while it is superior to it in lustre, being scarcely distinguishable, indeed, from fine silver when made up. It can, nevertheless, be used as a basis for electroplating, so that, when the silver wears off, the subjacent alloy, being of the same color, will not be observed.

The strength of this alloy is very great, and, indeed, may be substituted for steel in the manufacture of pistol barrels, possessing, as it does, three times the tenacity. It is stated that at present about 120 hands are employed in the works at Naubuc, near Hartford, Connecticut, the buildings being 500 feet long and 50 feet wide. The alloy is said to be workable in dies under a drop-press as easily as silver, and much more easily than German silver, and on account of its toughness is much less liable to become cracked in the process of working.—6 *D*, *October* 19, 1872, 263.

CLEANING WOOL BY SOLUBLE GLASS.

The *Journal of the Society of Arts* gives an account of a method for cleaning wool by means of soluble glass, which, according to its inventors, Messrs. Baerle & Co., of Worms, is far superior to any other now in use. For this purpose, take forty parts of water, at the temperature of 122° to 135°

Fahr., and one part of soluble glass; plunge the wool into the mixture, stirring it about for a few minutes by hand; then rinse it in cold or tepid water, and it will be found completely white and without smell. The wool after this operation remains perfectly soft, and loses none of its qualities, even when left for several days in the solution of the silicate, and then washed in hot water.

Sheep may also be washed with the same preparation, care being taken to cover the eyes of the animals with a bandage, as also to perform the washing with the solution instantaneously, and to remove the surplus with tepid water. In the case of combed wool this should be first steeped in the above solution, and afterward in another, having eighty parts of water, at about 100° Fahr., and one part of soluble glass.—4 *D*, *October* 19, 1872, 242.

CONVERSION OF INDIGO-BLUE INTO INDIGO-WHITE.

It is well known that if, in any manner, one equivalent of hydrogen be added to indigo-blue or commercial indigo, the former becomes changed to a substance known as indigo-white; and that if yarns be impregnated with this, without being previously mordanted and exposed to the atmospheric air, the indigo-white loses one equivalent of hydrogen by the absorption of one equivalent of oxygen, and is again transformed into indigo-blue, the fabric or yarn becoming a genuine blue color. This transformation of indigo-blue into indigo-white, according to Professor Böttger, can be made very readily by boiling the finely powdered indigo with a solution of stannous hydrate of tin in caustic soda.—6 *C*, XXXI., *August* 3, 1871, 308.

BORAX FOR DRYING OIL AND VARNISH.

The use of borax as an agent for causing the rapid drying of varnish and of oil colors has become extensive; and one method of its application consists in taking one hundred parts of water, twelve parts of shellac, and four parts of borax, and melting them at a gentle heat in a copper vessel, with continued stirring. The vessel is then to be covered, and the liquid allowed to cool; after which it is to be kept in well-closed bottles. This furnishes an excellent varnish, giving a beautiful and durable lustre, and is perfectly secure against the action of moisture and the air. To cause oil colors to dry rapidly, equal parts of this varnish and of the color are to be rubbed up with oil, and spirits of turpentine added until the whole forms a homogeneous liquid mass. Objects coated with this mixture will dry completely in ten or fifteen minutes, according to the season or state of the atmosphere.—9 *B*, *April* 11, 1872, 409.

IMPROVED FLUX.

A mixture of equal parts of cryolite and of chloride of barium, it is stated, forms a flux superior to borax for soldering iron, or brazing copper, brass, or bronze.—15 *A*, *August* 10, 1872, 183.

SOLDER FOR STEEL AND BRASS.

A solder for uniting steel to brass, and one which adheres perfectly to both, and is not affected by the unequal dilatation of the two metals, is composed of three parts of tin, thirty-nine and a half parts of copper, and ten parts of zinc. —9 *B*, *March* 14, 1872, 352.

NEW GLUE SIZE FOR PAPER.

A new glue size for paper-makers is described in the German papers as being nearly 50 per cent. cheaper than the old kinds, and much more suitable for paper. To produce this size, dissolve in a copper pan, heated by indirect steam, 45 to 50 pounds of soda in 200 to 240 pounds of boiling water; then add to it, stirring well at the time, 300 pounds of powdered resin, keeping the whole continually boiling until all the resin is perfectly dissolved, which is generally accomplished in three or four hours. This soda-resin composition, dissolved in the proportion of 1 pound of resin to 30 or 40 pounds of water, is to be mixed together with a glue solution, made by dissolving 100 pounds of glue in about 300 to 400 pounds of water; then boil up both solutions together for about ten minutes, after which run the mixture through a fine sieve or filter, and it is then ready for use. The best proportions for mixing the vegetable and animal sizes are, for one and a half parts of resin, add one part of glue; or, for some purposes, equal parts of each can be taken. The addition of starch, if required, can be made as usual; also the mixing of this improved size with the pulp. —17 *A*, *April* 1, 1872, 252.

IMPROVED LIQUID GLUE.

An improved liquid glue, according to the *Journal of Applied Chemistry*, may be prepared by dissolving three parts of glue, broken into small pieces, in twelve to fifteen parts of saccharate of lime. On warming, the glue dissolves rapidly, and remains liquid when cold, without losing its strength. Any desirable consistency may be secured by varying the amount of saccharate of lime.

The thicker glue keeps its muddy color, the thin becomes clear, on standing. The saccharate of lime is prepared by taking one part of loaf-sugar and dissolving it in three parts of water, adding to the sugar one fourth part of its weight of slacked lime, and heating the whole to 145° to 165°, and allowing it to macerate for several days, with frequent shaking. The greater part of the lime will thus be dissolved, and the solution may be decanted from the lime sediment, which has the properties of mucilage.

The solution of the glue in the saccharate of lime may be made very readily; and even old gelatine, which has become insoluble in water, will easily be dissolved. The glue has great adhesiveness, and admits of very many uses.—*Journal of Applied Chemistry*, *November*, 1872, 168.

NEW SAFETY LAMP.

A new form of safety lamp gives its indication of danger by means of a musical flame. When a mixture of inflammable gas and air passes into the lamp it is ignited on the surface of a disc of wire gauze, above which is placed a suitable chimney, in which is produced the musical sound, varying in pitch with the size of the flame and the dimensions of the chimney.—15 *A*, *August* 17, 1872, 215.

GLYCERINE BLACKING.

A blacking may be made by means of glycerine, which is said to be of very superior quality, and favorable to the preservation of leather. For this purpose six to eight pounds of lamp-black and enough of ivory-black, are to be brought to a homogeneous paste, with ten pounds of glycerine and ten pounds of molasses. About five ounces of gutta-percha cut into small pieces are then to be melted, and, after fusion, eighteen ounces of olive oil added, together with two to three ounces of stearine, when the solution is complete. This warm solution is to be stirred thoroughly into the first mixture, and nine ounces of gum-arabic, dissolved in forty-five ounces of water, then added. To supply an agreeable odor, a few drops of essence of rosemary or lavender may be stirred in. For use, this polish is to be mixed with three or four parts of water and applied to the leather, to which it communicates a brilliant lustre, and improves its durability and suppleness. —9 *B*, *March* 14, 1872, 361.

PREVENTION OF MOULDINESS IN GUM.

It is said that solutions of gum can be kept from becoming mouldy by adding a few drops of sulphuric acid. A little alum also has a decided effect.—22 *A*, *August* 31, 1872, 210.

N. MATERIA MEDICA, THERAPEUTICS, AND HYGIENE.

BROMIDE OF POTASSIUM IN EPILEPSY.

Du Saulle has lately presented the result of his experiments in the treatment of 207 cases of epilepsy by bromide of potassium. He finds that this treatment does not produce any mischievous effects, provided that it be of perfect chemical purity. He has had patients who have taken from one to two drams daily for a long period without any evil results. The ill effects recorded from the use of this drug, in his opinion, are experienced only when it is not of the best quality. Of the 207 cases referred to, in 17, absolute suspension of the epileptic symptoms ensued for from two to four years; in 28, absolute suspension for from twelve to twenty-two months; in 33, considerable amelioration; in 93, partial amelioration; and in 110, failure. He considers the bromide of potassium to be of the utmost possible value in this disease, if properly administered, and very likely to effect, if not a cure, at least a considerable improvement of the symptoms.—20 *A*, *March* 16, 1872, 316.

ARTIFICIAL EPILEPSY.

M. Brown Sequard succeeded in producing epileptic symptoms in Guinea-pigs by means of a hemi-section of the spinal marrow, or by the section of the sciatic nerve; and Dr. Prevost has observed the same phenomena in amputating the thigh of these animals. To produce a nervous attack, it is only necessary to excite the so-called epileptic zone, which includes the half of the face corresponding to the member amputated, when the animal immediately falls into convulsions. The excitability of this zone is enfeebled after a time, and it becomes always more and more difficult to provoke a new crisis. It is suggested that the study of this artificial epilepsy will doubtless throw some light on the genesis and nature of this disease.—*Mem. Soc. Physique de Genève*, XXI., 1870, 351.

CROTONATE OF CHLORAL.

Dr. Liebreich not long since presented to the consideration of the medical profession a new narcotic, which he named crotonate of chloral, and which he obtained by the action of chlorine upon allyl. The influence of this substance upon animals differs from that of chloral, the first result being a profound anæsthesia of the brain, the sensibility of the remainder of the body being retained. In the second stage, loss of function in the spinal cord occurs, characterized by the entire absence of reflex excitability. The pulse and respiration are unaffected. If the dose be increased, death results in the third stage from the paralysis of the medulla oblongata. The animals may be kept alive by means of artificial respiration, because the crotonate of chloral does not affect the heart's action, while chloral causes paralysis of the muscles of the heart.—*Journal of Physiological Medicine, April*, 1872, 377.

COD-LIVER OIL PILLS.

Dr. Van der Court, of Brussels, prepares cod-liver oil by adding carefully pulverized slacked lime to the oil, little by little, until the consistency requisite for forming into pills is obtained. Of this mass he gives four or five grains as a dose, after each meal, flavoring it with a small quantity of oil of bitter almonds, or other substance. This remedy he considers to be in many respects better than the liquid oil, and quite useful in the early stages of consumption. The more chronic the character of the disease, the more good may be expected from its administration.—20 *A*, *Dec.* 23, 1871, 776.

USE OF SULPHITES IN DISEASE.

Professor Polli, of Milan, renews his recommendation for the administration of the sulphites in zymotic diseases, and states that in the hospital and general practice of Italy they have proved of the utmost value. He claims that by their means the course of eruptive fevers is entirely under control, mild cases being rapidly cured, and aggravated ones being rendered mild. In intermittent fevers the same results were obtained, especially in Lombardy, where the amount of malaria produced by the extent of the marshy lands causes fevers of the most virulent type; and, indeed, he prefers the sulphites entirely to quinine, as patients treated with them are less liable to relapse. Typhoid and choleraic fevers are also beneficially affected by these remedies.

For internal administration, in a curative point of view, Professor Polli recommends sulphite of magnesia, both as containing more sulphurous acid and as being pleasanter to take. As a prophylactic, he recommends the hyposulphite of soda, when it is not to act as a purgative; and for external use he advises the use of the sulphites and bisulphites of soda, which are more soluble than the magnesian salts. He concludes by stating that these salts do not act as poisons toward the several morbific ferments which he considers the cause of zymotic disease; they do not kill directly the living germs of the organic poisons, but modify the aggregation of the material components of our own organism, rendering it by their presence incapable of being acted upon by these catalytic germs.—*Pamphlet.*

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 carbonic 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.—4 *B*, *September*, 1871, 626.

PHYSIOLOGICAL PROPERTIES OF OPIUM ALKALOIDS.

Rabuteau has lately prosecuted a careful inquiry into the physiological properties of the different alkaloids of opium, some experiments having been made upon the human subject, both sick and in health, and others upon dogs, mice, and frogs. They were given both by the mouth and in the form of hypodermic injections. The substances investigated were thebaine, papaverine, narcotine, codeine, narceine, morphine, meconic acid, and meconine.

He found that they could be arranged in the following order as regards their various effects upon man: first, as soporific agents—morphine, narceine, codeine (the others do not produce sleep); second, as poisonous agents—morphine, codeine, thebaine, papaverine, narceine, narcotine; third, as analgesic agents, or quieters of pain—narceine, morphine, thebaine, papaverine, codeine (narcotine does not seem to enter into this series at all); fourth, anexosmotic agents, or antagonists to diarrhœa—morphine and narceine, these alone having this peculiarity.

It is well known that the combined action of morphine and chloroform produces analgesia without the necessity of causing slumber. In the case of a dog which had received a hypodermic injection of three quarters of a grain of chlorohydrate of narceine, and which had been subsequently put to sleep by chloroform, no sensation of pain appeared to be felt on awakening, as the dog could be pinched, or stuck with a pin, or have its toes trodden upon, without exhibiting the least symptom of distress, although able to move about and run as usual. This extraordinary condition, in which the nervous-sensitive system seemed abolished, lasted several hours. Similar results were met with in employing bromoform.—6 *B*, *April* 22, 1872, 1111.

PHYSIOLOGICAL ACTION OF BEEF TEA.

The authority of Gustave Bunge is now added to the list of those who have taken ground against the value of beef tea and extracts of meat as articles of diet. He thinks the refreshment they give is only due to their warmth and pleasant taste, and that their chief value consists in enabling a person to take with appetite a larger amount of dry or tasteless food than he could otherwise do. The statements of Liebig that the addition of meat extract to vegetable food increases its nutritive value, and that the extractive matter of meat, especially creatine and creatinine, is the material for muscular work, have been disproved by Voit and Meissner; and the idea that beef tea and meat extract are beneficial on account of the salts they contain is an unlikely one, as these salts are already present in excess in ordinary food.

The suggestion, however, that they answer the purpose of stimulants, like coffee, tea, and alcohol, seems to be confirmed by experiment. Small doses of meat extract quicken the pulse, but large ones produced paralysis of the heart and death. This action is attributed to the potash salts contained in the extract, as the ash alone produced the same effect as the quantity of extract from which it had been obtained.—21 *A*, *April*, 1872, 314.

PROTEST OF LONDON PHYSICIANS AGAINST PRESCRIBING ALCOHOL.

A considerable degree of stir has been produced in London by the circulation of a declaration, from a large number of the most eminent physicians of that city, in regard to alcohol, in which they state that, believing the inconsiderate prescription of large quantities of alcoholic liquids by medical men to have given rise, in many instances, to the foundation of intemperate habits, they are of opinion that no medical practitioner should prescribe them without a grave sense of responsibility. They believe that alcohol, in whatever form, should be prescribed with as much care as any powerful drug, and that the directions should be accompanied by the understanding that its use is not to be interpreted as a sanction for excess, or for the continuance of its use when the occasion is past. They also state that many people immensely exaggerate the value of alcohol as an article of diet, and hold that every practitioner is bound to exert his utmost influence to inculcate great moderation in the use of alcoholic liquids. Being also firmly convinced that the large amount of alcohol drinking is one of the greatest evils of the day, they urge the utmost caution against doing any thing, either in their character as physicians or citizens, to extend its use.

The list of subscribers to the declaration embraces men of the highest position in the profession, including such names as Dr. Busk, Dr. Paget, Dr. Watson, Sir Henry Holland, Dr. Quain, etc., in all numbering more than two hundred and fifty. —20 *A*, *December* 23, 1871, 778.

ELIMINATION OF ALCOHOL FROM THE SYSTEM.

Dr. Dupré has been prosecuting extended investigations into the subject of the elimination of alcohol taken into the human system, and presents the results of his inquiries as follows: The amount of alcohol eliminated per day does not increase with the continuance of the alcohol diet; therefore all the alcohol consumed daily must of necessity be disposed of daily; and as it certainly is not eliminated within that time, it must be destroyed in the system.

The elimination of alcohol following the ingestion of a dose, or doses, of alcohol ceases in from nine to twenty-four hours after the last has been taken. The amount of alcohol eliminated, in both breath and urine, is a minute fraction only of the alcohol taken.—1 *A*, *February* 9, 1872, 61.

REPORT OF THE MASSACHUSETTS STATE BOARD OF HEALTH.

Of the many state documents issued during the present year, one of the most important is the annual report of the State Board of Health of Massachusetts. The value of the inquiries of this body are well known, and their proceedings are highly appreciated both at home and abroad. In the present volume we have special papers on the occurrence of arsenic in certain green colors; on the proper provision for the insane; on the use and abuse of opium; on the effect of sewing-machines upon the health of women; and others. The article on arsenic is illustrated by specimens of the paper itself, and timely warning is given not to make use of paper so colored either for covering walls, for putting up candies, or for any other purpose. The inquiry into the consequences resulting from the use of sewing-machines is of much importance, as the note of alarm has been raised on several occasions in regard to their supposed deleterious influences. The result of the inquiry in the present case, which agrees with one lately made by Decaisne in Paris, is to show that, in this as in other occupations, no real evil is to be expected beyond that caused by the fatigue and close confinement.

APOMORPHIA OF NO THERAPEUTIC VALUE.

Siebert informs us that apomorphine, to which considerable therapeutic value has been ascribed by Richardson and others, is of comparatively little real merit in its physiological action, and is very subject to decomposition.—18 *C, March* 6, 1872, 151.

CROTON CHLORAL, A NEW HYPNOTIC.

Dr. Liebreich, of Berlin, to whom we owe the discovery of hydrate of chloral, has lately been investigating the physiological properties of a new organic compound formed by the action of chlorine upon allylene, and which he calls croton chloral. When administered to animals a peculiar effect is produced, the head being to a great extent rendered insensible to feeling, while the rest of the body remains comparatively sensible. If the inhalation is prolonged, the spinal cord loses its function, and reflex excitability is every where extinguished. During that stage both pulse and respiration remain unchanged. The third stage, which is induced by large doses, is characterized by paralysis of the medulla oblongata, and death. Animals may, however, be kept alive by artificial respiration, because the action of the heart is not interfered with, while the ultimate effect of hydrate of chloral is to paralyze the heart. Croton chloral, therefore, promises to produce all the good effects of hydrate of chloral, without any drawback being attached to its judicious use.—3 *A*, *December* 9, 1871, 452.

