IT is announced in *Science* that Mr. George F. Baker, president of the First National Bank of New York City, has given a large sum, reported to be 400,000*l.*, to bring about an alliance between the New York Hospital and the Cornell Medical College. From the same source we learn that Dr. Arthur T. Cabot, a fellow of Harvard University, has bequeathed 20,000*l.* to the Harvard Medical School and the larger part of his estate, estimated at 100,000*l.*, to Harvard University, after the death of Mrs. Cabot. It is reported also that from the estate of George Crocker, Columbia University receives 315,00*l.* for the Crocker Cancer Research Fund, and that at the University of Rochester 52,500*l.* has been contributed to the endowment fund by old students living elsewhere.

FOR some years past Prof. M. J. M. Hill, F.R.S., has been endeavouring to bring into general use a modification of Euclid's method of treating the theory of proportion, in which one of the two distinct methods which Euclid employs to prove his propositions is shown to be sufficient to prove them all. The indirectness and consequent difficulty of Euclid's proofs then disappear. He has set forth his ideas in some detail in the July and October numbers of *The Mathematical Gazette* of this year, and he has arranged to give ten lectures, specially devised to meet the needs of teachers, on the subject, at University College, Gower Street, after Christmas. The lectures will be delivered on Tuesdays at 6 p.m., commencing on January 14, 1913. They are in connection with the London County Council, and are open on payment of a registration fee of 1*s.* to all teachers in schools and other educational institutions in the administrative county of London. Application for admission to the lectures should be made by January 1.

THE current session at University College, Nottingham, is the thirty-second since the foundation of the institution in 1881. The calendar for 1912–13, which has reached us, gives detailed information of courses of instruction for students desirous of graduating in one of the faculties of the University of London, and of classes arranged for technical instruction allied to the industries of the neighbourhood. The college confers the title of associate of University College, Nottingham, on students who have attended satisfactorily for three years any systematic degree or diploma course, and have passed the appropriate examinations, and on students who have passed the examinations of the three-years' course required by the Oxford and Cambridge Affiliation Scheme. College diplomas are awarded to those students who have followed the prescribed courses in engineering or mining, and passed the final examinations. Oxford and Cambridge affiliation certificates are awarded to students who, for three sessions, have received at least four hours' tuition weekly at the college, and have passed satisfactorily examinations approved by the University. The Universities of Cambridge and Oxford both grant certain privileges to students holding these certificates, who may subsequently enter either University. The diploma in mining has been approved by the Home Secretary for students qualifying for the Colliery Managers' Certificate.

A LETTER has been sent on behalf of the General Council of Edinburgh University to all the Scottish members of Parliament protesting against the action of the Treasury in respect of fees at the four Scottish universities. The Treasury has attached to the increased grants to the universities the condition that so far as class fees are concerned, an inclusive fee be substituted for the individual fees hitherto charged. In the statement addressed to the Scottish members of Parliament, we learn from *The Times*, the following paragraph occurs:—"In claiming that our ancient universities should be free we have no intention whatever of suggesting that they should not be required to give an account of how they spend public money. But the obligation to render such an account is a very different thing from the submission of the universities to the edicts of a State Department to which Parliament has assigned no right of interference with their internal affairs. The General Council protests against this extension of bureaucratic government to the Scottish universities. It is the first step towards a system which would in time destroy the true spirit of university education in Scotland." After reviewing French experience of State supervision of universities and contrasting it with the principle of academic freedom in German universities, the memorandum concludes:—"The plain teaching of history is not to be ignored. The universities of Scotland must remain free in respect both of their teaching and of their internal administration. The members of the General Council accordingly look with confidence to the Scottish members of Parliament to maintain this freedom, and to use their influence towards securing that the Treasury shall pay the grant to the universities, without deduction, and without conditions other than those laid down by Lord Elgin's Committee."

