

## Societies and Academies.

LONDON.

**Royal Society**, February 3.—Prof. C. S. Sherrington, president, in the chair.—Dr. G. B. Jeffery: The field of an electron on Einstein's theory of gravitation. Equations are obtained for the motion of a single electron about an atomic nucleus. If a ray of light passes through the field of the electron, provided that the distance of closest approach is not too small, the ray is deflected towards the electron. For closer approach the sense of the deflection is reversed until in the limit the ray is reflected back again along its original path. These results are used to ascertain whether any possible electric field of the sun would produce a measurable effect on the crucial phenomena of Einstein's theory. It is found that, while the sun's electric field would tend to diminish the displacement of the spectrum lines, the field required to produce compensation is of the order of  $10^{13}$  volts per cm. at the sun's surface.—Dr. M. N. Saha: A physical theory of stellar spectra. Elsewhere a theory of thermal ionisation (and partly of thermal radiation) of gaseous elements has been developed and applied to the explanation of the ionisation observed in the solar chromosphere, and the absence of certain elements from the Fraunhofer spectrum. In the present paper the theory has been extended towards a physical explanation of the ordered gradation in the spectra of stars. The stellar data, particularly those accumulated by the Harvard College Observatory, are discussed from the point of view of the present theory, and it has been shown that the varying spectra of stars can be explained as functions of a single physical variable, viz. the temperature of the stellar atmosphere.—W. F. Darke, J. W. McBain, and C. S. Salmon: The ultra-microscopic structure of soaps. The ultra-microscopic observations of Zsigmondy and Bachmann on soap-curds have been confirmed, interpreted, and extended. The kinematograph has been employed as an aid in elucidating the formation and disappearance of the various structures observed. The curds of sodium, potassium, and hydrogen soaps are described and discussed.—Dr. J. Mercer: Linear transformations and functions of positive type. The paper contains developments of the theory of linear functional transformations as developed by F. Riesz in his paper "Untersuchungen über Systeme integrierbarer Funktionen" (*Math. Annalen*, vol. lxi., pp. 449-97).

**Mineralogical Society**, January 18.—Mr. A. Hutchinson, vice-president, in the chair.—A. F. Hallimond: The olivine group. Since the discussion of the densities by Thaddeef in 1896, and of the optical constants by Backlund in 1909, numerous additions have been made to the published data. These have been collected and the most probable values for the pure compounds obtained. The molecular volume of monticellite is slightly greater than the mean between forsterite and  $\gamma$ - $\text{Ca}_2\text{SiO}_4$ . For the complex mixtures the density and mean refractive index yield additive relationships, but the birefringence and axial ratios follow no additive law. The conditions of plotting which must be observed if the variation of an additive property with composition is to be expressed by a straight line were briefly summarised.—W. A. Richardson: A method of rock-analysis diagrams based on statistics. Oxide variation diagrams, similar to those employed by Dr. Harker, can be used for expressing the chemical relations of rock groups and individuals. The diagrams obtained from plotting Iddings's selected analyses gave the maximum variation for all rocks.—L. J. Spencer: Identity of Trech-

mann's " $\beta$ -tin" with stannous sulphide. A re-examination of the original material described by C. O. Trechmann in 1879 as an orthorhombic modification of tin proved that he made his crystallographic determinations on crystals of one kind (viz. stannous sulphide), whilst the chemical analysis was made on crystals of another kind (viz. metallic tin). Tin is, therefore, dimorphous and not trimorphous, "white tin" being tetragonal and "grey tin" cubic. Orthorhombic crystals of stannous sulphide ( $\text{SnS}$ ) and tetragonal crystals of iron stannide ( $\text{FeSn}_2$ ) from tin furnaces and rhombohedral crystals of tin arsenide ( $\text{Sn}_3\text{As}_2$ ) isolated from a tin-arsenic alloy were described.

