

was well shown in 1872, when he placed the balance of 13,000 dollars, that remained after his lecturing tour in the United States, in the hands of a committee who were authorised "to expend the interest in aid of students who devote themselves to original research."

It would be superfluous for us to enumerate Tyndall's explorations in the domain of science, or to expatiate upon his remarkable power of presenting a subject both in speech and in writing, for among men of science these facts are common knowledge. To such men as he—not only original discoverers, but also popular and powerful interpreters of scientific fact—we owe much of the advancement that has been made during the last forty years.

NOTES.

MR. H. H. TURNER, of Greenwich Observatory, has been elected to the Savilian Professorship of Astronomy at Oxford, in succession to the late Prof. Pritchard.

THE Russian traveller Potanin, who has spent more than a twelvemonth in a botanical exploration of Thibet, is expected in St. Petersburg in January next. M. Dobrotworsky has arrived at Jenisseisk on the Jenissei, on a botanical expedition.

PROF. BEN. K. EMERSON, of Amherst College, and of the U.S. Geological Survey, who met with a serious railroad accident last summer, and was reported killed, has so far recovered that he started in November on a trip round the world, for rest and recuperation. He visits Italy, Egypt, India, Java, and Japan. Prof. Emerson has been engaged for a long time in mapping the crystalline rocks of Central Massachusetts and Connecticut.

DR. NICOLE has been appointed Director of the Bacteriological Institute of Constantinople.

DR. SEUBERT has been appointed Professor of Analytical and Pharmaceutical Chemistry in the University of Tübingen.

MR. W. F. C. GURLEY has been appointed Director of the Geological Survey of Illinois.

WE learn that Prof. D. A. Gilchrist has accepted the Professorship of Agriculture at the University Extension College, Reading.

DR. K. VON DALLA TORRE has been appointed Professor of Botany in the University of Innsbrück, and Dr. H. Möller Professor of Botany in the University of Greifswald.

MR. W. T. MCGEE, known for his contributions to geology, has been appointed Director of the Bureau of Ethnology at Washington, U.S.

THE Chair of Comparative Anatomy and Zoology in the Biological School of the University of Pennsylvania has been accepted by Prof. E. D. Cope, and that of Geology and Mineralogy by Prof. A. P. Brown.

THE death of Dr. Webb, the well-known Principal of the Aspatria Agriculture College, is a severe loss to agricultural education. After a very brief illness, he passed away on November 28, in the prime of life. Through his exertions the College at Aspatria has been raised from a very low condition to its present high standing. He was greatly respected by his students, and his place as a teacher of agriculture will not be easily filled.

THE first step towards the introduction of the decimal system into Russia will be taken on January 13, 1894, when, by order of the Czar, the chemists of the Russian empire will begin to use decimal weights and measures.

A PRIZE of 1800 liras is offered by the Italian Geological Society for the best account of the state of knowledge of Palæozoic and Mesozoic formation in Italy, the work to be in continuation of D'Archiac's "Histoire des progrès de la Géologie," and to be presented before the end of March, 1896.

Die Natur announces that the Berlin Academy of Sciences has granted Drs. Richarz and Krygar-Menzel two thousand marks for the carrying on of their investigations of the constant of gravitation. A like sum has been granted to Dr. Franz Reinecke for the furtherance of his ethnological and anthropological studies.

THE ninth congress of Russian Naturalists will be opened at Moscow on January 15, 1894. The Mathematical and Physical Faculty of the Moscow University has undertaken its organisation. Reductions of railway fares are offered to persons who will apply for that purpose to the Dean of the Faculty before December 13. The first general meeting of the congress will take place on January 16, and the conference will close on the 23rd of that month.

MR. C. M. IRVINE informs us that at four o'clock on the afternoon of December 4 a brilliant meteor passed over Lesmahagow, N.B., travelling true south. The altitude was about 45°. The arc through which it was visible was about 10°, and the duration of visibility nearly 3 secs. Colour, pale greenish blue. The sky was overcast with detached clouds. The passage of the meteor was slightly zigzag, deviating from a straight line by about 1° on either side.

