

THE current calendar of the Merchant Venturers' Technical College, in which the faculty of engineering of the University of Bristol is provided and maintained, gives particulars of the exemptions accorded to graduates of the University and students of the faculty by various examining bodies and learned societies. The Institution of Civil Engineers recognises the B.Sc. degree with honours in civil or mechanical engineering as exempting from examination for associate membership if a regular course of study, occupying not less than three academic years, has been pursued in the University. The institution also recognises the pass degree as exempting similarly if, in addition to the other conditions, the entrance examination to the engineering course in the University has been passed in the subjects prescribed by the institution. These degrees are also similarly recognised as qualifications for appointments as assistant engineers in the Public Works Departments of India and Egypt. The possession of the B.Sc. degree in civil or mechanical engineering is allowed to count as one year towards the three years' practical training required by candidates for the appointment of Assistant Civil Engineer in the Works Department of the Admiralty. The B.Sc. degree in mechanical engineering exempts from the associate membership examination of the Institution of Mechanical Engineers, and the degree in electrical engineering exempts from examination for the associate membership of the Institution of Electrical Engineers. Finally, the B.Sc. degree, or success in the intermediate examination for that degree, is accepted in lieu of the Army entrance examination.

CERTAIN representative science teachers and others interested in natural science in Yorkshire have decided to form an association with the object of encouraging a broad outlook on scientific problems, and of providing a means whereby they may be kept in touch with modern scientific views. The hearty support given to this proposal from many quarters justifies the view that such a natural science association would be welcome in Yorkshire, and a provisional committee has been appointed to undertake its organisation. Its aims have been formulated as follows:—(1) To afford opportunity for intercourse and co-operation amongst those interested in natural science (chemistry, physics, botany, zoology, and other natural sciences); (2) to discuss the teaching of science in all its bearings; (3) to discuss modern developments in science, and the applications of science in industry; (4) to arrange for visits to places of scientific interest; and (5) to afford a medium for the formulation of collective opinion upon matters affecting the place of science in the life of the community. Membership will be open to all who are interested in the objects of the association, and it is proposed that the subscription shall be 5s. per annum. The inaugural general meeting will take place on Saturday, November 23, at 3 p.m., in the University of Leeds, when the president-elect, Prof. W. Bateson, will deliver an address on "Science and Nationality." All who are interested in the movement are cordially invited to be present. Any further information may be obtained from the chairman of the provisional committee, Dr. Harold Wager, the University, Leeds, or from the hon. secretaries, Mr. F. Fairbrother, the Grammar School, Leeds, and Miss R. F. Shove, the University, Leeds.

M. PAUL OTLET has an interesting article on "Le traitement de la littérature scientifique" in the *Revue générale des Sciences* for September 15-30. His claim is that Governments should give more attention to the various methods by which the results of scientific investigation can be made widely known.

Among such methods he includes the publication of periodicals, abstracts, annual reports, bibliographies, dictionaries, and text-books. As an example to be followed he quotes the International Institute of Agriculture at Rome. This institute, founded in 1905 by international co-operation, has already an income of 900,000 francs, possesses a library of 70,000 volumes and pamphlets, and receives annually 2600 reviews and journals sent to Rome from the fifty-six co-operating countries. The institute issues three monthly bulletins, two annual volumes of statistics, three other publications appearing once or twice a year, a bibliography of agronomy, and many special monographs. M. Otlet looks forward to the foundation of a similar institute for science, supported by all the Governments of the world, or, at all events, by the Allied Governments. The International Catalogue of Scientific Literature would be a part of this institute, which would also publish abstracts of all scientific papers and periodical *résumés* of work in special branches of science, possess a library to which all scientific periodicals should be sent as they appear, and make arrangements for lending books and papers to subscribers. Finally, M. Otlet asks for an international or inter-Allied investigation into the whole domain of science (pure, applied, economic, and social), including the direction of original research, its application to industries, records of results, scientific literature of all kinds, the teaching of science, and the diffusion of scientific knowledge. The investigation would be followed by a congress with power to make the necessary agreements between the co-operating Governments, and to bring existing associations, institutions, and private undertakings into the general scheme. By such unification of the scientific activities of the world it is hoped to accelerate the progress of science and of its applications.

SOCIETIES AND ACADEMIES.

LONDON.

Zoological Society, October 22.—Dr. A. Smith Woodward, vice-president, in the chair.—Sir E. G. Loder, Bart.: Notes on the beavers at Leonardslee, 1916-18. Evidence was given of the hitherto unrecorded fact that beavers may breed twice in a season.—G. A. Boulenger: Madagascar frogs of the genus *Mantidactylus*, Blgr.—Prof. H. M. Lefroy: The Wheat Commission on Wheat Weevil in Australia.

