

Victoria Nyanza, and a year later Baker was able to supplement their discovery by arriving on the shores of the Albert Nyanza, the size of which he considerably over-estimated. He did not return to London until 1866, and found his fame as a traveller established. He received many honours, including that of knighthood and the gold medals of the Royal Geographical Society and the Paris Geographical Society; but in the following year, again accompanied by Lady Baker, he returned to Africa. The story of his first journey is recorded in two fascinating books—"The Albert Nyanza Great Basin of the Nile," in 1866, and "The Nile Tributaries of Abyssinia," in 1867. In 1869 he commenced the occupation of the upper White Nile provinces for the Egyptian Government, at the head of a body of Egyptian troops, and for five years laboured at the heavy task of restraining the slave-dealing Arabs and keeping in order his apathetic and often disaffected Egyptian subordinates. He established steam navigation on the Nile to the equator, and in his "Ismailia," published in 1874, told the story of the extension of Egypt. This completed his career as a pioneer and explorer; but a traveller he remained to the very end of life, and until last year he spent almost every winter either in Egypt or in India. He took a keen interest in the geography of Africa, and at critical moments in the course of recent developments in that continent he did not fail to give the benefit of his advice for the guidance of the country.

In 1879 he visited every part of the island of Cyprus, recording his impressions in "Cyprus as I saw it in 1879." The many reminiscences of his hunting adventures in every continent made his last book, "Wild Beasts and their Ways," a most valuable contribution to that liberal form of natural history which studies the lower animals as mankind is studied by the sociologist or historian rather than by the anatomist or physiologist. Baker was elected a Fellow of the Royal Society in 1869, and received the official recognition of several governments and innumerable learned societies in all countries for his services to geography and to humanity. His health kept up to within a month of his death, and to the last he remained a keen sportsman. He died in his residence at Sandford Orleigh, Newton Abbot, in Devonshire, and his funeral takes place at Woking to-day.

#### NOTES.

THE list of New Year honours contains the names of two men of science in the public service—Mr. Norman Lockyer, F.R.S., Professor of Astronomy in the Royal College of Science, and Mr. W. H. Preece, F.R.S., Engineer-in-chief to the General Post Office—upon both of whom have been conferred Companionships of the Bath.

WE note with much regret that Prof. Milnes Marshall, F.R.S., of the Owens College, Manchester, met with a fatal accident while ascending Scawfell, on Sunday, December 31. A notice of his life and work will appear in our next issue.

WE have to record the death of Mr. R. Bentley, Emeritus Professor of Botany in King's College, on December 24, at the age of seventy-two. Mr. Bentley became botanical lecturer at King's College in 1859, and three years later he was appointed professor of botany at the London Institute. He was twice—in 1866 and 1867—elected president of the Pharmaceutical Conference, and was well known for his works on pharmaceutical botany.

THE death is announced of Mr. R. Spruce, the well-known botanist and explorer, in his 67th year. Rather more than forty years ago Mr. Spruce visited South America on behalf of the Royal Gardens at Kew, and successfully carried out some very important scientific investigations. He explored the river

Amazon, and crossed the continent from the Atlantic to the Pacific. The introduction of the cultivation of cinchona into India was very largely the result of Mr. Spruce's work, and his fine collection of plants have done good service to commerce and to botanical science.

THE chair of Agricultural Chemistry in the University of Tokio has been accepted by Prof. Loew, of Munich.

MR. SMITH HILL has been appointed Principal of the Aspatria Agriculture College, in succession to the late Dr. Webber.

WE understand that the Queensland Government, in pursuance of their policy of retrenchment, have abolished the post of Government botanist hitherto held by Mr. F. M. Bailey.

PROF. W. H. CORFIELD has been appointed President, and Dr. P. F. Moline secretary, of the English committee of the International Congress of Hygiene and Demography to be held at Budapest this year.

DALZIEL's correspondent at Copenhagen states that the time of Central Europe was adopted throughout Denmark on the first day of this year.

A PRIZE of 1250 francs is offered by the Natural History Society of Dantzig for the best means of destroying the poisonous insects in the forests of Western Prussia.