THE second series of lectures given by the Sunday Lecture Society begins on December 10, in St. George's Hall, when Sir Benjamin W. Richardson, F.R.S., will lecture on "The Mastery of Pain." Lectures will subsequently be given by Prof. A. A. Rambaut, Royal Astronomer of Ireland; Dr. R. D. Roberts, Prof. Percy Frankland, F.R.S., Mr. C. T. Dent, Mr. Arthur W. Clayden, and Prof. R. Meldola, F.R.S.

THE following are among the lecture arrangements at the Royal Institution before Easter:—Prof. Dewar, six lectures (adapted to a juvenile auditory) on air, gaseous and liquid; Prof. Charles Stewart, nine lectures on locomotion and fixation in plants and animals; Mr. W. Martin Conway, three lectures on the past and future of mountain exploration; Prof. Max Müller, three lectures on the Vedānta philosophy; the Right Hon. Lord Rayleigh, six lectures on light with special reference to the optical discoveries of Newton. The Friday evening meetings will begin on January 19, when a discourse will be given by Prof. Dewar, on scientific uses of liquid nitrogen and air. Succeeding discourses will probably be given by Mr. A. P. Graves, Mr. T. J. Cobden-Sanderson, Prof. W. F. R. Weldon, Prof. Silvanus P. Thompson, Prof. John G. McKendrick, Dr. W. H. White, the Right Hon. Lord Rayleigh, and others.

ACCORDING to the *Times* correspondent at Cairo, Messrs. Garstin and Willcocks have inspected the four sites proposed for reservoirs in which to store water for irrigation purposes during the summer when the Nile is low, and their reports will shortly be presented. The Government will then invite three European hydraulic engineers of the highest reputation to come to Egypt and make a technical examination of the proposed schemes. This will probably be in February next. Three of these schemes are for the construction of dams across the river at either Kalabsheh, Assouan, or Silsileh; the fourth proposes to utilise the natural depression of the Wady Raian, in the province of Fayoum, by conducting into it the flood-water of the Nile.

THE London County Council some time ago decided to establish a pathological laboratory and museum in connection with the London lunatic asylums. Last week the Council accepted the plans prepared by Mr. G. T. Hine, and we understand that they will shortly be put into execution at Claybury. A competent pathologist is now to be appointed, who will be supplied with material from the Claybury and other asylums under the supervision of the London County Council. The necessity for

such a laboratory has long been felt, and although good work has been done in several asylums by enthusiastic workers, these investigations have hitherto been carried out at a great disadvantage, chiefly owing to the want of assistance on the part of the governing bodies. So great have been these difficulties that in many asylums pathological science has been totally neglected. The task of electing a pathologist will not be an easy one. It is to be hoped the choice will fall on one who has made his mark in all the various branches of neurological science; for the study of cerebral disease is so bound up with that of the spinal cord and nerves, that a knowledge of cerebral pathology must prove useless if not combined with a thorough mastery of the clinical phenomena of spinal and peripheral nervous diseases, of their lesions, and of the methods of clinical and experimental neurological investigation.

As might have been expected, the anti-vivisectionists, headed by the Lord Chief Justice of England, have memorialised the Viceroy of India and the members of the Executive and Legislative Councils. In this document the usual sentimental arguments against vivisection are stated. If with reference to the Indian Bill now under consideration for the regulation of vivisection experiments, it should be deemed advisable to legislate on the subject, the signatories suggest (a) that the higher animals, such as horses, asses, mules, dogs, and cats, for which special certificates are granted in England, and also monkeys, should be wholly exempted from experimentation; (b) that it should be made essential to keep the animals under an anæsthetic throughout the investigation; (c) that the use of curare should be entirely prohibited; (d) that it should be provided that one inspector at any rate shall be selected on account of his recognised humanity, not his scientific knowledge. The executive committee of the Society for the Protection of Animals from Vivisection have also recently transmitted to the Viceroy and the members of the Executive Council a protest against the establishment of a Pasteur Institute in India. They represent that similar institutes in Paris and elsewhere have so far failed to prevent deaths from the bites of dogs and other animals alleged to be rabid, and that 256 persons have died in spite of the preventive treatment invented by M. Pasteur. It is also remarked that the Pasteur system involves and depends upon the cultivation and perpetuation of the malady of rabies in series after series of sentient animals, to their great misery and suffering, but the benefits that mankind derives from it are naturally ignored.