**Linnean Society**, January 20.—Dr. A. Smith Woodward, president, in the chair.—E. H. C. Walsh: Lhasa and Central Tibet. The lecturer gave first a brief description of the country, the people, the religion, and the government. The country extends 1600 miles in its greatest breadth, and 800 miles in its greatest width, from the Koko Nor to the southern bend of the Takiang or Blue River; the superficial area is more than a million square miles, comprises the highest portion of the earth's surface, and is bounded on its southern frontier by the Himalayas, the loftiest chain of mountains in the world. The Tibetans are a Turco-Mongolian race and speak a monosyllabic language; it is believed that they originally lived in China, but were driven out by conquering races. They are mentioned as early as 770 B.C., when they were at war with the Chinese. There are two acknowledged forms of religion, the Buddhist and the Bon, pronounced Pön; the latter has adopted some of the formulas of the former, but reversed them, as in the case of the "Swastika" or fyle-fot cross; also the Buddhist prayer-wheel, with its invocation "Om mani padme hum." The two sects lived peaceably side by side. The Dalai Lama, the Pope of the Lamaist Church, is believed to be a continuous incarnation of previous Dalai Lamas, and of the Deity Avalokiteswara upon earth. When a Dalai Lama dies his reincarnation has to be looked for in some infant born shortly afterwards, and this is ascertained by the chief oracle indicating the part of the country and some clues, and the result of local inquiries is then reported to the leading Lamas, who decide by lot the actual child to be educated as the Dalai Lama.

**Physical Society**, January 28.—Sir W. H. Bragg, president, in the chair.—Prof. H. Nagaoka: The magnetic separation of neon lines and Runge's rule. The results of an investigation of the Zeeman effect for neon lines are given. The departures from Runge's rule—that the magnetic separation of the lines are aliquot parts of the separation of the normal triplet—are discussed. It is concluded that such discrepancies are due to variations of the ratio  $e/m$ .—E. V. Appleton: A method of demonstrating the retroactive property of a triode oscillator. The author, following Vallauri, gives an approximate treatment of the conditions which give rise to retro-action between the grid and anode circuits of a triode valve, and describes an arrangement of circuits whereby the property can easily be demonstrated to a large audience.—Dr. D. Owen and R. M. Archer: The quickness of response of current to voltage in a thermionic tube. Steady voltages were applied between the hot and cold electrodes of a thermionic tube for intervals of time varying from 0.0001 second to a minute or longer. The mean current during the interval was measured by the Wheatstone bridge, using a null ballistic method. Two types of thermionic tube were employed, one at a high gas pressure and the other

at a higher degree of exhaustion. The initial rise of current to its maximum is followed by a fall, the rate of which diminishes with time. In the tube at the high gas pressure the final value of current may be less than half the initial value. In the case of the tubes at lower gas pressure the fall is less pronounced, say 3 or 4 per cent. This fall is not attributable merely to the high temperature of the filament, but is conditional on the thermionic current being permitted to flow.

**Linnean Society**, February 3.—Dr. A. Smith Woodward, president, in the chair.—**M. Christy**: Wistman's Wood. Wistman's Wood is a small grove of ancient, but exceedingly gnarled and diminutive, oak-trees (*Quercus pedunculata*) growing out of an extensive pile of huge angular blocks of granite (known as a "clatter") without a particle of visible soil. The wood is almost in the centre of Dartmoor at an elevation of about 1500 ft. It contains about 300 to 400 trees, which are overgrown by masses of moss and lichens. Particulars of the habit and age of the trees are given.—**Dr. Agnes Arber**: The leaf-tips of certain Monocotyledons. The leaves of Monocotyledons are studied from the point of view of the phyllode theory. In simple monocotyledonous foliage leaves terminating in a solid apex, and also in spathe leaves ending in a similar tip, the main part of the leaf is of leaf-sheath nature, while the apex represents a vestigial petiole. In complex monocotyledonous leaves which are differentiated into sheath, stalk, and "blade," certain cases are known in which the "blade" terminates in a solid apex. It is provisionally suggested that such apices represent the unexpanded tip of the petiole.—**T. A. Dymes**: Seeding and germination of *Ruscus aculeatus*, Linn., in the south-eastern quarter of England. The berries and seedlings perish by severe frost, although the adult is hardy. Many seeds fail to germinate because immature. Frost kills many seedlings during the first winter. Better results are obtained by sowing, as soon as the seeds are ripe, at a depth of 1 in. than at a greater depth or in the spring. Survivors in the second season produce an axis some 3 in. long, bearing about six phylloclades in the axils of scale-leaves. The radicle perishes and adventitious roots are produced. During the second winter the seedlings are unable to withstand severe frost. There is no recapitulation of the ancestry by the seedling.

