

January 6, 1912. The meetings will be held at Birkbeck College, Bream's Buildings, Chancery Lane, E.C. There will be addresses and discussions under the heads of specialisation in schools; chalk, brush, and pencil work in elementary schools; the doctrine of formal training (mental discipline); the treatment of backward children; and educational experiments in schools. No charge will be made for admission to the conference. Application for tickets of admission should be made to the Chief Inspector, London County Council, Education Offices, Victoria Embankment, W.C.

It is announced in the issue of *The London University Gazette* for November 29 that a donation of 1000*l.* has been made by Mr. and Mrs. Walter Baily, in celebration of their golden wedding, for the purpose of rearranging and decorating the interior of a portion of University College. From the same source we learn that the Galton Laboratory Appeal Fund now amounts to 262*l.* 15*s.* 6*d.* The list of donations, many of which are conditional on the buildings being commenced within two years, includes gifts of 500*l.* from Mr. W. E. Darwin, and Prof. Karl Pearson, F.R.S., and Mrs. Pearson; 250*l.* each from Prof. Arthur Schuster, F.R.S., and Mr. E. G. Wheler; and 100*l.* each from the Earl of Rosebery, Viscount Iveagh, Mr. A. F. Butler, Major Leonard Darwin, the Hon. Rupert Guinness, and Major E. H. Hills, F.R.S.

An interesting experiment is being tried by the local education authority of Plymouth with the view of arousing an interest in the study of science among the children in its schools. On December 8 Mr. C. Carus-Wilson lectured to five thousand children in the Plymouth Guildhall, taking "Volcanic Outbursts" as his subject. Each child paid one penny for admission to the lecture, and it is expected that no contribution from the rates will be necessary to meet the expenditure incurred. The children seem to have been thoroughly interested, and the education authority is likely to arrange a series of similar lectures in the future. Descriptive accounts of natural phenomena, when judiciously illustrated, appeal to most children, and many men of science trace their first enthusiasm for their subject to a good lecture, supplemented by telling experiments. The Plymouth experiment deserves to be copied in other large towns.

It is not clear from the reports in the daily papers of a meeting held at Brighton on December 12 whether the intention is to establish a university or a university college in the town. *The Times* reports that the meeting was "in furtherance of the movement to make Brighton a university town," while *The Morning Post* states that at the meeting (over which the Mayor of Brighton presided) "the proposal to establish a college of university rank for the county was unanimously approved." There is, of course, a vast difference between the two proposals, but apparently it is a university college which Brighton has in mind, and not a university. Resolutions approving of the principle of the establishment of a university college for Sussex, and the appointment of general and executive committees, were carried unanimously at Tuesday's meeting. The Mayor of Brighton was elected chairman of the executive committee, and Mr. W. H. B. Fletcher, who has taken a prominent part in the educational affairs of West Sussex, vice-chairman.

An interesting account of the way in which American agricultural experiment stations come into contact with the farmer is given in Bulletin 208 of the Agricultural Department of the University of Wisconsin. Crop demonstrations are arranged on twenty farms connected with various public institutions throughout the State, making use of seeds bred at the experiment station, and of methods of cultivation and manures that previous experiments had shown to be advantageous. The fields selected for these demonstrations are, so far as possible, chosen alongside of the public highways, where the operations and results can be seen by the farmer throughout the whole season as he drives to and from town. The local papers also contain accounts from time to time of the work done and the appearance of the crop. Some time during the summer, when the crops are at their best, a demonstration picnic is arranged, to which large numbers of farmers are invited, the average attendance last year

being 320. These meetings occupy an entire day, and a definite programme is arranged dealing with six to eight subjects centring round the field work. The effective feature is the fact that all the practices suggested to the farmer are illustrated in operation on the farm, and the crops are there to show in concrete form what the results have been. The influence of the work is very great, many farmers putting the new methods into operation at once.

THE December issue of *The Reading University College Review* is one which reflects credit on the college. The most interesting feature to readers in general will be the forty pages of notes on the multifarious activities of the institution. From these we learn that the entry of new students for the present session was very satisfactory. The number of students taking degree courses is 114, of whom 44 belong to the faculty of science and 6 to the Department of Agriculture. During the previous session 80 students received instruction in the dairy institute, in which connection it is interesting to record that at the annual meeting of the Berks. and Oxon. Chamber of Agriculture the following resolution was passed:—"The Board of Agriculture having decided to establish a central research station for dairying, we, the Berks. and Oxon. Chamber of Agriculture, strongly urge that University College, Reading, which is already in close touch with agriculturists and farmers in Berks. and the adjoining counties, should be selected as that centre. Our contention is based on the fact that the college is situated in the centre of a large dairying district, and that in Reading it has the headquarters of this Chamber and of the Berks. and Adjoining Counties Dairy Farmers' Association, where it can readily consult the farmers of the district. Believing that such close relations are essential to any scheme of agricultural development, we are anxious to see advantage taken of the exceptional facilities afforded in Reading."