DURING the week ending the 2nd inst. several depressions passed across these islands, causing gales on our northern coasts. In the rear of these disturbances northerly winds set in, with a great fall of temperature; on the 1st and 2nd inst. the thermometer fell to 20°, or less, in nearly all parts. In Scotland the lowest readings were between 12° and 15°. But by Sunday, the 3rd inst., the temperature rose rapidly in the north and west, and subsequently the rise extended to the southern parts of the country.

THE *Meteorologische Zeitschrift* for November contains a paper on the frequency of halo phenomena, by G. Hellmann. Few text-books have dealt with this subject, and those that have done so state that lunar halos are most frequent, an error which appears to date from the time of Aristotle. Certainly the moon offers less opportunity for such phenomena. Prof. Hellmann points out that only such observatories as record hourly observations afford the necessary materials for giving a satisfactory answer to the question. He has examined various records, and especially those of the Upsala observatory, the result being that the solar phenomena exceed the lunar by about five to one, by far the most frequent halos being those of 22° radius. The halos as well as mock-suns and mock-moons show a distinct yearly period. The solar phenomena are most

frequent from April to June, and the lunar phenomena are most frequent in the winter half-year, being dependent on the length of the nights. These results are supported by observations made in the United States, and also in Japan.

THE *Pioneer Mail*, of November 9, contains an article on the past monsoon in India, based upon the official reports of rainfall between June 1 and October 15. These reports show a generally satisfactory state of affairs, about half the country having had excessive, and half deficient rainfall; some regions which generally receive only moderate rain had an excessive amount, while those which usually receive an excessive amount had a relatively light fall. The causes which bring about this half-yearly reversal of the winds are of especial interest, and offer a large field for study. Among the generally accepted theories, one attributes the origin of the rain-bearing current to the intense heating of the plains of Upper India, while another is that the chances of a good monsoon vary inversely with the amount of snow during the preceding winter. The writer thinks that these theories have failed in the present instance, while admitting that the distribution of heat and, under some circumstances, the snowfall exercise an influence on the monsoon. He sets up another theory, viz. that the monsoons are caused by the heated air of Asia rising up and overflowing at a great height to the southern hemisphere, where it settles down and is impelled northward by its own energy and by pressure in the rear. A reference to the "Memorandum on the Snowfall, &c." issued by the *Meteorological Reporter* on June 1 last, shows that the general forecast was to the effect that the rainfall might be deficient to a moderate extent in north-west India, and would very probably be at least normal in other parts. If any modification of the accepted theories be necessary, it will doubtless be shown by a study of the daily charts of the Indian monsoon area, to which we recently alluded, and the publication of which began with the present year. One of the special objects in preparing these charts is to elucidate the conditions which determine the advances, and variations in strength of the monsoon currents.

SOME interesting observations on the velocity at which crystallisation proceeds in a super-cooled substance are communicated by Mr. Moore to the current number of the *Zeitschrift für Physikalische Chemie*. The method of experiment resembles that originally used by Gernez. The substance is contained in a carefully cleaned U-tube, made of thin glass, which is immersed in a bath of liquid maintained at constant temperature, and which during an observation is kept open at both ends. When crystallisation sets in, in such a tube, the line of demarcation between solid and liquid can readily be followed by eye, and the time can easily be noted which is taken by the crystallisation to travel a definite distance down a limb of the U tube. Satisfactory observations cannot be taken when the crystallisation is rising in a limb of the tube, owing to the disturbing effects of the thermal changes attending solidification. Experiments on acetic acid showed that at any temperature the velocity is uniform, and is independent of the diameter of the tube, and observations on acetic acid, phenol, and mixtures of phenol with water and with cresol, show that the velocity increases with the amount of super-cooling, and at a diminishing rate. For phenol it is '6 c.m. per sec. with 4°·4 super-cooling, and 2·9 c.m. with 15°·8 super-cooling. The addition of water and of cresol to phenol largely reduces both the velocity of crystallisation and the rate at which it increases with the amount of super-cooling. Several of the curves indicate a maximum velocity as the extent of super-cooling increases. Attempts to observe this maximum were rendered fruitless, however, by the spontaneous crystallisation of the substances.