MANCHESTER.

Literary and Philosophical Society, October 15.—Mr. W. Thomson, president, in the chair.—J. W. Jackson: Discovery of quartz-pebble beds in the Carboniferous Limestone of Caldron Low, Staffs. These pebble-beds form the dip slope of the Low on its N.N.W. side, overlooking Caldron village. At the latter place a large series of fossils, reminiscent of the "Brachiopod beds" of Castleton, etc., has been obtained by Mr. W. E. Alkins. The beds here apparently follow the pebble-beds in true sequence. The two pebble-beds differ greatly in composition, that of Caldron Low being made up almost entirely of rounded pebbles of vein-stone-quartz with fragments of chert, while that of Castleton consists of Carboniferous Limestone pebbles.

SHEFFIELD.

Society of Glass Technology, October 23.—Dr. M. W. Travers in the chair.—Prof. J. W. Cobb: Refractory materials and the glass industry. Prof. Cobb emphasised the fact that, although temperatures in glass manufacture were by no means abnormally high, yet the nature of the chemical reactions taking place was

such as to render the problem of refractories extremely difficult. There was the corrosive action of the molten glass upon the container to contend with, and, in addition, the corrosive action of hot dust upon flues and furnace interiors. The nature of the various refractory materials used in the glass industry was then dealt with, and the effect of grain size on the refractoriness and strength of silica bricks received thorough treatment. Special emphasis was laid upon the necessity for the smallest joints in building up refractory materials, and furnace building should be regarded from the point of view of masonry rather than from that of bricklaying. The paper closed with a discussion of the evil effects on refractories of penetration of glass and batch materials and the importance of thermal conductivity.—**Dr. M. W. Travers**: The firing of glass pots. By means of a striking collection of specimens the author showed that the life of a glass pot was materially increased if, before filling in, the pot was completely "vitrified." Ways and means of carrying this out were given, and the reason why vitrification before filling gave such good results was fully discussed.—**S. N. Jenkinson**: The requirements of clay for glass-pot making. A brief survey was made of the position of the glass refractories trade, both in 1914 and at the present time, and the necessity for some specification of materials was shown to be urgent. The proposed specification drawn up by the Refractories Committee for clay for pots was then dealt with and its various sections discussed. The question of size, nature, quality, and function of "grog" received full treatment.—**Mr. Coad-Pryor**: Action of certain types of glass upon pots. The author discussed the reason for the quicker solution of the bottom of glass pots as opposed to the sides. Several interesting experiments were described dealing with this problem.—**Dr. Turner and J. H. Davidson**: The solubility of pot material in glass. The influence of grain size upon rate of melting was shown.

PARIS.

Academy of Sciences, October 14.—**M. P. Painlevé** in the chair.—**E. Fournier**: General expressions for the resistance of water to the translation of hulls and their teachings.—**E. Goursat**: The problem of Bäckland.—**E. Cartan**: The varieties of Riemann in three dimensions.—**J. Guillaume**: Observations of Borrelly's comet made with the *coudé* equatorial at the Lyons Observatory. Data for October 1 and 3 are given. On October 1 the comet showed as a nebulosity with undefined edges about 20" diameter, with a central condensation. Magnitude 10.5 to 11.—**M. Dechevrens**: An electrical tide in the soil derived from the oceanic tide. Observations made at the Saint Louis Observatory, Jersey, between October, 1917, and August, 1918. The gas and water mains connected through a galvanometer gave an e.m.f. of about 0.1 volt, and this has been recorded photographically.—**F. Morvillez**: The conducting apparatus of the leaves of the Saxifragas.—**P. Godin**: Pedagogic interest of the laws of growth.—**J. Amar**: The laws of feminine work and of cerebral activity. The curve of endurance in women is low and undulating, and the physical work amounts to less than 40 per cent. of that of men. It is irregular and lacks continuity.—**P. Duvál and A. Grigaut**: Intoxication by war wounds.

SYDNEY.

Linnean Society of New South Wales, May 29.—**Prof. H. G. Chapman**, president, in the chair.—**Dr. R. J. Tillyard**: The Panorpid complex. Part i.: The wing-coupling apparatus, with special reference to the Lepidoptera. The author shows that the most archaic type of wing-coupling apparatus was situated at the