WE learn from the *Times* that the sum of £600 a year has been bequeathed to the trustees of the Mason College, Birmingham, by the late Mr. Aubrey Bowen, of Melbourne. In making the bequest the testator stipulates that the trustees shall apply the sum in founding six scholarships of £100 a year each in connection with the college, to be called respectively the first, second, and third Bowen scholarships, for the promotion of the study of metallurgy, and civil, mechanical, and electrical engineering; and the rest Priestley scholarships, for the promotion of the study of chemistry.

THE refusal of the S.P.C.K. to withdraw a book by Prof. Percy Frankland because in it experiments on living animals were approved, has led Lord Coleridge to address a letter to the secretary of the Society, in which he says: "I have learned from what seems unquestionable authority that those who administer the affairs of the Society for Promoting Christian Knowledge have finally determined to range the society in the number of those favouring the practice of vivisection and advocating its horrors. It is my duty, as I regard it, to separate myself at once from such a body, and I have accordingly directed Messrs. Childs not to pay any further subscription to the society. As I informed you of what I should feel bound to do in the events which have happened, I shall not occasion the society any inconvenience."

THE following officers of sections have been appointed for the meeting of the Australasian Association for the Advancement of Science, to be held at Brisbane this year:—Section A—Astronomy, Mathematics, and Physics: Vice-presidents, Mr. Clement Wragge and Mr. John Tebbutt; secretary, Mr. J. P. Thomson. Section B—Chemistry: Vice-president, Mr. J. B. Henderson; secretary, Mr. G. Watkins. Section C—Geology and Mineralogy: Vice-president, Mr. W. H. Rands; secretary, Mr. Hargreaves. Section D—Biology: Vice-presidents, Dr. A. Dendy, Mr. F. M. Bailey, and Mr. J. J. Fletcher; secretary, Mr. J. H. Simmonds. Section E—Geography: Vice-president, Mr. D. S. Thistlethwayte, C.E.; secretary, Major A. J. Boyd. Section F—Ethnology and Anthropology: Vice-presidents, Rev. James Chalmers and Mr. E. M. Curr; secretary, Mr. Archibald Meston. Section G—Economic Science and Agriculture: Vice-presidents, Mr. G. A. Coghlan and Mr.

James Tolson; secretary, Mr. Wm. Soutter. Section J—Mental Science and Education: Vice-presidents, his Grace Archbishop Dunne, Mr. G. J. Anderson, M.A., and Mr. D. Cameron.

An earthquake shock was felt in Shepton Mallet, Somerset, and neighbourhood on December 30, about 11.30 p.m., and another shortly after midnight. The direction of motion of the waves was apparently from north to south. Prof. F. J. Allen sends us the following description of what was noticed by some friends of his. "At about 11.20 p.m. a shock was felt by three persons in one house; and about an hour later a second and more severe shock was observed by two of these persons. In another house, a quarter of a mile distant, three distinct shocks were felt by several persons. Both these houses are situated on the south side of the valley, whereas the reports published in the papers refer more particularly to movements observed on the north side. For those who are not acquainted with the district, I would mention that the strata (Carboniferous limestone, with overlying Trias, Lias, and Oolite) are very much disturbed, and present many interesting studies of horizontal as well as vertical faulting. It is just the kind of spot in which one might expect to have superficial movements occurring from time to time."

A LETTER from Prof. S. J. Bailey, of the Harvard College Observatory, to the editor of *La Bolsa*, published at Arequipa, Peru, gives an account of the establishment of the meteorological station on the summit of the Misti, in the Peruvian Andes, at an altitude of 19,300 feet above sea level, this being at present the highest observatory in existence. The fatigues undergone by observers ascending the conical peak from Arequipa are such as to render exact observations impossible, and it was therefore found necessary to construct a mule-path to the summit from a stone hut erected at an elevation of about 16,000 feet. This hut was erected on the north-east slope, being the most accessible side of this peak, which maintains its aspect of an isolated symmetrical cone from all points of view. On September 27 the summit was reached by Prof. Bailey, his assistant, several Indians, and two mules. The latter could hardly be made to go more than twenty paces without a rest. On October 12 the summit was revisited with two members of the Arequipa observatory, twelve Indians, and thirteen mules carrying materials for erecting two huts, and the registering meteorological instruments, comprising a barograph, a thermograph, several mercury thermometers, an hygrometer and anemometers. Each of the registering instruments works for ten days, and a member of the observatory will visit the station three times a month. A store of provisions is kept at the stone hut, and of the wooden huts at the top, one, provided with double wooden walls, is intended for the observer, the other for the instruments.