CAMPHOR AND BROMINE.

Among the new preparations in the *materia medica*, mention is made of the use of a combination of camphor and bromine, which is claimed as an excellent sedative of the nervous system. It has been used, as stated, with good effect in such cases of excitement as threaten to pass into a true delirium tremens. The medicine is given in the form of pills: 70 grains being made into 30 pills, one of which is to be taken every hour until 20 are taken, after this the quantity being somewhat decreased.

COMBINATION OF CHLOROFORM AND MORPHINE IN ANÆSTHESIA.

Some time ago Professor Claude Bernard ascertained that if a hypodermic injection of morphine be introduced into the system, a very complete anæsthesia will be produced by a much less quantity of chloroform than would otherwise be required. Messrs. Labbé and Guion have also been practically testing this same question. The experiment has been tried of making an injection of morphine while a patient to be operated on was under the influence of chloroform; this resulting in profound sleep, prolonged for several hours after the operation. The gentlemen referred to prefer to introduce the injection before the use of the chloroform, not so much for the purpose of preventing pain as for facilitating the production of anæsthesia, and rendering it less dangerous by reason of the smaller quantity of chloroform employed. In one case two centigrammes of morphia were injected, and after this twenty-eight grammes of chloroform were inhaled. In seven minutes anæsthesia was complete, and was prolonged for many minutes after the end of the operation, which lasted seventeen minutes. In another case the chloroform was given twenty minutes after the injection, and complete anæsthesia was produced in six minutes, extending through the operation, which lasted an hour and forty-five minutes. The total expenditure of chloroform was only forty-eight grammes.

It is not at all improbable that further experiments will determine whether a larger quantity of the morphine can be used with a proportionate reduction in the quantity of chloroform; and whether, by combining the substances in different ways, very important results may be produced both in causing anæsthesia and preventing the sensation of pain.—2 *A*, *March* 23, 1872, 350.

GLYCERINE FOR VACCINE LYMPH.

In the prevalence of the small-pox in many of the cities of the United States, our readers will excuse our reference to the application of glycerine as a vehicle for the long preservation of vaccine lymph, and for the almost indefinite extension of its employment during the period of epidemic visitation. The use of this substance, as practiced in Germany with the utmost success, makes it possible, by preserving lymph for a great length of time in considerable quantity, to meet such sudden emergencies as that of treating an entire city or large army. In numerous instances a reliable vaccination has been performed after the lapse of two years with the lymph thus prepared. Besides its preservative power, it is said that glycerine facilitates the operation of vaccination; the mixture, in consequence of the dilution, being far more efficacious and more easily employed than when water is used for this purpose. Indeed, the glycerine lymph has been found to act more certainly and more completely than when unmixed fresh lymph is employed. This may arise from the coagulability of the blood being diminished by contact with the glycerine, and the lymph being rendered more easily absorbable.

The purity of the glycerine for this purpose is a matter of prime importance, any adulteration being sure to cause more or less irritation. As a test in this case, we are recommended to mix equal volumes of rectified sulphuric acid of a specific gravity of 1.83 with the glycerine. If the latter be pure, an elevation of temperature takes place, the mixture in some rare instances becoming of a pale brown. It remains, however, quite clear, and, at the most, a few air-bubbles will be visible, not increased by continued stirring. The impure glycerine, however, immediately on being mixed with the acid, gives rise to a gas resembling carbonic acid gas in a clear fluid. After this gas has been removed, and the mixture has been left at rest, a renewed development is produced by stirring the fluid.

As the result of such experiments as this and others, we are informed that good glycerine should be colorless, of a pure, sweet taste, completely fluid, and miscible in any proportion with water or spirit of wine. Turbidity, or a gelatinous separation, induced by the addition of strong spirit of wine, indicates the presence of gum. Concentrated sulphuric acid should not induce a brown color or the development of gas; and further addition of spirit of wine should be followed by no turbidity nor deposit indicative of the presence of chalk or lead. No brown discoloration should ensue on heating in a solution of potash, nor should any smell of ammonia be perceptible.

In mixing lymph an equal portion of distilled water is to be added; but when the lymph is to be preserved for a long period, it may be mixed with undiluted glycerine, as this will probably preserve it longer from decomposition, and the water may be added when the lymph is to be employed in practice. —20 *A*, *October* 21, 1871, 504.

LOMBARD ON THE CLIMATE OF MOUNTAINS.

Dr. Lombard, in studying the climate of mountains, especially in Switzerland, has directed especial attention to the effect which such a climate exercises upon pulmonary disease; and he comes to the conclusion that an abode at a considerable altitude prevents the development of consumption, and may even cure it, either by developing the pulmonary emphysema, or in favoring the functional peripheral activity.—*Mém. Soc. Physique de Genève*, XXI., 1870, 375.

WEAKENING OF FATAL MALADIES.

According to M. Alphonse de Candolle, when a fatal malady has seriously affected the younger portion of a population, the succeeding generation, descended from persons who escaped the disease or were but little affected by it, will be found less liable to its attack, as an ordinary effect of the law of descent, this continuing to be the case from generation to generation. This, therefore, constitutes one cause of the weakening of epidemics, and may serve to explain the reason why a disease is most injurious when it first attacks any people, and why it becomes subsequently rarer or less dangerous, as has frequently been observed.

After the lapse of several generations, however, a population moderately affected by a disease approaches the condition of one which has never had it, and an increased intensity may then ensue. Applying these principles to the small-pox, M. De Candolle suggests that, at the epoch when Jenner introduced vaccination, the variolic affection had become enfeebled in proportion to the anterior epochs. The vaccination was then more efficacious as applied at this particular period. Small-pox having almost disappeared from Europe for two generations, a new population has sprung up less accustomed to it, and this cause of recrudescence tends now to render vaccination less potent. The author does not pretend that this is the only cause, but that, in connection with others, it exists, and in such a manner as to produce the results specified.—*Mém. Soc. Physique de Genève*, XXI., 1870, 351.

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.—18 *C, December* 13, 1871, 790.

NATURE OF VIRUS OF INFECTION MATTER.

M. Chauveau, in a communication published not long since, announced that the specific agent of virus from vaccine, charbon, small-pox, glanders, etc., is concentrated in very fine corpuscles, known under the general name of molecular granules; and, second, that the liquor or plasma in which these granules float is in itself inactive, as also the associated white globules or leucosites.—4 *B*, *October*, 1871, 698.

ACTION OF THE GASTRIC JUICE ON CALOMEL.

Professor Tuson has been experimenting upon the effect of the constituents of the gastric juice upon mineral substances, especially those employed as medicines, and for this purpose prepared, first, a mixture of calomel and distilled water containing two per cent. of hydrochloric acid; second, a mixture of calomel, pepsin, and distilled water; and, third, a mixture of calomel, pepsin, and distilled water containing two per cent. of hydrochloric acid. These mixtures were placed in glass vessels, and kept at 100° Fahr. for twenty-four hours, being shaken occasionally. They were then thrown on to filters of Swedish paper, and the filtrates saturated with hydrosulphuric acid.

The filtrates from experiments numbered one and two remained unaltered, while number three yielded a black precipitate of sulphide of mercury. These experiments, therefore, show that neither dilute hydrochloric acid (two per cent.) nor pepsin alone is capable of dissolving calomel, but that, when these agents are mixed, they do effect its solution, and, consequently, that the digestion of calomel, so far as its solution in artificial gastric juice is concerned, is brought under the same conditions as that of the albuminoids.

These observations are of considerable importance, as illustrating the method by which calomel enters the circulation, so as to exercise the various therapeutical effects which it exhibits.—1 *A*, *March* 22, 1872, 138.

MICROCOCCI IN MEASLES AND SCARLET FEVER.

Dr. Hallier, well known by his researches upon the fungi as supposed agents or concomitants of disease, states in a recent paper that measles and scarlet fever are both occasioned by the presence of certain fungi in the blood, which can be seen by the microscope in the form of minute cell-like spores, called micrococcus. In the course of treatment of persons affected with the above diseases, care was taken to collect the perspiration obtained from the patients under these circumstances, which, on being submitted to Dr. Hallier for examination, was found to contain the micrococcus in abundance.—13 *A, January* 15, 1872, 29.

XYLOL IN SMALL-POX.

A good deal of interest has been excited by the published success of xylol (dimethylbenzol, one of the many products of the distillation of coal-tar) as a remedy for the small-pox, for which it has been applied for a considerable time in Berlin by Dr. Zeulzer. The experiments are stated to have proved very satisfactory, and its use in one of the principal hospitals of Berlin is becoming very extended. The dose of this substance for an adult is from ten to fifteen drops, and from three to five for children, every few hours. No injurious effect has hitherto been noted, even when given in considerably greater quantity. It is applied from the earliest period of the disease till the complete drying up of the pustules. The best method of administering the xylol is in capsules, which are now furnished, containing three, eight, and twelve drops, although it can be given drop by drop in wine or water. Toluol appears to have no effect.—8 *C, January* 18, 1872, 23.

LETHEBY ON REVACCINATION.

Dr. Letheby, the eminent English sanitarian, in a recent paper, states that the present epidemic of small-pox is one of the severest on record, there having been nothing like it since the practice of compulsory vaccination. It began to be unusually severe as far back as the month of November, 1869, advancing steadily, month by month, throughout the whole of the following year. Some idea of the force of the epidemic may be gathered from the fact that while the average annual mortality in England from small-pox for the last twenty years has been only two in ten thousand, it was 24.2 during the year 1870 in the population of London. In reference to the prophylactic power of vaccination, Dr. Letheby shows that, although a very large proportion of small-pox cases had previously undergone vaccination (from seventy-three to seventy-nine per cent.), it was manifest that the operation had been imperfectly performed, or had been weakened by the lapse of time. But, even with these disadvantages, the mortality among those who had been vaccinated was remarkably small in comparison with that of the unvaccinated. While the general mortality was at the rate of nineteen per cent. of all attacked with the disease, it was only ten per cent. among the vaccinated, and as high as forty-five per cent. among the unvaccinated.

The general conclusion reached by Dr. Letheby in his inquiries was that vaccination, when properly performed, is protective during the growth of the body, and that revaccination is necessary at the age of fifteen or thereabouts, to protect the system during the remainder of life.—20 *A*, *June* 1, 1872, 635.

CHOLERA DISTRICTS.

An abstract of a very remarkable paper, by Mr. Jenkins, upon cholera, originally presented to the Imperial Academy of Sciences of Russia, is given in a recent number of *Nature*. In this the author takes the ground that instead of one home or *nidus* of cholera existing in the delta of the Ganges, there are seven, all situated on or near the Tropic of Cancer, and equally distant from each other, the most important of which is that at the mouth of the Ganges, while the others are to the east of China, to the north of Mecca, on the west coast of Africa, to the north of the West India Islands, to the west of Lower California, and among the Sandwich Islands; and the author maintains that the recorded appearances of cholera over the globe may be satisfactorily explained by supposing seven atmospheric streams, each 1400 miles in breadth, to proceed from these foci in a northwesterly direction, nearly all of these streams having been in activity at some periods, as during the cholera seasons of 1833, 1850, and 1866.

The author cites the history of past cholera epidemics to prove the accuracy of his observations, and points out a remarkable law—that in 1818 cholera advanced simultaneously in two directions, northwest and southwest, in such a manner that all the places attacked at given times by its northwest advance were situated at right angles to all places attacked at the same time by a southwest advance. The author also states that Europe is liable to attacks from two great sources, India and Arabia, and thinks that the continent will certainly be visited by streams from both during the present year. He explains the curious case of ships being suddenly attacked at sea by cholera by the supposition that at the time in question they come within the influence of the cholera stream, and he endeavors to show that all the places hitherto recorded as unafflicted with cholera lie outside of this stream.

He goes on still further to argue that cholera is intimately connected with auroral displays and solar disturbances, and that there is an essential relationship between the maxima and minima of cholera epidemics and of solar spots. The sun-spot period is now established at 11.11 years, and cholera epidemics, he thinks, have a period equal to one and a half of those of the sun-spot periods. He is not prepared to say that sun spots originate cholera, since both may be the effect of the same cause, possibly acting upon the earth and upon the sun. He thinks that each planet, in coming to and going from perihelion (more especially about the time of the equinoxes), produces a violent action upon the sun, and has a violent sympathetic action produced within itself—internally manifested by earthquakes, and externally by auroral displays and volcanic eruptions, such as that of Vesuvius at the present moment; in fact, just such an action as develops the tail of a comet when it is coming to and going from perihelion; and when two or more planets happen to be coming to or going from perihelion at the same time, and are in, or nearly in the same line with the sun—being, of course, nearly in the same plane—the combined violent action produces a maximum of sun spots, and, in connection with it, a maximum of cholera on the earth. The number of deaths from cholera in any year (for example, the deaths in Calcutta during the six years 1865–70) increased as the earth passed from perihelion, especially after March 21, came to a minimum when it was in aphelion, and increased again when it passed to perihelion, and notably after equinoctial day.—12 *A*, *May* 9, 1872, 26.

IMMUNITY OF COPPERSMITHS FROM CHOLERA.

During the cholera epidemic which prevailed in Europe several years ago, it was observed in Paris and elsewhere that workers in copper appeared to enjoy an almost absolute immunity from the disease, and a similar experience has been met with in Bagdad, where the disease was very prevalent the past year, indeed to such an extent that between the end of April and the end of October about 800 persons died in a population of 80,000. Out of this latter number about 500 were engaged in making or selling copper articles, and it is asserted that among them there was not a single victim to the cholera.—18 *A*, *July* 12, 1872, 422.

CHLORAL IN CHOLERA.

During the epidemic which has recently prevailed at Riga, Dr. Von Reichard has had recourse to chloral, administering it according to the following indications: 1. To relieve cramps at the commencement. 2. To assuage the præcordial suffering which is so distressing during the latter stages. 3. To arrest vomiting. 4. To procure the sleep so urgently demanded by the patients. Not only were these indications fulfilled, but the success obtained from the medicine surpassed all expectation. In one case in which the ordinary treatment had been pursued, and the patient seemed as if he had only a few hours to live, a dram of chloral was given him in four times the quantity of water, so that a strong sense of burning was felt while swallowing it. In two minutes sleep had commenced, and, troubled at first, it became calm, and lasted three hours. Respiration became easier, the warmth and turgescence of the surface reappeared, the cholera *facies* disappeared, and the pulse diminished from 130 to 90. The vomiting and stools ceased, and, in fact, a true resurrection was effected, the patient rapidly recovering. M. Blumenthal, also of Riga, has employed it successfully in two bad cases, giving the chloral in doses of a dram, which were repeated two or three times within the hour.—20 *A*, *October* 28, 1871, 547.

TREATMENT OF CHOLERA BY HYPODERMIC INJECTION.

Dr. Patterson, superintendent of the British Seamen's Hospital, Constantinople, gives an account of his experiments in the treatment of cholera by the hypodermic injection of morphine. During the recent severe epidemic the usual remedies had been tried by himself and colleagues with very little effect, and, as a last resort, a case which had been given up as incurable was selected for experiment. This patient had been previously suffering from inflammation of the liver, was in deep collapse, pulseless, with rice-water purging, severe vomiting, and cramps. A quarter of a grain of acetate of morphine was introduced, with a result far beyond expectation. In a quarter of an hour the cramps and vomiting ceased, the patient fell asleep, the skin gradually became warm and moist, and the pulse returned. After two hours the injection was repeated, and he again slept for three hours. He lived three weeks, but ultimately sank from typhoid exhaustion, as much produced by his old liver complaint as from the reactionary fever. The same good results followed in almost every case of trial. In ordinary cases one or two injections of from one quarter to one half a grain sufficed. It could be administered even to very young children, in doses of proper magnitude.

After the satisfactory result of this experiment, the treatment of cholera patients in the hospital was confined almost entirely to that in question, and out of forty-two cases twenty-two recovered entirely, and twenty died; but of these, eight were perfectly helpless from the first, being actually dying, one had severe liver complaint, and one was very far advanced in consumption. Of ten cases treated in the ordinary manner, only one recovered.—20 *A*, *Jan.* 27, 1872, 95.

CURE FOR SCIATICA, ETC.

Dr. Henry Lawson, of London, publishes a work upon the cure of sciatica, lumbago, and brachialgia, in which he gives the result of experiments upon himself as to the efficiency of hypodermic injections of morphine in curing these diseases. For this purpose he first induces local anæsthesia in the vicinity of the part affected, by means of Dr. Richardson's spray producer, with the use of ether of low specific gravity, and then inserting the needle of the syringe about an inch deep in the flesh of the patient, he injects the proper quantity of morphine (in the form of sulphate, probably), to the amount of a quarter or half a grain, or more. The application is to be made as near to the seat of pain as possible, and will almost inevitably be followed, in the course of a few minutes, by absolute relief. Should the pain recur, the remedy is to be repeated. This application may be made quite close to the same spot, and every day for a month, within a radius of an inch and a half, and in all cases as near the seat of pain as possible. The pain disappears in a few minutes, leaving a sensation of unutterable relief and quiet.—3 *A*, *January* 1, 1872, 480.

SKIN DISEASES CAUSED BY BAD SOAPS.

A writer in *Nature* calls attention to one possible source of skin diseases, which he thinks has hitherto escaped the observation of physiologists. In his communication he refers to the process by which what are called "prime old brown Windsor soaps" are manufactured, and states that this is obtained from old and putrid bones, which are crushed and ground to a coarse powder, and exposed to the action of boiling water under pressure until the grease and marrow are extracted. These substances are subjected to various processes, resulting in the preparation of bone glue, isinglass, etc., while the grease itself, which at first is of a dark brown color, with an abominable odor, is purified by various methods, and deodorized, and the more valuable portion converted into hard brown soap, the offensive smell of which is disguised by a strong perfume.

