

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE annual meeting of the Association of Technical Institutions will be held at the Skinners' Hall, London, on Friday, January 31, 1902. The Right Hon. Sir William Hart Dyke, M.P., will be in the chair, and an address will be delivered by the president-elect, Lord Avebury.

MR. WALTER PALMER, M.P., has offered the University of London the sum of 2000*l.* to provide the apparatus required for the proposed post-graduate courses of lectures in physiology. A committee has been appointed to consider the details of the scheme.

THE system of secondary education in Italy forms the subject of criticism at the hands of Prof. Amati Amato, writing in the *Lombardy Rendiconti*, xxxiv. 17. The author regrets that from 1894 to the present time statistical data are very meagre, and it is desirable that a volume should be annually issued showing the number of schools of different grades and their total attendances. The data available for the period up to 1894 are more detailed, and show a marked increase in schools under clerical control and a decrease in those under lay management, and reasons are given for believing that the tendency continues to be in the same direction.

A DEPUTATION representing a number of University colleges waited on the Chancellor of the Exchequer on Friday last in order to place before him reasons why the annual Government grant to these institutions should be increased. In connection with this subject the facts given on p. 175 of this issue are of interest. The grounds upon which the application was made were summarised as follows:—The grant was originally placed upon the Estimates in the year 1889–90, the total amount being 15,000*l.*, apportioned among eleven colleges. An additional grant of 500*l.* was subsequently made to University College, Dundee. In 1897 the grant was increased to 25,000*l.*, which was distributed among twelve colleges. Since then the work of the University colleges has grown in importance and magnitude. New departments have been created, and probably in all the colleges important additions have been made to the teaching staff, together with a largely increased provision of appliances and equipment. In the year 1892 a Treasury committee reported in favour of a total grant of 30,000*l.* being made to the University colleges, a sum in excess by 5000*l.* of that which is at the present time distributed among them. In 1897 new colleges at Reading and Exeter were inspected by a Treasury committee appointed to visit University colleges, and declared at that time not to have reached such a standard in University work as to justify a claim upon a share in the grant. These colleges, together with another, have been again visited by a similar committee, and if by this time they are reported to have reached a standard which justifies their claim to be treated as fully equipped colleges, in arts and science some decrease in the grants to other colleges would have to be made unless the total of 25,000*l.* is increased. Replying to the deputation, the Chancellor of the Exchequer said that there was no liability on the part of the Exchequer for University education in England, and declared that this was a doctrine which had always been accepted by Governments and by Parliament. The grant made in 1892 was a purely temporary measure, and did not imply any assumption of liability on the part of the Exchequer. It was only to be regarded as an attempt to aid local effort in places in which there was a strong desire for University education. The experience of the last five years had shown that the grant had had the effect of stimulating local effort. He would carefully consider the whole question; but, while he must decline to pledge himself to any increase of the present grant, he would do his best to prevent any loss falling on the colleges which were now in receipt of it by the admission of new colleges to its benefits.

SCIENTIFIC SERIAL.

American Journal of Science, December.—The geology of the Little Colorado Valley, by Lester F. Ward. The paper is accompanied by a section showing 3500 feet of Trias, of which 1200 are Painted Desert beds, 1600 Shinarump beds, and 700 Moencopie beds.—On pyrite and marcasite, by H. N. Stokes. It is pointed out that although there is no difficulty in distinguishing these two minerals in well-crystallised specimens, there remains a residuum consisting of massive or finely grained material in which this is not possible. The methods which

have been proposed for such cases are criticised and found to be insufficient. A method has therefore been developed in which advantage is taken of the difference between the two sulphides in their behaviour towards solutions of ferric ammonia alum, and it has been found possible to apply this to determine the amount of each in mixtures. The application of this process to various samples of doubtful nature, especially of concretions, has shown that the finely fibrous specimens usually passing as marcasite are very commonly pyrite.—Studies of Eocene mammalia in the Marsh collection, Peabody Museum, by J. L. Wortman.—The dielectric constant of paraffin, W. G. Wormwell. Four samples of commercial paraffin were examined with a modified form of the Blondlot oscillator, the refractive index for the D line of the samples being also determined. The dielectric constant of a given paraffin increases with the density of the paraffin. It augments rapidly from a temperature 20° above the melting-point to a temperature 30° below the melting-point, and among different paraffins the dielectric constant increases with a rise in the melting-point. A comparison of the results for short electrical waves and short light waves shows that Cauchy's formula as a means of obtaining the index of refraction for indefinitely long waves does not meet the experimental data.—On some new mineral occurrences in Canada, by G. C. Hoffman.—The estimation of molybdic acid reduced by hydriodic acid, by F. A. Gooch and O. S. Pulman, jun. The conditions under which molybdic acid may be accurately determined by reduction with potassium iodide and hydrochloric acid are here laid down, and test analyses showing the accuracy of the method are cited.—The Veramin meteorite, by H. A. Ward. The meteorite consisted of an intimate mixture of metal and mineral, in roughly equal proportions. Analysis of the metallic portion is given.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 5.—“Notes on Quantitative Spectra of Beryllium.” By Prof. W. N. Hartley, D.Sc., F.R.S.