At a dinner of the Clothworkers' Company held on December 6, the President of the Board of Education, replying to the toast of the Houses of Parliament, referred to the generous assistance rendered by the great City companies to the promotion of facilities for higher education in this country. The President said he found that the Goldsmiths' Company contributed 50,000*l.* to the new engineering buildings of the Imperial College of Science and Technology. The Drapers' Company contributed 10,000*l.* to the building fund of the new college at Bangor, and this year the Drapers' Company contributed 23,000*l.* to the physiological laboratory at Cambridge and 15,000*l.* to the University of Sheffield. This year the Clothworkers' Company contributed 5000*l.* to the textile industries department at Leeds University. The Merchant Taylors' Company maintain the Merchant Taylors' School, the Mercers' Company are identified with St. Paul's School, the Fishmongers' Company with the Gresham College, the Skinners' Company with Tonbridge School, and the Haberdashers' Company with Aske's Foundation. The Clothworkers' Company are second in the list of donors to the City and Guilds of London Institute. Words failed him, Mr. Pease said in conclusion, to commend sufficiently their liberality and generosity in the interests of education. The Clothworkers' Company has equipped the textile and dyeing department of Leeds University to the extent of 161,000*l.*, and 75 per cent. of its income is contributed to the promotion of education.

## SOCIETIES AND ACADEMIES.

### LONDON.

Royal Society, December 7.—Sir Archibald Geikie, K.C.B., president, in the chair.—Miss I. B. Sollas and Prof. W. J. Sollas: Lapworthura: a typical brittlestar of the Silurian age; with suggestions for a new classification of the Ophiuroidea.—Leonard Hill and Martin Flack: The physiological influence of ozone. Ozone, in concentrations of one part in a million and more, acts as an irritant to the respiratory tract, and diminishes the respiratory metabolism, as shown by the lessened output of carbonic acid and the diminished fall in body weight, which occur both during the period of administration and for some time after. Concentrations of several parts per million cause acute inflammatory congestion of the lungs, and

animals die as the result of this if kept long exposed to the ozone. Concentrations which can just be sensed by smell, *i.e.* far less than one part per million, have no injurious effect, and can be used safely in systems of ventilation. Injurious concentrations of ozone, by producing irritation of the air-passages, cough, and headache, compel anyone exposed to such to remove himself from the influence of ozone before any serious damage is done to the respiratory tract. Very low concentrations of ozone mask disagreeable smells, give a fresh quality to air vitiated by such smells, and vary the depressing monotony of air which is artificially warmed. Ozone may possibly have some use in the treatment of disease of the respiratory tract if used in concentrations which produce a slight irritation, and thus bring more blood and tissue lymph to the part.—**H. R. Dean**: The factors concerned in agglutination. (1) If, to a mixture of sheep corpuscles with antiserum so dilute that no agglutination is visible be added a solution of globulin obtained from normal guinea-pig serum, the corpuscles are markedly agglutinated. By use of suitable controls it can be demonstrated that neither the globulin solution nor the dilution of antiserum employed are of themselves capable of agglutinating the corpuscles. (2) The substance present in the globulin solution which aids agglutination is relatively thermostable, and its presence can be demonstrated in whole heated guinea-pig serum. (3) Corpuscles, sensitised and washed to remove free antibody, can be agglutinated by the globulin solution. If, after agglutination has taken place, the corpuscles be removed with a centrifuge, the supernatant fluid can be shown to have lost its agglutinating property. (4) The agglutinating power of an extremely dilute antityphoid serum can be increased by addition of globulin solution. Adding this to a mixture of emulsion of *B. typhosus* with a dilution of antiserum too weak by itself to agglutinate bacilli, distinct agglutination can be obtained. (5) Formation of a specific precipitate by interaction of serum and homologous antiserum depends on the presence in the mixture of a relatively large amount of antiserum. If to a mixture of serum with antiserum so diluted that it is no longer able to produce a precipitate is added the globulin solution, a definite turbidity is produced. (6) Probably agglutinating serum (antiserum) contains two factors, both of which are necessary to produce agglutination; one of these is the specific antibody, the other is a non-specific substance, possibly serum globulin. The interaction of antigen with antibody produces an aggregation of molecules of non-specific substance, which may ultimately result in formation of definite turbidity. This process of aggregation of the particles of non-specific substance is an essential part of the process of agglutination. It is possible to make a dilution of an antiserum which contains sufficient of specific anti-substance, but not sufficient of non-specific substance. Deficiency in non-specific substance can be made up by addition of globulin solution obtained from normal serum.—**Arthur Harden** and **S. G. Paine**: Action of dissolved substances upon the autofermentation of yeast. All dissolved substances which plasmolyse the yeast-cell also cause a large increase in the rate of autofermentation. Substances such as urea, which even in concentrated solution do not produce plasmolysis, have no accelerating effect. Toluene produces a similar effect to concentrated salt solutions. The effect produced by salts is probably a direct result of the concentration of the cell contents due to plasmolysis, but in the case of toluene it is possible that some other factor (such as disorganisation of the cell, or hormone action) is concerned.—**Prof. G. Dreyer** and **W. Ray**: Further experiments upon the blood volume of mammals and its relation to the surface area of the body.—**G. W. Ellis** and **J. A. Gardner**: The origin and destiny of cholesterol in the animal organism. Part viii.—On the cholesterol content of the liver of rabbits under various diets and during inanition. The authors have made analyses of the livers of a number of rabbits fed on the following diets:—cabbage, bran which had been extracted with ether, extracted bran to which cholesterol had been added. In some cases the cholesterol, instead of being given with the food, was injected in olive-oil solution into the peritoneal cavity. For animals fed on extracted bran alone the total liver cholesterol per kilogram of body weight is very constant, but when cholesterol is given with the