The brown color of the putrid grease gives it its acceptable tint without coloring by caramel, which was the original method of manufacture. The process of preparation causes the production of a large number of minute spiculæ of bone, which can not be entirely removed, and which, when the soap is used, tend to penetrate the skin, or to abrade its surface more or less. It is to the introduction both of the soap itself and of these fragments of putrid bone that the writer in question attributes the occurrence of various forms of eczema, etc., and states that he himself actually produced such a disease on several successive occasions by renewing the application of a soap of this kind. The suggestion seems extremely plausible at least, and is one well worthy of consideration.

The editor of the *Medical Times and Gazette*, in referring to the article in *Nature*, says that, to be entirely sure that no improper soaps are used, we had better confine ourselves to

Knight's Pale Primrose, or to some white scentless curd soap like the white Castile. Perfumed soaps should always be looked upon with suspicion.—12 *A*, *April* 11, 1872, 464, *and* 20 *A*, *April* 20, 1872, 466.

ACTION OF SKIN IRRITANTS.

The experiments of Röhrig and Zuntz had rendered it probable that all irritants applied to the skin exercise a tissue change in the body, and as carbonic-acid baths are recommended as stimulants to the skin, Paalzow tested the action of water saturated with carbonic acid on rabbits, but found that it neither increased the amount of oxygen and carbonic acid expired by rabbits, nor did it redden the skin either in them or in man. He thinks the effect of carbonic-acid baths, which has been ascribed to the carbonic acid dissolved in the water, is really due to alkaline salts. On applying real irritants, such as mustard, to the skin of rabbits, he found the consumption of oxygen and the production of carbonic acid invariably increased, often by more than one half—*i. e.*, tissue change in the body was rendered much more rapid by the application of the irritant. The relation between the oxygen consumed and the carbonic acid evolved was not constant. —21 *A*, *April* 22, 1872, 314.

BROWN INSTITUTION FOR ANIMALS.

On the 1st of January an institution was opened in London called the "Brown Institution," for the study of the diseases of animals. It results from a sum of money which was bequeathed in 1852 by a Mr. Thomas Brown to the University of London for the purpose of founding and upholding an institution for investigating, studying, and, if possible, endeavoring to cure the diseases and injuries of animals useful to man, the money to remain at interest for nineteen years. A hospital has been erected, consisting of stables for the reception of the larger quadrupeds, and of houses of various descriptions for those of a smaller size, and a laboratory for the study and investigation of disease has been built adjoining the hospital; the main object kept in view being the lessening of human evils by the study of the diseases which afflict the lower animals. Dr. Burdon Sanderson, Professor of Pathology in University College, London, has been appointed physician to the institution, and with him has been associated Dr. E. Klein, whose name is well known as the contributor of various articles to Stricker's "Histology," and the author of several important embryological researches.—*Communication.*

BROWN INSTITUTION.

The "Brown Institution," in London, for sick animals, of which we have already presented a notice to our readers, bids fair to be of great public utility in direct connection with its mission. A handsome grant having been made by the Chamber of Agriculture, the gentlemen connected with this institution are about undertaking a series of observations upon the treatment and comparative pathology of pleuro-pneumonia.—12 *A, February* 8, 1872, 292.

BROWN INSTITUTION.

We noticed some time since the foundation of the "Brown Institution," near London, for the treatment and investigation of the diseases of animals. Professors Sanderson and Klein are now undertaking in that establishment a work of great public utility, viz., a series of observations on the treatment and comparative pathology of pleuro-pneumonia, a disease which has committed such costly ravages among the herds of cattle in Europe and America during the last few years.—*Communicated.*

MILK OF DISEASED CATTLE.

Mr. Husson, in a paper upon the milk of animals diseased with the cattle-plague, announces, as the result of one of his researches, that neither the flesh nor the milk of animals suffering from this cattle-plague—contagious typhus—will convey the disease, although they may suffer greatly in their nutritive properties. The milk of diseased cows he found to have a more or less marked reddish-yellow tinge, and a disagreeable flavor, although cats fed upon it seemed to suffer no inconvenience.

As general conclusions, Mr. Husson remarks: First, that when the typhus breaks out in a cow-house, all the beasts therein are subjected, although in different degrees, to the epidemic influence. In fact, in one instance, the whole herd died, with the exception of four cows, which never seemed to be ill, although they furnished one of the three specimens of milk analyzed. Second, milk can not, any more than flesh, transmit the disease to man, nor to animals that do not belong to the ruminant family. Third, notwithstanding this, even during the first stage of the disease, when the yield still continues normal, the milk should not be employed as food for young children, in consequence of the modification that has taken place in its principles. Fourth, from the commencement of the disease, the combustible elements of the milk, in great part, disappear, while the azotised elements, on the contrary, are increased in considerable proportions, and are soon found commingled with sanguinolent matters. Frequently there may be observed, under the microscope, agglutinated globules, either mucous or purulent.—20 *A*, *December* 23, 1871, 777.

DESTRUCTION OF INFECTED GERMS IN COTTON.

Mr. Crace Calvert continues his valuable researches upon protoplasmic life, and presents the results in the *London Chemical News.* We have already referred to his announcement that protoplasmic life, so far from being generally destroyed by the heat of boiling water, in reality requires from 300° Fahr. to 400° Fahr. for this end, thus affecting very materially in many instances the soundness of the reasoning in regard to spontaneous generation. In his last paper he discusses the disinfectant effect upon germs by cotton fabrics baking in heated stoves for sanitary and hygienic purposes. The conclusions arrived at are essentially the same as those previously indicated, namely, that germ life, in cotton fabrics exposed to a stove heat of 300° Fahr., is not completely destroyed, although it is at 400° Fahr. At this latter temperature, however, the fabric is frequently either materially injured or destroyed. He concludes, therefore, that no beneficial result can be obtained by the employment of public stoves as a means of destroying germ life and contagion. We hope that the next step of Professor Calvert will be to show us some process which, without injuring or destroying the cloth, will have the effect of depriving the infection germs of their vitality.

A hint in this direction may perhaps be furnished by a communication to the *Chemical News* on the part of Mr. Richard Weaver, who, while agreeing in general with Professor Calvert's conclusions, remarks that the public disinfecting chamber in his town has the furnace within it, and as coke is the material employed, the whole place, with the articles under treatment, is impregnated strongly with sulphurous acid, that probably has a destructive action upon the germs. He thinks, however, that a more satisfactory result will be obtained by thoroughly impregnating infected materials with the vapor of phenol at a moderate temperature, and in the presence of steam.—1 *A*, *September* 22, 1871, 138.

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.—8 *C*, *January* 18, 1872, 23.

COMPARISON OF ANTISEPTICS.

A series of experiments by Dr. Dougall upon the relative powers of substances to prevent the generation of animalculæ gives some interesting and suggestive results. The metallic salts, he finds, possess the highest preventive powers—sulphate of copper occupying the first place, and nitrate of silver the lowest. Of the organic acids, benzoic acid has the highest, and acetic acid the lowest power, carbolic acid occupying the fifth rank. Chloride of aluminium, among the salts of the alkaline earths, stands the highest. The inorganic salts have but little power, with the exception of bichromate of potash, which ranks very high. The poisonous vegetable extracts appear to be inert.

The inference made from these observations is that, if carbolic acid prevents the growth of germs in wounds, etc., solutions of chromic acid, bichromate of potash, and the sulphate of copper have the same property to a still higher degree, and should have the preference, except where their use would be attended with some positively injurious effect.—13 *A*, *March* 1, 1872, 95.

CHROMIC ACID AS AN ANTISEPTIC.

Dr. Dougall states that chromic acid, as an antiseptic, is far beyond carbolic acid, and, in fact, may be considered as standing at the very head of the list. In one instance an ounce of ox muscle was immersed for twenty-four hours in a solution of one part of chromic acid in 2000 of water, and then suspended in the air. At the end of six days it became as hard as wood, in which condition it remained three months without mould or taint. The same quantity of ox muscle was soaked twenty-four hours in a solution of one part carbolic acid in 1000 of water, and then suspended in the air, and at the end of six days it was much hardened, colored brownish-black, speckled with mould, and distinctly tainted. Its action as an antiseptic consists in coagulating the proteine compounds, a property which it possesses in the highest degree; and its power of coagulating the albuminous cells is ten times that of carbolic acid, twenty times that of bichloride of mercury, and one hundred and fifty times that of chloralum. It also coagulates, hardens, and oxidizes decomposing organic matter, and when added to putrid flesh, urine, or fœcal matter, the offensive odor is soon absolutely removed, the mixture remaining fresh for an indefinite time.—14 *A*, *Jan.*, 544.

ACTUAL SANITARY VALUE OF CHLORALUM.

Professor A. Fleck has made a chemical examination of the several preparations of chloralum, so freely advertised all over the world by an English establishment, and finds reason to consider them not only as rather indifferent, but as even injurious. Of these preparations there are, first, chloralum, claimed to be the safest, most inodorous, and least noxious disinfectant, and used as an internal and external remedy against sore throat, diphtheritis, etc.; second, chloralum powder, an antiseptic, and an astringent when eaten in a mixture with wheat flour, besides being used as a disinfectant for ships, stables, etc.; third, chloralum wool, or wadding, for dressing wounds; disinfecting coffins, etc.; finally, the solution of chloralum as a very effective fertilizer, for which purpose it is absolutely worthless. Professor Fleck finds chloralum as a disinfectant even less active than alum, sulphate of alumina, or sulphate of iron, while its price is so exorbitant that it must be considered fraudulent. As a medical preparation he declares it highly dangerous, and earnestly warns the public against its use, it being contaminated with lead, copper, etc., and advises them not to be deceived by the similarity of the name to chloral hydrate, with which it has nothing in common.—28 *C, March*, 1872.

PROTOXIDE OF HYDROGEN AS A DISINFECTANT.

According to Dr. Day, of Victoria, the protoxide of hydrogen may be used to excellent advantage in destroying the infectious property of pus globules, its effect in cases of small-pox having been very decidedly marked.—*Microscopical Journal, February*, 1872, 79.

IODINE AS A DISINFECTANT.

It is stated that an excellent method of disinfecting rooms in periods of epidemics consists in exposing to the air a piece of dry iodine, care being taken to prevent the access of children to it, as it is poisonous. An ounce of iodine will answer for an entire month.—9 *C, February*, 1872, 27.

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 carbolic 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.—1 *A*, *January* 19, 1872, 32.

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.—*Journal of Applied Chemistry*.

ORIGIN OF MALARIA.

Mr. Daniel Vaughan, of Cincinnati, contends that malaria results primarily from the volatile oils of plants, which become evaporated from their surfaces and are carried into the atmosphere. If these were uniformly diffused, he thinks they would produce little injury; but, being carried from the high grounds into the moist, damp, low lands, they become accumulated in an excessive degree, and produce the evils referred to. He does not suppose that all the volatile oils have the same effect on human life, some, probably, being much more potent than others; but he thinks that this question can only be settled by observation and experiment.—*London, Edinburgh, and Dublin Philosoph. Mag.*, *November*, 1871, 209.

POLLUTION IN WATER.

A bill in reference to public health has been brought before the British Parliament, with a strong probability of its becoming a law, embracing, as it does, the recommendation of the Royal Sanitary Commission, which has been engaged for some time past in suggesting points for legislation. The principal part of the enactments have reference to the pollution of water by the discharge of refuse animal, solid or liquid, matters into it; and as it may be of interest to our readers to know what the highest sanitary authorities in England consider as "pollutions" of water, we append their definitions of the same as given by the act.

1. Any liquid containing in suspension more than three parts, by weight, of dry mineral matter, or one part, by weight, of dry organic matter in 100,000 parts, by weight, of the liquid; or,

2. Any liquid containing in solution more than two parts, by weight, of organic carbon, or 0.03, by weight, of organic nitrogen, in 100,000 parts, by weight, of the liquid; or,

3. Any liquid which exhibits by daylight a distinct color, when a stratum of it one inch deep is placed in a white porcelain or earthen-ware vessel; or,

4. Any liquid which contains in solution, in 100,000 parts, by weight, more than two parts, by weight, of any metal, except calcium, magnesium, potassium, and sodium; or,

5. Any liquid which, in 100,000 parts, by weight, contains, whether in solution or suspension, in chemical combination or otherwise, more than 0.05 part, by weight, of metallic arsenic; or,

6. Any liquid which, after acidification with sulphuric acid, contains, in 100,000 parts, by weight, more than one part, by weight, of free chlorine; or,

7. Any liquid which contains, in 100,000 parts, by weight, more than one part, by weight, of sulphur, in the condition either of sulphureted hydrogen or of a soluble sulphuret; or,

8. Any liquid possessing an acidity greater than that which is produced by adding two parts, by weight, of real muriatic acid to 1000 parts, by weight, of distilled water; or,

9. Any liquid possessing an alkalinity greater than that produced by adding one part, by weight, of dry caustic soda to 1000 parts, by weight, of distilled water.—20 *A*, *March* 16, 1872, 321.

UTILIZATION OF LIQUID SEWAGE.

A contract has recently been entered into by the police board of Glasgow for the supply from the public urinals of

5000 gallons of liquid sewage per day, for the sum of 1000 pounds sterling per annum. This substance is to be subjected by the purchasers to a chemical treatment for the purpose of converting it into sulphate of ammonia.—3 *A*, *November* 4, 1871, 351.

EFFECT ON DRAINAGE AND SEWAGE ON MORTALITY IN CALCUTTA.

The extent to which disease depends upon drainage and sewage may be gathered from the report of the results of sanitary improvements in Calcutta. In that portion of the city inhabited by the native population, the cholera fatality for twenty years prior to 1861 averaged nearly 5000 deaths per annum. In 1860, the deaths were 6000 by cholera; and in 1866, nearly 7000. About this time works of drainage and water supply were commenced, and have been gradually extended, and, as a result, the use of foul tank and river water was discontinued—this benefit being conferred upon the city in the beginning of 1870. As the first result of this action, which is confined to a limited portion of the city, the mortality from cholera in 1870 was only 1563, the general mortality also diminishing year by year with the extension of the works. The entire death-rate in 1870 was only 23 in 1000—considerably less than half what it was in 1865.—12 *A*, *December* 21, 1871, 150.

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.—16 *A*, *January*, 1872, 107.

PREVENTION OF NOXIOUS DECOMPOSITION OF SEWAGE.

The addition of chloride of calcium to sewage, it is stated, has the desirable effect of preventing noxious decomposition. —15 *A*, *Proc. Brit. Assoc.*, *August* 31, 1872, 272.

SEWERAGE SYSTEM IN MILAN.

The sewerage system adopted in Milan is recommended by Mr. Child, of Oxford, as being suitable for small towns and country villages. Its essential feature is the drainage of the houses into water-tight cess-pools, which are emptied frequently, efficiently, and quite inoffensively by means of a barrel-cart, previously exhausted of air, and a hose. The barrel-cart then conveys the sewage to a dépôt at a convenient distance, where all that is salable is sold to farmers, and the rest is manufactured into a kind of dry artificial guano. Many small towns and villages lie on dead flats or at the bottom of deep valleys, where ordinary sewerage works could not be established without an expensive provision for raising the sewage in order to render it available for irrigation. In such places the Milanese system might be carried out with ease, and at comparatively small outlay. A certain number of cess-pools must be rendered water-tight—a process not very expensive. One cess-pool would serve for several cottages, and frequent emptying would be better than large sizes of inclosures. Two barrel-carts must be procured, and these, with a small steam-engine at the dépôt to work the air-pump, would, together with about three men and two horses, form the whole of the apparatus required for testing the system on a small but sufficient scale. On the day on which Mr. Child visited the dépôt near Milan, farmers' carts were waiting there literally in scores to obtain their supply of it; and he feels sure that, if landed proprietors or farmers were to give this system a trial in this country, they would find it worth adoption.—1 *A*, *December* 8, 1871, 277.

SCOTT PROCESS OF UTILIZING SEWAGE.

A new feature has lately arisen in connection with the question of the disposal of sewage, a problem that has been so difficult of solution in most parts of the world. This consists in a process invented and patented by Major General Scott, of England, for making from sewage dissolved in water a cement equal to the best Portland cement, or an excellent hydraulic lime. The cost of this does not exceed that of Portland cement prepared in the usual manner, and the offensive nature of the fœcal matter is completely destroyed. The principle of the process consists in mixing with the sewage quantities of lime and clay, the former ingredient combining with the carbonic acid of the fœcal matter to form carbonate of lime, which is precipitated with the other solid ingredients in the form of an impalpable powder. The lime and clay are preferably thrown into the main sewer some little distance before the outlet, so as to insure a more complete incorporation of the different matters, while, at the same time, destroying the slimy, glutinous character of the sewage, "sludge," and keeping the drain free from the festering and putrefying deposit which otherwise tends to choke it. The clay and the lime do not merely facilitate the deposition of solid matter, but, as is well known, they tend to purify the supernatant water. As lime and clay are the chief constituents of those limestones which, on calcination, yield the best hydraulic limes and cements, it is claimed for this process that there is a sufficient gain of cement-making material abstracted from the sewage to make the operation profitable, independently of the advantages secured by thus deodorizing and defecating the excrementitious matters of towns, which must otherwise be disposed of in a manner more or less prejudicial to health, and very often at great expense.

The success of the new process depends in no small degree on the fact that the precipitated matter supplies to a considerable extent the fuel necessary for the burning operation. The sewage being allowed to settle in tanks and the supernatant water drawn off, it is found to be deodorized, and may be exposed to the drying action of the air for an indefinite period. It is then dried on tiles, and calcined in the ordinary manner. The fœcal matters, when dried and distilled, yield large quantities of inflammable gases, and readily furnish a most intense heat.—18 *A*, *May* 24, 1872, 341.

CONNECTION BETWEEN PYÆMIA AND BACTERIA.

Dr. Sanderson has lately published a lecture, delivered before the Pathological Society of London, in which he shows the connection between the disease called pyæmia (or blood-poisoning) and bacteria, and proves that blood-poisoning is produced by the presence of bacteria within the body.—22 *A*, *August* 31, 1872, 210.

MOULDINESS.