In a quantitative examination made in 1885 of all the known methods of separating beryllium from aluminium and from iron the various precipitates obtained were dissolved and diluted to a known volume corresponding with the amount of bases in solution.

The solutions were spectrographically examined, and the photographs compared with others taken from solutions containing accurately weighed quantities of pure beryllia. Wave-lengths of lines shown by solutions containing 0.000001 per cent. of beryllium: 3322.3 extinct, 3130.3 nearly one-half the line still strong, 2649.8 reduced to a dot, 2493.6 a dot scarcely visible, 2478.1 a very fine short line.

The actual length of the line 2478.1, as rendered by solutions of 0.00001 per cent. and 0.000001 per cent. strength, is, in the former, 0.07, and, in the latter, 0.05 of an inch. The normal length of the line at this part of the spectrum is 0.22 of an inch. The quantity of substance yielding this spectrum is equivalent to one-millionth of a milligramme of beryllium. The coefficient of extinction of the two lines $\lambda\lambda$ 3130.3 and 2478.1 had not been reached by the dilution specified.

Beryllia has been separated from the alumina contained in felspar obtained from a granite found in co. Wicklow. From numerous experiments on the analytical processes employed in the separation of beryllia from alumina it was found that it remained combined with the sesquioxide bases in so persistent a manner as to lead to the belief that ordinary alumina might be found more often than not to contain traces of beryllia. Such, however, is not the case, though gallium has been ascertained to be present in almost all minerals which contain aluminium. As they belong to the same group, the two elements aluminium and gallium may be expected to form isomorphous mixtures, which would account for their being so constantly associated in nature; but the position of beryllium in the periodic system of classification shows that a similar behaviour with that element is scarcely probable.

Geological Society, December 4.—Mr. J. J. H. Teall, V.P.R.S., president, in the chair.—On a new genus belonging to the *Lepiditidæ*, from the Cambrian Shales of Malvern, by Prof. T. T. Groom. Forms referred to *Beyrichia* have long been known from the Cambrian beds of Scandinavia, Stockingford and South Wales, and the writer has obtained from the

lowest part of the Malvern black shales a species identical with the Stockingford form, which had been provisionally identified with the Swedish *Beyrichia Angelini*. The characters of these specimens serve to separate the species from those now placed under the genus *Beyrichia*, a conclusion in which Prof. T. Rupert Jones concurs.—The sequence of the Cambrian and associated beds of the Malvern Hills, by Prof. T. T. Groom, with an appendix on the Brachiopoda by Mr. C. A. Matley. The series, exclusive of some 600 feet of igneous rocks, may be estimated at between 2500 and 3000 feet, and consists of the following members, tabulated in descending order:—(4) The bronil shales, 1000 feet thick; grey shales containing Dictyonema and many Tremadoc brachiopods and trilobites. (3) The white-leaved oak shales; black shales, including: (b) The zone of *Peltura scarabacoides*, *Sphaerophthalmus alatus*, *Ctenopyge pecten*, *Ct. bisulcata* and *Agnostus trisectus*; 500 feet. (a) The zone containing *Kutorgina pusilla*, *Protospongia fenestrata*, a new variety of *Acrotreta*, and a new genus of the Leperditidae; 30 feet. (2) The hollybush sandstone, comprising: (b) Massive sandstone probably not less than 1000 feet thick, and containing *Kutorgina Phillipsi*, *Orthotheca fistula*, *Scolecoderma antiquissima*, and new species of *Hyalolithus*. (a) Flaggy and shaly beds, not less than 75 feet thick; chiefly flaggy and shaly glauconitic sandstones, with *Kutorgina Phillipsi*, *Scolecoderma antiquissima*, *Hyalolithus*, &c. (1) The Malvern quartzite, consisting chiefly of grey quartzites and conglomerates, rarely glauconitic; probably at least several hundred feet thick; containing *Kutorgina Phillipsi*, *Hyalolithus primævus* and a new species of *Obolella*. Three new species of *Hyalolithus* are named and described in full, and four in outline, while a revision of Holl's species *H. fistula* is given. Notes are also given, by Mr. Philip Lake and the author, on *Agnostus trisectus*, *Cheirurus Frederici* and other trilobites, and a name is given to certain cylindrical bodies which appear to be the eggs or excreta of some animal.