WITH regard to meteorological work in Australia, Sir Charles Todd remarked at the last meeting of the Australasian Association for the Advancement of Science, that in New South Wales there were 175 meteorological stations and 1063 rain gauges; in Victoria, 31 meteorological stations and 515 rain gauges; in South Australia, 22 meteorological stations and 370 rain gauges. In Australia there were 385 meteorological stations and 2580 rain gauges. During the last four years the forecasts issued in South Australia have been justified to the extent of 73 per cent., partially justified 20 per cent., and wholly wrong 7 per cent.

THE radius of curvature of the cornea, together with the indices of refraction of the various refractive media of the eye, constitute the experimental data for determining the most important points about the eye. Drs. H. C. Chapman and A. P. Brubaker have measured this radius in fifty individuals by means

of the ophthalmometer (Proc. Acad. Nat. Sci., Philadelphia, 1893, p. 349), and they have found that in the average young man it amounts in the horizontal meridian to 7.797 mm., and in the vertical meridian to 7.552.

THE Director of the Central Meteorological Observatory of Mexico, Señor M. Bárcena, has published an interesting pamphlet on the climate of the city of Mexico, based on the hourly observations of sixteen years 1877-92. Mexico, from its position of 7431 feet above the sea, and latitude 19°, might be supposed to be subject to great extremes of temperature, but as one geographical element neutralises the other, the result is a temperate and agreeable climate. The mean annual temperature is 59°·7, and the monthly means vary from 53°·6 in December to 64°·6 in May. The absolute maxima in the shade vary from 73°·4 in December to 88°·9 in April, while the absolute minima vary from 28°·9 in December to 46°·8 in August and September. The greatest daily range amounted to 41° in the month of March. The mean annual rainfall amounted to 23·8 inches, the wettest months being June to September; the greatest fall in one day was 2·5 inches in August 1888. The prevalent wind is north-west, which blows during most part of the year, and is the coldest and wettest quarter. The strongest wind blows from the north-east; the greatest hourly velocity observed during the sixteen years was about 56 miles per hour.

A DETAILED investigation of the properties of mirror silver chemically precipitated on glass is published by Herr H. Lüdtke in *Wiedemann's Annalen*. The three modifications of silver obtained in the wet way, termed by H. Vogel the arborescent, the powdery, and the mirror variety respectively, have been recently enriched by Mr. Carey Lea through his discovery of colloid silve. Herr Lüdtke thinks that this last variety and mirror silver are closely allied; that the latter, when newly formed, is indeed identical with the former. The electrical resistance of several varieties of mirror silver decreases considerably with their age. No such decrease was, however, observed in the case of mirrors produced by Martin's process or by that of Liebig, *i.e.* reduction by means of milk-sugar. On introducing a pole of ordinary silver and one of allotropic mirror silver into a weak acid or salt solution, and closing the circuit, a current was obtained indicating a difference of potential of about 0·1 volt between the two varieties, the allotropic variety being the positive pole. These conditions were reversed if the solution was one of silver nitrate, but the difference of potential was less. Lehmann's surmise that the precipitation of the mirror on the glass is due to a thin layer of sodium silicate, was invalidated by precipitating it on mica, porcelain, quartz, and platinum by the same methods.

