

APPLICATIONS for grants in aid of scientific investigations bearing on agriculture to be carried on in connexion with a university, university college, or other approved institution or society in England and Wales during the academic year beginning Oct. 1 next are invited by the Ministry of Agriculture and Fisheries. Conditions on which the grants will be made are to be found on Form A.53/T.G., copies of which are obtainable from the Secretary of the Ministry, 10 Whitehall Place, S.W.1. The latest date for the return of completed forms of entry is May 15.

SECONDARY education in England and America is the subject of an article by Dr. Grizzell, professor of secondary education in the University of Pennsylvania, appearing in the December number of *School Life*. This is the fortieth of a series of articles sponsored by the National Committee on Research in Secondary Education, and records some of the conclusions reached as the result of a carefully planned co-operative study undertaken by a joint committee of experts of the two countries in 1928. Dr. Grizzell recognises the existence in both of a tendency in the direction of wider educational opportunity for the adolescent; but the resultant general reorganisation has been more rapid in the United States. The recent development in England of the higher elementary and central schools is compared with the high school movement which began in the United States almost a century earlier. He notes also a tendency in both countries to extend the period of secondary education upward. The 'junior college' movement in America is the counterpart of the development in England of two-year courses of specialised study after the 'first' school examination, but is, to all intents and purposes, a separate institution and avoids extreme specialisation in the academic field. The greater part of the article is devoted to a survey of contrasting practices and divergent tendencies which the author has observed in every important aspect of secondary education in the two countries. Some of these differences are summed up in the dictum, "To the English teacher, education is dominantly an art; to the American it is rapidly becoming a science".

THE United States Commissioner of Education, discussing, in his report for 1928-29, recent significant events and tendencies in higher education, gives the first place to increased scientific investigation of institutional problems and objectives. Such investigations have been reported during the year by scores of universities. Scientific and semi-scientific methods of investigation have been ousting the older methods of philosophy and mere observance of tradition. William James's passion for grappling with 'stubborn facts' seems to pervade the learned world, and this is attributed to necessity rather than choice, for the increasing industrialisation, machine production, changing of social customs, and other characteristics of a fast evolving civilisation make imperative a correspondingly rapid adaptation on the part of educational institutions, and for this they find themselves compelled to depend more and more on research and scientific study. Changes in general organisation of collegiate work are illustrated by the rapid growth of 'junior colleges' (including the first two years of the traditional 4-years liberal arts college course): the increase in their number during the year amounted to 25 per cent. Registration of full-time students in colleges and universities meanwhile increased by only 2 per cent. With some of the pressure of numbers removed and with a continued increase in financial support, stress may now be put, says the Commissioner, on quality of output. Institutions are studying, as never before, both the quantitative and qualitative demands by society for their human product.

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Birthdays and Research Centres.

Mar. 29, 1890.—Dr. H. SPENCER JONES, F.R.S., H.M. Astronomer at the Cape of Good Hope.

The erection of a large reflecting telescope in the southern hemisphere is an urgent need. It should have an aperture of at least 72 inches, since, for many purposes, great light gathering power is essential, and it should be equipped with a spectroscope adapted for one-, two-, or three-prism dispersion. Such a telescope would be available for determining the radial velocities of faint stars, and for the study of distant nebulae and other problems which are beyond the reach of existing instrumental equipment. The full interpretation of many observations obtained with large instruments in the northern hemisphere is dependent upon similar observations being secured in the southern hemisphere.

In recent work, the need has been felt of a publication in which are summarised the analyses of spectra for which the multiplet relationships have been investigated. The identified energy levels in the atom and the excitation potentials and multiplet identifications of individual lines should be given. Many of the original papers are in publications which are not available for reference anywhere in South Africa.

April 4, 1852.—Prof. A. P. COLEMAN, F.R.S., emeritus professor of geology in the University of Toronto.