Entomological Society, December 6.—The Rev. Canon Fowler, president, in the chair.—Mr. J. H. Carpenter exhibited a number of *Colas hyale* bred from ova laid by the parent butterfly taken at Sheerness, August 18, 1900. Twelve months ago there was no trustworthy evidence as to how *C. hyale* passed the winter, but Mr. Carpenter discovered that it hibernates in the larval state and pupates and emerges in the spring. No one has yet successfully bred *C. edusa* through the winter, as they do not, and cannot, feed up these in this country. *Hyalæ*, on the other hand, is perfectly quiescent during the winter months, and nothing would induce the larvæ to feed at that period even when subjected to a temperature of between 60° and 70° F.—Mr. R. S. Standen exhibited specimens of *Lycæna dolus*, the type, from Bordighera, and also *Pieris brassicæ* with greenish underwings, a common form in the neighbourhood of Florence.—Mr. C. P. Pickett exhibited pupa-cases of *Saturnia pavonia*, one with two openings, one with no openings, and a third containing three pupæ; from one only of which the imago had emerged. Mr. J. W. Tutt said that this phenomenon was not unusual in the case of silkworms, and commonly occurred also in the case of artificially bred *Lasiocampa lanestris*, being probably due to overcrowding.—The Rev. A. E. Eaton exhibited specimens of *Psychodidae* of morphological interest, preserved in corked tubes.—Mr. H. St. J. Donisthorpe read a paper entitled "The Life-History of *Clythra 4-punctata*," and Mr. G. Kirkaldy communicated "A Memoir upon the Rhyngochal Family Capsidæ."

Royal Meteorological Society, December 18.—Mr. W. H. Dines, president, in the chair.—The Hon. Rollo Russell read a paper entitled "Further Observations and Conclusions in relation to Atmospheric Transparency." For a number of years past he had made daily observations on the clearness of the atmosphere at Haslemere, Surrey, and in the paper he gave the results of the same. The principal conclusions derived from these observations are:—Haze and fog are commonly caused by the mixture of currents at different temperatures. These currents may be local or general, high or low. Thick haze or fog not dependent on different currents is rare, but differing currents frequently come into contact without producing haze or fog, and fairly clear weather under opposite currents is not uncommon. A fog may generally be taken *ipso facto* as evidence of the existence in the neighbourhood of a conflict of currents, and prevalent fog or haze commonly signifies that a different wind exists at a high level from that on the surface or at a slight

elevation. The production of fog or haze by mixing currents depends chiefly on differences in their temperature. Broadly-extended westerly winds, with westerly upper currents, are the clearest, and visibility may reach the highest figures during their prevalence, whether they are dry or nearly saturated. Easterly and north winds are the most hazy, owing to the ordinary upper current from the west being seldom displaced by them, and to the mixture of these masses of air of different temperatures. When, as an exception, east and north winds are clear, it may be presumed, without direct evidence, that the upper current coincides with them in direction. In winter, therefore, unusual clearness in these winds often signifies a long spell of frost.—The other papers read were: Remarkable phosphorescent phenomenon observed in the Persian Gulf, April 4 and 9, 1901, by Mr. W. S. Hoseason; and the mechanical principle of atmospheric circulation, by Capt. R. A. Edwin, R.N.

Mathematical Society, December 12.—Major MacMahon, R.A., F.R.S., in the chair.—Prof. Love, F.R.S. (hon. sec.) communicated a paper by Mr. J. H. Michell on the flexure of a circular plate. Prof. Lamb, F.R.S., also spoke on the subject of the paper.—Lieut.-Col. Cunningham, R.E., gave a short sketch of Euler's method of finding "amicable" numbers and announced the discovery of two new primes A, B; where $A = f.a$, $B = f.b.b^1$. Then, in one pair, $(A, B)f = 3^4.7.11^2.19$; in the other pair $(A, B) f = 3^5.7^2.13.19$. In both pairs $a = 8747$, $b.b^1 = 53^5.161$.

