UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

ABERDEEN.—The honorary degree of LL.D. is to be conferred on Sir J. C. Bose, founder of the Bose Research Institute, Calcutta; Prof. W. Bulloch, professor of bacteriology, London Hospital; Prof. J. Wight Duff, Armstrong College, Newcastle-upon-Tyne; Sir Daniel Hall, Permanent Secretary to the Board of Agriculture; Mr. J. H. Jeans, secretary of the Royal Society; and Sir Robert Jones, lecturer on orthopædic surgery, Liverpool University.

CAPT. JAMES W. LOW has been appointed assistant in the natural history department, University College, Dundee (University of St. Andrews).

APPLICATIONS are invited for the Radcliffe Crocker travelling scholarship in dermatology at University College Hospital Medical School. The scholarship is of the approximate value of 280*l*., and tenable for one year. Particulars are obtainable from the Dean, University College Hospital Medical School, Gower Street, W.C.1.

THE next election—the seventh—to Beit fellowships for scientific research will take place on or about July 15 next. The latest time for receiving applications is April 19. Forms of application and information respecting the fellowships are obtainable, by letter, from the Rector, Imperial College of Science and Technology, South Kensington.

A MOVEMENT has been started to form a properly constituted Old Students' Association at King's College, London. A committee has drawn up a provisional constitution, and a general meeting has been called for March 4, at 6 p.m., at the college. It has been possible to send notices of this meeting only to those old students whose names are on the register, but it is hoped that the meeting will be made widely known, and that as many old students as possible will be present.

THE first meeting of the International Federation of University Women, which will include delegates from the women's colleges throughout the world, will meet in London in July next. The chairmen of the International Federation are Dean Virginia Gildersleeve, of Barnard College, Columbia University, U.S.A., and Prof. Winifred Cullis, of the London (Royal Free Hospital) School of Medicine for Women, University of London.

THE Chadwick Trustees announce three public lectures on "Military Hygiene in Peace and War," by Gen. Sir John Goodwin, K.C.B., in the lecture-room, Royal Society of Arts, John Street, Adelphi, W.C.2, on Mondays, March 8, 15, and 22, at 5.15 p.m. The titles of the lectures are:—Army Hygiene prior to the Recent War, Army Hygiene during the Recent War (Application of its Principles to Active Service Conditions), and The Future of Army Hygiene (Its Relation to the Hygiene of the Civil Community). All information about Chadwick public lectures may be obtained from the secretary, Mrs. Aubrey Richardson, at the offices of the Trust, 40 (6th) Queen Anne's Chambers, Westminster, S.W.1.