food or injected into the peritoneal cavity a considerable increase takes place. A similar increase was observed in the liver cholesterol during inanition, when the animal lives on its own tissues. The percentage cholesterol content of the livers of newly-born animals is of the same order as that of normally fed adults. The results afford support to the working hypothesis, with regard to the origin and destiny of cholesterol in the organism, put forward some time ago by the authors, *viz.* that cholesterol is a constituent constantly present in all cells, and when these cells are broken down in the life process the cholesterol is not excreted as a waste product, but is utilised in the formation of new cells. A function of the liver is to break down dead cells, *e.g.* blood corpuscles, and eliminate their cholesterol in the bile. After the bile has been poured into the intestine in the processes of digestion, the cholesterol is reabsorbed, possibly in the form of esters, and carried in the blood stream to the various centres and tissues for reincorporation into the constitution of new cells.

**Physical Society, November 24.**—**Dr. A. Russell**: The maximum value of the electric stress between two unequal spherical electrodes. The experiments carried out by **F. W. Peek** (*Journal Am. Inst. of Electrical Engineers*, 1911) for the General Electric Company of America prove conclusively the value in practical work of a knowledge of how to compute the maximum value of the electric stress between high-pressure conductors. With equal spherical electrodes the electric stress between them can easily be computed from known tables. When, however, they are unequal the calculation becomes so laborious that it is prohibitive to nearly every experimenter. The author develops formulæ for this case, by means of which, and of the formulæ for the capacity coefficients given in a recent paper to the society, the calculation is very appreciably shortened. When the distance between the spheres is very small compared with the diameter of either, the following approximate formula for  $R_{\max.}$  (the maximum value of the electric stress) can be used

$$R_{\max.} = (V/x) \left[ 1 + (2b-a)x/(3ab) + \{4(a-b)^2 + ab\}x^2/45a^2b^2 \right],$$

where  $V$  is the maximum P.D. between the electrodes,  $x$  their distance apart,  $a$  the radius of the smaller and  $b$  the radius of the larger sphere. In this case a knowledge of the values of the capacity coefficients is not required.—**F. J. Harlow**: The cubical expansion of fused silica. The author describes experiments in which measurements of the cubical coefficient of expansion of fused silica from  $0^\circ$  C. to  $100^\circ$  C., and from  $0^\circ$  C. to  $184^\circ$  C., were made by the weight thermometer method. The values obtained were  ${}_0S_{100} = 99.8 \times 10^{-8}$  and  ${}_0S_{184} = 144.7 \times 10^{-8}$ . The fundamental coefficient is considerably less than that calculated from previous linear measurements, whereas  ${}_0S_{184}$  is only slightly less. A low value of the fundamental coefficient is to be expected, since the coefficient has been shown to change sign at about  $-80^\circ$  C. Observations of the ice-point before and after heating showed that no permanent change in the volume of the bulb occurred through heating, thus confirming the utility of fused silica for thermometric purposes.—**B. W. Clack**: The temperature coefficient of diffusion. The paper describes further experiments carried out by the author with an improved form of the apparatus previously described (*Proc. Ph. Soc.*, xxi., p. 374), by means of which the value of the coefficient of diffusion of salts through water can be found at various temperatures. Special flasks, similar to those already employed, were filled with the solution under investigation, and one was suspended from each arm of the balance in a large bath of distilled water maintained at constant temperatures in a thermostat room. The diffusion tubes of both flasks were of equal length, but their cross-sections differed considerably, and a method of differential weighing was used to compensate for any small changes in temperature. From the rate at which the flasks change in weight the value of the coefficient of diffusion of the salts is deduced. Figures are given for this value in the case of KCl and  $KNO_3$  at various concentrations and at different temperatures, and from these figures the temperature coefficient of diffusion is found.—**E. Marsden** and **T. Barratt**: The  $\alpha$  particles emitted by the active deposits of thorium and actinium. In a previous paper (*Proc. Phys. Soc.*, August) the authors showed that if  $\alpha$  particles are