CAMBRIDGE.

Philosophical Society, November 25.—Dr. J. Larmor, vice-president, in the chair.—The negative radiation from hot platinum, by Mr. O. W. Richardson. The radiation was investigated experimentally chiefly by measuring its variation with the temperature of the metal. The radiating surface was that of a fine platinum wire heated by a steady current. The saturation current from the wire to a surrounding cylinder was measured by means of a sensitive Thomson galvanometer through which the cylinder was put to earth. The pressure in the apparatus varied from .008 to .16 mm. The temperature of the wire was obtained by determining its resistance. It was shown that there was no sensible current when the wire was charged positively; with a negative charge on the wire the current rose to as much as 4×10^{-4} amperes at 1600° C. The results are shown to be consistent with the theory that the effect is due to corpuscles escaping from the metal.—On the ions produced by an incandescent platinum, by Prof. J. J. Thomson. The incandescent metal in these experiments was at a temperature between a dull red and a bright yellow heat. At these temperatures only positive ions are produced in the neighbourhood of the wire. Curves showing the relation between the current and the potential difference were obtained; these curves show three well-marked stages. In the first stage the current increases more rapidly than the potential difference. In the second stage the rate of increase of the current diminishes rapidly, the current becoming towards the end of the stage independent of the difference of potential; this at low pressures is followed by a third stage in which the current again increases rapidly, indicating the formation of fresh ions. The currents when the potential difference was increasing differed frequently from those for the corresponding potential when decreasing—the curves often indicating a kind of hysteresis. The saturation current between a hot and a cold platinum plate was found to be independent of the distance between the plates. The masses of the positive ions were determined by the method previously used by the author to determine the masses of the negative ions arising from ultra-violet light or metals at a white heat; it was found that the carriers of electricity were not all of the same kind; the mass of the smallest of these had a mass of the same order as that of a molecule of oxygen.—On the action of incandescent metals in producing electric conductivity in gases, by Mr. J. A. McClelland.—On the seminvariants of systems of binary quatics, the order of each quantic being infinite; by Major P. A. MacMahon.—On the zeros of polynomials, by Mr. J. H. Grace.—The type-specimens of *Lyginodendron oldhamium*, Binney, by E. A. N. Arber.

EDINBURGH.

Royal Society, December 2.—Lord Kelvin, president, in the chair.—The president read an obituary notice of Prof. Tait, which contained interesting reminiscences of their work together when they were preparing "Thomson and Tait."—Dr. Halm, in the second part of his paper, on the state of equilibrium of

stellar atmospheres, gave further illustrations, from the conditions holding in our own atmosphere, of the distinction between thermostatic equilibrium and convective equilibrium, the former being characteristic of the upper strata and the latter of the lower strata, especially in the neighbourhood of mountains. Passing to the case of the sun, he found it necessary to assume (in order to explain the height of the chromosphere) that hydrogen gas contains an appreciable amount of potential energy, latent heat, as it were, stored up by the dissociation of its molecules into smaller molecular groups. A comparison of the deviations from Dulong and Petit's well-known law led to a division of the elements into two groups, of which iron and carbon might be taken as the types. In the one group the molecular potential energy increases with the temperature, in the other it diminishes. Hydrogen belongs to the former group. These considerations also gave a clue to the comparative smallness of the layer of metallic vapours in the sun, and, moreover, explained why the spectra of the hottest stars were characterised by a broadening of the hydrogen lines and a narrowing of the lines of the metallic vapours. Finally, it was shown how a change of temperature in part of the sun's photosphere would, on the principles developed in the paper, at once cause violent outbursts of hydrogen gas, such as are observed in the solar protuberances.—Lord Kelvin exhibited a model of the diatomic equilateral crystalline assemblage described in his paper on molecular constitution of matter, Roy. Soc. Edin., July, 1889. By means of this model any relation between the rigidity and the resistance to compression could be obtained, thereby completely disposing of the reasoning of the older French elasticians, who believed that there must be a definite relation between the two elastic constants in an isotropic elastic solid.

DUBLIN.