DIURNAL movements of the ground have been noticed at Santiago for some years, and have usually been attributed to the

action of heat upon the Santa Lucia mountain. According to *La Nature*, the observatory has recently been removed to a plain at the south of the city, and Dr. Obrecht, the director, has investigated the movements. It appears from his observations that from noon until nine o'clock in the evening, the ground to the north-east is raised, and then gradually descends until seven o'clock on the following morning. These curious variations sometimes attain an amplitude of 3" or 4". There is also evidence that from July to September the ground to the north-east is continuously raised, while from September to November, the part to the east of the observatory is continuously elevated. The total amplitude of elevation is said to be about 35".

MR. A. SIGSON, a professional photographer at Rybinsk, contributes an account of his method of obtaining photographs of snowflakes to the *Journal of the Russian Physico-Chemical Society*. He used a Zeiss microscope provided with an aplanatic lens and a long focus camera. This was placed near an attic window at a strong inclination to the horizon. The flakes were received on some rough cloth and transferred to a small net of cocoon fibres stuck on a card perforated in the middle. This card was placed on the stage of the microscope, and the illumination was so arranged that half the field was uniformly illuminated, and the other half shaded off. For an enlargement of fifteen times the exposure lasted two to five seconds, with plates supplied by M. Lumière. To avoid the melting of the flakes by the breath of the operator, the latter is obliged to breathe through a pipe bent backwards during the adjustment of the apparatus.

IN *Bulletin* No. 8 of the Geological and Natural History Survey of Minnesota, Dr. Andrew C. Lawson publishes two papers of great importance for the systematic grouping of volcanic rocks in North America. The first paper is on the "Anorthosytes of the Minnesota Coast of Lake Superior," and is prefaced by a long note, written by Prof. Winchell, on "The Norian of the North-West." In this note Prof. Winchell gives up many of his previously-formed ideas regarding the Minnesota rocks, in favour of the conclusions now obtained by Dr. Lawson. There occurs on the Minnesota coasts a rock almost wholly composed of a plagioclase felspar which had been included by Prof. Winchell and Irving in the Keweenaw or Cupriferosus series of volcanic lavas and sheets. For this rock, Dr. Lawson accepts the name of "Anorthosyte," given by Prof. Adams to similar rocks in the Norian series of Quebec; and he proves conclusively that it is a Plutonic formation, solidified under deep-seated conditions, and exposed later during the long period of pre-Palæozoic erosion. On its eroded surface the volcanic lavas of the Keweenaw series were poured out, no rocks belonging to the Animikie series being present in this area. The thickness of the Keweenaw series had been estimated by Prof. Irving at 20,000 feet. Dr. Lawson is of opinion that the series is comparatively thin, ranging from zero to a maximum of a few hundred feet. Special interest attaches to the hummocky—*roches moutonnées*—aspect of the old surfaces of the Anorthosyte rock at Beaver Bay, Carlton Peak, &c., as this is such a marked feature of the ancient erosion planes of Archaean rocks in North America. Dr. Lawson compares the Anorthosytes of Minnesota with the Norian series of irruptive plagioclase rocks invading Archaean gneisses in Quebec, but until there is sufficient evidence in favour of this correlation, he suggests that a local name of "Carltonian" be given to the Minnesota Anorthosytes.

