

Mr. J. G. Legge, Mr. R. W. Livingstone, Mr. G. A. Macmillan, Prof. Gilbert Murray, Mr. Cyril Norwood, Prof. W. Rhys Roberts, Mr. C. E. Robinson, Prof. A. N. Whitehead, and Mr. C. Cookson (secretary). Communications intended for the Committee should be addressed to Mr. C. Cookson at the offices of the Board of Education, Victoria and Albert Museum, Exhibition Road, South Kensington, S.W.7.

THE eighth annual Conference of Educational Associations will be held in University College, Gower Street, London, W.C.1, from Wednesday, December 31, 1919, to Saturday, January 10, 1920. Mr. H. A. L. Fisher, President of the Board of Education, will give an address at the inaugural meeting, and the following are among the subjects to be discussed at meetings of some of the associations:—National Association of Manual Training Teachers and Educational Handwork Association: (a) The Measurement of Practical Ability and (b) Handwork and Science. British Psychological Society—Education Section: The Development of Mental Tests. Association of Science Teachers: Anti-gas Fans—with Experiments. Geographical Association: The Present Position of Geography in the Upper Forms—Some Causes and Possible Remedies; Spitsbergen; Islands, Peninsulas, and Empires; and Rainfall Considered as a Geographical Function. The Association of Science Teachers has arranged for a demonstration of Dr. Wilson's astronomical model at intervals throughout Monday, January 5.

THE inauguration of the University of Strasbourg under the new régime, which took place on November 22, was naturally an event of importance. The position of Strasbourg as the eastern outpost of French culture gives to its University a position of outstanding prestige. The authorities responsible for its "reconstruction" under the tricolour intend to maintain a very high standard of studies, and are especially anxious to attract students from this country. There are six faculties (law, sciences, letters, medicine, and Protestant and Catholic theology) and a *personnel enseignant* of 170 professors and *maitres de conférence*. A well-endowed Société des Amis de l'Université (2 rue Geiler, Strasbourg) has just been founded, and one of its chief objects will be that of welcoming students (of either sex) from abroad and of making life attractive to them. Inquiries should be addressed to the society. The cost of living is much to the advantage of British residents on account of the very favourable rate of exchange. The imposing university buildings (opened in 1884 at a cost of 2,000,000*l.*) stand in the centre of the city, and close at hand is the magnificent library of 1,200,000 volumes, so rich in German literature. Strasbourg itself is, without doubt, one of the most attractive and well-governed cities in Western Europe, and its close proximity to the beautiful forests of the Vosges gives it a further advantage as a place of residence for British students.

### SOCIETIES AND ACADEMIES.

LONDON.

**Royal Society**, November 20.—Sir J. J. Thomson, president, in the chair.—W. J. Johnston: A linear associative algebra suitable for electro-magnetic relations and the theory of relativity. The algebra is based on four fundamental units  $i, j, k, o$ . The square of each unit is  $-1$ , while the other binary products are polar ( $ij = -ji, io = -oi$ , etc.). This algebra is associative.  $i, j, k$  are interpreted as mutually rectangular unit vectors in Euclidean space, while  $o$  is a unit vector in the fourth dimension perpendicular to the other three. Let  $\omega$  be the pure imaginary scalar  $ct\sqrt{-1}$  and  $W = c^{-1}\phi\sqrt{-1}$ , where

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$\phi$  is the scalar potential, then if  $(F, G, H)$  is the ordinary vector potential the vector

$$U = iF + jG + kH + oW$$

is the fourfold vector potential. If  $\nabla_1$  is the operator

$$i\frac{\partial}{\partial x} + j\frac{\partial}{\partial y} + k\frac{\partial}{\partial z} + o\frac{\partial}{\partial \omega},$$