base of the wing, and consisted of four parts, two belonging to the forewing and two to the hindwing. These are named (1) on the forewing, the jugal lobe and jugal bristles; (2) on the hindwing, the humeral lobe and the frenulum. These four structures are only preserved in their entirety at the present day in two ancient families of the Mecoptera, the Choristidæ and Nannochoistidæ. The same type occurs in the Planipennia, with the absence of the jugal bristles. The evolution of these structures throughout the other orders of the complex is followed out, the paper dealing finally with the highly specialised types of coupling found in the wings of the Lepidoptera. The Micropterygidæ are shown to possess the archaic jugo-frenate type found in the Planipennia, but with certain specialisations. From the unspecialised jugo-frenate type there are developed in two different directions (1) the true jugate type, found in Hepialidæ and Prototheoridæ, and (2) the true frenate type, found in the other families, though with further specialisation to the amplexiform type in three groups that have lost the frenulum. The author suggests that the Lepidoptera should be divided into two sub-orders, Homoneura and Heteroneura, according to the state of their wing-venation, and that the former sub-order should be again subdivided into two divisions, the Jugo-frenata (Micropterygidæ s. lat.) and the Jugata (Hepialidæ and Prototheoridæ).—**Prof. W. N. Benson**: The geology and petrology of the Great Serpentine Belt of New South Wales. Part vii.: The geology of the Loomberah district and a portion of the Goonoo Goonoo estate, with two palæontological appendices by F. Chapman. The area in question, containing nearly 100 square miles, lies between the Tamworth district and the Nundle district, described in earlier parts of this series of papers. By the present work, therefore, the detail-mapping of a length of fifty miles of the Great Serpentine Belt is completed, permitting the correlation of the formations throughout. The present area has not been described previously. The points of interest arising in it are chiefly the occurrence of a third fossiliferous limestone zone in the Devonian series, with various important faunal peculiarities; the presence of a remarkable development of the highly albitic intrusive rocks, keratophyres; the abnormal absence of serpentine from the serpentine line; and the presence of dip-faults, breaking across the strike of the Devonian rocks, which may be of Carboniferous origin, but have been planes of movement in post-Permo-Carboniferous times.

July 31.—**Prof. H. G. Chapman**, president, in the chair.—**Prof. W. N. Benson**: The geology and petrology of the Great Serpentine Belt. Part vii. (continued). Several types of massive igneous rocks have been obtained that were not previously recognised in the Devonian rocks of the Great Serpentine Belt. A very typical example of pillow-structure developed in the spilitic rocks of this region is described and figured. This is the clearest example yet known in Australia.—**Dr. R. J. Tillyard**: Studies in Australian Mecoptera. No. ii.: The wing-venation of *Chorista australis*, Klug. Freshly turned pupæ of this rare Panorpid were obtained by digging and sifting soil in a selected locality. The result is the first study of wing-venation for the order Mecoptera, based on an examination of the pupal wing-tracheation. The pupal wings were dissected off and studied under water in the usual manner. A very remarkable result was obtained. There are only two tracheæ in the wing, one belonging to the costo-radial group and entering the radius, the other belonging to the cubito-anal group and entering the media. Hence the Mecoptera must be regarded as highly specialised in this respect,

like the Trichoptera and Diptera, but unlike the Planipennia and Lepidoptera, which retain all their main tracheæ. In the fresh pupa of Chorista the fusions which take place later on between certain veins are not yet accomplished, and hence the imaginal venation can be interpreted with certainty. Use is also made of the distribution of the macrotrichia to determine the limits of Cu₁.—W. W. L'Estrange and Dr. R. Greig-Smith: The springing of tins of preserved fruit. The blowing of tins containing fruits preserved in syrup appears to be due to the action of yeasts or other gas-forming organisms drawn into the containers through leaks in the joints while cooling after the cooking process. Although various organisms from defective containers were examined, none survived the temperatures to which the contents of containers were subjected during the canning process.

August 28.—Prof. H. G. Chapman, president, in the chair.—Dr. R. J. Tillyard: Mesozoic insects of Queensland. No. 3, Odonata and Protodonata. In the order Odonata two new forms are described from the Upper Triassic beds of Ipswich. One of these is placed in the family Lestidæ, forming the sole representative of a new sub-family Triassolestinae. It shows close affinities with the Epiophlebiinae, being more or less intermediate between this sub-family and the more reduced types like Synlestes. The other dragon-fly fossil is not placed, being only the tip of a wing, but it has sufficient characters of interest to merit a name. In the order Protodonata a very remarkable new fossil, *Aëroplana mirabilis*, is described, and is made the sole representative of a new sub-order *Aëroplanoptera*. The characters of this extraordinary insect are fully discussed, and a comparison made with *Meganoura* (Upper Carboniferous of Commeny). From this reasons are given why the insect should be placed in this order, though it stands very far apart from any known type, and might, perhaps, be considered better placed in a new order. A reconstruction of both wings of this fossil is shown in one of the plates.—J. Mitchell: The Carboniferous Trilobites of Australia. Of the nine species of Australian Carboniferous Trilobites previously recorded, five only are considered worthy of recognition. Thirteen species of *Phillipsia*, one of *Griffithides*, and one of *Brachymetopas* are described as new.