THE second paper in the same *Bulletin*, by Dr. Lawson, is entitled "The Laccolithic Sills of the North-West Coast of Lake Superior." Extensive trap-sheets are in this region associated with the Animikie and Nipigon groups of sedimentary rocks, and have up to this time been described as contemporaneous flows. Mr. Ingall had observed the intrusive nature of some of these

so-called flows, but drew no farther conclusions. Dr. Lawson now advances the view that "there are no contemporaneous volcanic rocks in the Animikie group, and that the trap-sheets are all intrusive in their origin, and are of the nature of laccolithic sills." He supports this view by weighty evidence, such as the simplicity of the trap-sheets, their regularity and persistence over wide areas, the passage of thick sheets from the Animikie series into the higher horizons of Keweenaw strata, the absence of pyroclastic rocks, the alteration of the rocks above and below the intruded sheets, and the direct continuity of the "trap-sheets" with dykes of the same intrusive rock. The "trap-sheets" occur as laccolithic sills both in the Animikie and Keweenaw series, and are therefore later than these. Dr. Lawson thinks they may belong to the great series of trap-rocks intruded in the Silurian rocks of Quebec, but calls them for the present "Logan Sills," in honour of the late Sir William E. Logan.

IT is well known that electric currents may be produced by heating a single metal, if there be any variation in temper, or if the distribution of heat be very irregular, and the changes of temperature abrupt. Mr. W. H. Steele has made some experiments on these effects, in the Physical Laboratory of Melbourne University (*Science*, No. 562). A sensitive galvanometer put in circuit with a piece of iron wire showed a current when the wire was simply warmed with the fingers. This was the only metal which gave a current when at a temperature below 100° C. Altogether twelve different metals and four alloys were examined, and the effect noticed in each of them. In order to raise the wires to a high temperature without fusing them, they were passed through clay tubes (stems of tobacco-pipes), and, in the case of metals having low melting-points, the tube was completely filled with the metal. The highest electromotive force obtained from iron was 0.002 volt; 0.3 volt was observed with six different metals—lead, copper, gold, tin, zinc, and antimony; while with others, *e.g.* silver and aluminium, the effect was exceedingly small. In the case of lead, the effect showed no sign of ceasing after the metal had been heated for half a day. Gold gave the highest effect, as much as half a volt being observed. Mr. Steele remarks that these phenomena are generally quite sufficient to mask the ordinary thermo-electric effect at a red heat, and that thermo-electric tables are consequently not trustworthy for high temperatures.

THE current number of the *Comptes Rendus* contains a note, by M. Ch. André, on the variation of the electric state of the high regions of the atmosphere in fine weather. During a previous attempt to investigate this point, the author unfortunately met with an accident which has prevented him personally making any more observations; the measurements contained in this note have, however, been made under his direction. At opposite corners of the car of the balloon were fixed two cylindrical reservoirs, filled with distilled water, and insulated on plates of sulphur. To the base of each of these vessels an india-rubber tube, about 20 metres long, was attached, each tube having a small jet at its end. When the balloon had come to rest at any desired height, the difference of potential existing between two points, at a known vertical distance, was determined by means of an electrometer (Exner's pattern) connected metallically with the water reservoir. This difference of potential, the distance being kept constant, gave a measure of the strength of the electrical field. As a result of two series of observations, the author considers that in fine weather the strength of the electrical field does not increase with the altitude, but is the same at a given instant at any point along the same vertical.

IN a paper communicated to the Reale Accademia delle Scienze, Torino, Signor Garbasso gives an account of his experiments on the reflection of electrical waves. The author allows the waves given out by a Hertz oscillator to fall upon a mirror consisting of a wooden plank 175 c.m. long and 125 c.m. broad, over which were stretched a large number (168) of parallel rectilinear resonators. These resonators were without spark-gaps, and consisted of wires 20 c.m. long with metal discs, 3.8 c.m. in diameter, fixed at either end. When another resonator, having a spark-gap, is placed so that the radiation reflected from this mirror falls upon it, bright sparks are produced, as has been shown by Trouton and others, when its length is parallel to the wires on the reflector, while no sparks are produced when it is at right angles to these wires. What seems curious, however, is that the radiation reflected, although it has such a large wave-length compared with the dimensions of the mirror, is not scattered but is regularly reflected.