**Aristotelian Society**, February 7.—Lord Haldane, vice-president, in the chair.—**Prof. R. F. A. Hoernle**: A plea for a phenomenology of meaning. The task of a phenomenology of meaning is to collect and examine all types of empirical situations in which signs function and meaning is present. This is the more necessary as all the higher activities and all control of social organisations depend on the use of signs. Yet current theories are fragmentary and one-sided. This is shown by an examination of the theories of F. C. S. Schiller, B. Russell, Lady Welby, C. S. Peirce, G. F. Stout, A. Meinong, and E. Husserl. A clue to a completer theory may perhaps be found in the distinction between the *indicative* and the *expressive* function of signs. We have the pure indicative function when the existence of A enables us to infer the existence (or non-existence) of B. We have the pure expressive function when an agent makes or utters signs. The two functions are curiously interlaced in intersubjective intercourse. The distinction, however, requires to be tested further by application to various kinds of non-verbal signs, to symbolic actions, and especially to the functions of sounds in music.

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CAMBRIDGE.

**Philosophical Society**, January 24.—Prof. Seward, president, in the chair.—**G. I. Taylor**: (1) Experiments with rotating fluids. A summary of results on three subjects connected with the dynamics of rotating fluids was given without proof. The subjects treated were (a) difference between two- and three-dimensional motion, (b) stability of fluid contained between two cylinders, and (c) motion of a sphere in a rotating fluid. Experiments were described, and in the case of (a) and (c) some were shown at the meeting. (2) Tides in the Bristol Channel. It is shown that the Bristol Channel, which contains some of the largest tides in the world, can be represented with considerable accuracy by a channel the breadth and depth of which vary uniformly from the mouth to the head. Calculations of the effect of such a channel in increasing the tides are shown to agree well with the observed tides in the Bristol Channel. It appears, therefore, from the results obtained that the usual hydrodynamical theory of tides accounts quantitatively as well as qualitatively for the abnormally high tides which exist at the head of the Bristol Channel.—**F. W. Aston**: The deterioration of fabric under the action of light, and its physical explanation. The only serious factor in deterioration of unprotected aeroplane fabric, doped or undoped, when exposed to weather is found to be the action of sunlight. On investigation this action is shown to be relegated to the ultra-violet part of the spectrum. This deterioration appears to be due to the formation of ozone from the oxygen of the air which acts upon the fibres. This explanation is upheld by the fact that if the fabric is kept in a vacuum or in an atmosphere of hydrogen the effect is enormously reduced. Normally, ozone is formed in oxygen only by the action of light of wave-length too short to occur in sunlight at all, but this difficulty has been removed by Prof. Lindemann, who shows that the high refractive index of the fibres modifies the photoelectric action, increasing the maximum effective wave-length by a factor which brings the value up to that actually determined by experiment.—**S. Lees**: Note on constant-volume explosion experiments. An attempt is made to compute the order of the effect of temperature variations in an explosion vessel on the values of the total internal energy measured. The author gives reasons which indicate that the experimentally determined values of internal energy so obtained ought to be reduced slightly to get the corrected values for uniform temperatures. The correction is probably less than 1 per cent. for air at 1600° C. This correction is probably within the limits of experimental error at the present time.—**V. Brun**: The function [x].

MANCHESTER.

**Literary and Philosophical Society**, November 30.—Sir Henry A. Miers, president, in the chair.—**Prof. T. G. B. Osborn**: Notes on stone implements from the Cooper's Creek District, South Australia. Most of the specimens were found in May last on old camping-grounds of the Deari tribe during a visit to Killalpannina, on the Barcoo (Cooper's Creek), in the Lake Eyre region. It seems probable that knives were manufactured in certain places and the finished articles carried away. A crude flake struck off at a single blow served as a temporary cutting instrument provided it had a sharp edge, and was then discarded. Scrapers, knives, flakes, hammer-stones, and stones for grinding and crushing food materials were found. The grinding stones were used for grinding small seeds of *Eucalyptus microtheca*, etc.; the crushing stones for breaking hard "beans" of "nardoo"