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 21.—Sir Archibald Geikie, K.C.B., president, in the chair.—A. S. **Russell** and R. **Rossi**: An investigation of the spectrum of ionium. The arc spectrum of an active preparation of ionium oxide mixed with thorium, separated by Prof. B. B. Boltwood from the pitchblende residues loaned to Prof. Rutherford by the Royal Society, has been investigated with a large Rowland grating. The complete spectrum of thorium was obtained, but no new lines were observed that could be attributed to ionium. It was deduced that if ionium were half transformed in 100,000 years, the preparation should contain about 16 per cent. of ionium oxide. By adding cerium and uranium to the preparation, it was found that 1 per cent. of the former and 2 per cent. of the latter could be easily detected spectroscopically. It was consequently concluded that the period of ionium cannot exceed 12,000 years. This result, taken in conjunction with Soddy's results on the period of ionium, points to the existence of at least one new, comparatively long-lived body between uranium and ionium in the disintegration series.—J. A. **Gray**: A note on the absorption of β rays.—J. A. **Gray**: The similarity in nature of X and primary γ rays. (1) Absorption experiments show that there is no fundamental difference in the absorption of X and γ rays. (2) The primary γ rays of radium E excite the characteristic radiations (series K) of silver, tin, barium, cerium, praseodymium and neodymium. (3) The scattering of the primary γ rays of radium E is probably similar in character and magnitude to that of ordinary X-rays.—J. Crosby **Chapman**: The spectra of fluorescent Röntgen radiations. Radiations belonging to groups K L have been investigated as regards their X-ray properties. The absorption of the various radiations of both groups in copper, silver, and platinum has been found. In all cases it is shown that, if radiations from different groups suffer the same absorption in aluminium, then they are equally absorbed in any other element.—Dr. Walter **Wahl**: Optical investigation of solidified gases. II., the crystallographic properties of hydrogen and oxygen.—R. E. **Slade**: An electric furnace for experiments *in vacuo* at tem-

© 1912 Nature Publishing Group

peratures up to 1500° C. This furnace was designed with a view to investigate, at temperatures up to 1500° C., certain cases of heterogeneous equilibrium in which the equilibrium is defined by the pressure of the system. Instances are the dissociation of oxides, nitrides, and carbonates and the reduction of oxides by carbon.—R. E. **Slade** and F. D. **Farrow**: An investigation of the dissociation pressures and melting points of the system copper—cuprous oxide. The melting point (temperature, composition) diagram of the system copper—cuprous oxide has been constructed. The following are the principal points:—Melting point of copper 1083°. Eutectic Cu_2O 3·5 per cent., Cu 96·5 per cent., 1065° (determined by Heyn). Two liquid phases appear at 1195°, the denser one having the composition Cu_2O 20 per cent., Cu 80 per cent., and the lighter one Cu_2O 95 per cent., Cu 5 per cent. Melting point of cuprous oxide 1210°. The critical temperature at which the two liquid systems become identical is too high to be determined.—Dr. A. **Russell**: Note on the electric capacity coefficients of spheres. In connection with Mr. Jeffery's paper published in vol. lxxxvii. of the Proceedings, p. 109, the author gives and refers to formulæ by means of which the values of the capacity coefficients of equal spheres can be easily found. He uses these formulæ to check the tables given in Mr. Jeffery's paper.—W. J. **Harrison**: The motion of viscous liquid due to uniform and periodic motion maintained over a segment of an infinite plane boundary.—Prof. B. **Hopkinson** and G. **Trevor-Williams**: The elastic hysteresis of steel. A bar of steel, the reduced portion of which is 4 in. long by ¼ in. diameter, is subjected to alternating stress in the high-speed fatigue-testing machine described in a previous communication. This machine gives direct axial stress up to range of 30 tons per square inch or more, between equal limits of tension and compression, at a rate of about 120 cycles per second. The elastic hysteresis is measured by determining, with the aid of thermo-couples, the fall of temperature between the centre of the piece and each end when it is undergoing alternating stress within the elastic range. The dissipation of energy corresponding to a given fall of temperature is determined by heating the specimen with an electric current and measuring the watts dissipated by resistance. In the mild steel used in the experiments the energy dissipated per cycle when the limits of stress are $\pm 12\frac{1}{2}$ tons per square inch (giving a range of 25 tons, which is within the limiting elastic range as determined by ordinary fatigue experiments) is about 25,000 ergs per c.c., and gives a fall of temperature of about 5°. This is of the same order of magnitude as that due to the magnetic hysteresis in similar material under strong magnetic forces. The elastic hysteresis varies approximately as the fourth power of the stress range.—W. R. **Bousfield**: Ionic size in relation to molecular physics, together with a new law relating to the heats of formation of solid, liquid, and ionic molecules. In a former paper it was shown that ionic volumes (derived from mobilities) and solution volumes were connected by an empirical linear relation.