IN No. 5, vol. xii. of the *Zeitschrift für Physikalische Chemie*, Mr. Harry C. Jones gives an account of an additional series of observations on the freezing-points of dilute aqueous solutions. The most dilute solutions employed were in general about 0.01—normal. Of the inorganic substances examined ammonia exhibited the most striking behaviour. Although the bases potash and soda like hydrochloric and nitric acid seem to be almost entirely dissociated into ions, ammonia is only dissociated to the extent of some twenty per cent. Phosphoric acid apparently dissociates into the two ions H and H_2PO_4 , and in the most dilute solutions is less dissociated than sulphuric acid, which in turn is less dissociated than the monobasic acids. The extent of the dissociation thus obtained agreed, in the main, with that deduced from Kohlrausch's observations on the electric conductivity of the solutions. The organic substances examined gave quite unexpected results. Cane-sugar, dextrose, urea, phenol, and ethyl and propyl alcohols, which, according to the new theory, cannot undergo electrolytic dissociation, behaved in all cases in the most dilute solutions as if they were really dissociated, and gave molecular lowerings of the freezing-point which were much higher than the calculated value. Indeed, if one supposes for the moment that cane-sugar can dissociate into two ions, the observations on the freezing-point of its aqueous solutions, when treated as in the case of an electrolyte, would indicate that twenty-seven per cent. of the sugar is dissociated, or an amount greater than that found for ammonia. With rise in concentration the molecular lowering for all the organic substances diminishes, in some cases reaching a minimum and then increasing, or, as in the case of urea and the two alcohols, remaining constant. This constant minimum value of the molecular lowering agrees closely with the theoretical number. The explanation of these remarkable results from the standpoint of the new theory will be awaited with interest.

THE marked increase in the vitality of the cholera bacillus in artificial culture media induced by adding larger than usual proportions of salt to the latter, was drawn attention to in these notes on August 24, in connection with the saline condition of the river Elbe at the intake of the Hamburg water-works during the great cholera epidemic. In a subsequent note, on September 28, it was pointed out how this property of the cholera organism had been taken advantage of by Koch and others in devising methods for the separate identification of this vibrio in water in the presence of other harmless saprophytic bacteria. Of extreme interest, therefore, are the experiments of Dr. M. N. Gamaleia, contained in a short paper, "Du cholera virulent et épidémique," contributed to the *Comptes Rendus*, No. 5, 1893, p. 285. This investigator states that he was able to increase the virulence of the cholera organism by cultivating it in media containing from

3, 4, up to 5 per cent. of common salt. Nor were these results confined to one particular cultivation of the cholera bacillus, but were also derived with cholera cultures obtained from numerous different sources. On inoculating these salt-cultures of cholera vibrios into pigeons and guinea-pigs, symptoms of septicæmia developed, invading the blood and all the tissues. If one drop of the blood of these infected animals was taken and inoculated into others, the malady was transmitted. These observations support the theory that the unusual saline condition of the Elbe may have assisted in supplying the conditions which so greatly favoured the vitality and virulence of the cholera bacillus during the Hamburg epidemic.

THE last two numbers of the *Botanische Zeitung*, published on November 1, are devoted to a memoir by E. Crato, "Morphologische und mikrochemische Untersuchungen ueber die Physoden." This memoir is stated to be an "Arbeit" carried on under the direct guidance of Prof. Dr. Reinke, at the University of Kiel, and the following is from the summary given by the author:—There lies at the basis of the vegetable cell a system of delicate lamellæ, arranged in such a way as to form a foam-like mass (Lamellensystem, Geristsubstanz). In those plants where the point has been carefully investigated, these lamellæ do not give the ordinary proteid reactions. The spaces enclosed by the lamellæ contain a clear, watery, slightly refractive fluid (Kammerflüssigkeit), whereto belong both cell-sap as well as enchylema. In these lamellæ there glide about, apparently at will, minute, refractive, bladder-like formations (physodes, to which the greater part of the microsomes belong), swelling out the lamellæ where they occur. These physodes certainly form readily transportable vehicles of chemical substances for the plant. In the brown Algæ these physodes contain substances similar to phenol. In all the Algæ which were investigated, the Laminaria excepted (their investigation is not complete), phloroglucin was found. Further, it would appear that these phenol-like substances are used up for the formation of the lamellar substance (plasma, &c).