(sporocarps of *Marsilea* sp.).—Prof. A. V. Hill: The purpose of physiology. As the handmaid of medicine, the task of physiology lies in the discovery and statement of the "normal" as distinguished from the "abnormal." As a pure science it is privileged to explore the mechanisms underlying the phenomena of life by any and every means provided by scientific progress. As an applied science, in co-operation with psychology, it deals with such questions as the conditions of maintenance of the "normal," the standards of fitness, mental, moral, and physical, and the biological factors in the economic or social system. Progress may be expected in the regions where physiology verges on the other, especially on the exact sciences, while the stimulus to the applications of physiology appears on the borders of medicine, sport and physical training, industrial fatigue, sociology or economics.

December 9.—Mr. R. L. Taylor, vice-president, in the chair.—Prof. T. E. Peet: Ancient Egyptian mathematics. Known to us chiefly from the Rhind papyrus in the British Museum, Egyptian mathematics is not a speculative science, but one purely practical in scope. The author dealt with the cumbersome notation; the use only of fractions the numerator of which was unity (with the one exception of two-thirds); tables for multiplication by 2 only, and with division by 2 only, larger divisions being done by trial. Problems such as the division of food, the measurement of areas, the exchange of loaves of various sizes and of jugs of beer were easily accomplished. A parallelepiped was correctly cubed, the volume of a cylinder obtained, and the circle given as the square of eight-ninths of its diameter. The existence in Egypt of a standard of rings or *shatyw* of various metals was dealt with.

## DUBLIN.

Royal Dublin Society, January 25.—Dr. F. E. Hackett in the chair.—J. J. Dowling: A direct-reading ultramicroscope. The apparatus, which was exhibited in operation, depends on the variation of the plate current in an oscillating-valve circuit, which accompanies a variation in the capacity of the oscillating circuit. The sensitivity of the arrangement is very high, but even under unfavourable conditions it shows remarkable steadiness. Preliminary measurements show that a displacement of about  $2 \times 10^{-8}$  cm. is detectable under ordinary working conditions, and with suitable precautions very much greater sensitivity can be reached. Further work in connection with the apparatus is being carried out.—J. Reilly and W. J. Hickinbottom: The distillation constant of certain primary alcohols. The authors have applied their method of distillation in steam to methyl, ethyl, propyl, butyl, and isoamyl alcohols. Percentage of alcohol is estimated from density or by oxidation. Distillation constant varied with concentration.

## EDINBURGH.

Royal Society, January 10.—Prof. F. O. Bower, president, in the chair.—The late Dr. John Aitken: Thermometer screens. This paper was left in manuscript by Dr. Aitken, and was completed a few days before his death. It gives a new series of experiments summing up his results communicated from time to time during the last thirty years. The points emphasised were (1) the inadequacy of the Stevenson screen, which in sunny weather always makes the enclosed thermometers read too high; (2) the uncertainty of measuring the temperature of the air, which cannot be other than a time-average varying with the

thermometer used; and (3) the description of a new simple form of screen which satisfies all practical needs.—Prof. W. Peaucet: The avoidance of relativity which is not of Galileo-Newtonian type. It is the aim of natural philosophy to find more and more inclusive laws describing the course of inanimate Nature. Examples are the conservation of matter and energy, the law of least time, stationary action, varying action, and Einstein's recent development of relativity. Their chief value lies in the fact that they give results which are independent of the particular mechanism involved. All actions which seem to occur at a distance take place, according to Newton, through a medium or æther. It is sometimes asserted that in consequence of the results of the principle of relativity the æther is non-existent; but the natural philosopher is entitled to claim that any such deduction from a theory which obtains its results independently of the mechanism involved can have no validity. Within its range the principle is of great value and constitutes the greatest advance made in connection with general laws since the introduction of the principles of action. These general laws can only be judged by the coincidence of their conclusions with observation. In this respect Einstein's principle stood successfully the test of two facts of observation, one of which was a prediction. In connection with a third the result is doubtful. It is, therefore, desirable to consider possible modifications of the basis to which the principle is applied. The only one now possible seems to be that connected with the postulate that light is propagated through a uniform æther regarded as at rest in space. If light is propagated through æthereal strain-forms associated with the atoms and moving with them, the æther itself may be at rest, but this experimental foundation for the recent extensions of relativity would disappear. On the other hand, in this case a positive result should be given by the Michelson-Morley experiment if made with light from a star moving rapidly to or from the earth. The paper concluded with a discussion of the possibility of a mechanical foundation of this view in an extension of Osborne Reynolds's theory of a granular æther.—F. Unwin: The transverse galvanomagnetic and thermomagnetic effects in several metals. This investigation into these minute effects gave results which were compared with certain conclusions derived by Livens from the modern electron theory. The agreement was satisfactory as regards the ratios of the effects, but not as regards their magnitudes.—P. Humbert: The confluent hypergeometrical functions of two variables.