then the electric and magnetic forces are the six components of  $c\nabla_1 U$ , the scalar part of which vanishes; and the eight scalar equations of the electro-dynamic field which connect these forces are expressed by the single equation  $\nabla_1(\nabla_1 U) = 0$ . This equation in the equivalent form  $\nabla_1^2 U = 0$ , when interpreted in terms of ordinary space, expresses that all the disturbances are propagated from their point-sources with uniform velocity  $c$ . Sir Joseph Larmor: Generalised relativity, in connection with Mr. W. J. Johnston's symbolic calculus. If  $ijk$  are polar units, so that  $i^2 = -1, ij = -ji$ , then  $ik + jy + kz$  is a binary form involving the position of a point  $xyz$  and that of a trihedron  $ijk$ . So far as regards relative position, a displacement of the one is the same thing as a displacement of the other. A vector  $iF + jG + kH$  represents an entity independent of the trihedron of reference, so is invariant for changes of the latter. Operations of addition and multiplication of vectors give results which are also invariant. Similar statements apply in geometric algebras of higher dimensions, and the scalars involved may be ordinary imaginaries. With the four dimensions  $x, y, z, ct\sqrt{-1}$  of Minkowski, Mr. Johnston has shown that the vector forces of the electro-dynamic field are specified by  $\nabla_1 U$ , where  $U$  is the fourfold vector potential, and the eight equations of the field are summed up in  $\nabla_1^2 U = 0$ . But a source, naturally conceived as a singular point in ordinary space, complicates now into a Minkowski line. Again, all the geometric quantities natural to any Euclidean hyperspace are those which are evolved immediately from the addition and multiplication of vectors in it. It is proved that the possible types of disturbance propagated through an æther, which conform to the principle of relativity, are restricted to the single one specified by Maxwell's electro-dynamic scheme. In an appendix the Einstein idea of gravitation is developed as a theory of correspondence of modes of action of a physical system; it appears, at any rate on this view, that it does not involve displacement of the solar spectral lines.—G. E. Bairsto: The variation with frequency of the conductivity and dielectric constant of dielectrics for high-frequency oscillations.—F. J. W. Whipple: Equal parallel cylindrical conductors in electrical problems. Dr. Alexander Russell has recently directed attention to the practical importance of determining the mutual induction between currents of high frequency carried by parallel cylindrical conductors, and pointed out that the problem is mathematically equivalent to that of finding the distribution of static charge on two electrified conductors. The first part of the present paper is devoted to the solution of this problem. The coefficients of mutual and self-induction and the force between the cylinders, regarded as carriers of high-frequency currents, concentrated on the surfaces, are also investigated.—G. A. Schott: The scattering of X- and  $\gamma$ -rays by rings of electrons. A crucial test of the electron-ring theory of atoms. This paper investigates the effect of the regular spacing of the electrons of a ring on the scattering of X- and  $\gamma$ -rays, treated as undamped simple harmonic wave-trains of high frequency. The ring, whether at rest or revolving uniformly about its axis, diffracts the waves incident on it in all directions, but not equally. For a single electron the law of distribution is that of Sir J. J. Thomson's simple-pulse theory, but it deviates

from it as the number of electrons increases, more energy going forward in the direction of the incident rays than backward. This asymmetry is retained, though to a less extent, by an irregular assemblage of similar electron rings with their axes distributed uniformly in space. An expression is obtained for the scattering coefficient, or mean total energy scattered per ring per unit intensity of the incident radiation, in a finite form, depending upon the number of electrons in the ring and on the ratio which its radius bears to the wave-length of the incident radiation.

**Physical Society**, November 14.—Prof. C. H. Lees, president, in the chair.—S. **Butterworth**: The self-inductance of single-layer flat coils. Two formulæ are established for the computation of the self-inductance of single-layer flat coils, one for the case when the inner and outer radii are not very different, and the other for the case of small inner radius. The two formulæ are shown to be consistent and capable of including all possible cases.—Dr. N. W. **McLachlan**: An experimental method of determining the primary current at break in a magneto. A method of obtaining experimentally the current at break in a magneto is described. A condenser is connected across the secondary winding to reduce the voltage below that required to cause sparking at the safety gap. The peak voltage due solely to interruption of the current at any speed is found. The interrupted direct current necessary to give the same peak voltage is also found by using a calibrating circuit. The magnitude of this current is equal to that broken in the magneto. The influence of the secondary condenser on the primary current at high speeds is discussed.—F. W. **Newman**: A new form of Wehnelt interrupter.