Recent work along the St. Lawrence and near Moose Factory and Churchill on Hudson Bay proves that the marine beds, long known in those regions, include not only postglacial deposits, as usually stated, but also interglacial beds. The interglacial sea reached twice the height of the postglacial one. The last glaciation in eastern America was much less massive than an earlier one, suggesting that the greater load of ice implied a correspondingly greater depression of the lowlands. How close to isostatic equilibrium do such adjustments come, and how much lag is to be expected when the load of ice is removed? Have similar relations been found between interglacial and postglacial marine levels in northern Europe?

Societies and Academies.

LONDON.

Physical Society, Feb. 6.—E. B. Moss: A ballistic recorder for small electric currents. The standard thread recorder is so modified that it records ballistic throws in instead of the usual steady deflection. By this means, the current-sensitivity may be increased at least twenty-five times.—F. J. Scrase: The instrumental phase-difference of seismograph records: an illustration of the properties of damped oscillatory systems. A discussion is given of the method of interpretation of the maxima shown on the records of earthquakes during the surface-wave phase. The usual procedure is to treat the waves (which actually appear as beats) as being truly simple harmonic. In general, this procedure does not necessarily lead to the correct interpretation. In direct registration, the true earth maximum may have occurred one half-period later than the time obtained by the usual correction. With galvanometric registration, the maximum may have occurred either one, two, or three half-periods earlier than the time indicated by the usual formula due to Galitzin. For direct registration, the phase correction at present in use appears to be as good as one of the alternatives. For galvanometric registration, the correction suggested by

Somville, which is one half-period less than Galitzin's, should be adopted.—H. E. Beckett: The reflecting powers of rough surfaces at solar wave-lengths. A hemispherical mirror was used for integrating diffusely-reflected energy upon a thermopile receiver. The paper deals at length with the errors inherent in the method and with the adjustment of the apparatus. The theory of the method is simplified by the introduction of an auxiliary specimen which, in particular, renders the observations independent of the degree of blackness of the thermopile receiver.

Institute of Metals (Annual General Meeting), Mar. 11.—W. F. Collins: The corrosion of early Chinese bronzes. The patina and patination deposits formed by corrosion have resulted in the formation of definite minerals. The Chinese bronzes contain an unusually high percentage of lead. This preliminary research indicates that the bronze metallurgy of the early Chinese is distinct from that of the Sumerians.—C. F. Elam: An investigation of the microstructures of fifteen silver Greek coins (500–300 B.C.) and some forgeries. All the genuine coins showed evidence of striking between dies, as opposed to the forgeries, which, with one exception, were made by casting only. Analyses indicated that the coins were sometimes made from nearly pure silver, and sometimes copper was added. The forgeries contained copper, and in two cases, zinc.—H. J. Gough and H. L. Cox: The mode of deformation of a single crystal of silver. A single crystal of silver has been tested under alternating torsional stresses with the especial object of studying the formation of twin bands. Throughout the tests, however, no definite twin markings were observed, although the surface of the specimen was covered by a complete system of slip-bands in good agreement with the maximum resolved shear stress law. The choice of silver as a suitable material for the study of the formation of twin bands under applied stress was made on the grounds that in the aggregate form silver is known to twin very readily.—C. H. M. Jenkins: Some properties of metallic cadmium. By maintaining cadmium cold during rolling, the material produced possesses properties markedly different from metal which is allowed to warm during this process. In the short-time tensile tests, worked material is stronger than cast material; but under prolonged stress the cast alloys are inferior to rolled samples. Microscopic examination was also undertaken on the various materials produced. The X-ray examination of samples of hot- and cold-worked cadmium does not indicate an allotropic modification at room temperature and ordinary pressures, but there are marked differences in properties, which suggest a preferred orientation.—P. J. Durrant: The constitution of the cadmium-rich alloys of the system cadmium-silver. The constitution of the alloys of cadmium and silver from 0 to 40 per cent by weight of silver has been re-investigated by the methods of thermal and micrographic analysis. The liquidus consists of four smooth curves which intersect with peritectic horizontals at 343°, 592°, and 640° C. In the solid state the system gives rise to the following solid solutions: (1) extending from 0 to 6 per cent by weight of silver; (2) extending from 18 to 33.5 per cent by weight of silver; (3) extending from 36.2 to 39 per cent by weight of silver.—D. Stockdale: The solid solutions of the copper-silver system. The mutual solubilities of copper and silver have been determined, chiefly by the method of examining quenched specimens under the microscope. As this method fails at low temperatures, further information about the position of the phase boundaries was sought by measuring the electrical resistance of quenched wires. A 'differ-