A French chemist has recently announced that borax and sub-borate of ammonia will prevent mouldiness, and will preserve animal matter. Each of the above salts have proved effectual when tried separately, but when combined in a single solution they seem to be well adapted for anatomical injections. For this purpose the following preparation is recommended: Rain-water one hundred parts, common borax six parts, and sub-borate of ammonia twelve parts. The liquid is to be used lukewarm; it does not change the color of the tissues, is not poisonous, does not blunt the dissecting instruments, and in a concentrated state may be used for embalming.—*Philadelphia Ledger.*

AMERICAN HEALTH ASSOCIATION.

An organization was established during the past summer in New York, under the title of the American Health Association, with Dr. Stephen Smith as president; E. M. Snow, of Providence, first vice-president; C. B. White, of New Orleans, second vice-president; John H. Rauch, of Chicago, treasurer; and Elisha Harris, of New York, secretary — several well-known physicians composing the executive committee. The objects of the association are to take cognizance of all matters bearing upon the public health, especially those of national importance; and in the membership are already enrolled ninety-five names, from all parts of the United States and Canada. The next meeting of the association is to be held in Washington in the last week in February, 1873.—*New York Herald.*

MAC CORMAC ON THE ORIGIN OF TUBERCULAR CONSUMPTION.

In 1855 Dr. Mac Cormac presented a theory in regard to tubercular disease of the lungs, or consumption, in which he maintained that this disease is caused solely by breathing air which has already passed through the lungs of man or other animals (or, otherwise, air that is deficient in oxygen), the inhalation of air already respired being accompanied by the retention of unoxidized carbon, or the dead, poisonous carbon within the body of the organism. This effete matter he considers to be the starting-point in the tubercle. He does not think that it forms the tubercle itself, but constitutes the poison from which tubercular disease takes its origin.

His deduction from this is to the effect that the greatest care must be taken to secure an ample supply of fresh air, especially in cases where numbers of persons are obliged, by cold weather or other causes, to occupy a limited space together, and in which a proper provision for a constant supply of fresh air has not been made. He believes that the predominance of tubercular disease in northern latitudes is not due to a tendency in the climate itself to produce this condition, but to the greater liability to huddling together for purposes of warmth, although it is probable that a diseased condition or irritation of the lungs in such cases may increase the morbification of the poisonous material. Where, in consequence of the mildness of the climate, persons are induced to live a great deal out of doors, or where the houses are not closed up to such a degree as to exclude the external air, or prevent its free passage, this disease becomes comparatively unknown. He, indeed, encourages open windows and draughts of air, especially at night, if the body be well covered.—18 *A, June* 28, 1872, 371.

POLLARD ON SEASICKNESS.

Dr. Pollard, in a paper in the *British Medical Journal* upon seasickness, remarks that two opposite theories have been suggested as explaining its cause — one that it arises from a depressing effect on the brain produced by the motion of the vessel, for which the remedy would be lying so as to obtain an increased supply of blood to the brain; the other, supported by Sir J. Alderson, that increase of blood in the brain is the real cause, an analogy being drawn between the blood in its vessels and the mercury of a barometer.

The most probable theory of seasickness is that held by Dr. Carpenter, Mr. Bain, and other writers, who consider that the mental and bodily prostration, and the other symptoms, arise from the continued action on the brain of a certain set of sensations, more particularly the sensation of want of support. This feeling, arising from the sudden loss of support, as when the footing, or any prop that we lean upon, suddenly gives way, is of the most disagreeable kind.

The phenomena of seasickness appear to be due to the constant repetition of this feeling of loss of support consequent on the pitching and rolling of the ship, more particularly the former. If, therefore, seasickness arises from certain impressions on the senses, the theory of its prevention is to render these impressions as feeble as possible. Application of the mind to an engrossing book will keep it off for a short period; but this answers only a temporary purpose.

To lessen the impressions as much as possible, the patient should preserve the recumbent position as near the centre of the ship as practicable; he should lie on a thickly-padded couch, so as to diminish the vibration. Fresh air should be admitted in order to remove bad smells. The eyes should be shaded, and as much noise as possible shut out. As regards drugs, the most rational suggestion is that of Dr. Döring, of Vienna, that a full dose of hydrate of chloral should be taken shortly before the vessel starts; and, even in long voyages, the repeated use of this medicine will insure comfortable nights without the disagreeable after-effects of opium and chloroform.—18 *A*, *June* 14, 1872, 323.

APPLICATON OF DISINFECTANTS.

According to the experiments of a committee of the Academy of Sciences of Paris in reference to disinfectants, it was ascertained that the first place among the agents destructive of infectious germs should be assigned to hyponitrous acid. This, however, being very poisonous, must be used with great precaution. It is said to be especially applicable for the disinfection of apartments in which cases of small-pox, yellow fever, or other grave diseases have existed. Before using this substance all crevices of the doors, windows, and fire-places should be carefully pasted up with paper. Acid fumes are to be generated by placing two quarts of water in earthen vessels of about ten quarts capacity for a small room, and adding to the water about three pounds of ordinary nitric acid and ten ounces of copper filings. Should the room be large, proportionally larger vessels should be employed. After starting the operation the door of entrance should be carefully sealed, and the room left undisturbed for forty-eight hours. Great care must be taken on entering the room after the operation, so as to avoid breathing the acid. Carbolic acid may also be used to great advantage by mixing it with sand or sawdust in the proportion of one part to three. This may be placed in earthen pots as above.—1 *A*, *June* 28, 1872, 306.

CUTANEOUS ABSORPTION OF DRUGS, ETC.

The question has been discussed for some time past as to whether the skin, when brought in contact with solutions of various substances, can absorb them to such an extent as to produce a marked effect upon the system. The general tendency of experiments has been against such a supposition. Bernard, however, has lately made a series of investigations on this subject, in which he shows conclusively that certain substances are readily absorbed when brought in contact with the skin by means of vapor-baths. This, however, only takes place when the temperature of the bath is at least one degree above that of the body, the sebaceous matter in the cells of the epidermis at a less temperature completely excluding its passage. A successful result can even be obtained with the water-bath, if this be brought up to a degree sufficient to dissolve the sebaceous matter of the skin.—1 *A*, *July* 12, 1872, 14.

POISONOUS RED AND OTHER COLORS.

Mr. Wallace Young, in commenting upon an important article by Dr. Draper, published in the journal of the Massachusetts Board of Health, in regard to the evil effects of the use of arsenic in certain green colors, brings forward the results of a critical examination of pigments, other than green, also containing arsenic. These were all of French manufacture, and intended for use in calico printing, but were rejected, first, on account of the large quantity of arsenious oxide present; and, second, because colors equally good for calico could be obtained by other less expensive and less dangerous methods. The colors in question were named light scarlet pigment, scarlet ponceau, dark green and steam chocolate, and catechu pigment, all containing arsenious oxide, which is supposed to have been added for the purpose of giving body to the pigment, not being essentially necessary to the color. It is thought very probable that these are used extensively in the manufacture of paper-hangings.—1 *A*, *Aug.* 30, 1872, 105.

NATURE OF CROUP.

Dr. Jordan, in a recent lecture upon croup, as reported in the *Medical Times and Gazette*, takes occasion to refute the hypothesis that croup is the result of membranous exudation in the larynx or trachea, and maintains that whenever this occurs the actual disease is diphtheria. The usual cause of croup is a membranous inflammation of the mucous membrane of the larynx and tracheæ, accompanied with secretion of tenacious mucus, and also considerable swelling, caused by effusion into their submucous areolar tissue—in fact, a catarrhal inflammation of the larynx and tracheæ. The chief danger of the disease is in consequence of the obstruction to the entrance and exit of air to and from the lungs, which frequently requires a very prompt treatment. For this the patient is to be placed in a warm room having no draughts, at a temperature of at least 70° Fahr. The air breathed is to be thoroughly saturated with moisture, this being sometimes accomplished very effectually by the steam from a boiling kettle in the room.

Whatever application be adopted, it is to be remembered that the soft moist vapor is an important agent in the treatment. A linseed poultice to the throat helps, and has a soothing power. These external applications being attended to, an emetic of ipecacuanha is then to be given, and repeated every twenty minutes or half hour until not only copious vomiting but copious perspiration is induced. The result of this is to cause the secretions of the air-passages to become thinner and more easily got rid of, a looser cough always bespeaking a lessened danger. Other modifications of the treatment are, of course, to be suggested by the attendant physician.—20 *A*, *August* 31, 1872, 221.

RELATION OF CHLORAL TO STRYCHNINE.

Not long ago we were informed by Dr. Liebreich that hydrate of chloral might be considered as a perfect antidote to strychnine; but Dr. Oré announces, as the result of an elaborate series of experiments recently communicated to the Academy of Sciences of Paris, that this statement is entirely erroneous, and that strychnine and chloral have no such relation to each other, but that they rather co-operate to produce an injurious or even fatal result.—6 *B*, *July* 22, 1872, 218.

CORALLINE NOT POISONOUS.

Some time ago it was stated in English journals that coralline is poisonous, and it was asserted that cutaneous eruptions have been caused by wearing clothes dyed with it. On the other hand, however, the opinion has been advanced that such diseases, if really occurring, have probably been originated by arsenious mordants, and not by the dye-stuff, as many and careful experiments have shown that coralline itself is innoxious.—25 *C*, 1872, XII.

LIEURNUR'S SYSTEM OF CLOSETS.

Lieurnur's system of cleaning cities has lately been tested in Amsterdam over an area of four streets, with 207 houses, and has given entire satisfaction. Hereafter all privies in a given district in that city (which may contain 20,000 to 25,000 inhabitants) are to be brought in connection with a large reservoir by means of iron pipes, and the fœcal matter conveyed into this reservoir by an air-pump, and thence in a similar manner into iron cylinders, which are then carried off to their place of destination.—28 *C*, V, *May*, 1872, 313.

DISPOSAL OF SEWAGE.

A communication to the *English Mechanic*, discussing the sewage question, which is always a serious problem, urges the great importance of receiving such matter into a mixture devised by the writer, and which, in his opinion, contains the ingredients of the utmost value in agricultural economy, and which, when united with fœcal matter, will prove to be a manure of extraordinary value. The mixture is composed of the following ingredients: Perfectly dry humus or soil, 100 parts; calcined gypsum powder, from 10 to 20 parts; common alum, from 1 to 5 parts; copperas (green), from 1 to 5 parts; and sulphuric acid, from 1 to 5 parts. This preparation is calculated to fix the ammonia of the night-soil and prevent its escape, thereby deodorizing the mass effectually. The composition is to be prepared beforehand and kept in large quantities, and used as required. Other substances, such as blood, or offal of any kind, may also be treated with it.—18 *A*, *July* 5, 1872, 397.

DETERMINATION OF ARSENIC IN WALL-PAPER.

To ascertain whether wall-paper is colored with any arsenious substance, the following test may be employed. A piece of the paper is impregnated with a solution of nitrate of soda in a mixture of water and alcohol, and dried. The dried piece is burned, and the resulting ashes moistened with a lye of caustic potash, previously boiled and filtered. The filtrate is acidulated with sulphuric acid, and permanganate of potash added until a portion of it remains unchanged. After filtering again and cooling, some sulphuric acid and a piece of pure zinc are added, and the solution placed in a closed vial containing two slips of test-paper, one of which is impregnated with a solution of nitrate of silver and the other with acetate of lead. The presence of arsenic is indicated by the blackening of the nitrate of silver paper.—8 *C*, 1872, 195.

ACTION OF VARIOUS SALTS ON LEAD.

It is well known that the presence of certain salts in water greatly diminishes its solvent action on lead; and for the purpose of determining the possible effect of such solutions upon cisterns and water-pipes, an English chemist suspended pieces of bright lead, having a known area, in various solutions, for different periods of time, and the amount of lead dissolved was estimated by the most accurate method of color-tests. A critical examination of the tabulated results shows that solutions containing nitrates, and especially ammonium nitrate, exert the greatest solvent power, while the carbonates have the greatest protecting power; and next to them the sulphates, so that a water containing the latter, even if a considerable amount of nitrates be present, has not a very marked solvent action on lead.—1 *A*, *June* 14, 1872, 283.

FAYRER ON POISONOUS SERPENTS OF INDIA.

An extremely important work from the pen of Dr. Fayrer, upon the poisonous serpents of India, has lately been published, embracing an account of all the species that are known to possess venomous characteristics. Dr. Fayrer has been well known by the publication of numerous experiments tending to show that the ammonia injection process of Dr. Halford, of Australia, is not the certain remedy for snake bite that has been claimed, and, indeed, that with serpents in India it has little effect. These experiments have been made by injecting the ammonia immediately after the bite of a cobra, by mixing the ammonia with the cobra-poison at once, or by administering the ammonia by the mouth, and by subcutaneous injection, with the same result in all—death. The experiments of Dr. Fayrer show the importance of a prompt application of a tight ligature to the limb, above the bite, after which excision and the actual cautery are to be used. In the case of the finger or toe being bitten, amputation should be performed immediately at the next joint. A fowl bitten on two occasions by cobras had amputation of the wing performed each time, and survived.

Carbonate of ammonia or spirits of ammonia may be given, but with no more effect than spirits and water. Treatment, to be efficacious, must prevent the entrance of the poison. When the virus is once in the blood no known agent is capable of neutralizing it. Dr. Fayrer found that snakes have a great repugnance to carbolic acid, which acts as a sudden and fatal poison to them; for which reason carbolic acid is recommended for regions infested with poisonous serpents, as one of the best methods of preventing their entrance into buildings and outhouses.

The most poisonous snakes appear to possess a perfect immunity from the poison of their own species, and a considerable immunity from that of other kinds. Indeed, the result of most of the experiments was to show that the cobra and some other serpents were unable to poison themselves or each other. The rapidity of the action of the poison seems to be in proportion to the warmth of the blood, birds dying very quickly; but the power of resistance, although generally in proportion to the size of the animal, is not invariably so, as a cat will resist poison almost as long as a dog of three or four times the size. Cold-blooded animals, as fish and non-venomous snakes, and invertebrates generally, are sure to die if bitten. In poison by the colubrine snakes the blood coagulates firmly, but in death by the viperine, according to Dr. Fayrer, it remains permanently fluid.—20 *A*, *August* 31, 1872, 243.

NATURE OF GUARAUNA.

The Indians of Brazil are in the habit of preparing a substance known as "Guarauna," from the *Paullinia sorbilis*, and of using it in an infusion as a beverage. The substance has recently been imported in large quantity into Germany, and is considered of much efficacy as a remedy for sick-headache. The crystallizable principle of this substance, which is termed guaraunine by Dr. Stenhouse, and generally considered identical with theine and caffeine, has recently been subjected to examination by Mr. Williams. After adopting a better method than that of Dr. Stenhouse for isolating it, he joins in the opinion of its relationship to the other substances named, but thinks it is rather more soluble in water, and not quite so bitter in taste.—1 *A*, *August* 30, 1872, 97.

SULPHOHYDRATE OF CHLORAL.

The sulphohydrate of chloral is a newly-discovered substance, the chemical and physiological properties of which have been discussed by Mr. Byasson. It is prepared by submitting anhydrous chloral to a current of dry sulphuretted hydrogen, various precautions being taken to render the experiment successful. The sulphide body, after being purified, is white, of a disagreeable smell, and of a peculiar odor, somewhat similar to that of chloral-hydrate. It crystallizes in right prisms, and readily evaporates, like camphor, its vapors blackening moistened paper impregnated with a soluble salt of lead. As this substance is decomposed by water, and alcohol containing any per cent. of water, its administration presents considerable difficulties. Rabbits treated by subcutaneous injection with quantities dissolved in ether, in moderate doses, exhibited an appreciable diminution of temperature, a relaxation of the muscles, with quiet slumber lasting for about two hours, no notable diminution of sensibility, and a slight acceleration of the beating of the heart, after the slumber the animal returning to its normal condition.—6 *B*, *March* 13, 1872, 1292.

PHYSIOLOGICAL ACTION OF CARBOLIC ACID.

The physiological and chemical action of carbolic acid upon the animal organism has lately been the subject of a memoir by Salkowski. According to this author, it causes irritation when applied, increasing the reflex excitability of the spinal cord, and producing convulsions similar to those occasioned by strychnine. These symptoms are accompanied by paralysis in frogs, but not in rabbits. The respiratory nervous centre is first stimulated, both directly and through the vagi, and respiration is quickened; but afterward the centre becomes paralyzed, the breathing stops, and death ensues. The beats of the heart are rendered slow in frogs by large doses, but are quickened in man by small doses. Carbolic acid is absorbed as such, and can be detected in the blood. It is partly excreted unchanged, and partly oxidized in the system, yielding oxalic acid, which is found in the blood.

Another writer, in speaking of this substance, remarks that the general effect when applied to animals is to cause great dilatation of the blood-vessels, weak respiration, and a lowering of the temperature.—21 *A*, *July*, 1872, 627.

ATROPIA INJECTION AN ANTIDOTE TO OPIUM.

Dr. James Johnson, of Shanghai, contributes an important article to the *Medical Times and Gazette* upon the effect of atropine as an antidote to opium, and details the circumstances of sixteen cases in which this substance was injected subcutaneously for this purpose. The result was that ten recovered and six died. It is probable that all the cases would have been fatal but for the remedy thus employed.—20 *A*, *September* 7, 1872, 268.

EFFECTS OF A SUPEROXYGENATED ATMOSPHERE ON ANIMALS.

In a communication, by Birt, upon the result of certain experiments upon animals kept in a superoxygenated atmosphere, it is stated that birds succumb whenever the proportion of carbonic acid generated amounts to twenty-five per cent., while dogs require thirty-five per cent. for a similar fatal result. It would appear that, in an atmosphere of this kind, it is not so much the carbonic acid contained in the blood, as that which accumulates in the tissues, which causes death. When the tissues are treated first by potassa, and then by sulphuric acid, it is shown that the accumulation is considerable in the liver and kidneys, but most in the brain. Carbonic acid abounds in the intestines, and also in the urine and the blood.—8 *B*, *August* 17, 1872, 166.