MAJOR J. W. POWELL's eighth annual report, as Director of the U. S. Bureau of Ethnology, is a splendid addition to ethnological literature. In the first part of the volume the plans and operations of the Bureau are described, a brief account being given of the many investigations carried on during the fiscal year 1886-87 by the twenty-five assistants. The contributions contained in the volume are: "A Study of Pueblo Architecture, Tusayan and Cibola," by Mr. Victor Mindeleff, and "Ceremonial of Hasjelti Dailjis and Mythical Sand Painting of the Navajo Indians," by Mr. James Stevenson, this being his last official work before his death in 1888. In these papers "the prehistoric archæology of the Pueblos in the special department of architecture is the most prominent single subject presented and discussed; but the papers also include studies of the history, mythology, and sociology of that people, as well as of their neighbours and hereditary enemies, the Navajo." All these correlated studies are set forth in detail, and are profusely illustrated. Mr. Mindeleff's study relates to the ruins and inhabited towns found over a large territory in the interior south-western parts of the United States. His research leads him to conclude that there is no need for the hypothesis of an extinct race with dense population and high civilisation to account for the conditions actually existing in North America before the European discovery. Mr. Stevenson's paper is most interesting, and it has the advantage of being a statement of facts actually witnessed by the deceased author. Translations of six of the Navajo myths are also presented, some of which elucidate parts of the ceremony forming the main title of his paper. The whole work has been excellently done, and our only regret is that there should have been a delay of six years in its publication.

DURING the summers of 1891 and 1892 Mr. W. P. Hay took the opportunity, while visiting the caves of Southern Indiana, to observe the habits of the blind crayfish, *Cambarus pellucidus*. In some of the caverns, as at Shiloh Cave, the crayfish were extremely abundant. When observed in an undisturbed state, they were found resting quietly in some shallow part of the underground streams on the clay banks. They lay with all their legs extended, and their long antennæ gently waving about to and fro. They were easier caught by the hand suddenly seizing them than with a net. Noise did not seem to affect them. When first taken out of the water they were of a translucent pinkish white colour, with the alimentary track showing through as a blue body, but they soon lost these hues. The variation in the general spininess is very great. As a rule, the farther north the specimens were taken the smoother they were. At Mayfield's Cave, in Monroe County, a variety was found entirely without spines; this is described and figured as a sub-species. (Proc. U.S. Nat. Museum, No. 935, 1893.)

IN Wundt, *Philosophische Studien*, ix. Bd., I Heft., Herr Bruno Kämpfe brings together all the values of the integral for the probable error, *i.e.*

$$\phi(\gamma) = \frac{2}{\sqrt{\pi}} \cdot \int_0^{\gamma} e^{-t^2} dt,$$

which gives the whole number of errors, both positive and negative, whose numerical magnitude falls between the given limits. The number of errors between any two given limits will be found by taking the difference between the tabular numbers corresponding to these limits. Since the total number of errors is taken as unity in the table, the required number of errors in any particular case is to be found by multiplying the tabular numbers of the actual number of observations. Thus, to take an example, if there were 1000 observations, and we wish to employ the limits 0.0 and 0.5, then looking in the column giving the values of γ , we find against them the numbers 0.0000 and 0.5205, which when subtracted from one another, and multiplied by 1000 give 520.5 or 520 errors. If the limits had been 1.5 and 2.0, then we should have found the corresponding values 0.9661 and 0.9953, which subtracted give 0.0292, and multiplied by 1000 give 29, *i.e.* 29 errors that lie between these limits out of 1000 observations. This table is published also as a *separatabdruck* by Wilhelm Engelmann, Leipzig, which is in a more useful form for computation. The values of γ can be read directly to three places of decimals.

WE have received a report of the meteorological observations made during 1892 at the Royal Alfred Observatory, Mauritius.

THE new issue of Mr. Edward Stanford's compendium of geography and travel includes a revised and partly rewritten edition of "Australasia." Under this title Dr. A. R. Wallace's excellent description of Australia and New Zealand has been published, and a second volume, embracing Malaysia and the Pacific Archipelagoes, by Dr. F. H. H. Guillemard, is in preparation.