$$EV_s = a - bI_v.$$

In the present paper a new empirical relation is established of the form

$$D^{-1} = p - qN(I_v - K),$$

where D is the effective molecular freezing point depression, i.e. $\Delta/N(1+a)$. In the former paper the experimental data were given for KCl and NaCl, and in the present paper for LiCl, which data determine the constants *a*, *b*, *p*, *q*, for each salt. It is now shown that we can express in terms of these constants—(1) The factor required to reduce arbitrary ionic volume units to absolute units; (2) the volume of the ionic nuclei; (3) the volume and mean density of the "watery atmospheres" associated with the ions. It is shown for a group of fourteen solid and liquid salts and acids that their heats of formation are given by the expression $7/8\delta V + H_1 + H_2$, where δV is the reduction of volume (or contraction) which takes place on combination, and H_1 and H_2 are constants for the elements of which they are composed. It is found that the heats of ionisation of the three salts may also be expressed under the same law as

$$\Sigma 7/8\delta V + H_1 + H_2 + 1{\cdot}3n - 29$$

where δV includes volume change of combined water as well as of ionic nuclei, n is number of molecules of combined water and -29 is a constant which represents endothermic changes involved in ionisation.—Dr. J. Emerson **Reynolds**: The synthesis of a silicalcyanide and of a felspar. During recent years the writer has obtained many compounds of silicon in which that element is directly united with the nitrogen of various organic groups, and amongst these silicocyanogen, SiN, in combination. The proof so obtained that silicon has a strong attraction for trivalent nitrogen in organic substances suggested that a similar capacity is operative in the mineral kingdom, but in respect of trivalent aluminium acting in the nitrogen rôle towards silicon. It seemed probable that some at least of the more important rock-forming minerals may be regarded as fully oxidised products of alumino-*silicides* somewhat analogous to SiN. The experimental work recorded in the paper supports this view, and has resulted in the formation of a remarkably stable substance termed *Calcium Silicalcyanide*, $Ca(SiAl)_2$, analogous to ordinary calcium cyanide, $Ca(CN)_2$. From this silicalcyanide a further synthesis of the felspar *Anorthite*, $CaSi_2Al_2O_8$, has been effected.—Prof. C. **Niven** and A. E. M. **Geddes**: A method of finding the conductivity for heat.

Royal Microscopical Society, November 20.—Mr. H. G. Plimmer, F.R.S., president, in the chair.—E. **Heron-Allen** and A. **Earland**: The distribution of *Saccammina sphaerica* (M. Sars) and *Psammosphoera fusca* (Schulze) in the North Sea, with particular reference to the suggested identity of the two species. These Foraminifera, belonging to the family Astrorhizidæ, and originally described as from the North Sea, but occurring also in all the great oceans, have been the subject of considerable controversy. Dr. Ludwig Rhümbler asserts that Psammosphœra is only an immature stage of Saccammina. As a result of the examination of about 150 dredgings made in the North Sea, the authors have no hesitation in affirming that the life-history of Saccammina, as recorded by Rhümbler, is a composite sketch, involving three separate and generally recognised specific organisms: Stages I. to III. represent the life-history of *Crithionina mamilla* (A. Goes); stage IV. is *Psammosphoera fusca* (Schulze), an extremely variable species, which occurs both free and sessile, but is in all its stages normally recognisable by the absence of a general aperture; stages V. to VII. represent the complete life-cycle of *Saccammina sphaerica* (Sars), so far as it is a shell-bearing organism.—Rev. Hilderic **Friend**: British Henleas. The Henleas are microscopic annelids belonging to the family of Euchytræids. The genus was created in 1889 by Michaelsen, and contained four authentic species and four which were doubtful. The present paper gives an enumeration of no fewer than nineteen species, eighteen of which are found in England and one in Ireland. Of these, seven new to science were found at Hastings in December last, and three have been found in Nottingham during the present year.—J. **Murray**: African

© 1912 Nature Publishing Group

Tardigrada. This paper adds thirteen species to the list of African Tardigrada; twelve were described in the author's previous paper, and Daday added a new species, *M. tetronyx*.