THE *Philosophical Magazine* for the present month contains a paper, by H. Nagaoka, on the hysteresis attending the change in length produced by magnetisation in nickel and iron. The author at first used the interference fringes produced between a plano-convex lens and a plate of plane glass attached to the end of the rod under examination to measure change in length. He found, however, that it was impossible to keep the temperature of the apparatus constant during the time necessary to make an observation, and also that there was considerable difficulty in counting the number of fringes displaced. To overcome the temperature difficulty the author has made use of the principle of the gridiron-pendulum, and has by this means succeeded in almost entirely overcoming this difficulty. In place of the interference bands he uses an optical lever, that is, a mirror fixed to a small base, to which are attached three needle points, two of these rest in a groove on the base-plate of the instrument, while the third rests on a small glass plate fixed to the end of the iron or nickel rod. The rod was placed along the axis of a solenoid which lay in a horizontal position pointing

magnetic east and west. The deflection of the mirror was measured by means of a microscope with a micrometer eyepiece, such that one division of the scale corresponded to a deflection of the mirror of  $0^{\circ}295$  of arc, or to an elongation of  $0.805 \times 10^{-7}$  c.m. Experiments were made on wires of iron and nickel of different lengths, and he finds in every case that the elongation in iron and the contraction in nickel by magnetisation is accompanied by marked hysteresis. The curve of hysteresis is symmetrical with respect to the line of zero magnetising force, so that the elongation or contraction during cyclic changes is an even function of the magnetising force. When a wire has been magnetised it cannot be brought to its original length by simply reversing the magnetic field.

In a note communicated to the same number of the *Philosophical Magazine*, Prof. Knott calls attention to the similarity between the effects observed by Mr. Nagaoka, and those which he has himself observed in the case of magnetic-twist cycles for iron and nickel. A steady current was passed along the wire under observation, and the longitudinal field acting on the wire was gradually altered between the limits  $\pm H$ , and at suitable intervals observations of the twist made. It was found that with a small range of field the hysteresis curve obtained by plotting twist against field was very similar to the well-known hysteresis curve of magnetisation. With limiting fields, however, stronger than the field which produces the maximum twist, the hysteresis curve crossed itself twice and formed three loops. In the magneto-elongation cycle the change of sign of the magnetising force does not produce a change of sign in the elongation. On the other hand, in the magnetic-twist cycle, as the magnetic force passes through zero from positive to negative, the twist tends to do the same, though with a lag. The author considers that the twist, under a given combination of circular and longitudinal magnetising forces, depends not only upon the elongations but also upon some function of these forces which changes sign with each, and to which the existence of the maximum twist is largely if not entirely due.

AN entertaining chapter on minerals, and the popular superstitions connected with them in Germany, is contributed to *Die Natur* by Friedrich Klinkhardt. The fact that variety among minerals is less easily perceived than that among plants and animals, is emphasised by the great influence that "a stone" pure and simple, without further specification, is capable of exerting in the popular estimation. Children under the age of one may not play with stones, otherwise bread will be scarce. An ill omen may be made innocuous by throwing a stone into the road before taking the next breath. Chalk is credited with many virtues, and is used both for its own efficacy and for making signs with. Cows marked all down the spine with chalk consecrated at Epiphany, remain healthy, and always find their way home. Alabaster in water is used for curing sick children in Bohemia. A flint pebble from the brook, if thrown over the roof into the poultry yard, encourages the hens to lay eggs. The beliefs connected with "thunderbolts," which are sometimes flint instruments, or quartz crystals, or lightning tubes, are exceedingly numerous. In the Palatinate it is believed that thunderbolts, after penetrating seven yards into the ground, rise a yard every year; this reminds one of Miölnir, Thor's hammer, which returned to his hand.