MM. J. B. BAILLIÈRE ET FILS have added to their library of contemporary science a volume entitled "Pêches et Chasses Zoologiques," by the Marquis of Folin. The book is well illustrated, and, though much of the matter it contains is only of local interest, a large portion will be read with profit by students of natural history.

It is very doubtful whether any useful purpose is served by the issue, from Mr. Edward Stanford's, of the series of maps edited by Captain A. Staggemeier, of Copenhagen. The maps show very little except the configuration of the land surfaces, the editor's idea being that they will be of service to physical geographers for placing observed facts of natural history,

meteorology, &c., in their proper geographical position. There are five maps in the portfolio before us, two showing the Polar regions down to 30°, and three the zone between 45° of North and South latitude, on Mercator's projection; hence the zones between latitudes 30° and 45° are represented on both projections. It is intended to issue other maps on a larger scale, the whole series to comprise twenty-five plates, which will be published in six parts.

IT is encouraging to learn, from the forty-first annual report of the working of the Manchester Public Free Libraries, that during the year 1892-93, 77,878 volumes dealing with science and art were issued from the reference library, and 67,456 were referred to in the reading-room. The total number of books issued to borrowers by the nine branch libraries was 872,655, of which 45,526 are classified under science and art. Of the 100,123 volumes consulted in the reading-rooms of the branch libraries, 7869 were on science and art subjects. The record is a good one; but if the committee were to classify science separately from art, we should be better able to estimate from the figures the growth of interest in natural knowledge.

DR. ARTHUR GAMGEE has just completed the second volume of his text-book on the Physiological Chemistry of the Animal Body, upon which he has been engaged for some years. Like the first volume, it constitutes an independent and complete treatise, dealing with the physiological chemistry of the digestive processes. It has been the author's aim to give the reader a very full and, so far as possible, independent account of the state of knowledge on the subjects discussed. Messrs. Macmillan and Co. will publish the volume immediately.

MESSRS. MACMILLAN AND CO. are also about to publish a revised and enlarged edition of "Elementary Lessons in Steam Machinery and the Marine Steam Engine," by Messrs. Langmaid and Gaisford, Instructors on H.M.S. *Britannia*. It will be followed by other works constituting a Britannia Science Series. Among those already in hand may be mentioned "Physics for School Use," by Mr. F. R. Barrett, Mr. A. E. Gibson, Rev. J. C. P. Aldous, and others; a "Physics Note-Book," by Messrs. Gibson and Aldous; "Trigonometry for Practical Men," by Mr. W. W. Lane; and "Geometrical Drawing, Perspective, and Mechanical Drawing," by Mr. J. H. Spanton.

THE additions to the Zoological Society's Gardens during the past week include a Mozambique Monkey (*Cercopithecus pygerythrus*, ♂) a Sykes's Monkey (*Cercopithecus albigularis*, ♂) a Bell's Cinixys (*Cinixys belliana*) from East Africa, presented by Mr. T. E. C. Remington; a Red Tiger Cat (*Felis chrysothrix*) from the Gold Coast, West Africa, presented by Mr. William Adams; a Common Otter (*Lutra vulgaris*) from Yorkshire, presented by Mr. C. B. C. de Wit; a Herring Gull (*Larus argentatus*) British, presented by Mr. J. G. Goodchild; a Northern Mocking Bird (*Mimus polyglottus*) from North America, presented by Miss Dorothy Williams; a Viperine Snake (*Tropidonotus viperinus*) European, presented by Miss Ffennell; five Barbary Partridges (*Caccabis petrosa*) from North Africa, deposited.

OUR ASTRONOMICAL COLUMN.

THE VARIATION OF LATITUDE.—In the *Astronomical Journal*, No. 19 (November 14), Prof. S. C. Chandler gives the eighth of the important series of articles that he has been contributing on the variation of latitude. The special part of the subject which is referred to deals with the direction of the rotation of the pole and is accompanied by an explicit demonstration which includes all the data bearing upon it. Owing to the insufficient extent of series of observations in widely different longitudes to furnish independent values of the constants