EFFECT OF BATHING ON THE WEIGHT OF THE BODY.

Drs. Jamin and De Laures, in an account of some experiments made by them upon the loss of weight experienced by the human body in a bath, remark that, under ordinary conditions, a man of good constitution will consume about 4000 grammes of food in the course of a day, of which 1500 grammes are excreted, while the remaining 2500 grammes are consumed in the course of twenty-four hours, either by the lungs or by the skin, being a loss of about 100 grammes per hour. This loss, however, is not uniform, as it amounts to about 125 grammes after dinner, diminishing until the following morning, when it is only 80 grammes between six and seven o'clock, and increasing again after breakfast. In exercising under a hot sun it sometimes amounts to as much as 340 grammes per hour.

When the body is immersed in a bath there is a certain temperature at which the weight is maintained unchanged, this, however, increasing when the temperature is lowered, and diminishing very rapidly as the water becomes more and more heated. Before taking the bath 30 grammes may be lost by respiration, and 60 by perspiration; but during the hour after it the conditions are different: a much less loss will take place, and sometimes none at all; indeed, occasionally there may be a slight increase of weight. As, however, the quantity of water exhaled can not be less than before taking the bath—and, indeed, should be greater, in consequence of the humidity of the epidermis—the diminution or loss of weight, it is thought, can not but be the result of a single cause, namely, a diminution in the amount of carbonic acid expired. But these conclusions are not to be considered as established, and further investigations are to be made by the gentlemen named.—3 *B*, *July* 18, 1872, 489.

CURE FOR ECZEMA.

Dr. Sacc, of Neufchatel, communicates what he considers to be a perfect specific against eczema, one of the most trying and painful of cutaneous maladies, and one very widely distributed. This is characterized by a redness of the skin, in spots, over all parts of the body, accompanied by small pustules filled with a colorless liquid, and by itching so persistent and varied as to produce not only sleeplessness, but even, at times, delirium. The usual remedies for this disease consist of emollient baths (iodized, sulphurized, or saline), as also the mercurial remedies. Dr. Sacc, however, has treated it for fifteen years by the application of acetic acid of eight degrees, rubbed on night and morning upon the parts affected, until the disease disappears. Generally two or three applications are sufficient to effect a temporary cure. Each successive return of the disease will be weaker and weaker, and should be treated as at first, and finally the cure will be complete. The smarting caused by the first friction will be intense, but will soon cease with the other symptoms.—4 *B*, *August*, 1872, 688.

DEFECTS OF VISION IN THE YOUNG.

Dr. Liebreich, the eminent ophthalmic surgeon connected with St. Thomas's Hospital, London, has lately written an article in regard to school-life in its influence on sight, and attributes many of the permanent defects of vision from which educated people suffer to the physical conditions of the school-rooms in which they were taught. The more important changes in the functions of sight developed under these circumstances, according to the author, are three in number—namely, decrease of the range of vision, decrease of the acuteness of vision, and decrease of the endurance of vision. Decrease of the range, or short-sightedness, he remarks, is developed almost exclusively during school-life, rarely afterward, and very rarely before. It may be true that short-sightedness is often hereditary, but this condition is suspended, and in most cases would not probably be developed but for the tendencies of school-life. The effect of short-sightedness is to injure the general health by inducing the habit of stooping for the purpose of more readily seeing objects, and this increase of the defect, in a national point of view, is to be considered a serious evil.

The decrease in the acuteness of vision is generally the result of a positive disease of the eye, which may be exceptionally induced at school, while the decrease of endurance arises principally from two causes: the first, a congenital condition, which can be corrected by convex glasses, and can not, therefore, be the product of school-life; the second, a disturbance in the harmonious action of the muscles of the eye, a defect difficult to cure, generally caused by unsuitable arrangements for work. All these three anomalies in vision may arise from the same circumstances—namely, insufficient or ill-arranged light, or a wrong position during work, the former obliging us to lessen the distance between the eye and the book while reading or writing, and the same being required if the desks or seats are not in the right position, or of the right shape and size.

If the muscles of the eye are not strong enough to resist such tension for any length of time, one of the eyes is left to itself, and while one eye is being directed on the object, the other deviates outwardly, receives false images, and its vision becomes indistinct—*amblyopic.* Or perhaps the muscles resist these difficulties for a time, become weary, and thus is produced the diminution of endurance.

To prevent these evils the light of the school-room should be sufficiently strong, and should fall on the table from the left-hand side, and, as far as possible, from above. The children should be obliged to sit straight, and not have the book raised nearer the eye than ten inches. In addition to this, the book should be raised twenty degrees for writing, and forty degrees for reading. Dr. Liebreich thinks that in very few schools are the conditions here stated complied with. He remarks that the proper light is most easily obtained if the class-room is of an oblong shape, the windows being in one of the long sides, and the tables arranged parallel to the short walls, so that the light falls from the left side. The desk of the master should be near the short wall toward which the scholars look.

This simple and practical arrangement, which in some places is a matter of course, is in England almost exceptional. Light coming from the right hand, according to Dr.

Liebreich, is not so good as that from the left, because the shadow falls upon the part of the paper to which we are looking. Light from behind is still worse, because the head and upper part of the body throw a shadow upon the book; but the light that comes from the front, and falls on the face, is by far the worst of all.

A similar principle should be adopted in regard to the use of artificial light. Naked gas jets Dr. Liebreich considers to be injurious because of their unsteadiness, and he recommends that glass cylinders be used with them; and reflectors are still better. Ground-glass globes ought not to be used. These are useful for the ordinary lighting-up of a room, as they diffuse the light more equally throughout all parts, but for that very reason they give an indistinct light for work, and, if they are opposite the eye, are dazzling and injurious. Ground-glass, for the same reason, is objectionable for lighting rooms, and should only be used for skylights or the upper portion of windows.

The arrangement of seats in drawing-schools should differ from that in ordinary class-rooms by having a diagonal arrangement; or if the room be long and very narrow, and the pupils only draw from copies, while the light comes from the top, it will be best to turn the back to the light.—3 *A*, *July* 27, 1872, 49.

PHYSIOLOGY OF VIRUS.

Professor Chauveau has lately published an elaborate memoir upon the general physiology of virus, and sums up his inquiries with the following propositions: *First*, healthy or non-putrid pus has the power of producing inflammation in any conjunctive tissue with which it is brought in contact; *second*, this power belongs exclusively to the solid particles held in suspension in the serum, the latter, at least, not containing morbific elements of positive activity; *third*, the inflammation produced in the conjunctive tissue by these solid particles is not the result of mechanical irritation, but is brought about by means of a specially irritating power inherent in them; *fourth*, the activity of this property depends upon the intensity of the inflammatory process which has produced the matter experimented upon; very intense or moderately acute, with corresponding phlegmons, it becomes very weak, or almost nothing, in chronic phlegmons; *fifth*, the morbific action of the pus appears to be influenced by its age, that recently formed being more potent than that which is older.

The professor also remarks that it may be considered as well established that a putrid pus which produces mortal or gangrenous ulcers, when brought in contact with tissue, becomes inert when freed of its solid particles by filtering.—8 *B*, *July* 20, 1872, 68; *and July* 27, 1872, 91.

HOT SAND-BATHS.

One of the therapeutic novelties in London, recently introduced from the Continent, consists in the erection of establishments for administering hot sand-baths, as a remedy for rheumatism, recent cases of nervous disorders, affection of the kidneys, and all cases where heat is wanted as the chief therapeutic agent. The advantages of this treatment are that it does not suppress perspiration like the hot water-bath, but rather increases it, and does not interfere with the respiration like the steam-bath or Turkish-bath. The body can endure its influence for a much longer time, and a much higher temperature can be applied. It can be used for infants, and permits of easy application to a part or to the whole body.—20 *A*, *August* 31, 1872, 243.

PHYSIOLOGICAL ACTION OF DELPHINIUM.

Recent researches made at the physiological laboratory at Leipsic have shown a remarkable action of the poisonous principle of delphinium, or the common larkspur, upon the muscular tissue of the heart. The lower two thirds of the ventricle of the frog's heart have not, as is well known, the power of spontaneous rhythmical contraction when cut out and placed in a condition of isolation. If a portion of the base of the ventricle be included, however, in the piece cut off from the frog's heart, rhythmical contraction will continue in the isolated portion, on account of the presence in that case of some of the nervous ganglion cells which lie at the base of the ventricle. Dr. Bowditch has found that the introduction into its cavity of a solution of delphinium in serum acts upon an isolated lower two thirds of a frog's heart ventricle like providing it with a nervous system. The portion of heart which, as is well known to physiologists, is invariably inert, now, under the influence of delphinium, exhibits spontaneous and continued rhythmical contractions.—15 *A*, *November* 9, 1872, 453.

PURITY OF THE WATER OF THE UPPER HUDSON.

The Water Commissioners of the city of Albany lately employed Professor C. F. Chandler, the well-known expert in such matters, to make a report upon the water of the Hudson River above Albany, with a view of ascertaining its availability for the supply of that city. He reports that the most critical scrutiny has failed to reveal any thing to sight, taste, smell, or chemical examination that can be considered as throwing the slightest suspicion upon the purity of the water of the Hudson, or on its fitness for a wholesome beverage; and, furthermore, that, owing to an unusual combination of circumstances, the aeration of the water, so necessary to render it palatable, has been accomplished thoroughly by Glenn's Falls, the Falls of the Mohawk at Cohoes, and by the State Dam at Troy.—*Report of C. F. Chandler.*

A NEW FEBRIFUGE.

A new febrifuge, said to be an excellent substitute for quinine, is reported to have been discovered in France, which is much cheaper than quinine. This substance consists of the green leaves of the laurel, or *Laurus nobilis*, which are dried in a close vessel on a fire, and are afterward reduced to fine powder, of which one gramme, or 15.5 grains, may be taken as a dose in a glass of cold water. Forty-six and a half grains, it is asserted, are sufficient to effect a cure, and it has even been successful in African fevers of long standing, against which quinine was ineffectual.

EFFECTS OF USING BROMIDE OF POTASSIUM.

Long-continued use of the bromide of potassium has, as is well known, a tendency to produce certain nervous diseases, which, according to Carles, present themselves under five different forms. The first is represented by acne; the second by ulcers of a dull yellow, having an offensive odor; third, red blotches, like purpura; fourth, by furuncles; fifth (the rarest of all), exhibits the appearance of eczema. Hitherto the only known method of causing the eruptions to disappear has been to suspend or diminish the employment of the bromide of potassium; but, as there are cases where its continued use is necessary, it becomes important to discover some other way of meeting the difficulty.

From the observations of Dr. Carles, he is satisfied that the bromide of potassium is chiefly eliminated by the urine, and that it only establishes itself under the skin, producing the effects referred to when elimination by the kidneys is incomplete. On this account, therefore, he suggests the use of diuretics, and the opening of the pores of the skin by means of hot baths; and he found a very remarkable measure of success by this treatment.—1 *B*, *October* 13, 1872, 25.

EFFECT OF BATHING ON THE HEAT OF THE BODY.

Dr. John C. Draper has lately published the results of some experiments upon the heat produced in the body, and the effects of exposure to cold, as determined, in his own case, by the use of the bath. He found that exposure for an hour to water at a temperature of about 74° lowered the temperature of the mouth 2°; of the armpits, 4°; and of the temples, 2°. The rate of respiration was also diminished—in one case two, and in another four movements; and that of the pulse twenty beats in one, and twenty-three in another case. It is therefore evident that the effect of the long-continued application of cold is to reduce the temperature of the body, and to make the pulsation slower, and that it affects the pulsations more profoundly. One of the consequences of this effect of the cold on the action of the heart was a great reduction in the quantity of oxygen introduced into the system. The rate of pulsation being reduced nearly one third, the quantity of oxygen introduced into the interior of the body was diminished in a somewhat similar ratio.

From this resulted an almost overwhelming and, indeed, uncontrollable disposition to fall asleep. A similar result to this sluggish movement of the blood is a disposition to congestion of the various internal organs.

In summing up the conclusions from the entire series of experiments, Dr. Draper remarks that the primary and most important effect of the application of cold to the whole surface of the body is to reduce the action of the heart. This reduction is still further increased on removing the cold, if the application has continued for a sufficient length of time; and, as a consequence of the reduction of the heart's action, the phenomenon of stupor, or sleep, appears, produced either by deficient oxidation or by imperfect removal of carbonic acid. There is also a tendency to congestion of various internal organs, especially of the lungs, and the establishment of a pulse-respiration ratio similar to that of pneumonia.—4 *D*, *December*, 1872, 445.

INJECTION OF SEPTICÆMIC BLOOD.

According to a communication from M. Davaine upon the subcutaneous injection of septicæmic blood (that is, blood derived from an animal poisoned by putrefied blood), the virus acquires increased intensity and power by passing through the animal organism. This follows as the result of twenty-five series of experiments on rabbits and Guinea-pigs, and the accumulated intensity of power became so tremendous that "the blood of the rabbit killed by the ten-millionth part of a drop was injected into five rabbits in doses of the one-hundred millionth, the billionth, the ten billionth, the one-hundred billionth, and the *trillionth of a drop*. All died within twenty-five hours."—20 *A*, *September* 28, 1872, 356.

COLD MILK FOR INFANTS.

Dr. King, of the United States army, strongly recommends the use of *cold* milk in rearing infants on artificial food. He believes the tendency to gastric and intestinal disorders is much less when the feeding-bottle is kept in cold or ice water than when the milk is raised to the temperature of mother's milk. He has also found that infants relish cold food, and that its effect is particularly good during the teething period.—*New York Medical Journal*, *August*, 1872, 207.

ON THE PHYSIOLOGY OF SLEEP.

In an elaborate paper upon the physiology of sleep, Dr. Henry B. Baker takes the ground that the general cause of normal sleep in man and animals is the accumulation in the organism of the products of oxidation, and mainly of carbonic acid, that accumulation being favored and controlled by reflex action of the nervous system, which thus protects the organism from excessive oxidation, and also allows of sufficient accumulation of oxidizable material to enable the organism to manifest its normal functional activity throughout a succeeding rhythmic period.—*Detroit Review of Medicine and Pharmacy*, 1872, 494.

ARSENIC IN CARPETS.

It is well known that the green, as also some other tints of paper-hangings, contain more or less arsenic, sometimes in a quantity sufficient to produce serious injury to health. It is now known that both the green and the red coloring matter of certain carpets contain arsenic, especially the brilliant dark reds now so fashionable. Samples of these carpets being experimented on, burned with the blue arsenic flame and gave off the characteristic garlic odor. Enough color to give a distinct arsenic reaction could be rubbed off with the finger. A solution in hydrochloric acid produced with copper the usual grayish precipitate of metallic arsenic.—3 *A*, *April* 6, 1872, 287.

O. MISCELLANEOUS.

THE ROYAL SOCIETY'S CATALOGUE OF SCIENTIFIC PAPERS.

The *Catalogue of Scientific Papers* in the transactions of societies and periodicals, undertaken fourteen years ago for the Royal Society of London, mainly in consequence of a suggestion by Professor Henry, of the Smithsonian Institution, has now been completed by the publication of the sixth and concluding quarto volume. The first series brings the subject down to 1863; and it is understood that the society is now collecting material for another decade, which is to end in 1873.—15 *A*, *December* 7, 1872, 737.

STATUE TO SIR HUMPHREY DAVY.

A statue has just been erected to the memory of Sir Humphrey Davy at Penzance, in Cornwall, at a cost of £600. This is of massive granite, and is placed in front of the post-office, a few yards from the house in which he was born.—12 *A*, *October* 31, 1872, 542.

MEMORIAL HALL TO GEORGE STEPHENSON.

It is proposed by the Derby and Chesterfield Institute of Engineers to endeavor to secure funds for the erection of a memorial hall, to cost from £20,000 to £30,000, in memory of George Stephenson.—12 *A*, *October* 31, 1872, 542..

NEW BUILDING FOR THE JARDIN DES PLANTES.

It is said that the French government proposes to appropriate £48,000 toward the rebuilding of the museum and conservatories of the *Jardin des Plantes*. There is also to be a sum of £8000 devoted to the construction of laboratories of chemistry and zoology, and for the completion of the reptile house.—12 *A*, *October* 31, 1872, 542.

REPORT OF THE COUNCIL OF THE BRITISH ASSOCIATION.

The council of the British Association, at its Brighton meeting, presented a report in regard to action upon certain instructions given to it at the preceding meeting. In reference to the subject of observations on the solar eclipse of December, 1871, they reported that application to the government for a contribution of £2000 toward the expenses of the expedition, and the assistance of a government steamer to convey the parties to the station selected for observation, on the coast of Ceylon, in India, had met with a favorable response; that the expedition organized had been reasonably successful in accomplishing its objects; and that a report of the results would be published by the Royal Astronomical Society, in connection with the observations of the eclipse of 1860 and that of 1870.

The resolution of the Association directing the president and council to co-operate with the president and council of the Royal Society in securing a circumnavigation expedition, specially fitted out to carry the physical and biological exploration of the deep sea into all the great oceanic areas, was acted upon conjointly by the two bodies named, and application made to the government for aid. The result of this was the detail of the ship *Challenger*, under Captain Nares, for a three years' voyage, which vessel is now fitting out at Sheerness.

By another resolution the council was directed to apply to the government for funds to enable the Tidal Committee to make observations and continue their calculations; also to urge upon the government the importance, for navigation and for science, of accurate and continued observations on the tides at several points on the coast of India. Application by the council to the government of India secured its promise of defraying the expense of making detailed observations in India, and causing the experiments to be properly reduced. But an application to the British treasury for the sum of about $900 to secure the continuance of the investigation was met by a positive refusal, on the ground that, should they accede to this request, it would be impossible to refuse to contribute toward the numerous other objects which men of eminence may desire to treat scientifically. The British Association had already expended $3000 on this object, and could not spare the funds necessary to complete it.

The council had been authorized to take such steps as might be most expedient in support of a proposition made to establish a telegraphic meteorological station at the Azores; but, on consideration, it was concluded not to recommend any grant for the purpose.