ential' method which shows up small, abrupt changes in the electrical resistance of alloys at the temperatures at which they occur is also described.—T. P. Hoar and R. K. Rowntree: A note on the silver-rich aluminium-silver alloys above 600° C. Aluminium of high purity and the combined use of thermal and micrographic analysis make possible certain modifications in the previously existing diagram.

PARIS.

Academy of Sciences, Feb. 9.—Molliard: The relations existing between the various organic acids elaborated by *Sterigmatocystis nigra*. In cultures containing insufficient mineral salts, both gluconic and citric acids are formed as oxidation products of the sugars. Both can serve as food material for the mould; but citric acid is not formed from gluconic acid.—Paul Marchal: Micropterism and seasonal dimorphism in *Trichogamma*.—André Blondel: The rationalisation of the electromagnetic equations.—M. de Sparre: Concerning Foucault's pendulum. Remarks on a communication of Charron.—Armand de Gramont was elected a free academician in succession to the late Achille Le Bel.—A. Buhl: Conoidal propagations in wave geometry. Waves derived from the ellipsoid.—Jean Capoulade: Green's harmonic function of a domain of revolution.—Jean Pierre Robert: Mediation and metaharmonic functions.—Georges Calugaréano: A generalisation of Borel's theorem on meromorph functions.—L. Tchakaloff: The interval of variability of ξ in the formula

$$\int_a^b p(x)\phi(x)dx = \phi(\xi)\int_a^b p(x)dx.$$

—F. E. Myard: The realisation of mechanisms with pure rolling.—Paul Le Rolland: A resonance method for measuring rigidity and testing the stability of a construction.—E. Brylinski: A new system of units. Discussion of a recent communication by A. Blondel on the same subject.—Vernotte: The impossibility of assuring at any moment a sufficient and known thermal isolation with a solid insulating material. The loss through the insulating material is only relatively small when the steady state is attained. At any given moment, the loss depends not only on the temperatures, but also on the variation of these temperatures with the time.—L. Dubar: Rectifying elements with copper oxide. By micrographic analysis, Pélabon has shown that the oxide layer of a copper oxide rectifier is essentially non-homogeneous and consists of a relatively thick and semi-conducting layer of cuprous oxide holding some cupric oxide in suspension, this layer being separated from the copper by a very thin semi-insulating skin of nearly pure cuprous oxide. The electrical properties of these layers have been studied separately, and the results are in agreement with Pélabon's hypothesis.—Th. V. Jonsescu and C. Mihul: The dielectric constant and the conductivity of ionised gases.—Jean Louis Destouches: The capture of electrons by positive ions. Contrary to the views expressed by Rutherford, the results obtained show that the phenomenon of capture of electrons is the same whatever may be the relative velocity of the ions and electrons.—J. Peltier: The exploration of ferromagnetic bodies of revolution by the use of rotating fields.—J. Gilles: The dispersion of internal energy at the quadruple and triple terms $3sP$, $3pP$, $3pD$, in the spectra of the elements carbon, nitrogen, oxygen, and fluorine at different degrees of ionisation.—Pauthenier and Bart: The double refraction of safrol. Safrol, whether of commercial quality or carefully purified, shows no residual double refraction in either constant or alternating fields. This is not in agreement with the results of Leiser.—Desmaroux and Mathieu: Remarks on the structure