## PARIS.

Academy of Sciences, January 31.—M. Georges Lemoine in the chair.—The president announced the death of M. Emile Bourquelot, member of the section of chemistry.—L. Favé: Curves designed for the determination of orthodrome routes. On a sheet of transparent material curves are drawn representing, in Mercator's projection, a series of great circles cutting the equator at the extremities of a given diameter. A second family of curves of a different colour serve to measure the orthodrome distance.—A. P. Dangeard: Observations of an alga cultivated in the dark for eight years. *Scenedesmus acutus* has been cultivated in the absence of light since January, 1913, and is as green as specimens grown in the light in the ordinary way. The examination of the absorption spectrum of the chlorophyll shows no difference between the two series. A special culture medium is required, the composition of which is given.—E. Mathias, C. A. Crommelin, and H. K. Onnes: The

rectilinear diameter of hydrogen. Supplementing earlier work, the densities of liquid hydrogen between  $-239.91^{\circ}$  C. and the boiling point,  $-252.76^{\circ}$  C., have been studied. The cryostat used consisted in a bath of superheated hydrogen vapour, obtained from the evaporation of the liquefied gas and heated by electrical means. The automatic current regulator employed permitted control of the temperature to within  $0.01^{\circ}$  C. for several hours. The experiments required the preparation of about 170 litres of liquid hydrogen and 400 litres of liquid air. The ordinate of the diameter was found to be  $-0.06351-0.00039402\theta$ . The critical density was 0.03 and the critical coefficient 3.276. Hydrogen obeys the law of the rectilinear diameter.—Auguste Béhal was elected a member of the section of chemistry in succession to the late Armand Gautier.—G. Fubini: Automorphic functions.—T. Varopoulos: A class of multiform functions.—A. Véronnet: The variation of a conical trajectory under the action of the resistance of a medium.—J. Villey: Experimental installations for aerodynamical researches. A discussion of the recent proposal by M. Margoulis, suggesting the use of carbon dioxide under high pressures and at low temperatures as the circulating gas in the testing of aeroplane models. Apart from certain difficulties of construction which would add to the cost of the apparatus, the author is of opinion that the use of carbon dioxide could only be complementary to the use of air, and could not safely be employed instead of the latter.—M. Curie: The action of red and infra-red rays on phosphorescent substances. An account of experiments in which zinc sulphide and other phosphorescent substances were submitted to the simultaneous action of ultra-violet rays (mercury lamp with nickel oxide glass filter) and infra-red rays (arc lamp with cuprous oxide glass filter). The sulphides examined behaved differently from fluorescent bodies such as uranium nitrate, barium platinocyanide, and fluorescein.—M. de Broglie: The corpuscular spectra of the elements.—A. Léauté: Complement to the theory of the induced reaction for saturated alternators.—H. Colin and Mlle. A. Chaudun: The application of the law of hydrolysis to the determination of molecular weights.—A. Mailhe: The catalytic preparation of secondary amines and an attempt to introduce the alkyl group into these bases. Schiff's bases, mixed with a small quantity of finely divided nickel and heated to  $170^{\circ}$  C., are reduced smoothly to secondary amines by hydrogen. An attempt to prepare tertiary amines by passing a mixture of the secondary amine and alcohol over alumina heated to  $380^{\circ}$ – $400^{\circ}$  C. was not successful, as the bases were split up in contact with the catalyst.—E. Saillard: The balance of chlorine during the manufacture of sugar and the proportion of chlorine in the beetroot.—L. MacAuliffe and A. Marie: The study and mensuration of 117 Belgians.—P. Audigé: The growth of fishes maintained in a medium at a constant temperature.—E. Rabaud: The paralysing instinct of the spiders.—R. Bayeux: Respiratory insufficiency at very high altitude and its correction by subcutaneous injections of oxygen.—A. Lumière and H. Couturier: The nature of the anaphylactic shock. Further experiments tending to show that the causes of the anaphylactic shock are the same as those of the anaphylactoid crises resulting from the sudden introduction of insoluble substances into the circulation.—Et. and Ed. Sergent: Attempts at vaccinating against paludism in birds due to *Plasmodium relictum*.—E. Woolman: The rôle of flies in the transport of pathogenic germs studied by the technique of aseptic cultivations. These experiments show that contaminated flies remain infected for some days only. Removed