counted on a zinc sulphide screen at a mean rate of  $\mu$  per second, then the probability of occurrence of a time interval, of length between  $t$  and  $t+\delta t$ , is  $\mu e^{-\mu t}$ . This formula may be applied to test whether two  $\alpha$  particles are given off simultaneously from a disintegrating atom or whether in any source of  $\alpha$  particles there exist two successive  $\alpha$ -ray products, the latter being of short life. In the previous paper uranium and polonium were shown not to give such irregularities, and in the present paper the same result has been found for actinium and thorium active deposits, although experiments of various investigators pointed to the probability of positive results. The experiments further suggest a lateral disintegration in thorium active deposit, and this is proved to be the case by results, which show that the two  $\alpha$ -ray products in Thor. Act. Dep. (Th. C<sub>1</sub> and C<sub>2</sub>) do not give an equal number of  $\alpha$  particles when the active deposit is in equilibrium which is required by the ordinary disintegration theory. Thus it is concluded that of the atoms Th. C<sub>1</sub>, 35 per cent. give rise to  $\alpha$  particles of 4.8 cm. range and 65 per cent. to  $\alpha$  particles of 8.5 cm. range, with probably the intermediate emission of  $\beta$  particles. Various cognate questions are also discussed in the paper.—S. W. J. Smith, W. White, and S. G. Barker: The magnetic transition temperature of cementite. The temperature at which cementite (carbide of iron) loses its ferromagnetism is determined sufficiently accurately for purposes of thermo magnetic analysis, and examples are given to show the possibility of using the thermomagnetic properties of cementite to determine whether that substance is present in any iron-carbon alloy.

## MANCHESTER.

Literary and Philosophical Society, November 28.—Prof. F. E. Weiss in the chair.—Dr. J. N. Pring and D. M. Fairlie: The synthesis of hydrocarbons and their stability at high temperatures and pressures. The reaction between carbon and hydrogen, which has been found to produce methane at all temperatures up to 1600°, has been examined at various pressures up to 200 atmospheres. In this way it has been possible to evaluate and verify the equilibrium in the formation of methane, arising according to the equation  $C+2H_2 \rightleftharpoons CH_4$ . In accordance with this reaction it follows from the law of mass action that  $\frac{p_{CH_4}}{p_{(H_2)^2}}=K$ , a constant at any given temperature. This was found to be the case in these experiments when any particular form of carbon was used. The yield of methane was found to increase with the pressure to the extent demanded by the above formula. At atmospheric pressure the equilibrium value with graphite corresponds to 0.24 per cent. at 1200° and 0.06 per cent. at 1575°. Values which were considerably higher were obtained with amorphous carbon, viz. an equilibrium which corresponds to 0.38 per cent. at 1200° and 0.18 per cent. at 1550°. This divergence is due to the fact that amorphous carbon is unstable at these temperatures, and gives temporarily "false" or "metastable" equilibria, which are higher than the true values. The great inertness of methane to decomposition enables this false equilibrium value to persist for some time. The velocity of the reaction between carbon and hydrogen is very much increased at high pressures. No other saturated hydrocarbon is formed or can exist at temperatures above 1100°, and at pressures up to 200 atmospheres. The heat evolved in the transformation of carbon into graphite can be calculated from the data obtained in this work by means of certain deductions of van 't Hoff. The results show that this heat of transformation increases in the range of temperature between 1100° and 1600°. It follows from this, in accordance with the law of Kirchhoff, that the specific heat of carbon increases more rapidly and is higher than that of graphite at these temperatures, whereas the reverse would follow from the accepted values of Kuntz and of Weber, which do not therefore apply at high temperatures.