of nitrocellulose. Discussion of the results of X-ray studies of nitrocellulose.—Mlle. O. Hun: Contribution to the ebullioscopic study of the complexes formed by the cadmium halides and the corresponding alkaline halides.—Augustin Boutaric and Jean Bouchard: The influence of light on colloidal solutions in fluorescent media. The rôle of antioxidants.—Maurice Auméras: The specific heats of solutions of sodium sulphate.—N. Slomnesco: The decomposition of carborundum by a mixture of nitric and hydrofluoric acids.—P. Cordier: The dibenzylsuccinic acids.—A. Mavrodin: The action of ethylmagnesium halides on ethyl diethylcyanacetate.—V. Hasenfraz: Nativelle's digitaline and digitoxin.—Jean Lacoste: Stratigraphical notes on the southern Rif (Moulay Bou Chta region).—Bogdan Varitchak: Remarks on the distribution of the cytochrome at the moment of zoospore formation.—L. Margailan: The oil of *Wrightia annamensis*, an oil resembling castor oil. This oil strongly resembles castor oil in physical and chemical properties; there is one point of difference, the *Wrightia* oil is much more soluble in light petroleum ether.—J. Millot: The comparative anatomy of the middle cephalo-thoracic intestine in the true spiders.—A. B. Chauchard and S. Kajiwara: The relation of the chronaxies of antagonists in narcosis produced by compression of the brain.—Georges Bourguignon and Socrate Eliopoulos: The action of iodine, calcium, and magnesium ions on the oscillometric index and the arterial pressure in trans-cerebral-dielectrolysis.—R. Marcille: An apparatus affording protection against toxic gases.—Charles Richet: Remarks on the preceding communication.

WASHINGTON, D.C.

National Academy of Sciences (*Proc.*, Vol. 16, No. 11, Nov. 15).—William Hořgaard: (1) The stress distribution in welds. By a process of integration and variation, which presupposes continuity, an expression, valid within the limit of elasticity, is obtained for the stress distribution in the case of a bar connected to another structural member subject to simple tension or compression.—(2) The stress distribution in-welded overlapped joints.—H. Diamond and F. W. Dunmore: A radio system for blind landing of aircraft in fog (see *NATURE*, Feb. 14, p. 252).—Theodore Theodorsen: A sensitive induction balance for the purpose of detecting unexploded bombs. A power coil produces a field and the fluxes through two pick-up coils are compared. The field is considered to consist of the undisturbed power field and the superimposed field induced in the hidden object; the latter is detected by the pick-up system. A small 500-cycle generator is used.—Frederick D. Rossini: The heat of formation of water. The calorimeter was surrounded by a constant temperature jacket and contained a measured quantity of water, a temperature measuring device, stirring mechanism and a reaction vessel for burning the gases at constant pressure, and a heating coil. The thermal energy liberated by combustion of oxygen and hydrogen to form a measured mass of water is compared with that liberated by a measured quantity of electrical energy. Thus the results depend on the determination of a mass of water formed and a quantity of electrical energy passed. The heat of formation of one mole (18.0156 gm.) of liquid water found is $285,890 \pm 40$ absolute joules or $68,313 \pm 10$ gm. cal. (15°).—Horace S. Isbell: (1) Crystalline alpha and beta methyl-*d*-gulonides.—(2) The ring structure of mannose.—M. Demerec and J. G. Farrow: (1) Non-disjunction in the X-chromosome in *Drosophila virilis*.—(2) Relation between the X-ray dosage and the frequency of primary non-disjunctions of X-chromosomes in *Drosophila virilis*. Primary non-

