

its grant of £105 in aid of the University's extension work, and the Drapers' Company has renewed for the year 1932 its grant of £500 for the Department of Applied Statistics at University College. The Civil Service Commission has notified the University of the renewal for 1931-32 of the present subvention of £2250 from Indian revenues towards the cost of probationary instruction of selected candidates for the Indian Civil Service.

OXFORD.—At Rhodes House, on May 9, Prof. A. Einstein delivered in German the first of his three Rhodes Lectures on "The Theory of Relativity—its Formal Content and Present Problems". He gave a general exposition of the special and general theories of relativity, emphasising the need of "logically satisfying" assumptions and explaining the methods of advance from the Euclidean to a pseudo-Euclidean metric and hence to the Riemann metric. The general theory could not, however, provide a logical explanation of the electromagnetic field. In his second lecture, on May 16, Prof. Einstein will discuss the problem of the finite universe. In his last lecture, on May 23, he proposes to give an account of his attempt to derive both the gravitational and electromagnetic fields by the introduction of a directional spatial structure.

THE following courses of free public lectures in metallurgy have been arranged by the Armourers and Brasiers' Company :—At 8 o'clock on May 21 and 28 and June 4, at the Royal School of Mines, "Thin Films on Metals", by U. R. Evans, and at 5.30 on May 27 and June 3 and 10, at King's College, Strand, "Some Impurities in Metals and the Production of Metals of High Purity", by Dr. W. Rosenhain. No tickets are required.

#### Birthdays and Research Centres.

May 18, 1873.—Dr. H. ELTRINGHAM, F.R.S., president of the Entomological Society of London (1931).

Is more or less continuously engaged in the histological structure of insects, more especially that of special glands and organs. At present investigating the structure of the abdominal organs in the smaller caddis flies, the action of 'diaphanol' on chitinous and other structures, and the structure of the eye in Aleurodes.

At all times prepared to undertake histological investigations into the finer structure of insects, and should be glad to have unusual material for this purpose from anyone who has the opportunity of obtaining same in a proper state of preservation. Would be glad to furnish suitable preservative fluids to anyone who can obtain material suitable for investigations of this character.

May 19, 1876.—Prof. W. K. GREGORY, curator of the Department of Ichthyology, American Museum of Natural History.

My chief investigation now in progress is the study of the skulls of fish of many orders and families. Each skull is considered from two points of view : first, as a natural mechanism (the inert part of a machine that serves in the complex turnover of energy taken in and paid out by the organism as a whole) ; secondly, as a morphological pattern, which has acquired its various characters at different stages of its phylogenetic history.

I should welcome researches bearing upon the hypotheses that triradiate sutures arise through the equal growth away from each other of three centres

of ossification and that the semicircular canals arose in a similar manner. A functional analysis of parts of the neurocranium (cranial vault, interorbital bridge, ethmo-vomer block, keel-bone or parasphenoid) leads to interesting results.

May 23, 1850.—Dr. G. C. DRUCE, F.R.S., Fielding curator in the University of Oxford.

I am at present engaged in an investigation of the flora of Cyprus.

May 23, 1864.—Sir ARTHUR SMITH WOODWARD, F.R.S., lately Keeper of the Department of Geology, British Museum (Natural History).

I have accumulated many fossil fishes on which I hope soon to continue research, but I have been occupied for a long time in preparing (and largely rewriting) a second English edition of Zittel's "Palaeontology", vol. 2 (Fishes, Amphibians, Reptiles, and Birds), which is now in type and nearly completed. A new edition of my "Outlines of Vertebrate Palaeontology" will probably follow. I think that one who has had long experience of any sphere of research can do good service to science by attempting, from time to time, to digest and correlate the results of the multitude of technical papers and memoirs which now appear in more rapid succession than ever.

#### Societies and Academies.

LONDON.