Royal Irish Academy, December 9.—Prof. R. Atkinson, president, in the chair.—Prof. J. P. O'Reilly read a paper on the waste of the coast of Ireland. In this paper the author discussed the different stages of change that the country had gone through following the work of Prof. Boyd Dawkins, "Early Man in Britain and his Place in the Tertiary Period." Taking the state of the country at the end of the Pleistocene period, when the great forests covered the surface of the upraised drift surface, he pointed out how this has been taken to indicate the then existence of land extending off to the west either as a continental plateau or as a series of islands which sheltered this forest growth, now impossible owing to the harsh winds which come in directly from the ocean. He directed attention to the report of Messrs. Newton and Teall, referred to in NATURE, vol. lvii. p. 324, on the lava sheets of Franz Josef Land, which tends to admit the former existence of an immense basaltic plateau of which the islands Spitsbergen, Jan Mayen, Iceland, Greenland, the Faroes, Hebrides and N. Ireland formed part, the subsequent break-up of this plateau giving rise to islands and to the present state of those mentioned. Explaining how meagre the details are concerning the changes undergone by the coast of Ireland in past times, he pointed out how these might be supplemented by examining what the coasts of the northern islands, Scotland, Cornwall and of France had suffered in loss from the continual beat and wear of the Atlantic storms and waves. The loss and waste he showed to be far greater than is generally imagined, and that Ireland and the islands which once bordered it to the west, south-west and north-west must have undergone, and be actually suffering, very great and serious waste and change. Considering the great scientific importance of the question, it was submitted that it would be becoming on the part of the Royal Irish Academy to promote a survey of the coast line as it actually stands at this commencement of the twentieth century, and to have points fixed as has been done for the coast of Scandinavia, so that hereafter it may be possible accurately to fix the rate at which the island is being wasted away by the Atlantic waves, and in this manner to allow of a determination being made of what was its former extent in prehistoric and early historic times.—Prof. Charles J. Joly read a paper on the point representations of screws. The reciprocal of the quadric in six variables representing screws of a given pitch plus ϕ , taken with respect to the quadric of zero pitch, is shown to be the quadric of pitch minus ϕ . From this property the remarkable relations detailed by Sir Robert Ball in his recent memoir, "Further Developments of the Geometrical Theory of Six Screws," are easily deducible. In the second part of the paper a method is explained of representing a screw by a pair of

weighted points in a given plane—the five numbers required consisting of the ratio of the weights and the two coordinates of each point of the pair.

NEW SOUTH WALES

Royal Society, October 3.—Prof. Liversidge, F.R.S., president, in the chair.—Marriage and descent among the Australian aborigines, by R. H. Mathews. In this short paper the author dealt with the social laws of some tribes in New South Wales, Queensland and elsewhere. Tables and genealogies were supplied illustrating the marriage restrictions, and the descent of the resulting progeny. A brief description was given of certain inaugural ceremonies through which the youths have to graduate in order to reach the status of aboriginal manhood.—On the constituent of peppermint odour occurring in many Eucalyptus oils—part i., by Henry G. Smith. The first Eucalyptus oil was distilled by Dr. White in 1788, at Sydney, and owing to the great resemblance between this oil and that obtained from the peppermint *Mentha piperita*, he named the tree from which he had obtained the oil the "Peppermint Tree." Its botanical name is *Eucalyptus piperita*. Since then many other species of Eucalyptus have been found to have this peppermint odour, and are generally known as "peppermints." The constituent giving this odour has now been isolated. It occurs in greatest amount in the oil obtained from the leaves of *E. dives*, next in that of *E. radiata*, and in fair amount in the oils of several other species. It is usually found in those Eucalyptus oils in which the principal terpene is phellandrene, although this is not always so, but generally there is an almost entire absence of Eucalyptol in those oils in which it occurs most abundantly. The crude oil of *E. dives* was taken for the preparation of this peppermint constituent. This constituent is not menthone, and is probably a new ketone; a molecular determination gave 155, so that probably its formula may eventually be found to be $C_{10}H_{18}O$.—On the crystalline structure of gold nuggets from Klondyke, Victoria and New Zealand, by Prof. Liversidge, F.R.S.. Sections of three nuggets from Klondyke were shown. The crystal faces are comparatively small, and the nuggets have a granular structure, as if built up of separate grains, of one or two millimetres in diameter. They are also more fissured and contain more cavities than usual. The sections of Victorian (Australian) and New Zealand nuggets are also made up of small crystals, and they present numerous small cavities after the removal of the quartz and iron oxide by treatment with hydrofluoric and hydrochloric acids, so that the sections present quite a different appearance from the very compact and largely crystallised nuggets from West Australia.

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