THE opening of the British Bureau of the Office National des Universités et Ecoles Françaises at 50 Russell Square by M. Lucien Poincaré took place on Monday, February 23, in the presence of many distinguished university men of both countries. The bureau is intended to serve as a university *liaison* office between the two countries, giving advice to British students who may wish to study abroad or French students seeking to pursue their studies in England, and so bringing British and French universities into closer touch with one another. M. Poincaré, in declaring the bureau open, said the work which would be done in Russell Square would be of the greatest use, particularly to England and France. He hoped the day would come when all Englishmen would speak French and all Frenchmen would speak English. It was too early, he thought, to say we were internationalists, using the word in its better meaning. We were rather inter-Allies. It was still necessary to struggle for civilisation. He trusted that the Office National would be a powerful factor in uniting England and France in closer bonds and for working for the good of humanity. In the evening, M. Millerand, the Prime Minister of France, in the chair, a dinner given by the Groupe Inter-Universitaire Franco-Britannique was held at the Connaught Rooms in honour of M. Poincaré and to celebrate the formal opening of the bureau. Many public men were present, and the general trend of the speeches during the evening was to emphasise the possibility of this alliance of the universities helping to cement the already established union between France and England.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 12.—Sir J. J. Thomson, president, in the chair.—J. W. **McBain** and C. S. **Salmon**: Colloidal electrolytes. Soap solutions and their constitution. For the first time a comprehensive theory of soap solutions has been set up. This has led to a definition of colloidal electrolytes, a class the members of which will probably prove more numerous than acids and bases put together. They are salts in which one of the ions has been replaced by an ionic micelle. The ionic micelle in the case of soap exhibits an equivalent conductivity equal to that of potassium ion, and double that of the palmitate ion which it has replaced. Its formula may correspond to $(P')_n . m(H_2O)$, but more probably it is $(NaP)_x(P')_n . (H_2O)_m$, where P′ is the anion of the fatty acid in question. In concentrated solutions soaps exist chiefly in colloidal form, together with sodium or potassium ion, equivalent to the ionic micelle present, whereas in dilute solution both undissociated and dissociated soaps are crystalloids of simple molecular weight. In mixtures of soaps the tendency is to form more micellæ. Addition of electrolytes, however, exerts opposing influences, dehydrating and driving back dissociation. The conception of the ionic micelle serves to explain the behaviour of solutions of dyestuffs, indicators, and proteins. A modification of the dew-point method is described, which has enabled measurements of osmotic activity and "molecular weight" to be carried out, free from the uncertainties of interpretation of the results obtained for colloids by the osmometer method, and superseding the well-known but erroneous data of Krafft.—C. C. **Farr** and D. B. **Macleod**: The viscosity of sulphur. The results are discussed of a number of experiments, under a great variety of conditions, on the viscosity of sulphur with temperatures rising and falling between 123° C. and 278° C. The method employed was that of rotating cylinders, usually with a bifilar suspension. A unifilar suspension was, however, employed in the neighbourhood of the point of minimum viscosity. Great care was taken to secure that the sulphur had actually attained the temperature indicated by the thermometer used. The effects were observed of prolonged heating, also the effects of the absorption of gases, especially NH_3 and SO_2. The relation of the viscosity to the amount of "insoluble sulphur" present is considered.—C. V.

Raman and B. **Banerji**: Kaufmann's theory of the impact of the pianoforte hammer.—Comdr. T. Y. **Baker** and Prof. L. N. G. **Filon**: A theory of the second order longitudinal spherical aberration for a symmetrical optical system. The authors obtain a formula for the longitudinal spherical aberration in a symmetrical optical system of the type

$$\Delta x = (At^3 + Et^5)/(1 + Bt^2),$$

where Δx is the longitudinal spherical aberration on the axis, t is the slope to the axis of the emergent ray calculated by Gauss's method, and A, B, E are polynomials in the magnification of degrees 4, 3, and 6 respectively. It is shown (1) that a formula of this kind is, on the average, superior in numerical accuracy to the first two terms of the usual series of aberrations of successive order; and (2) that it removes a number of difficulties connected with convergency which occur in the methods at present in use. In particular, developments in powers of trigonometrical functions of the true inclination of the emergent ray are shown to be unsatisfactory. Certain invariant relations are obtained, connecting A, B, and E in general, and facilitating their computation. Formulæ are found enabling the functions A, B, and E to be calculated for a combination of lenses when the corresponding functions for the individual lenses are given, and a method is indicated whereby the contribution of each lens to the final image defects can be rapidly traced.—Prof. J. W. **Nicholson**: The lateral vibrations of sharply pointed bars. The paper is a sequel to one already published, which arose from a suggestion as to the formation of siliceous deposits on sponge-spicules of a certain type. The present paper deals with an exceptional case, for which the necessary analysis presents unusual features. It is that of a double rod each half of which is generated by rotation of the parabola $y = Ax^2$ about the axis of x. The influence of sharpness on the frequencies and nodal positions of the notes is traced numerically after the general analysis. It is shown that a limiting frequency and nodal position exist, so that the frequency is a lower limit to those producible under any conditions of support. As the rod becomes sharper all its frequencies tend to this value, while of the nodes one for each frequency tends to a definite position, and all the others to the extreme ends of the rod. The same conclusions apply to a single rod.—R. E. **Slade** and F. C. **Toy**: A new method of spectrophotometry in the visible and ultra-violet and the absorption of light by silver bromide. A new method of measuring the absorption of light by a substance has been devised. This method is independent of the relation between density and exposure of the photographic plate. The following values of the extinction coefficient of silver bromide at various wave-lengths have been determined:

λ		k	λ		k
450 μμ	...	270	400 μμ	...	2000
440 ,,	...	410	390 ,,	...	2790
430 ,,	...	600	380 ,,	...	3800
420 ,,	...	900	370 ,,	...	5100
410 ,,	...	1380	360 ,,	...	6700

This extinction coefficient is defined by the formula

$$I_2 = I_1 e^{-kd_1},$$

where I_1 and I_2 are the intensities of the light at points d centimetres apart in the absorbing medium. It is estimated that the average error of any of these values is less than 3 per cent.—Dr. S. **Chapman**: A note on Dr. Chree's discussion of two magnetic storms.—Dr. C. **Chree**: An explanation of the criticisms on Dr. Chapman's recent paper, "An Outline of a Theory of Magnetic Storms."