Royal Society, April 30.<sup>1</sup>—J. A. Todd : On twisted cubic curves which satisfy twelve conditions. The paper deals with the problem of determining the number of twisted cubic curves in space which satisfy the joint condition of meeting  $r$  lines in one point,  $s$  lines in two points, and of passing through  $t$  fixed points where  $r+s+2t=12$ , so that the condition determines a finite number of curves. The simpler cases are treated by a variety of elementary methods; for the more complicated cases the principle of special position is employed, in which the given lines and points are made to assume particular positions in such a manner that the curves which are required fall into various classes, of which the number of curves in each is determined by simpler considerations.—H. T. Flint : A metrical theory and its relation to the charges and masses of the electron and proton. This paper points out the analogy existing between the equations of the quantum theory and the electromagnetic equations of Maxwell, pointing to the existence of a definite natural metric in a five-dimensional continuum. Parallel displacements along the world lines in this continuum are associated with no change in length, but in the four-dimensional world the change of length is a periodic function, with a frequency proportional to the mass associated with the world line. This view leads at once to the interpretation of the ratio of the masses of the electron and proton as a metrical ratio, and makes a unitary physical theory possible.—A. M. Mosharraf : Material and radiational waves. The Maxwellian equations of electromagnetic and electron theory are derived from one set of basic relations in a manner which throws some light on the relationship between material and radiational waves, and accounts for the existence of exactly three types of physical entities, namely : positive electricity, negative electricity, and radiation. It is shown that a physical entity may be associated with the propagation of a vector  $A$  in a direction  $n$ . If  $A$  and  $n$  are in the same direction, the entity is recognised

<sup>1</sup> Continued from p. 726.

as positive electricity, if in opposite directions as negative electricity, and if mutually perpendicular, then as radiation. In the general case,  $A$  will have both a longitudinal and a transverse component, corresponding to the co-existence of matter and radiation.—J. Guild : The colorimetric properties of the spectrum. The paper describes an investigation carried out at the National Physical Laboratory to determine the colorimetric properties of a group of seven subjects as obtained from direct measurements of the trichromatic coefficients of the spectrum on a trichromatic colorimeter. A proposal is made for the adoption of a set of standard data, to represent a normal eye for technical colorimetric purposes, based on the results of this investigation and those recently published by W. D. Wright.—C. Robinson and H. A. T. Mills : The colloid chemistry of dyes. The aqueous solutions of benzopurpurine 4B and its isomer prepared from *m*-tolidine (1, 2). Although benzopurpurine 4B is a well-known cotton substantive dye, its isomer prepared from *m*-tolidine has not sufficient affinity for cotton for it to be of practical use as a dye-stuff. An investigation of the solutions of these dye-stuffs has been carried out in order to see if correspondingly great differences could be found in their colloidal properties. The viscosity of their solutions (if not super-saturated) are the same and are of the order to be expected in an unhydrated colloid. The viscosity does not vary with rate of shear, and the conductivities are of the same order. On the other hand, ultra-filtration, flocculation by electrolytes, and ultra-microscopic examination show marked differences between the two dyes, which may be explained if it is assumed that benzopurpurine 4B forms larger aggregates than the meta isomer. The osmotic pressures of the two dyes are almost the same ; this can be accounted for in spite of the difference in particle size shown by experiments described. It is concluded that these dyes exist in solution as totally dissociated colloidal electrolytes, hydrolysis being negligible.—G. B. Deodhar : X-ray nondiagram lines. In the K and L series, nondiagram lines pairs are found which show approximately constant  $\sqrt{n/R}$  differences. These seem to resemble the usual screening doublets.—T. E. Stern : The chemical constant of chlorine vapour and the entropy of crystalline chlorine. By statistical mechanics the molecular composition of chlorine gas is calculated, assuming that the ratio between the numbers of atoms of the two isotopes 35 and 37 is known. It is found in this calculation that the angular momenta of nuclei are without effect upon the constitution of chlorine gas. The vapour pressure of chlorine crystals is also calculated and, finally, the entropy of chlorine per mole in the crystalline form at the absolute zero.—I. E. Knaggs : The molecular symmetry of hexa-aminobenzene in the crystalline state and certain other properties of the substance. An examination of crystals of hexa-aminobenzene by the powder X-ray photographic method has shown the crystal symmetry to be that of the holohedral cubic class, the space-group being  $O_h^2$ . There are 16 molecules in the unit cell of side 15.14 Å., and the molecules possess a threefold axis of symmetry.—H. W. Melville and E. B. Ludlam : The effect of foreign gases on the lower critical oxidation limit of phosphorus vapour. The experiments were carried out to test the equation originally proposed by Semenoff. In the present approximate state of the theory, the differences obtained are explained on the variation of the diffusion coefficient of the chain propagators into the foreign gas. The results show no correlation with those obtained for foreign gases at the upper critical oxidation limit.—L. Rosenhead : The lift on a flat plate between parallel walls. The effect of the walls