disjunction increases with X-ray dosage at first, but falls off eventually, when the fertility of treated flies also declines.—L. J. Stadler: Recovery following genetic deficiency in maize. Recovery of an 'inactive' gene has been observed equally in X-rayed and untreated material.—Walter M. Nielsen: Magnetic analysis of negative ions in mercury vapour. Electrons from a tungsten filament are projected parallel to a magnetic field of 100 gauss; mercury vapour passes up the discharge space and ions are produced by a beam of electrons. Positive or negative ions are 'pulled out' by an accelerating potential and analysed magnetically. Evidence was found of negative ions at pressures of the order of 10^{-4} mm. of mercury.—Hugh L. Dryden and George C. Hill: The pressure of the wind on large chimneys. An experimental chimney-stack, 10 ft. in diameter and 30 ft. high, was erected on the roof of one of the U.S. Bureau of Standards buildings and wind pressures measured at twenty-four stations round the circumference at a single elevation about two-thirds of the height from the base. Arrangements have been made for similar observations on a new chimney at the Bureau. Wind pressure on a chimney is a function of the ratio of height to diameter of chimney and possibly of surface-roughness. It may reach large values locally, but 20 lb. per square foot of projected area at a wind speed of 100 miles an hour is generally a safe value. Experiments on small cylinders cannot be used to predict wind pressure on account of the large scale effect.—L. P. Eisenhart: Projective normal co-ordinates.—H. S. Vandiver: (1) On the norm-residue symbol in the theory of cyclotomic fields.—(2) On the second factor of the class number of a cyclotomic field.—E. T. Bell: Periodic recurring series.—H. F. Bohnenblust: Note on singularities of power series.—J. H. C. Whitehead: A method of obtaining normal representations for a projective connexion.—Tracey Yerkes Thomas: On the unified field theory (1). Einstein's theory introduces the possibility of distant parallelism into the scheme of Riemannian geometry; in each point of the underlying continuum of space and time, there is a local Cartesian co-ordinate system in which the Pythagorean theorem is satisfied. These systems are determined by four independent vector fields. Subject to certain conditions, a system of sixteen wave equations is constructed to represent the combined gravitational and electromagnetic field.—Marston Morse: The critical points of a function of n variables.

Official Publications Received.

BRITISH.

- Geological Survey Department: Tanganyika Territory. Short Paper No. 6: A Note on the Geology of the Country around Tendagaru, Lindi District. By Dr. John Parkinson. Pp. 16+7 plates. (Dar es Salaam.) 2s.
- Canada. Department of Mines: Geological Survey. Memoir 163: Geology of Southern Alberta and Southwestern Saskatchewan. By M. Y. Williams and W. S. Dyer. (No. 2244.) Pp. iii+160+5 plates. Summary Report, 1928, Part C. (No. 2218.) Pp. 115. Summary Report, 1929, Part A. (No. 2251.) Pp. 319. Summary Report, 1929, Part C. (No. 2250.) Pp. 50. Economic Geology Series, No. 8: Zinc and Lead Deposits of Canada. By F. J. Alcock. (No. 2229.) Pp. vii+406+8 plates. 75 cents. (Ottawa: F. A. Acland.)
- Department of Agriculture, Straits Settlements and Federated Malay States. Scientific Series, No. 4: The Bionomics and Control of *Leptocoris acuta* Thunb., with Notes on other *Leptocoris* spp. By G. H. Corbett. Pp. ii+40+7 plates. (Kuala Lumpur.) 1 dollar.
- Southern Rhodesia. Geological Survey Bulletin No. 17: The Geology of the Country between Gatooma and Battledfields. By A. M. Macgregor. Pp. 144+13 plates. (Salisbury.) 4s. 9d.
- Department of Health for Scotland. First Report of the Scottish Advisory Committee on Rivers Pollution Prevention. 1: Summary of the Law relating to Rivers Pollution Prevention; 2: The River Tweed and its Tributaries. Pp. 58. (Edinburgh and London: H.M. Stationery Office.) 1s. net.
- Proceedings of the Society for Psychical Research. Part 117, Vol. 39, February. Pp. 347-378. (London.) 2s. 6d.
- South Australia. Annual Report of the Director of Mines and Government Geologist for 1929. Pp. 8. (Adelaide: Harrison Weir.)