

missions granted to other graduates and students is 273. Honours and distinctions conferred include one Companionship of the Bath, one Victoria Cross, thirty Military Crosses, and seventy-eight Mentions in Despatches. Eighty-nine members of the contingent have fallen in the war. Returns received already from schools and institutions of the University show that upwards of 600 members of the staffs, and more than 6000 of their present and former students, have gone to the war. During the year the number of these who have given their lives has been 226. A large number of professors, demonstrators, and others, both teachers and students, are engaged in assisting the national authorities as chemists, physicists, engineers, and otherwise.

OXFORD.—The statute providing that original experimental investigation shall be a necessary condition for obtaining a class in the honour school of chemistry passed Convocation on May 16 without a division. This marks an important new departure in the regulation of chemical work at Oxford. It is hoped in many quarters that the principle thus established may be widely extended, so as to affect other scientific subjects besides chemistry.

The Halley Lecture for 1916 will be delivered in the Hall of Queen's College at 8.30 p.m. on Saturday, May 20, by Dr. G. W. Walker, late fellow of Trinity College, Cambridge. His subject is "The Measurement of Earthquakes."

SHEFFIELD.—Under the will of the late Mr. W. Edgar Allen, for many years chairman of Messrs. Edgar Allen and Company, Ltd., Imperial Steel Works, Sheffield, the sum of 32,000*l.* has just been paid to the University. Mr. Edgar Allen left estate of the gross value of 271,068*l.*, of which the net personalty was sworn at 251,792*l.* Among the numerous legacies for Sheffield institutions was the whole of his books for the University library, of which Mr. Allen was the donor. He also appointed the University one of the residuary legatees. Two-fifths of the residue of the property was to go to the University of Sheffield, one-fifth to Dr. Barnardo's Homes for general purposes, one-fifth to the Church Army for general purposes, and one-fifth to the Salvation Army for general purposes.

The 32,000*l.* mentioned is part of the residue of the estate, though when the distribution is completed the University will most likely receive further substantial proof of the late Mr. Allen's thoughtful generosity. The sum of 5000*l.* is intended by the will for the Applied Science Department of the University, and the balance is to go to University scholarships, half of the sum to be reserved for the sons of workmen.

Sir Joseph Jonas, chairman of the Applied Science Committee, who has been a generous supporter of the University from the time of its inception, was a close friend of the late Mr. Allen, and he agreed to give 5000*l.* to the Applied Science Department, and this, with the sum left by Mr. Allen—10,000*l.* in all—will be devoted to the provision of materials-testing laboratories for the department, to be known respectively as "The Edgar Allen Physical Testing Laboratory" and "The Jonas Mechanical Testing Laboratory." In regard to any further amount which may still be received under Mr. Allen's will, this sum will be set aside for the provision of further scholarships.

SUMMER evening classes began at the Manchester Municipal School of Technology on May 15. From the prospectus, a copy of which has been received, we find that classes at low fees have been arranged in numerous branches of mechanical, electrical, muni-

cipal, and sanitary engineering, chemical technology, mining, the textile industries, and in some departments of pure science. That Manchester students are willing to devote themselves to evening study during the summer months is a satisfactory indication of their earnest intention to qualify themselves to take a worthy part in the international industrial competition of the future.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 11.—Sir J. J. Thomson, president, in the chair.—Major P. A. Macmahon: Seventh memoir on the partition of numbers. A detailed study of the enumeration of the partitions of multipartite numbers. Whereas a unipartite number m enumerates objects of the same species, a multipartite number m_1, m_2, m_3, \dots may be regarded as numbering objects which involve similarities. The problem is the partition of a multipartite, or dividing up into sets of objects a given assemblage of objects, the division being subject to various governing conditions. The author showed long ago that the solution is implicitly contained in the algebra of symmetric functions. The difficulty has been in the evaluation of numerical coefficients which arise in the development of the symmetric function which presents itself as the solution for a particularly specified problem of partition. The discovery of the paper is principally that there exists a set of symmetric functions, $Q_1, Q_2, \dots, Q_i, \dots$ such that the effect of any one of the operations upon the product $Q_1^{k_1}, Q_2^{k_2}, \dots, Q_i^{k_i}, \dots$ is merely to multiply it by an easily ascertainable integer, combined with the circumstance that the symmetric function operand can be expanded in terms of such products. The result is that laws are obtained. It is established that under any given conditions enumeration in regard to a unipartite number m_s is given by the expression $\lambda a_s + \mu b_s + \nu c_s, \dots$ wherein λ, μ, ν, \dots are constants. Then the enumeration in regard to a multipartite number m_1, m_2, \dots, m_s is given by

$$\lambda a_1 a_2 \dots a_s + \mu b_1 b_2 \dots b_s + \nu c_1 c_2 \dots c_s + \dots$$