Linnean Society, February 5.—Dr. A. Smith Woodward, president, in the chair.—Dr. R. Ruggles **Gates**: The existence of two fundamentally different types of characters in organisms. The experimentalist point of view regarding evolution, resulting from the work in mutation and Mendelism, is frankly antagonistic to the views of palæontologists, anatomists, and others who deal with orthogenesis and the inheritance of acquired characters. While these two factors bear entirely different relations to evolutionary changes, both are necessary to account for evolution as it has taken place. The conclusion is reached that higher organisms exhibit two contrasted types of characters, which differ fundamentally (1) in their manner of origin, (2) in their relation to the structure of the organism, (3) in their relation to such phenomena as recapitulation, adaptation, and inheritance, and (4) in their relation to geographic distribution. To the first category belong cell-characters, which arise as mutations, are represented in every cell of the individual, and are usually inherited as distinct entities. To the second category belong organismal characters, which arise gradually through impact of the environment or through orthogenetic changes, may modify only localised portions of the life-cycle, and may not be incorporated in the germ-plasm from the first.

Zoological Society, February 10.—Prof. E. W. MacBride, vice-president, in the chair.—H. R. **Hogg**: Some Australian Opiliones. The genera and species described belonged to the sub-orders Palpatores and Laniatores, the Palpatores being represented by the genera Pantopsalis and Macropsalis of the family Phalangiidæ, and the Laniatores by genera of Triænobunidæ and Triænonychidæ. In the case of the Phalangiidæ the author had been able to establish that long mandibles were a male and short mandibles a female character.—Dr. C. F. **Sonntag**: Larynx and œsophagus of a common macaque, exhibiting several unusual features.—R. E. **Turner** and J. **Waterston**: A revision of the Ichneumonid genera Labium and Pœcilocryptus.

Physical Society, February 13.—Prof. C. H. Lees, president, in the chair.—Prof. C. H. **Lees**: Presidential address: The temperature of the earth's interior. In an average cubic centimetre of matter within the earth's substance the energy generated by radio-active matter is equivalent to the sum of the following quantities: (1) Heat utilised in rise of temperature, (2) loss of heat by conduction, etc., (3) change in gravitational energy, and (4) thermal stress. The only factor known with certainty is the loss by conduction, which works out to an average of 10 ergs per annum per c.c. The approximate water equivalent of the material of the earth is 0·8; therefore a rise of temperature of 1° C. requires 33,000,000 ergs. Hence, if there was nothing to take into account but the conduction loss, the temperature would fall by 1° in 3·3 million years. The discovery of radio-activity, however, showed that near the earth's surface the average amount of energy radio-actively generated is 1000 ergs per c.c. The quantity falls off rapidly as deeper rocks are reached. The present Lord Rayleigh suggests that the average may be about 10 ergs—just sufficient to balance the heat lost from the surface. If we accept this theory, we have to deal with a steady state, in which the temperature neither rises nor falls, and the calculation of the temperature at points inside the mass is simple. The equilibrium theory has been much criticised, however, and it is necessary to consider other alternatives. There are two possibilities: Either the temperature may be rising, due to the radio-energy exceeding the surface loss, or it may be falling if the balance is the other way. The geological evidence