**Royal Meteorological Society**, November 19.—Sir Napier Shaw, president, in the chair.—Lieut. C. W. B. **Normand**: Effect of high temperature, humidity, and wind on the human body. The climatic conditions under which a wet bulb, restricted to a certain maximum rate of evaporation and having an initial temperature of  $36.5^{\circ}$  C., will neither gain nor lose heat are derived from kata-thermometer and wet-bulb formulæ. The application of these results to the human body is then considered, and, on the assumption that conditions resulting in a rise of body temperature above  $36.5^{\circ}$  C. must be fatal, the upper limits to liveable climatic conditions are deduced. The scorching, and sometimes deadly, simoom of tropical deserts is considered to be a case of the onset of a high wind without necessarily a change of temperature or humidity, converting liveable into unliveable conditions. The suggestion is also made that an essential feature of heat-strokes may be that a portion of the body has been exposed for a time to air conditions which are above the limit for existence. The wet kata-thermometer and wet-bulb formulæ were found to furnish quite discordant results regarding the behaviour of a wet surface under varying wind velocities, and it is suggested that this discrepancy is due to a less efficient wetting of the kata-thermometer bulb and to a consequently restricted rate of evaporation from it.—Capt. A. J. **Bamford**: Some observations of the upper air over Palestine. This paper gives a brief summary of some upper-air observations made in Palestine during the last two years. Tables and graphs are given showing the monthly averages of the horizontal movements at different altitudes over three stations, at one of which (near Ramleh) observations were kept up continuously for a year. The second part of the paper deals with vertical velocities, and includes frequency curves, showing for each of the layers 0–2000 ft., 2000–4000 ft., and 4000–6000 ft. the number of times in each month that the observed

velocities differed from the theoretical ones by not more than 10, 20, 30, or 40 per cent., etc. The lowest layer is appreciably the most varied, and in it differences of 50 per cent. are not unusual, although the average velocity differs very slightly from theory. In the other layers there is a distinct increase in the compactness of the frequency curves, while the average velocity changes from slightly above to slightly below the theoretical value.—E. G. **Bilham**: Barometric pressure and underground water-level. The results recently obtained from a study of an experimental well with autographic registration at Kew Observatory, Richmond, Surrey, are compared with some earlier records obtained by Dr. Isaac Roberts at Maghull, near Liverpool, and by Prof. K. Honda in the neighbourhood of Tokyo, in Japan. As at Kew, the sensitiveness of the water surface at Maghull to pressure changes varies considerably, high sensitiveness being associated with saturation of the soil by previous heavy rainfall. In Japan it was found that in surface wells the water-level was not affected by pressure changes, sensitiveness being exhibited by deep artesian wells only. Prof. Honda has pointed out that by determining the sensitiveness of a well to barometric pressure the extent to which pressure changes affect strata at a given depth below the surface can be deduced. Data for Japan and the British Isles obtained in this way show marked points of difference.