Another resolution directed the council to take into consideration the desirability of the publication of a periodic record of advances made in the various branches of science represented by the British Association. This, however, the council concluded would be better accomplished by the co-operation of the different societies having special subjects in charge, as is now done by the Chemical Society for Chemistry, the Zoological Record for Zoology, etc.—15 *A*, *August* 17, 1872, 209.

NEGLECT OF CHEMICAL STUDIES IN GREAT BRITAIN.

Dr. Frankland, in his anniversary address as president of the Chemical Society of London, delivered in March last, renews the expression of his regret at the apparent decline of chemical science in Great Britain. He states that while the number of fellows of the society has increased from 208 in 1848 to 624 in 1872, the number of researches communicated to this society has undergone a marked diminution. The aggregate number laid before the society in five years, ending March, 1852, amounted to 190; while in the five years ending March, 1872, with a much larger number of members, there were only 168. This lack of progress Dr. Frankland can not attribute to the increasing difficulty of chemical research, since the progress of original investigation elsewhere exhibits extraordinary activity. Thus the German Chemical Society, numbering 463 members in 1870, received 235 papers; and in 1871, with 528 members, received the result of 238 original investigations.

The main cause of this difference Dr. Frankland considers to be the non-recognition of experimental research by the universities, and the fact that the highest degrees, and even honors, in experimental science are bestowed without any proof being required that the candidate possesses the capacity to conduct an original experimental investigation, or that he is competent to extend the bounds of his science. On the other hand, in the best German universities no candidate for a scientific degree is even admitted to an examination unless he has first submitted a memoir or dissertation on some original experimental investigation conducted by himself, the investigation to furnish results of interest and importance.—21 *A*, *May*, 1872, 360.

SECOND REPORT OF THE ROYAL COMMISSION ON SCIENTIFIC INSTRUCTION.

The second report of the Royal Commission on Scientific Instruction and the Advancement of Science has just been issued. The principal members of this commission are Professor Huxley, Sir John Lubbock, Mr. Norman Lockyer, and other names well known in scientific circles. The present report is mainly directed to the consideration of science-teaching in schools and training colleges, and its general recommendations are summed up as follows: "From a consideration of the evidence, we are of opinion that instruction in the elements of natural science can be, and eventually ought to be, made an essential part of the course of instruction in every elementary school. The instruction to which we refer, though scientific in substance, should in form be devoid of needless technicality, and should be almost wholly confined to such facts as can be brought under the direct observation of the scholar. It should, in fact, be conveyed by object lessons, so arranged and methodized as to give an intelligent idea of those more prominent phenomena which lie around every child, and which he is apt to pass by without notice."—15 *A*, *April* 20, 1872, 501.

COLLEGE OF PHYSICAL SCIENCE IN BIRMINGHAM.

A college of physical science, somewhat on the plan of that at Newcastle-on-Tyne, has lately been established in Birmingham by Mr. Josiah Mason, who has assigned a property valued at half a million of dollars, in trust for the purposes of the college. Out of the net income a sum, not exceeding one tenth, is to be set apart annually for providing scholarships, exhibitions, and prizes for the pupils, the remainder going to the general support of the college, payment of professors, etc. Instruction, by means of classes, is to be provided in mathematics, and in the natural and physical sciences, and their industrial applications; as also in the English, French, and German languages, mechanical drawing, and architecture. No person is to be admitted to the benefit of the institution who is not, for the time being, wholly or principally dependent for a livelihood upon his own skill or labor, or else supported by his parents or some other person or persons; but the poorer classes of the community are not to be considered as having exclusive right to the benefit of the institution.—12 *A*, *August* 15, 1872, 304.

REPORT OF THE ZOOLOGICAL SOCIETY FOR 1871.

The Zoological Society of London continues in the prosperous condition to which we have had occasion to advert in previous years. The report of its anniversary meeting on the 29th of April announces an income in the year 1871 of about $123,000, exceeding that of the preceding year by nearly $7000. Of the sum mentioned, $66,000 was for single admissions to the garden. Including season tickets, the yield to the society by their gardens may be estimated at fully $100,000, the remainder being the result of the subscriptions of members, the sale of publications, etc.

The secretary announces the appointment as prosector of Mr. Alfred Henry Garrod, who succeeded Mr. James Murie. The duties of this officer are to make anatomical and other examinations of the animals dying in the society's gardens; and should the new incumbent be as industrious in this respect as Mr. Murie, his labors will doubtless be equally well appreciated. The total number of visitors to the gardens in 1871 amounted to 595,917, being nearly 23,000 more than in 1870, and more than in any previous year excepting in the exhibition years of 1851 and 1862. The greatest number of admissions in any one day was on the 29th of May, Whit-Monday, amounting to 31,400.

The number of vertebrate animals, mammals, birds, and reptiles in the society's gardens in 1871 was 2072.

DAMAGE TO THE PARIS MUSEUM BY THE BOMBARDMENT.

According to the editor of the *Journal de Conchiliologie*, of Paris, the Paris Museum received twenty-three shots from cannon of the German besiegers in the course of the siege, destroying many of the plant-houses. Two of these balls exploded in the conchological laboratory, in the care of Professor Deshayes, causing great injury to the specimens, and the *Septaria* in the general collection were literally ground to powder. The large collection of shells of the lower sands of the Paris basin was entirely destroyed. This is much to be lamented in a scientific point of view, as it contained many types. A ball also passed through a glass case containing the unios and anodonta.—1 *C*, 1871, 721.

PENNY LECTURES IN GREAT BRITAIN.

Several of the large towns in Great Britain have made arrangements to continue the system already begun of having penny lectures on science for the benefit of the working classes. The most eminent men in Great Britain are concerned in this movement, and the attention paid to their addresses has been of the most gratifying character.—12 *A*, *November* 23, 1871, 70.

RELATION OF EUROPEAN NATIONS TO SCIENTIFIC PROGRESS.

M. Berthelot publishes a remarkable article in the *Temps* on the scientific relations between Germany, France, and England, in which he points out that, without depreciating the scientific position of the other countries of Europe and of America, the lead in all great scientific discoveries and movements has been taken by one or other of these three great nations, often by all three simultaneously; and he strongly urges the necessity, especially as regards the first two, of a complete cordiality and union, under the penalty of a general loss to civilization.

OPERATIONS OF THE BRITISH MUSEUM IN 1871.

Nature contains an analysis of the late report of the operations connected with the British Museum in the year 1871, from which we find that, notwithstanding the desire of the authorities, in view of the present crowded state of the collections, to increase their magnitude as little as possible, nearly 16,000 specimens have been added. The total increase made during the last twelve years has amounted to over 662,000 specimens, of which 435,000 belong to the department of zoology, the remainder being divided between geology, mineralogy, and botany.

The zoological additions in 1871 were 10,577 specimens. Reference is made in the report to the ultimate transfer of the collections to the new buildings authorized by Parliament, and which are said to be under way. In their new quarters it is expected that ample room will be had for the arrangement of all the collections now owned by the Museum, and for additions for many years to come, while the opportunity of displaying the number on hand will enable the authorities to take measures for eliminating the duplicates and distributing them to other establishments, and, at the same time, greatly increasing the available space in the cases. It is stated that the use of methylated spirit for the preservation of reptiles and fishes has produced injurious effects to some of the specimens, and that for the future pure alcohol will be used. This fact has long been known in the United States, where substitutes like that in question have never found favor.—12 *A*, *June* 13, 1872, 119.

APPROPRIATIONS FOR THE BRITISH MUSEUM.

The estimates lately voted by the British House of Commons embrace the sum of $480,000 for the various objects connected with the British Museum for the year 1873. In addition to this there was a special vote of $60,000 for purchases for the Museum; $15,000 to be expended in completing the excavations of the Temple of Diana at Ephesus; $50,000 for the purchase of coins and medals, etc. The Science and Art Department at South Kensington receives $580,000.—22 *A*, *August* 10, 1872, 131.

NEW BUILDING OF THE PHILADELPHIA ACADEMY OF NATURAL SCIENCES.

A very interesting event in the history of American science took place on the 30th of October last, in Philadelphia, on the occasion of laying the corner-stone of the new building of the Philadelphia Academy of Natural Sciences. This institution, which has for many years occupied the foremost rank among natural-history establishments in America, was started in 1812, and numbered among its earliest active members William M'Clure, Thomas Say, C. A. Lesueur, etc.; and in later years such men as Samuel George Morton, Joseph Leidy, John Cassin, Dr. Gamble, Edward Hallowell, E. D. Cope, and many others who have made their mark upon the history of science.

The academy since its establishment has been the recipient of many benefactions. Among those who have been most conspicuous in this connection may be mentioned William M'Clure and Thomas B. Wilson. To the latter gentleman is due very much of the present extent of its library and museum.

The new establishment is to be built on a lot at the corner of Nineteenth and Race streets, fronting 288 feet on the former and 198 on the latter. A wing on Race Street will be first erected, to cost $125,000. The expense of the entire building, it is expected, will amount to $500,000, and it is hoped that sufficient funds will be contributed by the liberal-minded citizens of Philadelphia to complete the entire structure in a comparatively short space of time.

The present building, at the corner of Broad and Sansom streets, has long been inadequate to the accommodation of the collections of the academy; and although these are already sufficient to fill the wing of the new building first to be erected, the specimens will be displayed to better advantage than before. Another wing will probably be begun by the time the first is completed. According to statements made on the occasion referred to, the academy now possesses more than 6000 minerals, 700 rocks, 65,000 fossils, 70,000 species of plants, 1000 species of zoophytes, 2000 species of crustaceans, 500 species of myriapods and arachnidians, 25,000 species of insects, 20,000 species of shell-bearing mollusks, 2000 species of fishes, 800 species of reptiles, 21,000 birds, with the nests of 200 and the eggs of 1500 species, 1000 mammals, and nearly 900 skeletons and pieces of osteology. Most of the species are represented by four or five specimens, so that, including the archæological and ethnological cabinets, space is required now for the arrangement of not less than 400,000 objects, as well as for the accommodation of a library of more than 22,500 volumes.—*Philadelphia Ledger, October* 31, 1872.

WASHINGTON MEETING OF THE NATIONAL ACADEMY OF SCIENCES.

The annual meeting of the National Academy of Sciences was convened, on the 16th of April last, at the Smithsonian Institution in Washington. The existence of this body was authorized by an act of Congress passed in 1863; and it was originally limited to fifty members, designed to represent the most eminent men of science in the country, who were to be organized for the purpose of serving as advisers to the United States government in questions of a scientific nature. The Academy has rendered excellent service in this capacity, and has had referred to it very many important questions, the satisfactory solutions of which have saved much money to the government, and increased the efficiency of many of its bureaus. One condition of membership is that all such service to the government is to be performed without charge.

As this society, by its national character, takes the lead of state institutions for a similar object, and the number of members being at first limited, considerable dissatisfaction was felt by many persons who believed themselves worthy of membership, but were excluded by this restriction. The Academy, therefore, after mature deliberation, decided to ask Congress to remove the limitation as to number, which being done, the principal business of the Academy at its late meeting consisted in the increase of its force. Twenty-five new members were selected, representing the various branches of theoretical and applied science, and the number is to be increased by five each succeeding year. Very few papers or communications were presented before the Academy, as all the time of the meeting was required in carrying out the changes involved by the alteration of the charter, including the formation of a new constitution and rules for its government.

The following is the list of members elected: Professor C. A. Young, Dartmouth; Professor E. D. Cope, Philadelphia; Professor J. Lawrence Smith, Louisville; W. S. Sullivant, Columbus; Professor W. B. Rogers, Boston; J. H. Trumbull, Hartford; Professor J. P. Cooke, Cambridge; Dr. A. S. Packard, Jun., Salem; Professor W. B. Trowbridge, New Haven; J. E. Oliver, Massachusetts; Professor E. W. Hilgard, Oxford, Maine; Professor R. Pumpelly, State Geologist, Missouri; Professor J. H. Lane, Coast Survey; Professor A. E. Verrill, New Haven; Dr. J. W. Crafts; Theodore Lyman, Boston; Professor A. M. Mayer, Stevens Institute, Hoboken; Professor J. Clarke, Amherst; J. Ericsson; Professor Hadley, New Haven; Dr. F. A. Genth, Philadelphia; Charles A. Schott, Coast Survey; Professor A. H. Worthen, State Geologist, Illinois; Captain J. B. Eads, St. Louis; General H. L. Abbott, U.S.A.

CAMBRIDGE MEETING OF NATIONAL ACADEMY OF SCIENCES.

The National Academy of Sciences, which by its charter holds its annual meeting in Washington, is also authorized to have intermediate meetings at such times and places as may be decided upon. For several years such meetings were held in the month of August, at Newport, Northampton, or elsewhere. After a lapse of two years an intermediate meeting was held, on the 21st of November last, at Cambridge, in the hall of the Museum of Comparative Zoology. Quite a large attendance was present, fully equal to that at the regular meetings in Washington. Numerous interesting papers were presented, among them one by Professor Agassiz upon the present condition and prospects of the great Museum of Comparative Zoology under his direction. In this he gave an account of the immense mass of material collected by him during the voyage of the *Hassler*, and expressed the earnest hope that proper facilities might be granted by those who controlled the museum in making such disposition of these collections as would enable them to be of service to the scientific world at large.

He also communicated a paper upon the different modes of dentition among the sharks, and called attention to the fact that many different genera had been heretofore established upon what are simply successive stages of one species. One of the most interesting papers of the meeting was that by Professor Young on the results of the Coast Survey astronomical expedition to the Rocky Mountains. As we have already given the principal facts of these discoveries in these pages, we need not reproduce them.

Other papers presented to the meeting of the Academy were, one by Professor Hilgard on the International Standard Commission, of which he is a member, and whose meeting he attended during his last visit to Europe. He stated that the principal conclusions reached by the committee were that the international meter is to be of the length of the meter of the Paris archives at the temperature of melting ice. Its material is to be an alloy of platinum and iridium, in the proportion of nine to one; its form is to be similar to an H beam, but with the upright sides sloped like an X. Several copies are to be preserved at a nearly constant temperature, as tests of the invariability of length.

Professor Agassiz made a communication upon glacial phenomena of the southern hemisphere, and also upon Darwinism, in which he took occasion to express anew the views he had entertained for so long a time, and which are entirely adverse to the hypothesis.

Professor Verrill gave an account of the recent deep-sea explorations on the coast of New England, and some general remarks were presented by General Meigs on the proper construction of a large aneroid barometer.

In the great variety of other articles communicated, we are, of course, unable to enumerate the whole; and we can only say, in conclusion, that this was one of the most interesting meetings ever held by the Academy. It was adjourned to meet in Washington in April next.—*New York Tribune.*

TWENTY-FIRST MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The twenty-first annual meeting of the American Association for the Advancement of Science took place in Dubuque, Iowa, the sessions commencing on the 21st of August. San Francisco was originally designated as the place of meeting; but, in view of the difficulty of making certain necessary arrangements in regard to the fares upon the railroad, Dubuque was selected instead. The sessions continued throughout the week, and a number of interesting communications were presented.

Professor Gray, the retiring president, delivered the usual address, and resigned the position to his successor, Professor J. Lawrence Smith. In addition to the meetings of the association, numerous excursions were made to the surrounding regions, most of them of a geological and industrial character, and the members separated at the close of the session after a week of much enjoyment.

The number of members enrolled on the books of the association previous to the meeting at Dubuque was about six hundred and fifty, and the list was increased very considerably during the session. The officers elected for the coming year were, Professor Lovering, of Cambridge, President; Professor A. H. Worthen, of Illinois, Vice-President; F. W. Putnam, Esq., of Salem, Permanent Secretary, in place of Professor Lovering, who has held the position for many years.

FIFTH REPORT OF THE PEABODY MUSEUM, CAMBRIDGE.

The fifth annual report of the trustees of the American Peabody Museum on American Archæology and Ethnology, as presented by its director, Professor Jeffries Wyman, has just been published, and, like its predecessors, shows a gratifying evidence of that progress which has already made this museum the foremost collection of the kind in America as regards the ethnology and archæology of the Old World. The collection is extremely rich in every thing illustrating the stone age of Denmark and Sweden, the reindeer period of France, and the lacustrian period of France, Switzerland, Italy, etc.; indeed, the number of European collections equally full must be very small. During the year 1871–72 a large part of the archæological collection of the late Dr. Clement, of St. Aubin, was obtained, and the remainder was procured during the present year. This is extremely rich in specimens from the ancient dwellings of Lake Neufchatel.

The report chronicles the result of several explorations made under the auspices of the museum, among them that of Rev. E. O. Dunning in Tennessee. The specimens obtained during his investigations of certain caves and mounds were extremely important, particularly in reference to the objects of ornamented shell, which, as is well known, are very rare. Some very interesting specimens of pottery were also obtained in the same connection.

Professor Wyman recounts his own explorations in Florida, which he has been in the habit of visiting for several years past. Among these the most remarkable is one at Silver Spring, on the western side of Lake George, near Pilatka, from the fact that the lower part of the shell deposit is cemented by lime, uniting the whole in a solid mass, in which were inclosed the bones of the eatable animals, and implements of shell and bone, as in the ancient caves of France.—*Report.*

REPORT OF THE PEABODY ACADEMY OF SCIENCE FOR 1871.

The report of the officers of the Peabody Academy of Science of Salem, lately made to the trustees, presents a satisfactory exhibit of the progress made during the past year. It will be remembered that this establishment received a moderate endowment from George Peabody, of London, and the income is expended in the care of the valuable museum belonging to the academy. The directors of the establishment are Mr. F. W. Putnam and Dr. Packard, both eminent as men of science, and occupying a prominent place before the public, not only for their own special researches, but as being the editors of that popular serial, the *American Naturalist.*

The principal additions to the museum of the academy during the year have consisted mainly of insects and archæological specimens, and also a series of the animals inhabiting the Mammoth Cave of Kentucky. All of these, together with the collections previously in the museum, have been properly arranged and classified, and tend to render the museum very attractive. The report urges very strongly the propriety of securing an additional endowment, to enable the academy to publish in its memoirs certain valuable scientific manuscripts now in hand, the alternative of being obliged to send them to some other establishment having more means at its disposal being greatly deplored, as they were based upon the collections of the academy, and should legitimately appear under its auspices.