renders the first contingency highly improbable. For a rate of change of temperature of 1° per million years the change in thermal energy involved is 33 ergs per annum per c.c., while the change in gravitational energy is 20 ergs per annum per c.c. These quantities can be lumped together and regarded as one by assuming the water equivalent of the earth's substance to be 1·6 times its actual value. Thus, neglecting radio-active effects, the time taken to cool 1° would be 5·4 million years instead of 3·3 million, as calculated without taking gravitational energy into account. From the relative amounts of lead and uranium found in rocks it has been calculated that the time which must have elapsed since the formation of the crust is of the order of 1,000,000,000 years. The temperature of solidification was probably about 1300° C., so we have the data necessary to give the present rate of cooling. From this, for any assumption regarding the actual distribution of radio-active material, the temperature at points within the earth can be determined.—Sir Arthur **Schuster**: The influence of small changes of temperature on atmospheric refraction. The paper is an investigation of the possible deviation of the light from a star near the sun due to the temperature changes in the atmosphere produced by the passage of the moon's shadow across the earth during an eclipse. It is shown that while the actual displacements from this cause vary widely for slight differences in the assumed conditions, they are always negligibly small compared with the effects observed at the last solar eclipse.

Royal Meteorological Society, February 18.—Mr. R. H. Hooker, president, in the chair.—Capt. C. J. P. **Cave**: The status of a Meteorological Office and its relation to the State and to the public (see p. 705).—W. H. **Dines**: Atmospheric and terrestrial radiation. The author endeavours to follow the flow of radiant energy, other than solar, both upward and downward across any horizontal plane in the atmosphere. Certain theoretical assumptions are made to render the calculation possible, and it is shown that the curves that represent the net loss or gain of heat from strata at different heights are all more or less of the same character, whatever possible values are ascribed to the emissivity of the various strata. It is found that over Europe the air from the earth's surface up to about 8 km. is losing heat by radiation, and that from 8 km. to 12 km. it is gaining heat, losing it again at more than 12 km. The validity of the assumptions made is then discussed, and it is pointed out that the numerical values agree well with those obtained by entirely different means.—D. **Brunt**: Internal friction in the atmosphere. When a steady state of motion is assumed, any portion of the atmosphere is in equilibrium under the action of three forces: the gradient of pressure, the deflecting force at right angles to its motion, and the frictional force. The first two of these are measurable, and so the third can be evaluated. The paper gives a comparison of the frictional force calculated in this manner, with the values derived from a theoretical discussion of turbulent motion. A new derivation of the solution of the equations of motion is given. Use is made of observations at the top and base of the Eiffel Tower to derive the value of the coefficient of eddy viscosity. An additional note shows that a solution of the equation of motion is possible in cases where the coefficient of eddy conductivity varies with height.

CAMBRIDGE.

Philosophical Society, February 9.—Mr. C. T. R. Wilson, president, in the chair.—F. W. **Aston**: The mass spectra of the chemical elements. By means of a special arrangement of electric and magnetic fields it is found possible to bring positive rays of definite mass to a focus, independent to some extent of their velocity, so that the dispersion can be made much greater than hitherto without loss of intensity. In this way a mass spectrum is formed on which the values of mass can be compared, in favourable cases, to an accuracy of about one part in a thousand by comparison with known reference lines such as O (16), C (12), etc. In this way atmospheric neon is definitely proved to consist of two isotopes of mass 20 and 22. Argon gives a line exactly at 40, and if it is a mixed element the other constituents must be present in very small proportion. Chlorine gives a group of four lines exactly at 35, 36, 37, and 38, and others from which good evidence can be adduced that this element consists of at least two isotopes, Cl^{α} (35) and Cl^{β} (37), (36) and (38) being the two corresponding hydrochloric acids. Mercury is also found to be a mixture of isotopes, probably three in number, their masses not yet being accurately determined. Very interesting results are yielded by helium and hydrogen; the former appears to be a "pure" element of mass 4·00, but hydrogen is very definitely heavier than unity (O=16. H_1, H_2, and H_3 all give consistent values in approximate agreement with that accepted by chemists: 1·008 for hydrogen. When due allowance has been made for multiple charges, it is found that of more than fifty atomic and molecular masses so far determined, every one, with the exception of the three hydrogen lines, falls on a whole number within the error of experiment.—K. **Molin**: An examination of Searle's method for determining the viscosity of very viscous liquids.—H. W. **Richmond**: Note on the Diophantine equation $t^3+x^3+y^3+z^3=0$.—Prof. H. F. **Baker**: Mathematical notes: (1) The stability of rotating liquid ellipsoids; (2) the general theory of the stability of rotating masses of liquid; (3) the stability of periodic motions in general dynamics; (4) the invariance of the equations of electrodynamics in the Maxwell and in the Einstein forms; (5) a property of focal conics and of bicircular quartics; (6) the Hart circle of a spherical triangle; (7) a proof of the theorem of a double six of lines by projection from four dimensions; (8) a group of transformations of rectangular axes; (9) transformations with an absolute quadric; and (10) the reduction of homography to movement in three dimensions.