Institution of Mining and Metallurgy, November 21.—Mr. Edward Hooper, president, in the chair.—Allan J. **Clark** and W. J. **Sharwood**: The metallurgy of the Homestake ore. The round of operations after delivery of the mined ore to the mill bins may be summarised briefly as follows:—The ore is fed to mortars fitted with one inside amalgamation plate, when it is crushed wet by gravitation stamps and thence passes over a series of amalgamating plates. A special cone system separates a small proportion of the coarsest sand, which is reground and returned. A system of cone classifiers, the last of the series provided with bottom water feed, separates successive portions of the fine slime. The sand is collected, drained, and treated with cyanide solution, in vats from which the residues are discharged by sluicing. The slimes overflowing the various cones are thickened in classifying tanks having conical bottoms and peripheral overflow, and the thickened slime is conveyed by a pipe line to a cyanide plant, where it is collected and treated in filter presses, which are discharged without opening by means of an automatic sluicing device. Solutions are precipitated by zinc dust. Concentration proper is not practised, and no ore is sorted. From the time the ore leaves the mine, no elevation is necessary, and only a small proportion of the water has to be pumped back at certain stages. Of the total ore value 94 per cent is recovered, about 72 per cent. as amalgam, and 22 per cent. by the cyanide process.—J. W. **Ashcroft**: The flotation process, as applied to the concentration of copper ore at the Kyloe Copper Mine, New South Wales. An adjourned discussion on this paper, which had been introduced at a previous meeting, gained additional interest from the fact that a working model of the particular flotation process referred to in the paper was exhibited, and samples of well-known ores were treated before the members present.

CAMBRIDGE.

Philosophical Society, November 11.—Sir J. J. Thomson in the chair.—Sir J. J. **Thomson**: The theory of the motion of charged ions through gases.—Dr. G. F. C. **Searle**: A simple method of determining the viscosity of air. Air is compressed into a vessel of volume S c.c. (about 10 litres) and is then allowed to escape through a capillary tube of length l cm. and radius a cm. into the atmosphere, the pressure of which is P dynes per sq. cm. The pressure in the vessel falls from p_1 to p_2 during t secs. Over a considerable range of initial pressure the value of t/λ is found to be constant. The temperature of the air in the vessel is maintained nearly constant by the surrounding atmosphere. The method is convenient as a rough and ready method in a large practical class.—R. **Whiddington**: Note on the Röntgen radiation from kathode particles traversing a gas. During some experiments with a lime kathode it was noticed that even when the beam of kathode particles was not permitted to strike a target a comparatively strong radiation could be detected, proceeding apparently from the path of the kathode particles. The evidence goes to show that this is a Röntgen radiation arising from the encounters taking place between the kathode particles and the molecules of the residual gas within the discharge tube. It has been shown that a metal plate insulated and exposed to the action of these rays may charge up positively, emitting negative particles of very nearly the same velocity as the kathode particles traversing the discharge tube. The potential applied to the discharge tube varied in these experiments between 90 and 300 volts.—W. L. **Bragg**: The diffraction of short electromagnetic waves by a crystal. The paper deals with the interference phenomena observed by Herren Friedrich, Knipping, and Laue when a crystal is traversed by a narrow beam of rays from an X-ray bulb. The theory which is put forward by Laue to account for these phenomena postulates the existence of definite wave-lengths in the incident radiation, in order to explain the interference pattern of spots obtained. The paper shows that, on the contrary, the pattern obtained with the crystal of cubical zinc blende used by Laue is in reality the most general one possible for a continuous range of wave-lengths in the incident radiation, if the arrangement of atoms in the crystal is in accordance with the theory of valency volumes of Pope and Barlow. The incident radiation is regarded as a series of independent pulses, and the interference maxima as formed by reflection of these pulses in ideal planes in the crystal in which the atoms can be arranged, this point of view leading to greater simplicity of calculation.—H. E. **Watson**: Experiments on the electrical discharge in helium and neon.—H. C. **Pocklington**: Some diophantine impossibilities.—G. N. **Watson**: A class of integral functions defined by Taylor's series.—A. J. **Berry**: Notes on the volatilisation of certain binary alloys in high vacua. Experiments have been performed on the behaviour of certain binary alloys when heated in high vacua with the object of isolating intermetallic compounds (compare Roy. Soc. Proc., 86A, 1911, 67). In the case of alloys of copper and cadmium it was found that these two metals are quantitatively separable. When alloys of cadmium and magnesium are heated *in vacuo*, both metals volatilise together, but no definite relation between the composition of the residue and the distillate was established. The behaviour of the magnesium lead alloys indicates that the compound Mg_2Pb is largely dissociated in the vaporous state.