is to increase the lift-coefficient, and curves and tables are given showing this increase for various values of the angle of attack and the ratio of chord of aerofoil to width of channel.—J. A. V. Butler and A. D. Lees : The behaviour of electrolytes in mixed solvents (3). The molecular refractivities and partial molar volumes of lithium chloride have been determined in a series of mixed water-alcohol solvents. It is found that the molecular refractivity is constant in each solvent over the range of concentrations investigated. Its value is scarcely affected by the presence of alcohol until the molar fraction of the latter is more than 20 per cent, and then falls off steadily to the value for pure alcohol. The effect of lithium chloride on the density of the solutions varies greatly with the composition of the solvent.—T. C. Marwick : An X-ray study of mannitol, dulcitol, and mannose. The relationship is traced between the structures of mannitol and dulcitol, and between the structures of mannose and other saccharides. (See also NATURE, Jan. 3, 1931, p. 11.)—G. I. Finch and J. C. Stimpson : The electrical condition of hot surfaces during the adsorption of gases. The electrical conditions of a carbon rod and a copper sheet have been studied at temperatures up to 850° C. *in vacuo*, and in contact with various gases. The results of these experiments suggest that 'normalisation' of the carbon involves the evolution of occluded gases accompanied by structural changes in the surface, but that in the case of copper it involves a process of sintering.—A. B. D. Cassie and C. R. Bailey : Investigations in the infra-red region of the spectrum (3, 4). The absorption spectrum of carbon disulphide is described between the limits of 1  $\mu$  and 22  $\mu$ , and the results compared with those of Coblenz for the liquid. The molecule possesses a rectilinear structure, with probably a single linkage between the carbon and sulphur atoms. The Raman spectrum has been co-ordinated with the infra-red spectrum, and an explanation is offered for the appearance in both of the characteristic doublet associated with the inactive frequency.—D. R. M'Rae : Asymmetry observed in the stark component of  $H_a$ . A special grating having a very intense first-order spectrum on one side has been used to resolve the Stark components of  $H_a$ . Asymmetry is observed in the displacements of the components, and also in the relative intensities of the components. Altering the number of atoms in the initial states does not explain completely the asymmetry of intensities.—F. D. Miles : The apparent hemihedrism of crystals of lead chloride and some other salts. Lead chloride, which normally shows holohedral orthorhombic symmetry, can, under certain specified conditions, be obtained from hot solutions containing dextrine in microscopic crystals consisting of a single form (a bisphenoid), which can have only axial symmetry. By reducing the concentration of dextrine this form can be gradually repressed. Normal crystals of lead chloride were grown and investigated by X-ray methods. The difficulty of X-ray work with crystals impervious to the radiation is emphasised, and a simple method is given for finding whether any given reflection will emerge from any crystal face. The structure contains two glide planes of symmetry. The symmetry is, therefore, in all probability holohedral. The idea that crystal faces lying opposite to each other across a plane of symmetry may behave differently to an optically-active reagent is supported. The cases described appear to be the first to demonstrate that the presence of optically-active material may induce the growth of a hemihedral crystal of a substance, the normal symmetry of which is certainly higher.—C. E. Wynn-Williams : The use of thyratrons for high speed automatic counting of physical phenomena. The thyratron may be regarded as a triode valve which

contains a trace of mercury vapour or inert gas at low pressure. Under appropriate conditions, a positive voltage impulse of only a few micro-seconds' duration applied to the grid will cause an arc to strike between the anode and cathode (or filament). The arc then continues independently of further grid potential changes until the anode circuit is momentarily interrupted. In this respect the thyratron behaves as a very delicate, inertialess relay, capable of controlling considerable currents. Some circuits are described for utilising to the greatest advantage the 'inertialess relay' characteristic of the thyratron, for high-speed automatic counting of voltage impulses set up by physical phenomena. Two impulses separated by as little as 1/500th second can be separately recorded.