EDINBURGH.

Royal Society of Edinburgh, January 12.—Prof. F. O. Bower, president, in the chair.—Prof. W. **Peddie**: The atomic space lattice in magnetite. The question of the uniqueness of the determination by the X-ray method was discussed. It appears that the solution is probably not unique within the limits of accuracy in observation.—J. **Marshall**: An unnoticed point in the theory of Newton's rings. By consideration of the passage of light-waves through three media the author discussed the considerations under which the centre of the rings was a black spot or a bright spot. These depend upon the relative refractive indices of the three materials. It was shown that the reason why Brewster obtained a bright spot at the centre with an appearance of interference rings was because the refractive indices of his materials were approximately in geometrical progression.—A. T. **Doodson**, R. M. **Carey**, and R. **Baldwin**: Theoretical determination of the longitudinal seiches of Lake Geneva. The essential feature of this paper was the development of a mathematical method (due to J. Proudman) of successive approximations by which the nodes of seiches in irregular-shaped basins can be calculated. The method was applied to the seiches of Lake Geneva with satisfactory results.

February 2.—Sir George A. Berry, vice-president, in the chair.—Dr. C. G. **Knott** and Miss **Dallas**: Magnetic strains in nickel-steel tubes. The material was the usual commercial nickel-steel with 2·63 per cent. of nickel. The four tubes were cut down from the same bar, being all of equal length and equal width, and the bores were $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1 in. in diameter. The changes in the length of each tube in various fields were measured, as were also the corresponding changes in volume of the bore of the material and in the external form when the bores were plugged so that the tubes were in appearance solid cylinders; and from these measurements the values of the several linear dilatations in these fields were calculated. The longitudinal dilatation was always positive, attaining a value of from $3{\cdot}5\times10^{-6}$ to nearly 5×10^{-6} in field 500. The corresponding radial and tangential dilatations were negative, and ranged from $-1{\cdot}3\times10^{-6}$ to $-2{\cdot}4\times10^{-6}$. The results indicate that a spherical element becomes ellipsoidal or spheroidal, with the longest axis along the axis of the tube. If the effect is to be explained in terms of the orientation of magnetic molecules, then these molecules tend to set with their longer axes along the lines of magnetisation. In former experiments with iron and steel the longitudinal dilatation changed sign from positive to negative in fields of about 300 to 400. In nickel, again, the longitudinal dilatation was always negative and about eight or ten times larger than in the case of either iron or steel. In nickel-steel the dilatation remained positive up to the highest fields used (about 900), although in three of the tubes it passed its maximum in field 400 or 500. So far as magnetic strains are concerned, the small admixture of nickel does not impart to the alloy any nickel characteristic whatever.—Prof. W. **Peddie**: The adequacy of the Young-Helmholtz theory of colour-vision and colour-blindness. Trichromasy in normal eyes is not now theoretical, but a proved fact. Hering's theory, which is favoured by some investigators, is, as Helmholtz showed, also a trichromatic theory; and while both can account for the observed facts, the Young-Helmholtz theory is the simplest that can be formulated. Lack of recognition of its accuracy has been due to non-recognition of the fact of normal trichromasy; or to the erroneous supposition that it is tied down to any one definite view of the nature of the physical and physiological actions concerned in vision; or to the equally erroneous supposition that it can account for only one particular type of colour-blindness with merely individual variations. It can account for any type that is known, or for any at present unknown which may afterwards be found to exist, provided only that it arises from limitation of the at present known normal conditions.—Prof. W. **Peddie**: Note on the quaternionic system as the algebra of the relations of physics and relativity. The author showed that in all cases in which our observations are upon directed phenomena occurring in tridimensional space, but which are actually or merely descriptively to be regarded as influenced by the existence of that space in space of a higher order, the appropriate algebra to be used in their investigation is that of quaternions with the addition of the symbol of the space involved.