MANCHESTER.

Literary and Philosophical Society, October 29.—Prof. F. E. Weiss, president, in the chair.—Dr. Kurt **Loewenfeld**: Importance of autograph documents in the history of science (part i.). The author dealt with the usefulness of historical studies for the student of natural history, and the value of such studies for education as a whole. The documents exhibited and discoursed upon included many connected with John Dalton, the last table of atomic weights as drawn up by Dalton, between 1818 and 1827, amongst others; also letters by William Henry. A letter by Charles William Henry, inasmuch as it contradicts a statement in his own biography of Dalton, proves that he is not a trustworthy historian, and, as Charles William Henry's biography supplies some of the most valuable material for the important question of the genesis of the atomic theory, Dr. Loewenfeld considered this incident of importance.

DUBLIN.

Royal Irish Academy, November 11.—Count Plunkett, vice-president, in the chair.—W. J. **Dakin** and Miss **Latarche**: The plankton of Lough Neagh. The paper gives the results of the first detailed quantitative plankton research carried out on the lakes of the British Islands. Owing to the large area of the lake surface and the moderate depth (40 ft.) Lough Neagh is of particular interest. It is already famous for the presence, in very large numbers, of the Schizopod *Mysis relicta*. The authors have traced the seasonal development and interrelation of both the animals and plants by means of quantitative catche

© 1912 Nature Publishing Group

made at frequent intervals throughout a year. The seasonal variation is compared with that known for various European lakes. An interesting resemblance of Lough Neagh to the Danish lakes is discussed, and the contrast between the plankton of the Scottish lakes and Lough Neagh treated. The investigation has shown that so far as both the animals and plants are concerned Lough Neagh plankton contains a mixture of Arctic and Central European forms. Seasonal *form* variation has been observed in the case of several species, and the whole question of form variation is discussed. The authors cannot accept the Wesenburg-Lund-Ostwald theory that changes in shape in pelagic organisms are called forth directly by changes in the viscosity of the water. *Mysis relicta* has been found in thousands in the *surface* water of the lake at midnight. It was not previously known that *M. relicta* was a common plankton form.—Rev. T. **Roche**: The quadratic vector functions. The most general form of the quadratic vector function is taken to be

$$aS\rho\phi_1\rho+\beta S\rho\phi_2\rho+\gamma S\rho\phi_3\rho,$$

ϕ_1, ϕ_2, ϕ_3 being symbols of linear vector functions, which may be taken as self-conjugate. A discussion on the properties of the function $k_1\phi_1+k_2\phi_2+k_3\phi_3$ is prefixed by way of introduction. Some very interesting relations are found between the invariants and associated functions of three linear functions. Then an attempt has been made to classify the functions, cases of degeneration to binomial and monomial forms are examined, and a few paragraphs have been added on the problem of inversion. The general problem does not seem capable of a solution; two particular cases are worked out fully. The number of roots for which the function vanishes has been investigated, this problem being a special case of the general problem of inversion. The last paragraph deals with the "central axes" of the quadratic function.—In connection with the Clare Island Survey the following reports were read:—G. H. **Carpenter**: Pycnogonida.—W. F. **Johnson**: Myriopoda.—A. D. **Cotton**: Marine algæ, part ii.—P. H. **Grimshaw**: Diptera. This paper embodies the results obtained from the examination of more than 4000 specimens collected mainly during the summer months of 1910 and 1911. The number of species identified is 519, of which 160, or rather more than 30 per cent., are new to the fauna of Ireland. Some forty-four families are represented, and five species are new to Britain. Critical remarks are made regarding several of the species in the more difficult families, *e.g.* the Tendipedidæ (Chironomidæ) and the Anthomyiidæ, and it is hoped that such will prove an aid to future workers. The fauna of Clare Island includes, as at present known, 211 species, as compared with 476 recorded from the adjacent mainland. The species common to the island and the mainland number 168, while forty-three are recorded from the island alone.