WE read an interesting paper "On the Kulm District of Lenzkirch in the Black Forest," by Dr. Rafael Herrmann. A geological map of the district is given, scale 1 : 50,000 (*Berichte der Naturforschenden Gesellschaft zu Freiburg i. B.*, June, 1893). In the Black Forest, just as in the Hartz and in Thüringia, two main series of carboniferous rocks are recognisable, an older group of dark shales, and a younger formation of conglomeratic rock. During the intermediate epoch, the upraising and folding

of the rocks took place, associated with intrusions of crystalline rock. The eruptive rocks of the district are granite, coarse and fine grained, granitite, granitic dykes, quartz porphyry, porphyritic dykes, and porphyritic breccias. Herrmann does not agree with Vogelgesang that the granite and granitite are petrographical varieties of one and the same rock united by a complete transitional series, but regards them as two independent masses of rock, differing in composition and structure. All the granitic rocks have been intensely affected by pressure, whereas the younger porphyry shows no appearance of it. Herrmann deduces, therefore, that the intrusion of porphyry marks what was probably the last phase of folding and overthrusting of rocks in the Black Forest during the Carboniferous period.

THE region watered by the upper part of the Yenisei (which is known to the Mongols under the name of Ulu-Khem, and is made up by the confluence of the Bei-khem and the Kha-khem) belonged until lately to the least known parts of north-west Mongolia. The opinion expressed in the "General Sketch of the Orography of East Siberia" (*Zapiski of the Russian Geographical Society*, vol. v. 1874), to the effect that it must be a high plateau, and that the so-called circular chain Erghik-targak-taiga is nothing but a border ridge, or often but the steep slope of the plateau, had been contested. Now it finds its full confirmation in the recent exploration of the region by Mr. Kryloff, published, with a map, in the *Izvestia of the Russian Geographical Society* (vol. xxix. 4, 1893). The whole region really has the above-mentioned character. After having left the valley of the main river, which has, even at the junction of the two Khems, an altitude of 1873 feet, Mr. Kryloff had to travel all the time on the level of the high plateau, never finding altitudes less than 3000 feet, till he returned to the Russian dominions in the basin of the Tuba. Mr. Kryloff's journey having been performed for the St. Petersburg Botanical Garden, special attention has been paid by the explorer to the flora of the region; and he found that the vegetation on the plateau assumes in many places the character of a Steppe vegetation, namely, in the flat but high valleys of the rivers, which are dotted by numerous small lakes. At the sources of the Bei-khem, the flat surface of the water parting, as well as large portions of the plateau itself, raise above the level of the tree-vegetation, usually marked by the cedar, and are covered with Alpine meadows. As to the ridges which rise above the surface of the plateau, they attain heights of over 7000 feet, and over 8000 feet in the Tannu-ola ridge in the north of Lake Ubsa-nor.

THE same number of the *Izvestia* contains a paper by M. M. Pomortseff, on his extremely valuable observations on the directions and angular speed of motion of clouds. The method resorted to for these observations is described at length, and the instrument which was used for this purpose is figured on a plate. The chief results are given on 94 separate small maps. The author himself sums up his results as follows:—(1) The middle of the cumulus clouds moves almost in the direction of the isobar which passes through the place of the observer. (2) The cirrus, cirro-cumulus, and cirro-stratus clouds move on a pretty long distance as a broad and nearly straight-line current—the direction of the stream being almost parallel to the part of the 760 mm. isobar which stands on the line connecting together the centres of two nearest and contiguous regions of high and low pressure. (3) There is doubtless a connection between the distribution of atmospheric pressure and the march of the barometer on the earth, and the vertical circulation of the atmosphere; but this connection does not extend farther than the height of the upper, *i.e.* cirrus clouds.

In a letter addressed to the Russian Geographical Society from Lan-chou, in March last (*Izvestia*, vol. xxix. 4), Mr.

Obrucheff wrote that while crossing the plateau of Shan-si, he was enabled to supplement to some extent the observations of Richthofen; namely, he has discovered some fossil plants in the middle parts of the series of deposits which cover in China the carboniferous formation, and which Richthofen had described under the names of *Ueberkohlen-sandsteine* or *Plateau-sandsteine*. The plants unearthed by Mr. Obrucheff would indicate that the middle portions of this formation belong to the Mesozoic age, and are Triassic or Liassic. This formation spreads from Shan-si into the Shensi, the Alashan, and Gan-su, without losing in thickness, and probably represents an uninterrupted series of deposits from both the Mesozoic and the first half of the Cainozoic times.