#### CAMBRIDGE.

**Philosophical Society**, November 10.—Mr. C. T. R. Wilson, president, in the chair.—Dr. **Hartridge**: Colorimeter design.—J. T. **Saunders**: A note on hydrogen-ion concentration and photosynthesis. Spirogyra and elodea during photosynthesis cause the surrounding water to become markedly alkaline. Acids are very rapidly absorbed.—J. **Gray**: (1) The effects of some ions on spermatozoa. A suspension of Echinus spermatozoa in sea-water behaves in an electric field or in the presence of hydrogen ions or trivalent ions in the same way as an emulsion of albumen in alkaline solution. (2) The effects of ions on ciliary movement (gills of *Mytilus edulis*). By far the most potent ions in sea-water which affect ciliary movement are hydrogen ions and hydroxyl ions.—C. **Warburton**: Note on the solitary wasp, *Crabro cephalotes*. A small colony of *C. cephalotes* took possession in August, 1919, of a log in the author's garden, and afforded an opportunity of studying their habits with some accuracy. Observations were made on the time occupied in capturing and bringing home their prey and in packing them in the burrows.—Miss M. D. **Haviland**: Preliminary note on the life-history of a Proctotrypid (*Lygocerus* sp.) hyperparasite of Aphidius. *Lygocerus Cameronei*, Kieff (Proctotrypidæ), is a hyperparasite of certain Braconid parasites of plant-lice, and not a parasite of the aphides themselves, as has hitherto been assumed.—H. J. **Snell** and W. H. **Tams**: The natural history of Rodrigues, with exhibits. The paper gives a brief account of the island of Rodrigues as it at present exists. Since it was first discovered it appears to have been completely swept by fire, save only for peculiar deep pits in the elevated coral rock which in places overlies the volcanic. Here a certain number of the indigenous plants still survive, but probably the species in the flora are only half as numerous as when the island was first discovered; great damage has also been done by pigs and goats. The fauna previously described was almost in its size that of a coral island, but the present collections reveal much larger numbers of species and more variety, indicating probably a greater age for the island; the fauna also shows a close parallel to that of Mauritius and other volcanic islands in its adaptability to island conditions.

## MANCHESTER.

**Literary and Philosophical Society**, November 4.—Prof. F. E. Weiss in the chair.—Prof. W. H. Lang: One of the simplest land-plants, *Hornea Lignieri*. The further results obtained by Dr. R. Kidston and Prof. W. H. Lang in the study of the silicified Old Red Sandstone plants at Rhynie were described. Two species of Rhynia are now distinguished, *R. Gwynne-Vaughani* and *R. major*. The latter is the larger in all its parts, and differs in some details of anatomy. These plants are rootless and leafless, and consist of a subterranean rhizome with rhizoids, dichotomously branched cylindrical aerial stems, and large terminal sporangia. Another equally simple plant, associated with these in the family Rhyniaceæ, has been discovered and investigated. This, *Hornea Lignieri*, consisted of rhizomes, branched stems, and terminal sporangia, without roots or leaves. The rhizomes were lobed parenchymatous structures, suggesting comparison with the protocorm of certain species of Lycopodium. The stems branched dichotomously, and had a simple central cylinder, cortex, and epidermis. No stomata have yet been discovered in this plant, as they have in Rhynia, but its organisation suggests a similar land-habit. The sporangia are remarkable in the presence of a columella-like central region, making the spore cavity dome-shaped. These simple vascular Cryptogams suggest comparisons with Bryophyta and Algæ.

## PARIS.

**Academy of Sciences**, November 10.—M. Léon Guignard in the chair.—M. Hamy: A case of diffraction of images of circular stars.—H. Douvillé: The geology of Mont Blanc.—A. Blondel: A solution of heterochromatic photometry permitting of a physical measurement of the luminous intensity. The instrument proposed is based on the inversion of a spectrograph, the slit being replaced by a thermocouple.—L. Cuénot: The coaptation of the anterior femurs and of the head in the Phasmidæ.—E. Bompiani: Surfaces of translation and minimum surfaces in curved space.—B. Baillaud: Return of the Finlay comet; re-found by M. Schaumasse; compared by M. Fayet with the recent Sasaki comet. The comet discovered on October 25 by Sasaki is considered by M. Fayet, director of the Nice Observatory, as identical with the periodic Finlay comet recently found by Schaumasse.—A. Véronnet: Time and temperature of formation of a star. The author concludes that the sun originally could not have had a temperature more than three times its present temperature, or a radius more than double the present one. Even in this case the time of formation would have to be less than a million years. The physical conditions have never been greatly different from the existing ones.—M. Girousse: The calculation of the current thrown into the ground by the rails of electric tramways.—H. Colin and Mlle. A. Chaudin: The diastatic inversion of saccharose; influence of the products of the reaction on the velocity of hydrolysis. In all the cases studied the velocity of hydrolysis is a linear function of the fluidity of the solutions. The reduced velocity of hydrolysis of sugar by sucrase caused by the presence of lævulose or glucose must be attributed to the purely physical effect of increased viscosity.—L. Chelle: The detection of hydrocyanic acid in a case of poisoning. Its *post-mortem* transformation into thiocyanic acid. It is well recognised that hydrocyanic acid apparently disappears from the body at a certain period after death. It is now shown that this acid is not destroyed or transformed in an irreversible manner, but takes up sulphur and is converted into thiocyanic acid. The latter resists the action of putrefaction, and can be extracted from the tissues and reconverted by oxidation into hydro-