BOOKS RECEIVED.

- Contributions to Embryology. Vol. viii. Nos. 24, 25, and 26. Pp. 198+plates. (Washington: The Carnegie Institution of Washington.)
- Winter Botany. By Prof. W. Trelease. Pp. xxxii+394. (Urbana: Prof. W. Trelease.) 2.50 dollars.
- The Cambridge Pocket Diary, 1918-19. (Cambridge: At the University Press.) 2s. net.
- Reports of the Progress of Applied Chemistry. Vol. ii., 1917. Pp. 536. (London: Society of Chemical Industry.) 6s. 6d.
- Alfred Russel Wallace: The Story of a Great Discoverer. By L. T. Hogben. Pp. 64. (London: S.P.C.K.) 2s. net.
- A Manual of the Common Invertebrate Animals, Exclusive of Insects. By Prof. H. S. Pratt. Pp. 737. (Chicago: A. C. McClurg and Co.)

DIARY OF SOCIETIES.

- THURSDAY, NOVEMBER 7
- ROYAL SOCIETY, at 4.30.—Prof. G. E. Hale: The Nature of Sun-spots.—E. O. Hercus and T. H. Laby: The Thermal Conductivity of Air.—T. K. Chinnayandam: Haidinger's Rings in Mica.
- CHEMICAL SOCIETY, at 8.
- INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Tenth Kelvin Lecture—L. B. Atkinson: The Dynamical Theory of Electric Engines.

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FRIDAY, NOVEMBER 8.

- ROYAL ASTRONOMICAL SOCIETY, at 5.—H. C. Plummer: The Distribution of the Stars.—Rev. A. L. Cortie: (1) The Spectrum of the Corona, 1914, August 21; (2) The Earlier Spectrum of Nova Aquilæ.—R. J. Pocock: The Relation Between Mean Parallax and Magnitude.—H. H. Turner: Note on the Nebulosity round Nova Persei.—R. Watson: Observations of the Light Variation of Nova Aquilæ, 1918.—A. S. Eddington: The Pulsations of a Gaseous Star and the Problem of the Cepheid Variables. Part I.—S. Chapman: The Energy of Magnetic Storms.—Prof. G. E. Hale: The 100-inch Telescope of the Mount Wilson Observatory.—*Probable Paper*: Royal Observatory, Greenwich: Magnitudes of Nova Aquilæ from June 10 to November 1, 1918.
- MALACOLOGICAL SOCIETY, at 7.—The Rev. Dr. A. H. Cooke: The Radula of *Thais*, *Drupa*, *Concholepas*, *Cronia*, *Rapana*, and the Allied Genera.—W. T. Webster: Notes on the Life-history of *Planorbis corneus* and other Freshwater Mollusca.
- PHYSICAL SOCIETY, at 5.—Prof. J. C. McLennan: Low-voltage Arcs in Metallic Vapours.—Dr. W. Wilson: Relativity and Gravitation.—C. R. Gibson: Experiments Illustrating Colour-blindness.

MONDAY, NOVEMBER 11.

- ROYAL GEOGRAPHICAL SOCIETY, at 8.—Col. G. S. F. Napier: The Road from Baghdad to Baku.

THURSDAY, NOVEMBER 14.

- ROYAL SOCIETY, at 4.30.—*Probable Papers*:—A. Mallock: Sounds produced by Drops falling on Water.—G. H. Hardy and S. Ramanujan: The Coefficients in the Expansions of certain Modular Functions.—Hon. R. J. Strutt: The Light Scattered by Gases; Its Polarisation and Intensity.—Dr. F. Horton and Ann C. Davies.—An Investigation of the Ionising Power of the Positive Ions from a glowing Tantalum Filament in Helium.
- OPTICAL SOCIETY, at 8.—T. Smith: Some Generalised Forms of an Optical Equation.—H. S. Ryland: The Manufacture of Binoculars.

FRIDAY, NOVEMBER 15.

- INSTITUTION OF MECHANICAL ENGINEERS, at 6.—*Adjourned Discussion*: Prof. C. A. Edwards and F. W. Willis: A Law Concerning the Resistance to Penetration of Metals which are Capable of Plastic Deformation, and a New Hardness Scale in Fundamental Units.—R. G. C. Batson: The Value of the Indentation Method in the Determination of Hardness; and Dr. W. C. Unwin: The Ludwik Hardness Test.—T. T. Heaton: Electric Welding.

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Editorial and Publishing Offices:

MACMILLAN AND CO., LTD.,

ST. MARTIN'S STREET, LONDON, W.C.2.

Advertisements and business letters to be addressed to the Publishers.

Editorial Communications to the Editor.

Telegraphic Address: PHUSIS, LONDON.

Telephone Number GERRARD 8830.