WE notice in the *Memoirs (Trudy)* of the Kazan Society of Naturalists (vol. xxvi. No. 2) a very interesting work by N. Wnukow, on the bacilli of leprosy. In addition to his own experimental researches, the author has carefully studied the West European and Russian literature of the subject, and has divided his memoir into three parts: the localisation of leprosy bacilli in the tissues of the human body; the inoculation of the bacilli to animals; and the artificial culture of the bacilli. The paper is accompanied by a coloured plate. The author's conclusions are:—The *Bacillus lepræ* is motile, and is found both within and outside the cells; but it has never been discovered in the cells of the epithelial layers of the skin or the mucous membranes. In the wounds the bacilli are brought to the surface, and undoubtedly may be transported on the skin of other individuals, thus becoming a cause of infection. Neither the injection of the pus containing leprosy bacilli, nor the grafting of pieces of skin taken from leprosy patients to rabbits, could provoke leprosy in these animals. The bacilli introduced from man into rabbits and fishes, diminish in numbers after a time, and ultimately disappear. Most inoculated rabbits contract tuberculosis, but the illness must be ascribed in such cases to other causes than infection proper. As to the artificial culture of the *Bacillus lepræ*, it has failed with all culture media experimented upon by the author; the culture of *B. Uffreduzzi*, described by Eisenberg as leprosy, cannot be recognised as such.

AN elaborate paper, entitled "Les Vibrions des Eaux et l'Étiologie du Choléra," by Dr. Sanarelli, has recently appeared in the *Annales de l'Institut Pasteur*, vol. vii. Numerous bacteriological examinations were made of the river Seine water above and below Paris, as well as of drain water, and the effluent of sewage after irrigation. In all no less than thirty-two vibrios were isolated, morphologically distinct, four of which gave the indol reaction, and in their pathogenic action on guinea-pigs could not be distinguished from the cholera-bacillus. Dr. Sanarelli is of opinion that there exist many varieties of vibrios, morphologically distinguishable, but capable of exciting in man and animals a disease in its morbid and clinical aspects identical with those regarded as typical of cholera, and that the conception of a restricted monomorphism is no longer tenable in the diagnosis of the cholera-vibrio. In all the more or less contaminated waters which were examined vibrios were present, finding in these surroundings conditions highly favourable to their existence and multiplication. It is possible that although the larger number of such vibrios may exist in the saprophytic or harmless state, yet probably pathogenic vibrios are more frequently present in such waters than has hitherto been suspected. Dr. Sanarelli points out that the saprophytic condition of some at least of these vibrios is, in all probability, due to the modification in and attenuation of their biological functions which residence in such media has produced. Thus an extremely virulent vibrio was reduced to a harmless saprophyte deprived of its pathogenic properties and power of

producing the indol reaction, by being kept in boiled Seine water for a month, whilst even after three months it had undergone no change in its morphological condition. In the same manner that pathogenic organisms may be deprived of their virulence, it is conceivable that circumstances may arise under which they may recover their toxic character; so far, however, bacteriology has been unable to establish the correctness of this hypothesis, either in the laboratory or in actual experience.

FOR several years the State of Massachusetts has been attempting to exterminate the Gipsy Moth, and a Bill has recently been introduced into the House of Representatives to appropriate 100,000 dollars to rid the State of that troublesome insect. The *American Naturalist* points out, however, that the desired end can never be attained by merely hunting the moths in trees, hedgerows, and garden patches. In its future work, the Gipsy Moth Commission of Massachusetts should employ at its head a trained entomologist who should devote his time to finding and introducing some natural enemy to the pest. Moths, eggs, larvæ, and cocoons will escape the most careful of field agents, whereas insect parasites will keep the pest in continual check.

MESSRS. T. D. A. COCKERELL AND WALTER E. COLLINGE have published "A Check-list of the Slugs." It is a reprint from the *Conchologist*, vol. ii., 1893. The authority for the list is the first-named author; Mr. Collinge adds an appendix and notes; 628 species are recorded with very numerous varieties. There would appear to be a very ardent discussion as to the respective value of morphological and anatomical characters for the due determination of the species and varieties among these molluscs; but surely here, as elsewhere, the rational method would be to employ all such points of difference, whether external or internal, as may be found constant.