BLOOMINGTON SCIENTIFIC ASSOCIATION.

An organization entitled the Bloomington Scientific Association was instituted at Bloomington, Illinois, in 1871, having for its object the diffusion and popularizing of science in that state. The officers are Professor B. S. Perry, Mr. R. H. Holder, Dr. Vasey, and Mr. J. A. Jackman. The society already has a large number of members, meets frequently, and, we trust, will be of greater permanence than several similar establishments which have preceded it in the same region.

MEETING OF THE AMERICAN PHILOLOGICAL SOCIETY.

As previously announced, the annual meeting of the American Philological Society took place in Providence on the 23d of July, and was attended by a very large number of members, embracing some of the most eminent scholars of the country. The papers read were by Messrs. Charles A. Bristed, W. W. Fowler, J. Hammond Trumbull, Professor Evans, and others; and with the discussions, when printed, as they will be in due course of time, will doubtless form an important contribution to philological science.

CIRCULAR OF THE CHICAGO ACADEMY OF SCIENCES.

The president and secretary of the Chicago Academy of Sciences have lately issued a circular, addressed to its friends and correspondents throughout the world, detailing the amount of loss incurred by the disastrous fire of October, 1871, in which the building of the academy, although considered fire-proof, was entirely destroyed, with all its contents, nothing whatever having been saved from the flames.

According to the circular, the general collection of the academy contained about 2000 mammals, 10,000 birds, 15,000 specimens of insects, 5000 fishes, and 8000 species of plants, together with a large series of ethnological implements and other objects. The special collections were of the greatest value: among these the birds of the Audubon Club; the state collection of insects, purchased from the heirs of Mr. B. D. Walsh; the cabinet of marine shells formerly belonging to Mr. William Cooper, of New York; the Florida collections, made during two winters by Mr. Blatchford and Dr. Stimpson; the cabinet of minerals purchased from the estate of Mr. G. W. Hughes; the collections made in Alaska by Bischoff and the other naturalists of the Western Union Telegraph expedition; the deep-sea crustacea and mollusca dredged in the Gulf Stream by Count Pourtalès; a large collection of tertiary fossils of the United States; the mineralogical collection of Mr. Atwater; the herbarium of the late Dr. Scammon; the Scammon collection of ancient Central American pottery; the collections from the deep-sea dredgings by Dr. Stimpson and Mr. Milner in Lake Michigan. The most serious losses, however, were those of the Smithsonian collections of crustacea, undoubtedly the largest alcoholic collection of this class in the world. This filled over 10,000 jars, and contained the types of the species described by Professor Dana, besides hundreds of new species, many of which were described in manuscripts lost by the same fire. The invertebrates of the United States North Pacific Exploring Expedition, collected mainly in the Japanese seas by Dr. Stimpson in 1853–56, and the collection of the marine shells of the east coast of the United States, were also lost.

The collections of the Smithsonian Institution had been placed in Dr. Stimpson's hands for investigation, having been largely gathered by him on various government expeditions, and he had already completed the manuscript of a report upon them to the institution at the time of the fire. An immense number of drawings and several completed manuscripts were also consumed. In addition to the natural history specimens, all the undistributed copies of the Transactions were burned, together with several valuable paintings. Manuscripts of the works on the shells of the east coast of North America, and on the crustacea of North America, by Dr. Stimpson, which were in an advanced stage of preparation, and illustrated by cuts, already engraved, were also destroyed.

The officers of the academy, however, in reporting these losses, desire it to be understood that, although now prostrate by this terrible disaster, they hope soon to resume the place they have formerly held among sister institutions, the trustees having determined to build up again the material interests of the institution. They therefore appeal to their correspondents at home and abroad for help in supplying at least a second set of the publications with which they had already been favored.

REGULATIONS OF THE NEW YORK MUSEUM OF NATURAL HISTORY.

A sensible rule has been adopted by the authorities of the American Museum of Natural History at the Central Park in this city in setting apart Monday and Tuesday especially for the use of those persons who may desire to examine the specimens in the museum for the purpose of special study. Notifications of this arrangement have been distributed to the principal learned societies throughout the country, inviting them to attend on these days, and informing them that tickets can be obtained by applying at the office of the Department of Public Works, 265 Broadway, or by letter to the museum.

AMERICAN JOURNAL OF CONCHOLOGY.

We learn that the publication of the *American Journal of Conchology* has closed with the completion of its seventh volume. This quarterly, edited by Mr. George W. Tryon, has appeared under the auspices of the Academy of Natural Sciences in Philadelphia, and has included, from time to time, a great many very important conchological monographs, chiefly presented to the Philadelphia Academy, many of them accompanied by colored plates. Hereafter, such communications will be published in the Journal or in the Proceedings of the Academy itself.

RENEWED ACTIVITY OF THE ST. LOUIS ACADEMY OF SCIENCES.

The St. Louis Academy of Sciences, after its forced inactivity for some years past, has again entered upon its career of usefulness. The paralysis of scientific effort in the Southwest caused by the late war, and a destructive fire which in 1869 consumed the entire museum and a great part of the library of the society, crippled its resources to such an extent that it has published no transactions for several years. The meetings, however, have been maintained, and much interesting matter has been presented before them from time to time. During the present year a great improvement has taken place in its condition, and the active membership has rapidly increased until it numbers one hundred, while the nucleus of a new museum has been formed, and a very respectable library has again been brought together. It is now proposed to proceed at once with the publication of transactions, to embrace the most important memoirs that have accumulated in its archives. Quite recently, in connection with the Historical Society of St. Louis, it has received the donation of a valuable lot of ground from Hon. James H. Lucas, upon which it is proposed to construct a suitable building.

THEFT AND RECOVERY OF THE OBJECT-GLASS OF THE ALLEGHANY OBSERVATORY.

As long ago as the 8th of July, 1872, the glass of the great telescope of the Alleghany Observatory, one of the largest of the kind in the country, and valued at about $4000, was stolen from the building, and all efforts to detect the robber and regain the plundered article were unavailing. We now learn from the *College Courant* that the lens has been recovered under the following circumstances: Not long since information was communicated to the parties interested that a gentleman, some months before, had overheard two men in a saloon in Cleveland talking of the proposed theft of an object-glass. They spoke of a failure to obtain one from the Ann Arbor Observatory in consequence of the residence of the janitor's family in the building, and they discussed the possibility of obtaining the coveted prize from the Alleghany Observatory. This clew was followed up with great ingenuity until the 8th of November, when the glass was discovered in the rooms of a friend of one of the parties referred to. This has since been returned to the observatory, but was found to have received serious damage in the form of several scratches, which may require the regrinding of the glass at a cost of thirty or forty per cent. of the original cost.—*College Courant, November* 16, 1872, 217.

GREAT INTERNATIONAL EXHIBITIONS.

International industrial exhibitions are prominent among the many new institutions marking the onward progress of civilization. They promote industry, peace, and prosperity among nations, and are rapidly increasing in frequency and popular appreciation, as shown by the following figures:

Date.	Locality.	Area of Buildings.		No. of Visitors.
		Square Metres.	Acres.	
1851...	London................	92,663	20	6,039,195
1862...	London................	113,287	28	6,211,103
1855...	Paris.................	120,822	30	5,162,330
1867...	Paris.................	158,742	39.2	10,000,000
1873...	Vienna will be.........	103,000	25	
1876...	Philadelphia will be....	202,340	50	

The area given for the Paris Exposition of 1867 is that of the main building only. There were many outside constructions of which we give no account. The total area devoted to the exhibition was a little over 171 acres. The total area given up to the Vienna Exhibition of 1873 is greater than this, and for the Centennial International Exhibition of 1876, at Philadelphia, from 250 to 500 acres of Fairmount Park will be assigned.

SHIPWRECK OF THE BARK JAPAN.

The *Commercial Advertiser*, of Honolulu, of November 11, contains an account of the shipwreck of the bark *Japan*, the first whaler ever fitted out through a Victorian agency, and which was wrecked on the Siberian coast of Behring Straits, in the Tschucktchie country, about latitude 66°, on the 8th of October, 1870. The crew were obliged to betake themselves to the shore, where they were hospitably treated by the natives, and where they spent the winter, undergoing more or less of privation. On the 16th of June, 1871, however, they succeeded in reaching the bark *John Wells*, of New Bedford, and the shipwrecked men were distributed among the different vessels of the whaling fleet, and were sharers in the disaster which lately befell that body of men.

EXHIBITION OF CURIOSITIES IN JAPAN.

According to the *Yale College Courant*, a new era in the educational development of the Japanese has been entered upon in the opening of an exhibition of curiosities of nature and art in Yedo in the beginning of April last. The formation of collections of this kind is usually characteristic of an advanced stage of culture; and, in imitating the European and American example in this respect, the Japanese show their great superiority to the Chinese and other Oriental nations. The exhibition referred to was opened in a temple sacred to the spirit of Confucius, and situated in the grounds of the old Chinese college. This institution was the chief seat in Japan of the study of the Chinese literature, but has been closed for some years, as the study of the Chinese has now become obsolete.

The exhibition, to which a charge for admission of about two cents was made, was projected by the Japanese themselves, and although small, yet, according to the writer in the *Courant*, it was really very good and well selected. The specimens were those mainly pertaining to the fauna and flora of Japan, embracing reptiles, fishes, insects, and birds, the last being well stuffed and mounted. Specimens of timber, in polished slabs, were exhibited; and the cases of insects were filled with a very great variety of species. To the wonders of nature were added numerous art curiosities, mainly of old and rare patterns of lacquered bronze.—*College Courant, June* 8, 1872, 268.

NATURAL HISTORY SOCIETY OF MARQUETTE.

The scientific tendency of the age, manifested in the continual springing up of new associations in different parts of the country, receives an additional illustration in the establishment of the Natural History Society of Marquette, Michigan, which was organized during the month of December, 1871, under the presidency of Dr. Hewitt.—*Marquette Mining Journal, December* 16, 1871.

VICE-CHANCELLORSHIP OF SIR JOHN LUBBOCK.

Sir John Lubbock, Bart., M.P., F.R.S., so well known for his researches into the history of prehistoric man and the earliest forms of civilization, has been elected Vice-Chancellor of the University of London, which has always taken the lead among the English universities in recognizing the importance of the cultivation of natural science.

MURCHISON GEOLOGICAL FUND.

Sir Roderick Murchison has bequeathed £1000 to the London Geological Society, to be known as the Murchison Geological Fund, the proceeds of which are to be annually devoted by the council to the encouragement and assistance of geological investigation.—12 *A, December* 14, 1871, 130.

SCIENTIFIC APPOINTMENTS IN PARIS.

Albert Gaudry, the well-known author of the work upon the paleontology of Mount Pikermy, in Greece, and of other memoirs, has been nominated as Professor of Paleontology in the Museum of Natural History of Paris. Charles Sainte-Claire Deville has been appointed inspector-general of the meteorological stations of France; while Marié-Davy becomes chief of the service of meteorological and terrestrial physics.

ELECTION OF M. LOEWY TO THE BUREAU DES LONGITUDES.

The position in the Bureau of Longitudes of France, rendered vacant by the death of M. Laugier, has been filled through the election of M. Loewy by the French Academy of Sciences.—12 *A, August* 15, 1872, 304.

MEDAL OF THE HAARLEM SOCIETY OF SCIENCES.

The Society of Sciences at Haarlem celebrated its 120th annual meeting on the 18th of May last, and decreed the Boerhaave Medal to Mr. H. C. Sorby for the microscopical investigations carried on by him upon the structure of minerals and rocks. They also proposed quite a number of premiums for questions embracing many interesting problems in the physical and natural sciences at the present day.

COPLEY MEDAL GRANTED TO PROFESSOR MAYER.

The Copley Medal, one of the highest prizes within the gift of the Royal Society of London, has lately been adjudged to Professor Julius Robert Mayer, of Heilbronn, as a recognition of investigations which embrace some of the most profound subjects of philosophy and physical science; as, for example, the forces of inorganic nature, organic movements in connection with nutrition, celestial dynamics, the economical equivalent of heat, etc. A medal was also granted to Dr. Stenhouse for important chemical researches, having special application to the arts and to agriculture.—3 *B, December* 21, 1871, 649.

APPOINTMENT OF PROFESSOR RAMSAY.

The vacancy at the Geological Survey office, caused by the death of Sir Roderick J. Murchison, has been filled up by the appointment of Professor Andrew Crombie Ramsay, LL.D., F.R.S., as director-general. Professor Ramsay has for many years been director of the Geological Survey and Professor of Geology in the Royal School of Mines.—18 *A, March* 16, 1872, 231.

LOGAN CHAIR OF GEOLOGY IN MONTREAL.

Sir William Logan, long well known as director of the Geological Survey of Canada, and as a geologist of high position, has endowed a "Logan Chair of Geology" in the M'Gill University, Montreal, with the sum of $20,000. Professor Dawson will be the first Logan Professor; and it is intended that by means of this endowment he shall, as soon as possible, be relieved from other duties, so as to enable him to devote his entire time to geology and paleontology.—12 *A, April* 4, 1872, 414.

ELECTION OF NEW MEMBERS OF THE LINNÆAN SOCIETY.

At the meeting of the Linnæan Society of London, held May 2, Professor Joseph Leidy, of Philadelphia, and Professor Notaris, of Genoa, were elected, on the recommendation of the council, to the two vacant places in the list of foreign members. The number is limited to fifty.

APPOINTMENT OF ASSISTANT-KEEPER OF THE BRITISH MUSEUM.

The position of assistant-keeper in the Zoological Department of the British Museum, rendered vacant by the death of Mr. George R. Gray, has been filled by the appointment of Dr. Alfred Günther, the well-known herpetologist and ichthyologist of the museum. The vacancy caused by Dr. Günther's promotion will be occupied by Mr. R. B. Sharpe, at present librarian of the Zoological Society. This gentleman is an accomplished ornithologist, and will doubtless discharge the duties of his position with entire satisfaction. Of his abilities we have ample testimony in the great work upon the birds of Europe, upon which he is engaged in connection with Mr. Dresser, and in his monograph of the *Alcedinidæ*, etc.—12 *A*, *August* 15, 1872, 304.

HONORS CONFERRED ON DR. GROSS AND PROFESSOR AIRY.

At the meeting of the Convocation of the University of Oxford, in the middle of June, the honorary degree of D.C.L. was conferred on Dr. Samuel David Gross, Professor of Surgery in the Jefferson Medical College of Philadelphia.

We also learn that Professor G. B. Airy, the eminent head of the Greenwich Observatory, has been gazetted as K.C.B. —12 *A*, *June* 20, 1872, 149.

EXCELLENCE OF AMERICAN MEDICAL BOOKS.

A gratifying tribute to the excellence of the American medical faculty is paid in a recent number of the *Medical Times and Gazette*, in which it is stated, as an illustration of the thoroughness of the inquiries prosecuted in this country, that half of the best text-books available for use in the English language are American in their origin.—20 *A*, *January* 6, 1872, 9.

GOLD MEDAL TO PROFESSOR DANA.

No person in the United States, perhaps, occupies a higher position in the esteem of his colleagues as a man of science than Professor Dana, of New Haven, while to those who enjoy the pleasure of his acquaintance he is the exemplar of all that is excellent for his personal qualities. Occupying, as he has for many years, the position of co-editor of the *American Journal of Science*, the leading organ of scientific investigators in the United States, he has been brought into communication with more than one generation of workers, and inspires all with the same feeling of regard and affection.

It is, therefore, with no little gratification that his friends and admirers have seen the announcement that the Wollaston Gold Medal, in charge of the Geological Society of London, has just been conferred upon him; and the remarks made by the president, Mr. Prestwich, in transmitting the medal, can not be considered as exaggerated when he says that Professor Dana enjoys the rare honor of having prosecuted original investigations in such totally dissimilar departments of science as zoology and mineralogy, and as having taken rank with the first specialists in both departments—his principal works in the one being contained in several huge volumes, treating of the crustacea and corals, published in the reports of the United States exploring expedition, and in the other consisting of his treatise on mineralogy, which has gone through several editions. His manual on geology, which, perhaps, occupies an intermediate position between the two divisions of his labors, is equally excellent, and is a standard text-book throughout the world.

RETURN OF DR. BROWN-SEQUARD TO THE UNITED STATES.

Dr. Brown-Sequard, the eminent physiologist, has resigned the chair of Comparative and Experimental Pathology in the Faculty of Medicine in Paris, which he has occupied for several years. It is understood that this is preliminary to establishing his permanent residence in Boston.

P. NECROLOGY.

The following list embraces the principal losses by death, during the year 1872, in the ranks of men of science.

Appun, Karl F. Born at Bunzlau, May 24th, 1820. Died July 18th, in British Guiana. Author of numerous papers in "Ausland" and elsewhere on the geography and natural history of Guiana.

Baird, Dr. William. Assistant in the zoological department of the British Museum; author of a "Cyclopedia of the Natural Sciences," and of numerous zoological papers. Died in London, January 27th, aged 69.

Baird, William M. Known as an ornithologist in connection with the publication of a list of the birds of Cumberland County, Pennsylvania, and a description of two new species of fly-catchers. Died at Reading, Pennsylvania, October 19th, aged 55.

Bowring, Sir John. Born October 17th, 1792. Died November 23d. A political and statistical writer, as well as geographer, of much eminence.

Brooks, Rev. Charles. An ornithological writer. Died July 7th, at Medford, Massachusetts, aged 77.

Blythe, Dr. A distinguished chemist, lecturer, and editor of the English editions of Baron Liebig's works. Died in Ireland, in January, 1872, aged 58.

Catlin, George. An eminent explorer and ethnologist; author of a work on the North American Indians, and an extensive series of paintings representing the various tribes of North and South America. Born at Wilkesbarre, Pennsylvania, July 26th, 1796, and died December 23d, 1872, aged 76.