## DUBLIN.

Royal Dublin Society, November 28.—Prof. T. Johnson in the chair.—Sir Howard Grubb: Improvements in equatorial telescope mountings. The paper is divided into two parts, one dealing with the anti-friction arrangements of the large equatorials which are at present in course of

construction for Johannesburg, Santiago de Chile, and Madrid. This first portion of the paper describes the newly designed apparatus, and reports upon the result of the first trials. The apparatus described is a development of that used in Sir Howard Grubb's large instruments, improved in many ways and adapted for use with the modern ball or cylinder bearings, which have been found to give very satisfactory results. The second portion of the paper deals with a new arrangement for a differential hour circle. There are two designs described, one of which has been suggested by Sir David Gill, and is being adapted to the Johannesburg and Santiago telescopes. In this arrangement the differential hour circle is kept continually moving by a series of electric contacts from the sidereal clock of the observatory. The other form which has been designed by the author of the paper has been adapted to the Madrid equatorial, and in this case the differential hour circle is kept moving backwards as respects the polar axis by a small piece of clockwork carried on the axis itself, and this enables actual right ascensions to be read off by this circle from a fixed vernier.—Prof. T. Johnson: *Forbesia cancellata*, gen. et sp. nov. This fossil plant was collected by the Geological Survey of Ireland in 1851 from the Lower Carboniferous of co. Cork, and named in 1864 by W. H. Baily "Sphenopteris, sp." The fossil shows marked dichotomy in all its parts, even in the ultimate pinnule segmentation. There is no sign of vascular tissue, but axis and frond are alike honeycombed. The chambers are lined with rows of parenchymatous cells and their septa, apparently strengthened by sclerotic bands connected with submarginal vertical striæ. One specimen shows signs of a fruiting condition comparable with that in *Cephalopteris*, Nathorst, from the Upper Devonian of Bear Island. On the assumption that *Forbesia* is evascular, the author considers it to be the most primitive of the *primofilices* yet found. Comparison with *Sphenopteris devonica*, Ungler and Richter, is made.

## BOOKS RECEIVED.

- Traum und Traumdeutung als Medizinisch-Naturwissenschaftliches Problem im Mittelalter. By Dr. P. Diepgen. Pp. 43. (Berlin: J. Springer.) 1.20 marks.
- Traité complet d'analyse chimique appliquée aux essais industrielles. By Profs. J. Post and B. Neumann. Deux. édition française by G. Chenu and M. Pellet. Tome troisième—premier fascicule. Pp. 468. (Paris: A. Hermann & Fils.) 15 francs.
- Traité de Physique. By Prof. O. D. Chwolson. Ouvrage traduit sur les éditions russe et allemande, E. Davaux. Deux. édition française. Tome premier, by E. Cosserat and F. Cosserat. Pp. xviii+515. (Paris: A. Hermann & Fils.) 17 francs.
- Lehrbuch der Physik. By Prof. H. Ebert. Erster Band. Pp. xx+661. (Leipzig: B. G. Teubner.) 14 marks.
- Das Leben im Ozean nach Zählungen seiner Bewohner. By Prof. V. Hensen. Pp. v+406+28 Tabellen u. 1 Tafel. (Kiel: Lipsius & Fischer.)
- Religion and Modern Psychology. By J. A. Hill. Pp. 200. (London: W. Rider and Son, Ltd.)
- A Treatise on Hydrodynamics. Part i. Hydrostatics. By Dr. W. H. Besant and A. S. Ramsey. Seventh edition. Pp. 275. (London: G. Bell and Sons, Ltd.) 7s. 6d. net.
- Results of Meteorological Observations made at the Radcliffe Observatory, Oxford, in the Six Years 1900-1905 under the direction of Dr. A. A. Rambaut, F.R.S. Vol. xlix. Pp. xx+304. (Oxford: H. Frowde.)
- Aus Natur und Geisteswelt:—Die Milch und ihre Produkte, by Dr. A. Reitz; Die Kinematographie, by Dr. H. Lehmann; Die Sonne, by Dr. A. Krause; Probleme der modernen Astronomie, by Prof. S. Oppenheim; Einführung in die Biochemie, by Prof. W. Löb; Aus der Vorzeit der Erde, by Dr. F. Frech, i. to vi., Zweite Auflage; Das Süßwasser-Plankton, by Prof. O. Zacharias, Zweite Auflage; Moleküle, Atome, Weltäther, by Prof. G. Mie, Dritte Auflage. (Leipzig: B. G. Teubner.) 1.25 marks each.
- Wirkungsweise und Gebrauch des Mikroskops und Seiner Hilfsapparate. By Prof. W. Scheffer. Pp. vii+116. (Leipzig: B. G. Teubner.) 2.40 marks.