PARIS.

Academy of Sciences, February 2.—M. Henri Deslandres in the chair.—The president announced the death of Jules Boulvin, correspondant of the Academy.—C. **Moureu** and G. **Mignonac**: The dehydrogenation of the primary and secondary alcohols by catalytic oxidation. A general method of preparation of aldehydes and ketones. Finely divided silver deposited on asbestos was found to be the best catalyst, and the oxidation is carried out in stages, only about half the amount of air theoretically required for the full reaction being employed in the first stage. The results for nine alcohols are given; the yields are high—62 per cent. for formaldehyde and 70 to 95 per cent. for the higher aldehydes.—A. **Gautier**: The normal arsenic in living tissues and the traces of iodine found in air and waters. Some necessary corrections.—G. A. **Boulenger**: An extraordinary tortoise, *Testudo Loveridgii*. This tortoise is the first example of a reptile in the adult state without ribs, and is a unique case of normal osteolysis.—M. Chodat was elected a correspondant for the section of botany in succession to M. Flauhault, elected non-resident member, and M. Ch. Nicolle a correspondant in the section of medicine and surgery in succession to the late M. Lépine.—L. **de Pesloüan**: A congruence between Bernoulli's numbers.—P. **Idrac**: Study of hovering flight in Upper Guinea.—M. **Romieux**: Alluvial strata of the Lot in the neighbourhood of Fumel.—L. **Brillouin**: The continuous spectrum of X-rays.—F. **Canac**: The determination of the axes of symmetry of a cubic crystal.—R. **Abrard**: A Mesoliassic fauna of Sidi Mouley Yakoub (Western Morocco).—F. **La Porte**: Atmospheric observations at Gâvre by means of free rubber balloons. The experimental results can be fairly well represented by Dines's formula with a modified numerical constant, $V=\frac{90\sqrt{F}}{(F+P)}$, where V is the ascensional velocity per minute, F the ascensional force, and P the weight of the envelope in grams.—L. **Emberger**: The evolution of the chondriome in the vascular Cryptogams.—L. **Daniel**: Antagonistic reactions and *rôle* of the pad in grafted plants.—M. **Bezssonoff**: Experimental sexuality in fungi, situated on the typical structure of the sexual plasma.—F. **Gard**: Division in *Euglena limosa*.—G. **André**: The inversion of saccharose in the juice of the orange.—E. **Hérouard**: Double monsters of the scyphistome.—C. **Gessard**: Pyocyanoid bacilli.

BOOKS RECEIVED.

The Topographical Anatomy of the Limbs of the Horse. By Dr. O. C. Bradley. Pp. xi+172. (Edinburgh: W. Green and Son, Ltd.)

Harmsworth's Universal Encyclopedia. No. 1. Pp. xix+128. (London: The Amalgamated Press, Ltd.) 1*s.* 3*d.*

Index of Economic Material in Documents of the States of the United States. Pennsylvania, 1790–1904. Part i. By A. R. Hasse. Pp. 810. (Washington: Carnegie Institution of Washington.)

Index to U.S. Documents relating to Foreign Affairs. 1828–1861. In three parts. Part ii. By A. R. Hasse. Pp. 795–1331. (Washington: Carnegie Institution of Washington.)

British Journal Photographic Almanac and Photographer's Daily Companion, 1920. Edited by G. E. Brown. Pp. 912. (London: H. Greenwood and Co., Ltd.) 1*s.* 6*d.* net.

A Field and Laboratory Guide in Physical Nature-Study. By Prof. E. R. Downing. Pp. 109. (Chicago: University of Chicago Press; London: Cambridge University Press.) 1 dollar net.

Practical Pharmacology: For the Use of Students of Medicine. By Prof. W. E. Dixon. Pp. viii+88. (Cambridge: At the University Press.) 7*s.* 6*d.* net.

Chemistry for Textile Students. By B. North. Assisted by N. Bland. Pp. viii+379. (Cambridge: At the University Press.) 30*s.* net.

An Introduction to the Study of Cytology. By Prof. L. Doncaster. Pp. xiv+280+xxiv. (Cambridge: At the University Press.) 21*s.* net.