THE Association for the Promotion of Home and Foreign Travel has issued a programme of tours arranged for this winter.

THE December number of *Insect Life* is almost entirely taken up with the proceedings of the meeting of the Association of Economic Entomologists, held at Madison in August last.

MR. C. MELDRUM, the Director of the Royal Alfred Observatory, Mauritius, has issued his report for the year 1891, and also the results of meteorological observations made at the Observatory during 1892.

A PAPER on "Technical Education in Glasgow and the West of Scotland: a Retrospect and a Prospect" read before the Philosophical Society of Glasgow in November last, by Dr. Henry Dyer, has been issued in pamphlet form. It is of interest to all concerned with matters of technical instruction.

MR. W. WARDE FOWLER, a disciple of Gilbert White, has put on record his observations of the Marsh Warbler (*Acrocephalus palustris*) in Oxfordshire and Switzerland, and the differences between it and the Reed Warbler. His paper (issued by Simpkin, Marshall, & Co.) will be read with pleasure by all lovers of nature.

THE number just issued of the Journal of the Royal Agricultural Society (vol. iv. part 4) contains several important articles. Mr. Carruthers describes the "Cross-fertilisation of Cereals," and his paper is given additional interest by means of seven good illustrations. "Water in Relation to Health and Disease" is treated by Prof. J. Wortley Axe, and under the title "Peat and its Products," Dr. Fream gives an account of the occurrence and utilisation of peat in various peat-producing countries of Europe.

MESSRS. BAILLIÈRE AND SON have recently added to their series of works on chemical industries a volume entitled "Le

Cuivre," by M. Paul Weiss, in which the origin, mode of occurrence, properties, metallurgy, applications, and alloys of copper are fully treated. The author has visited the chief copper mines and works in Europe, and his book is a very useful *résumé* of the fundamental principles of the copper industry. The ninety-six figures inserted in the text include twelve excellent sections illustrating the molecular structure of various metals and alloys.

THE structure of snow-crystals photographed by G. Norden-sköld formed the subject of an article in our last volume. Another important contribution to the subject has recently been published, namely, Prof. G. Hellmann's "Schneekrystalle" (Rudolf Mückenberger, Berlin). The work begins with a brief history of the study of snow-crystals, illustrated by reproductions of the various forms observed and drawn by different observers, from the spikes, crescents, and daggers of Magnus in the sixteenth century, to the elaborate and perfectly symmetrical stars designed by Glaisher. But in meteorology as in astronomy, photography is rapidly taking the place of the observer; so much, indeed, is this the case that the modern meteorologist and physical astronomer views visual observations with more or less suspicion. At any rate, the remarkably fine series of micro-photographs of snow-crystals obtained by Dr. Neuhaus during the winter 1892-3, and reproduced in Prof. Hellmann's work, indicates that eye-observations of their forms are no longer necessary. After discussing the structure of snow-crystals, Prof. Hellmann proposes a classification into tabular and columnar crystals, the former class being subdivided into radiating stars, plates, and a combination of the two, and the latter into prisms and pyramids. A descriptive bibliography is given, thus increasing the value of a work upon a subject of which much more can yet be said.

THE cause of the violent explosion which usually occurs when any considerable quantity of metallic sodium is brought in contact with water in a more or less confined space, forms the subject of a communication to the *Journal für praktische Chemie*, by Prof. Rosenfeld. It has been hitherto supposed to be due to the formation of a quantity of sodium peroxide, by the decomposition of which oxygen is liberated, which mixes with the hydrogen produced in the main reaction, thus forming an explosive mixture. Prof. Rosenfeld has fully investigated the question experimentally. It was first established that steam may with impunity be passed over sodium contained in a slightly bent iron tube, no explosion ever occurring under these conditions. This would be quite compatible with the above explanation of the cause of the explosions, for any explosive mixture would be rapidly carried from the seat of the reaction by the escaping hydrogen or the excess of water vapour. No oxygen, however, was ever detected in the gas thus liberated. In all the experiments in which explosion was brought about by the action of water, whether in open vessels or in vessels closed by a water column, it was invariably observed that the sodium was blown to powder from the centre outwards—that is to say, the seat of the explosion was the interior of the piece of metal experimented with. Prof. Rosenfeld comes to the conclusion, from the whole of the phenomena observed, that the explosion is brought about by the sudden dissociation of a hydride of sodium which is formed in the first stage of the reaction. As such a compound can only be produced in an atmosphere of hydrogen, the only safe mode of decomposing water by metallic sodium is considered to be that previously mentioned, of passing a rapid current of steam over the metal; for the hydrogen is then removed from the sodium as quickly as it is produced, and the formation of hydride, and therefore all risk of explosion, is