cyanic acid.—R. Levailant and L. J. Simon: The action of methyl alcohol on sulphuryl chloride and on methyl chlorosulphonate.—J. Barthoux: Relation of volcanic eruptions and marine transgressions in Egypt.—A. Briquet: The age of the old littoral lines of the Bas-Champs of Picardy.—G. Mouret: The prolongation to the north-west of the zone of crushed rocks recognised between Asprières (Aveyron) and Fromental (Haute-Vienne).—Ph. Glangeaud: The plateau of Millevaches, its cycles of erosion, its ancient glaciers and peat-bogs.—J. de Lapparent: The conglomerates of the valley of la Bruche and the character of the breccias of sedimentary origin.—P. Garrigou-Lagrange: The kinematography of atmospheric movements and weather prediction.—C. E. Brazier: Relations of wind with gradient in the lower layers of the atmosphere.—A. Goris and Ch. Vischniac: Characters and composition of primeverose. The new sugar was isolated from two glucosides extracted from *Primula officinalis*. Its physical and chemical properties are given. Glucose and xylose are the products of hydrolysis, and primeverose is the first known biose of this composition.—G. Tanret: The *miellée* of the poplar. Melezitose has been isolated from the sugary deposit (*miellée*) found in warm seasons on the upper faces of the leaves of certain species.—J. Amar: Mechanism of the cough in respiratory diseases.—J. Nageotte: The formation of conjunctive fibres in a non-living medium at the expense of dead protoplasm.—MM. G. Bertrand, Brocq-Roussou, and Dassonville: Destruction of *Sitotroga cerealella* by chloropicrin.

## BOOKS RECEIVED.

- Human Personality and its Survival of Bodily Death. By Frederic W. H. Myers. Edited and abridged by S. B. and L. H. M. Pp. xiii+307. (London: Longmans, Green, and Co.) 6s. 6d. net.
- South: The Story of Shackleton's Last Expedition, 1914-17. By Sir Ernest Shackleton. Pp. xxi+376. (London: William Heinemann.) 25s. net.
- Identification of the Economic Woods of the United States: Including a Discussion of the Structural and Physical Properties of Wood. By Prof. Samuel J. Record. Second edition, revised and enlarged. Pp. ix+157+vi plates. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 8s. 6d. net.
- The Theory and Practice of Working Plans (Forest Organization). By Prof. A. B. Recknagel. Second edition, thoroughly revised. Pp. xiv+265+vi plates. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 9s. net.
- Spiritual Pluralism and Recent Philosophy. By C. A. Richardson. Pp. xxi+335. (Cambridge: At the University Press.) 14s. net.
- The Principles of Electrical Engineering and their Application. By Prof. Gisbert Kapp. Vol. ii.: Application. Pp. viii+388. (London: Edward Arnold.) 18s. net.
- Asbestos and the Asbestos Industry: The World's Most Wonderful Mineral and Other Fireproof Materials. By A. Leonard Summers. (Pitman's Common Commodities and Industries.) Pp. ix+107. (London: Sir Isaac Pitman and Sons, Ltd.) 2s. 6d. net.
- Meteorology for All: Being Some Weather Problems Explained. By Donald W. Horner. With an introduction by C. S. Salter. Pp. xvi+184+vii plates. (London: Witherby and Co.) 6s. net.
- Ions, Electrons, and Ionizing Radiations. By Dr. James Arnold Crowther. Pp. xii+276. (London: Edward Arnold.) 12s. 6d. net.
- Psychology and the Day's Work: A Study in the