from the source of contamination, they free themselves very rapidly, probably mechanically, from the infecting germs.—MM. Kohn-Abrest, Sicard, and Paraf.

MELBOURNE.

Royal Society of Victoria, November.—Mr. F. Wise would, vice-president, in the chair.—E. Ashby: A description of the Bracebridge Wilson collection of Victorian Chitons, with a description of a new species from New Zealand. This collection was made by the late Mr. J. Bracebridge Wilson, working in connection with the Port Phillip Exploration Committee of the Royal Society, and was dealt with by E. R. Sykes in the Proc. Malac. Soc. in 1896. In addition to the five species described by Sykes as new, the author notes four other species then undescribed, *Callochiton rufus*, Ashby, which has hitherto been known only by a single type-specimen dredged in South Australia, and a new species of *Lepidopleurus* from New Zealand.—Dr. J. M. Baldwin: Application of genetics to plant-breeding. The problems of genetics are those which grow out of a study of the resemblances and differences in individuals related by descent. There are four general lines of attacking the problems: (a) The method of observation used by Darwin in marshalling evidence in favour of the evolution theory; (b) biometrical methods employed with such success by Pearson; (c) cytological methods, which are primarily concerned with a study of cell-mechanism; and (d) experimental breeding, which involves the raising of pedigreed cultures of plants. From the last method have come many stimulating ideas of heredity and variation, including the Mendelian theory of heredity, the pure-line theory of Johannsen, and the mutation theory of De Vries.

### Books Received.

- Journal of the Royal Statistical Society. New Series. Vol. lxxxiv., part 1, January. Pp. x+165. (London.) 7s. 6d.
- A New Bristol Flora: British Wild Flowers in their Natural Haunts. By A. R. Harwood. (In 6 vols.) Vol. i. Pp. ix+244. Vol. ii. Pp. xi+243+ xvii plates. (London: Gresham Publishing Co.) 12s. 6d. net per vol.
- Principles of Human Geography. By E. Huntington and S. W. Cushing. Pp. xiv+430. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 21s. net.
- Rapid Methods for the Chemical Analysis of Special Steels, Steel-making Alloys, their Ores and Graphites. By C. M. Johnson. Third edition, revised and enlarged. Pp. xi+552. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 36s. net.
- The Health of the Industrial Worker. By Prof. E. L. Collis and M. Greenwood. Pp. xix+450. (London: J. and A. Churchill.) 30s. net.
- Poverty and its Vicious Circles. By Dr. J. B. Hurry. Second and enlarged edition. Pp. xvi+411. (London: J. and A. Churchill.) 15s. net.
- The Mother and the Infant. By Edith V. Eckhard. (Social Service Library.) Pp. viii+256. (London: G. Bell and Sons, Ltd.) 6s. net.
- The Microscope: Its Design, Construction, and Applications. Edited by F. S. Spiers. Pp. v+260+ plates. (London: C. Griffin and Co., Ltd.) 21s. net.
- Il Regime delle Acque nel Diritto Pubblico e Privato Italiano. By A. Vitale. Pp. x+480. (Milano: U. Hoepli.) 25 lire.