## PARIS.

**Academy of Sciences**, Mar. 30.—**Camille Matignon**: Some properties of commercial calcium nitrates. These have been regarded by some people as liable to spontaneous combustion, and some insurance companies have enforced special premiums on this account. It is shown experimentally that these views are erroneous.—**Gabriel Bertrand** and **V. Ciurea**: Tin in the animal organism. Previous work on this subject is criticised on the ground that the method employed did not differentiate tin from silica. The authors, using a more exact method, have found in the organs of the ox, horse, and sheep quantities of tin varying between 0·4 and 26 parts per million, the largest proportions being found in the tongue: no tin was found in the peritoneum.—**André Blondel**: The limitations of photometry.—**Léon Guillet** and **Jean Cournot**: Remarks relating to the influence of occluded gases on the mechanical properties of metallurgical products. Criticisms of the conclusions of Guichard, Clausmann, Billon, and Lanthon on the effect of occluded gases on the hardness of electrolytic iron.—**D. Wolkowitsch**: The representation of the results of a series of experiments by an approximate formula with two parameters.—**Paul Delens**: Congruences of curves and figuration of invariants.—**D. Pompeiu**: The property of holomorph functions.—**A. Magnan** and **A. Sainte-Laguë**: The distribution of aerodynamic velocities round an aeroplane in flight.—**L. Joly**: A method of measuring the heat conductivity coefficient of materials.—**Guy Emschwiller**: The chemical action of ultra-violet light on the alkyl iodides. From a study of the action of ultra-violet light on liquid alkyl iodides, it is concluded that the primary action is removal of a molecule of hydrogen iodide; this can react with another molecule of the iodide, giving a saturated hydrocarbon and iodine. The other secondary products found can also be explained on this hypothesis.—**Ch. Bedel**: The electrical resistance of silicon. It has been found possible to secure good electrical contacts with pure silicon, and obtain consistent figures. The presence of small proportions of iron in the silicon has a marked effect on the resistance.—**R. Gibrat**: The optics of uniaxial heterogeneous structures.—**H. Le Breton**: The age of the recent marine terraces of Xu-Nghé in North Annam (French Indo-China).—**D. Chalonge** and **E. Dubois**: The distribution of ozone in the atmosphere. From the study of absorption spectra it is concluded that ozone is distributed in the atmosphere in a much less discontinuous manner than has hitherto been supposed; there are appreciable quantities at relatively low altitudes.—**Mme. F. Bayard-Duclaux**: The electrical conductivity of the air at Paris.—**Pierre Lesne**: Organic adaptation in xylophage insects of the family of the Bostrichidae. Commensalism of Lyctoderma.—**Mme. Lucie Randon and René Fabre**: Comparative researches on the proportion of SH derivatives in

striated muscle, liver, and blood in the normal rat, in the underfed rat, and in the rat deprived of the B vitamins.—**J. Lefèvre** and **A. Auguet**: The problem of the relationship between the heats of work and repose. The solution and laws. Why work is more economical at low temperatures.—**Ch. Hruska**: Vaccination against anthrax with non-attenuated virus. Saponin is added to the virus and this is injected. The local swelling is cured in 15–20 days, and the animal is resistant to infection. The mixture of the virus and saponin is unaltered after keeping for fifteen months.

## Official Publications Received.

## BRITISH.

Scientific Reports of the Imperial Institute of Agricultural Research, Pusa, (including the Reports of the Imperial Dairy Expert, Physiological Chemist, Government Sugarcane Expert, and Secretary, Sugar Bureau), 1929–30. Pp. vi+165. (Calcutta: Government of India Central Publication Branch.) 3·8 rupees : 6s.

The Indian Forest Records. Chemistry Series, Vol. 16, Part 2: Indian Ephedras. By Dr. S. Krishna and T. P. Ghose. Pp. iii+32+5 plates. (Calcutta: Government of India Central Publication Branch.) 1·14 rupees : 3s. 3d.

Agriculture and Live-stock in India. Vol. 1, Part 1, January. Pp. xi+108+6 plates. (Calcutta: Government of India Central Publication Branch.) 1·8 rupees : 2s. 6d.

The Indian Journal of Agricultural Science. Vol. 1, Part 1, February. Pp. vi+156+15 plates. (Calcutta: Government of India Central Publication Branch.) 2·8 rupees ; 4s. 6d.