consequently avoided. In order to carry out this reaction an iron crucible is best employed which is capable of being closed in a gas-tight manner by means of an iron plate, which can be pressed firmly down against a flange on the edge of the crucible by means of a screw threading through a suitably supported nut. Steam is blown into the body of the crucible containing the sodium by means of a side tube, and the escaping hydrogen is led away by a similar tubulus upon the other side. If the supply of steam is arrested the moment hydrogen ceases to escape, solid caustic soda is obtained, mixed in a curious manner with more or less finely divided iron, probably owing to the formation of a quantity of an alloy of iron and sodium, which is subsequently decomposed with liberation of iron. Silver is likewise attacked in a similar manner. The method may also be employed to prepare solutions of soda of known strength. Thus, if twenty-three grams of sodium are employed, and the escaping hydrogen is washed through a little water, an exactly normal solution of soda can at once be obtained by dissolving the product in water, adding the wash water, and making up to a litre.

AN interesting investigation of the amount and nature of the gases occluded in the coal derived from several collieries in the Durham coal field has been carried out by Mr. W. McConnell, of the Durham College of Science. The collieries from which samples were taken are situate at different points along the same seam, known in Durham as the Hutton seam. It is bituminous coal used as gas-coal and as steam-coal. The coal or coal-dust was placed in an apparatus constructed entirely of glass, and which was capable of continuous exhaustion while heated in baths to known temperatures varying from 100° to 180°; the gas previously occluded by the coal was delivered by the pump into a receiving gas-holder, and subsequently measured and analysed. The coals from the Ryhope colliery were found to contain as combustible gases considerable quantities of occluded free hydrogen, marsh gas, ethane, and other members of the paraffin series of hydrocarbons as far as pentane. Moreover, a portion of the gas, consisting chiefly of the higher members of the paraffins and smaller quantities of olefines, is so firmly retained that crushing to fine powder and heating to 180° under reduced pressure is insufficient to remove it. It is also singular that the coal retains a remarkably high proportion of free oxygen in the occluded form, even after heating to 180°. In the case of the Hebburn colliery, a notably "gassy" mine, in which frequent "blowers" are met with, the results are especially interesting. The "blowers" deliver such large quantities of gas that some of it is actually "piped" up to the bank and burnt under the boilers. The combustible constituent of the gas thus utilised is found to be entirely marsh gas. The coal itself is found to contain a relatively very large volume of occluded gas, the combustible constituents being mainly marsh gas and ethane; and the ground coal and coal-dust yield in addition considerable quantities of higher members of the paraffin series. From the whole of the results derived from the various collieries, there can be no doubt that the coal-dust largely owes its sensitiveness to ignition to the denser occluded gaseous hydrocarbons which it retains so tenaciously.

THE additions to the Zoological Society's Gardens during the past week include a Leopard (*Felis pardus*, ♂, black variety), from India, presented by the Duke of Newcastle; a Herring Gull (*Larus argentatus*) from Jersey, presented by Mr. John Stanton; an Alligator (*Alligator mississippiensis*) from the Mississippi, presented by Mr. C. Knox Shaw; a Diamond Snake (*Morelia spilotes*) from Australia, presented by Commander A. Burgess, R.N.R.; a Diamond Snake (*Morelia spilotes*) from Australia, purchased.