CAPE TOWN.

Royal Society of South Africa, October 16.—Dr. T. **Muir**: Note on double alternants.—Dr. T. F. **Dreyer**: *Xenopus laevis* (the Plathander).—J. **Walker**: A short note on the occurrence of Aspergillosis in the ostrich in South Africa. The occurrence of Aspergillosis in the ostrich is recorded, and the author believes this to be the cause of mortality in chicks and to a less extent in adults. The fungus concerned was *Aspergillus fumigatus*. The seat of lesions is principally the lungs (pneumomycosis).—Dr. J. R. **Sutton**: A preliminary survey of the meteorology of Kimberley. A contribution to a study of the meteorology of the tableland of South Africa. An account is given of the principal meteorological elements of Kenilworth (Kimberley), all of which, with the exception of the rainfall, are expressed in deviations from the normal monthly means derived from observations made during the last fifteen years.—C. **Moorsom**: Some geodetic elements.—Dr. E. S. **Goddard** and D. E. **Malan**: (1) South African Oligochæta. Part i., a Phreodrilid from Stellenbosch Mountain. The anatomy of a new genus of *Phreodrilid oligochaeta* is described, and constitutes the first record of the family in Africa. The specimens were obtained on the top of Stellenbosch Mountain. The new genus—Gondwanædrilus—is of interest since its occurrence in Africa completes the circumpolar distribution of the family. Its anatomy is important since it fills in the last gap in the series of peculiar relations of the spermathecæ, and leads to an understanding of modifications such as the "autospermatheca" of Phreodriloides—an Australian form.—(2) Part ii., description of a new species of Phreodrilus. An account of a new species of Phreodrilus taken on Table Mountain. It is interesting since it is related to *P. beddardi* and *P. subterraneus*. The peculiar anatomical features concern the dorsal position of the spermathecal pores, and a large hollow penis. The new form suggests that Phreodrilus is the central type of the family. (3) Contributions to knowledge of South African Hirudinea. Part ii., some points in the anatomy of *Marsupiobdella africana*. An account of the anatomy of Marsupiobdella, a new Glossiphonid leech, with a large internal brood pouch. The main points are concerned with the distortion and displacement of the digestive, nervous, and reproductive systems by the great development of the brood pouch.—Dr. L. **Péringuey**: Portuguese commemorative pillars erected on the South African coast. During the reign of John II., King of Portugal, the Portuguese navigators sailed for the first time provided with commemorative pillars, or "Padraos" to be erected at the furthest point reached. Diogo Cam is the first of these navigators who left Portugal with these regulation pillars. Portuguese historians attribute to him the erection of three, the most southern of which, erected at Cape Cross in 15° 40′ S. in 1486, was rediscovered in 1893. But the old chroniclers are not clear about the number of Padraos erected by Bartholomew Dias, and hitherto three only were mentioned, whereas it would appear that he put up five. Of all these pillars two only are now known to be in existence, Cam's pillar at Cape Cross, and a fragment of the Padrao Santiago, from Angra Pequena, is in the Cape Museum. The object of this note is to direct attention to the possibility of finding some remnants of the others.

BOOKS RECEIVED.

Smithsonian Institution. Bureau of American Ethnology. Bulletin 52: Early Man in South America. By A. Hrdlička and others. Pp. xv+405. (Washington: Government Printing Office.)

The Ways of the Planets. By M. E. Martin. Pp. v+273. (New York and London: Harper and Brothers.) 5*s.* net.

Le Origini Umane. By G. Sergi. Pp. xi+202. (Torino: Fratelli Bocca.) 3.50 lire.

Le Principle du Mouvement des Eaux Souterraines. By J. Versluys. Dutch translation by F. Dassesse. Pp. 147. (Amsterdam: W. Versluys.) 7 francs.

In the Shadow of the Bush. By P. A. Talbot. Pp. xiv+500+plates+map. (London: W. Heinemann.) 18*s.* net.

New Trails in Mexico. By C. Lumholtz. Pp. xxvi+411. (London: T. Fisher Unwin.) 15*s.* net.

A Systematic Course of Practical Science for Secondary and other Schools. By A. W. Mason. Book I. Pp. vi+126. (London: Rivingtons.) 1*s.* 6*d.* net.

© 1912 Nature Publishing Group