Report of the Kodaikanal Observatory for the Year 1930. Pp. ii+4. (Calcutta: Government of India Central Publication Branch.) 6 annas.

Government of India: Department of Industries and Labour. Functions and Organisation of the India Meteorological Department (1931). Pp. 18. (Delhi: Government of India Press.)

Proceedings of the West Indian Conference of Agricultural Officers, 1930, held at the Imperial College of Tropical Agriculture, Trinidad, B.W.I., on the 23rd January 1930 and following Days. Pp. 56. (Trinidad: Government Printing Office.) 2s. net.

Mysore Geological Department. Bulletin No. 11: Review of Mineral Production of Mysore for 1915 to 1929. By A. M. Sen. Pp. xiv+203+4 plates. (Bangalore: Government Press.) 3 rupees.

Silvicultural Research Manual for use in India. Vol. 2: Statistical Research (The Statistical Code). By H. G. Champion and I. D. Mahendru. Pp. viii+264+10 plates. (Calcutta: Government of India Central Publication Branch.) 12·10 rupees ; 20s. 6d.

Journal of the Royal Microscopical Society. Series 3, Vol. 51, Part 1, March. Pp. xvi+108. (London.) 10s. net.

Madras Fisheries Department. Fish Statistics for 1926–27. (Supplement to the Administration Report for 1927–28.) Edited by Dr. B. Sundara Raj. (Report No. 2 of 1929, Madras Fisheries Bulletin, Vol. 23.) Pp. 87–151. (Madras: Government Press.) 10 annas.

## FOREIGN.

Memoria del R. Istituto Lombardo di Scienze e Lettere. Vol. 24, Fascicolo 2: Pier Candido Decembrio, contributo alla Storia dell'Umanesimo Italiano. Memoria di Ernst Ditt. Pp. 21–108. (Milano: Ulrico Hoepli.) 22 lire.

Rendiconti del Seminario Matematico e Fisico di Milano. Vol. 4 (1930–VIII). Pp. xi+236. (Milano.)

Smithsonian Institution: Bureau of American Ethnology. Bulletin 97: The Kamia of Imperial Valley. By E. W. Gifford. Pp. vii+94+2 plates. (Washington, D.C.: Government Printing Office.) 25 cents.

The World Calendar. By Elisabeth Achelis. Second edition. Pp. 26. (New York City: The World Calendar Association, Inc.)

Pubblicazioni del R. Osservatorio Astronomico di Merate (Como) succursale del R. Osservatorio di Brera (Milano). N. 4: Ricerche sulla frequenza delle grandezze assolute delle stelle delle diverse classi spettrali. Per Gino Cecchini. Parte 1: Catalogo generale di parallassi stellari. Pp. 152. (Milano: Ulrico Hoepli.) 30 lire.

Conseil Permanent International pour l'Exploration de la Mer. Bulletin trimestriel des résultats acquis pendant les croisières périodiques et dans les périodes intermédiaires. Publié par le Bureau du Conseil avec l'assistance de C. H. Ostenfeld. Résumé des observations sur le planктon des mers explorées par le Conseil pendant les années 1902–1908. Quatrième partie: Sommaire général des parties 1 à 3. Pp. 601–672. (Copenhagen: Andr. Fred. Höst et fils.)

Proceedings of the United States National Museum. Vol. 78, Art. 21: Description of a New Species of Amidostomine Worm of the Genus *Epomidostomum* from the Gizzard of Anserine Birds. By Rudolf Wetzel. (No. 2884.) Pp. 10+2 plates. (Washington, D.C.: Government Printing Office.)

## CATALOGUES.

Nickel Alloy Steels: a Summary of their Properties and Applications. (Nickel, A7.) Pp. 12. (London: The Mond Nickel Co., Ltd.)

Spectrometric Apparatus (Spectrographs). Pp. 16. (London: Bellingham and Stanley, Ltd.)

New Books at Reduced Prices in various Subjects. (No. 457.) Pp. 44. (Cambridge: Bowes and Bowes.)

New Models. (Catalogue No. T.L.20.) Pp. 19. (London: The Medical Supply Association, Ltd.)

Fungi, Plant Pathology, etc.: Catalogue of the Library of the late Dr. N. Patouillard. (Catalogue No. 185.) Pp. 52. (London: Dulau and Co., Ltd.)