Chapman, E. T. An English chemist of much promise, who was killed by an explosion of nitrate of methyl while engaged in a laboratory experiment. Died July 4th, aged 27.

Chapman, James. A South African explorer, who died February 6th, in New Griqua Land. Best known by his "Travels in the Interior of South Africa."

Chesney, General F. R. Born in Ireland in 1789. Died in Ireland, February 1st, aged 84. Best known for his exploration of the Euphrates and Tigris, prosecuted in 1835, etc.

Curtis, Rev. M. A. At the time of his death the leading American fungologist, and author of a report on the fungi collected by the United States Exploring Expedition, and of numerous memoirs. Died in April, 1872.

Day, Dr. G. E. Chandos professor in the University of St. Andrew, Scotland; known as an author in the line of medicine and pathology. Died at Torquay, January 31st, aged 56.

Delaunay, M. Director of the Paris Observatory. Drowned during the summer of 1872, on the coast of Normandy, by the upsetting of a boat.

Duhamel, M. Known as a physicist, especially in the line of acoustics and heat. Died at Paris, April 29th.

Eisenlohr, William. Born January 1st, 1799. Died July 9th. Professor of physics for a time on the Polytechnicum at Karlsruhe, and director of the Mannheim Observatory.

Enys, J. S., of Penrhyn, Wales. A patron of science, and a supporter of the Royal Cornwall Institution. Died at the age of 76.

Fraser, Professor John F. Long connected with the American Philosophical Society and Franklin Institute, and professor of physics in the University of Pennsylvania. Died October 12th, aged 61.

Hubbard, Dr. Resident of Staten Island. Much interested in the study of American conchology.

Goldstücker, Dr. Theodore. Professor of Sanskrit in the University College, London, and president of the London Philological Society; a native of Germany.

Granville, Dr. A. B. One of the oldest Fellows of the Royal Society, London. Died in London, March 3d, aged 88.

Gray, George Robert. Assistant-keeper of the zoological department of the British Museum, and one of the most distinguished of modern ornithologists. Author of numerous hand-books and articles on birds of great value, among them one in three quarto volumes on the genera of birds. Died at the age of 64.

Hill, Mr. Charles, of Bristol, England. Proprietor of a private astronomical observatory. Died June 27th, aged 78.

Hooker, Lady. Widow of Sir William Hooker. Died at Torquay, aged 77.

Jackson, Dr. Samuel. Formerly professor of the institutes of medicine in the University of Pennsylvania, and author of several text-books, among them "The Principles of Medicine." Died in Philadelphia, April 5th, aged 85.

Jerdon, Dr. Thomas C. An author of several works upon the birds of India, and engaged on several treatises upon mammals and birds at the time of his death. Died in England, January 12th, aged 61.

Kaiser, Professor. Born at Amsterdam. Director of the Leyden Observatory, and professor of astronomy in the Leyden University. Editor of the "Annals of the Leyden Observatory." Died July 28th, aged 64.

Kessler, Charles. An ardent student and collector in entomology, especially of *Lepidoptera*. Died at Reading, Pennsylvania, December 26th, 1871, aged 66.

King, John. Born at Antrim, December 15th, 1838. Died at St. Kilda, Victoria, January 8th. A prominent Australian explorer.

Klebsch. A mathematician. Died at Copenhagen at the age of 40.

Krantz, Dr. Augustus, of Berlin. Geologist, and dealer in specimens of geology and mineralogy. Died April 6th, aged 62.

Kutzner, J. G. Born February 27th, 1822. Author of numerous geographical works.

Laugier, P. A. E. An eminent astronomer, and an examiner of the Naval School at Brest. An associate with Arago in many of his physical researches. Died at Paris, aged 50.

Lespés, M. Author of various zoological papers. Died at Marseilles in July, aged 46.

Lord, John Keast. Late manager of the Brighton Aquarium; author of several works relating to the natural history of British Columbia and Vancouver's Island. In early life naturalist to various exploring expeditions. Died at Brighton, December 9th.

Lyon, Sidney J. At one time state geologist of Kentucky, and an industrious explorer into the geology and ethnology of the West. Died at Jeffersonville, Indiana, in June.

Maurer, Franz. Died at Charlottenburg, Jan. 27th, aged 41. Author of works on geography and history.

Mitchell, Captain. Superintendent of the Central Museum at Madras. Died in July.

Mohl, Professor Hugo von. An eminent vegetable physiologist; professor of botany at the University of Copenhagen, and director of the Botanic Garden of that place. One of the editors of the *Botanische Zeitung.* Died April 1st, aged 67.

Mollien, Gaspard. Died at Nice, the last summer, at an advanced age. As early as 1818 prosecuted an exploration to the sources of the Senegal and the Gambia.

Morse, Professor S. F. B. Well known in connection with the history of the telegraph. Died in New York, April 2d, aged 81.

Oersted, Professor A. S. Born at Copenhagen, 1815. Professor of botany in the university of that city. Traveled extensively in Central America, and author of a folio work (incompleted at his death) on the botany, etc., of Central America.

Olney, Jesse. Author of geographical text-books, which at one time were highly esteemed. Died at Stratford, Conn., July 30th, aged 83.

Parthey, Gustav. An eminent Egyptologist, born in Berlin, October 27th, 1798. Died at Rome, April 2. Author of a large number of works on archæology, as also several on meteorology.

Patterson, Robert. Author of popular text-books on zoology and natural history. Died at Belfast, February 14th, aged 72.

Pictét, Professor J. A leading savant of Switzerland, and author of important works upon natural history, paleontology, etc. Died at Geneva, March 15th.

Pitcher, Dr. Zina. An early cultivator of science in the Northwest, and for a time connected with the medical department of the University of Michigan. Died at Detroit, April 5th, aged 75.

Perry, Professor J. B. Lately in charge of the department of primordial geology in Harvard College, and associated with Professor Agassiz in the Museum of Comparative Zoology. Died October 30th, aged 47.

Pouchét, Dr. Well known for his support of the doctrine of spontaneous generation. Died at Rouen, December 21st, aged 72.

Ravenel, Edmund. A leading naturalist of the South, known especially as a conchologist. Died at Charleston, South Carolina.

Reuter, G. F. Botanist and curator of the Herbarium of Boissier. Died in June at Geneva.

Sartorius, Dr. Charles. A German naturalist, long resident in the department of Vera Cruz, at Mirador, and distinguished for his zeal as a student and collector of plants and animals, and for the extent of his contributions to the principal cabinets in America and Europe.

Siebe, Augustus. An eminent mechanician, and well known for his improvements in diving-bell apparatus. Died in London, April 15th, aged 84.

Smith, Commander Alexander John. Formerly lieutenant on board the *Erebus*, under the command of Sir James Clark Ross, and subsequently in charge of the Magnetic Observatory at Hobart-Town. Died at Sandhurst, Victoria.

Smith, Sir Andrew. A distinguished African explorer, and author of a work on the zoology of South Africa. Died in August, aged 75.

Somerville, Mrs. Mary. A mathematician and physicist, known for the publication of several important text-books in connection with physical science and physical geography. Died near Naples, November 29th, aged 92.

Stimpson, Dr. William. One of the most distinguished of American naturalists, and especially in the line of marine invertebrates; author of numerous memoirs and separate works on these subjects. Late secretary of the Academy of Sciences, Chicago. Died, May 26th, near Baltimore, aged 42.

Swift, Robert. A native of Philadelphia, and for a long time resident on the island of St. Thomas. Much interested in shells, of which he made large collections illustrative of the species of the West Indies. Died at St. Thomas, May 5th, aged 77.

Sykes, Colonel William Henry. Author of several papers upon the mammals and birds of India, published by the Zoological Society. Died June 16th, aged 83.

Upham, Professor T. C. Born at Deerfield, New Hampshire, and graduated in 1818 at Dartmouth College. In 1825 elected to the chair of mental and moral philosophy in Bowdoin College. Best known as an author by his "Elements of Mental Philosophy," for a long time the principal text-book in American colleges on that subject. Published also in 1857 a volume of travels in Europe, Egypt, and the Holy Land. Died April, 1872.

Von der Leuth, Arnold Escher. A distinguished geologist. Born at Zurich, June 8th, 1807. Died in the same city, July 12th. Professor of geology in the University of Zurich, and devoting himself especially to the study of the Alps.

Vortisch, Louis. A clergyman, resident at Satow, in Germany, and interested in the subjects of zoology and ethnology, and author of several treatises. Died December 9th, aged 68.

Waddington, Alfred. Died at Ottawa, February 26th, aged 72. Projector of a railroad from Canada to the Pacific, and author of a memoir on the subject in the Journal of the Royal Geographical Society.

Welwitsch, Dr. Frederick. An African explorer; at one time director of the Botanical Garden in Lisbon. Died in London, October 20th, aged 66.

Wiegrebe, Dr. Ernst. Born in Hanover, in 1793. Died March 8, near Cassel. Director of the Geodetic Survey of Kur-Hessia.

Wight, Robert. Botanist, and author of important works on the botany of India. Died near Reading, in England, May 26th, aged 76.

Q. INDEX TO THE REFERENCES.

In the large number of serial works received regularly by mail for use in the preparation of material for the *Record*, it has been found expedient to adopt some mode of abbreviating the titles, so as to save both time and space in writing and printing them. For this purpose the different countries have been represented by letters, and the journals numbered as in the following table. Publications referred to only occasionally are indicated by abbreviations of their titles at the end of the articles. Where no references are made, it is to be understood that the article is partially or entirely original, and prepared by the editor or his collaborators; in some cases, however, that the quotation has been mislaid or overlooked.

A. *Great Britain.*

1. The Chemical News and Journal of Physical Science. Weekly. London.
2. Land and Water. Hunting, Shooting, Fishing, practical Natural History. Weekly. London.
3. The Mechanics' Magazine: an illustrated Journal of Science, Arts, and Manufactures. Weekly. London. (With 1873 this periodical bears the title of "Iron.")
4. Hardwicke's Science Gossip. Monthly. London.
5. The Popular Science Review. Quarterly. London.
6. Ocean Highways: the Geographical Record. Monthly. London.
7. London, Edinburgh, and Dublin Philosophical Magazine. Monthly. London.
8. Scientific Review: Record of progress in Arts, Industry, and Manufactures; and Journal of the Inventors' Institute. Monthly. London.
9. The Student and Intellectual Observer of Science, Literature, and Art. Quarterly. London.
10. The Annals and Magazine of Natural History. Monthly. London.
11. Proceedings of the Scientific Meetings of the Zoological Society of London. London.
12. Nature: a weekly illustrated Journal of Science. London.
13. The Academy: a Record of Literature, Learning, Science, and Art. Semi-monthly. London.
14. The Pharmaceutical Journal and Transactions of the Pharmaceutical Society. Weekly. London.
15. The Athenæum: Journal of English and Foreign Literature, Science, and Fine Arts, Music, and the Drama. Weekly. London.

16. The Quarterly Journal of Science, and Annals of Mining, Metallurgy, Engineering, Industrial Arts, Manufactures, and Technology. London.

17. The Journal of Applied Science: a monthly record of progress in the Industrial Arts. London.

18. English Mechanic and World of Science. With which are incorporated "The Mechanic," "Scientific Opinion," and the "British and Foreign Mechanic." Weekly. London.

19. The Field, the Farm, the Garden: the Country Gentleman's Newspaper. Folio. Weekly. London.

20. Medical Times and Gazette. Weekly. London.

21. Journal of the Chemical Society, containing the papers read before the Society, and abstracts of chemical papers published in other journals. Monthly. London.

22. Illustrated London News. Weekly. London.

B. *France.*

1. Bulletin hebdomadaire de l'Association Scientifique de France. Weekly. Paris.

2. Cosmos. Weekly. Paris.

3. Les Mondes: revue hebdomadaire des Sciences et de leurs applications aux Arts et a l'Industrie. Weekly. Paris.

4. Le Moniteur Scientifique du Dr. Quesneville. Journal des Sciences pures et appliquées. Bi-monthly. Paris.

5. Le Technologiste, ou Archives des progrés de l'industrie française et étrangère. Monthly. Paris.

6. Comptes rendus hebdomadaires des séances de l'Académie des Sciences. Weekly. Paris.

7. Science pour tous. Weekly. Paris.

8. Revue Scientifique. Weekly. Paris.

9. Revue hebdomadaire de Chimie scientifique et industrielle publiée sous la direction M. Ch. Mène. Weekly. Paris.

10. Bulletin Mensuel de la Société d'Acclimatation. Monthly. Paris, 8vo.

C. *Germany and Austria.*

1. Aus der Natur. Die neuesten Entdeckungen auf dem Gebiete der Naturwissenschaften. Weekly. Leipsic.

2. Archiv der Pharmacie. Monthly. Halle.

3. Das Ausland. Ueberschau der neuesten Forschungen auf dem Gebiete der Natur- Erd- und Volkerkunde. Weekly. Augsburg.

4. Badische Gewerbzeitung für Haus und Familie. Monthly. Karlsruhe.

5. Deutsche illustrirte Gewerbezeitung. Weekly. Berlin.

6. Deutsche Industrie-Zeitung: Organ der Handels- und Gewerbekammern zu Chemnitz, etc. Weekly. Dresden.

7. Gaea. Natur und Leben. Zeitschrift zur Verbreitung und Hebung naturwissenschaftlicher, geographischer, und technischer Kenntnisse. Monthly. Köln und Leipsic.

8. Industrie-Blatter: Wochenschrift für Fortschritt und Aufklarung in Gewerbe, Hauswirthschaft, Gesundheitspflege, etc. Weekly. Berlin.

9. Kurze Berichte über die neuesten Erfindungen, Entdeckungen und Verbesserungen im Gebiete des Gewerbwesens, des Handels und der Landwirthschaft. Monthly. Mannheim.

10. Landwirthschaft und Industrie; Monatsschrift für Landwirthe, Fabrikanten und Geschäftsleute jeder Art. Monthly. Berlin.

11. Die neuesten Erfindungen im Gebiete der Landwirthschaft, der Bergbaues, der Fabriks und Gewerbwesens und des Handels. Illustrirte Zeitschrift. Semi-monthly. Vienna.

12. Oberlausitzer Gewerbeblatt. Organ der Gewerbe- und Handwerker-Vereine des Konigreichs Sachsen. Semi-monthly. Bautzen.

13. Polytechnisches Centralblatt. Semi-monthly. Leipsic.

14. Polytechnisches Journal, etc. Dr. E. M. Dingler. Semi-monthly. Augsburg.

15. Polytechnisches Notizblatt für Gewerbtreibende Fabricanten und Künstler. Bi-monthly. Mainz.

16. Blätter für Gewerbe, Technik, und Industrie. Leipsic.

17. Mittheilungen aus Justus Perthes geographischer Anstalt über wichtige neue Erforschungen auf dem Gesammtgebiete der Geographie. Dr. A. Petermann. Monthly. Gotha.

18. Chemisches Central-Blatt. Repertorium für reine, pharmaceutische, physiologische, und technische Chemie. Weekly. Leipsic.

19. Der Naturforscher. Wochenblatt zur Verbreitung der Fortschritte in den Naturwissenschaften. Weekly. Berlin.

21. Neues Jahrbuch für Pharmacie. Monthly. Heidelberg.

22. Landwirthschaftliches Centralblatt für Deutschland. Monthly. Berlin.

23. Das Deutsche Wollen-Gewerbe. Organ für die Wollen-Waaren-Industrie, etc. Weekly. Grünberg.

24. Färber-Zeitung. Organ für Färberei, Drückerei, Bleicherei, Appretur, etc. Dr. N. Reimann. Weekly. Berlin.

25. Muster-Zeitung. Zeitschrift für Färberei, Drückerei, Bleicherei, Appretur, etc. Dr. F. Springmühl. Weekly. Berlin.

26. Deutsche Färber-Zeitung. J. C. H. Geyer. Bi-monthly. Mühlhausen.

27. Preussisches Handelsarchiv. Wochenschrift für Handel, Gewerbe und Verkehrs-Anstalten. Weekly. Berlin.

28. Centralblatt für Agrikulturchernie und rationellen wirthschaftsbetrieb. Monthly. Leipsic.

29. Bayerische Industrie und Gewerbeblatt. Monthly. Munich.

30. Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie, und Urgeschichte. Monthly. Braunschweig.

31. Mittheilungen der Anthropologischen Gesellschaft in Wien. Vienna, 8vo.

32. Allgemeine deutsche Polytechnische Zeitung. Herausgegeben von Dr. H. Grothe. Weekly. Berlin.

33. Annalen der Chemie und Pharmacie. Herausgegeben von F. Wohler, J. Liebig, H. Kopp, E. Erlenmeyer, J. Volhard. Monthly. Leipzig und Heidelberg.

34. Neue deutsche Gewerbe-Zeitung. Bi-monthly. Leipsic.

D. *America.*

1. Journal of the Franklin Institute, devoted to Science and the Mechanic Arts. Monthly. Philadelphia.

2. Proceedings of the Academy of Natural Sciences of Philadelphia. Monthly. Philadelphia.

3. Proceedings of the Boston Society of Natural History. Occasionally. Boston.

4. The American Journal of Science and Art. (Silliman—Dana.) Monthly. New Haven, Ct.

5. The American Naturalist: a popular illustrated Magazine of Natural History. Monthly. Salem, Mass.

6. Scientific American: a journal of practical information in Art, Science, Mechanics, Chemistry, and Manufactures. Weekly. New York.

E. *Netherlands.*

1. Archives néerlandaises des Sciences exactes et naturelles publiées par la Société hollandaise des Sciences a Harlem. Occasionally. La Haye.

F. *Switzerland.*

1. Bibliothèque Universelle et Revue Suisse. Archives des Sciences physiques et naturelles. Monthly. Geneva, 8vo.

G. *Italy.*

1. Rivista Scientifico-industriale compilata da Guido Vimercati. Monthly. Florence, 8vo.

H. *Denmark.*

1. Tidsskrift for Fiskeri. Semi-annual. Copenhagen.

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