It is therefore only necessary to obtain the unipartite solution in the form above given, when the multipartite solution at once follows. The set of functions Q can be modified to meet any specified conditions of partition. The complete solution of the problem of multipartite partition has thus been reached.—Lord Rayleigh: Legendre's function $P_n(\theta)$ when n is great and θ has any value. As is well known, an approximate formula for Legendre's function $P_n(\theta)$, when n is very large, was given by Laplace. The subject has been treated with great generality by Hobson, who has developed the complete series proceeding by descending powers of n , not only for P_n , but also for the "associated functions." The generality arrived at by Hobson requires the use of advanced mathematical methods. A simpler derivation, sufficient for practical purposes and more within the reach of physicists with a smaller mathematical equipment, may be useful. It had, indeed, been worked out independently. The series, of which Laplace's expression constitutes the first term, is arithmetically useful only when $n\theta$ is at least moderately large. On the other hand, when θ is small, P_n tends to identify itself with the Bessel's function, $J_0(n\theta)$, as was first remarked by Mehler. A further development of this approximation is here proposed. Finally, a comparison of the results of the two methods of approximation with the numbers calculated by A. Lodge for $n=20$ is exhibited.—Prof. A. Dendy: The occurrence of gelatinous spicules and their mode of origin in a new genus of siliceous sponges.

Collosclerophora arenacea, n. gen., n. sp., a sand-sponge from Australia, contains an entirely new type of spicule, for which the name *collosclere* is proposed, and similar spicules are met with in another species from the Indian Ocean. The collosclere differs from all spicules previously known in the fact that it consists of a gelatinous material, contracting on the addition of alcohol and swelling up again on the addition of water. Evidence is brought forward to show that these spicules are composed of colloidal silica containing a higher percentage of water than the hydrated silica or opal of which ordinary siliceous spicules are composed. The colloscleres lie in vesicles in the mesogloea, but these vesicles do not represent the mother-cells or scleroblasts by which they are secreted. On the contrary, the collosclere is an extra-cellular product, and first appears as a knob on the outer surface of the cell-membrane of a large spherical scleroblast. The colloscleres may be homologous with isochelæ, but the supposed intra-cellular origin of the chelate and other microscleres must be re-investigated before this point can be established.—E. S. Goodrich: The classification of the Reptilia. The group Reptilia represents not a true monophyletic class, like the class Mammalia and the class Aves, but rather an assemblage or grade of Amniotes retaining a more primitive general structure. The Reptilia thus include a basal Protosaurian group of amphibian-like forms leading to a central point, from which diverge two main branches—the Sauropsidan branch leading to the birds, and the Theropsidan branch leading to the mammals. The modern classification of the reptiles, based chiefly on the structure of the skull, is in a very uncertain state. There is a great difference of opinion as to the relationship of the various orders. Certain specialisations in the skeleton of the hind foot and in the structure of the heart and great vessels (in living forms) are of great importance in classification, and deserve more weight than has hitherto been attributed to them. The development of a hook-shaped fifth metatarsal and of a metatarsal articulation, and the subdivision of the aortic trunk so as to form two systematic arches crossing at their base in such a way as to become separated by the interventricular septum, clearly distinguish the Sauropsidan from the Theropsidan line of evolution. The possession of these characters shows that all living Reptilia belong to the Sauropsidan group, while the structure of the foot enables us to determine the affinities of many incompletely known fossil genera, and to conclude that only certain extinct orders can belong to the Theropsidan branch.—Dr. R. McCarrison: The experimental production of congenital goitre.

Mathematical Society, May 11.—Sir Joseph Larmor, president, in the chair.—Prof. H. M. Macdonald: A note on electrostatic problems.—G. B. Jeffery: The relations between spherical, cylindrical, and spheroidal harmonics.—E. K. Wakeford: The double six.—J. G. Leathem: Theorems on conformal transformation.—G. H. Hardy and S. Ramanujan: A problem in the analytic theory of numbers.

EDINBURGH.

Royal Society, May 1.—Dr. J. Horne, president, in the chair.—Dr. H. Rainy and Miss C. M. Hawick: A clinical method for the estimation of sugars in the blood. The method was a modification of the method described by Bang, and had advantages over other methods on account of the small quantity of blood which was required and the comparatively short time in which the tests and measurements were made. The method was also equally applicable to the estimation

of sugar in the urine. Experiments showed that the blood sugar rose very rapidly to its maximum, while in the kidneys the maximum was not reached until an hour later.—Dr. A. E. Cameron: The insect association of a local environmental complex in the district of Holmes Chapel, Cheshire. The districts with which the study is concerned were two fields, Glover's Meadow and the alluvial pasture situated in the farm land of the Holmes Chapel Agricultural College. In these fields the soils were respectively a reddish clay loam and a dark-coloured loam. The plant environment and its relation to the insects were fully considered; also the physical factors of the environment, such as water content, humidity, light, temperature, precipitation, wind, soil, exposure, slope, and the like. The index of an insect's habitat is where it breeds, and it is important to recognise endemic forms which are proper to an association and polydemic forms which are invaders. Detailed accounts were given of the various orders of insects found, such as Diptera, Coleoptera, Neuroptera, Apterygota, Hymenoptera, etc.; and the facts were brought together in a series of tables, showing the months of occurrence of the different species, their habits, and the plants with which they were associated. Another point of interest was the relation of the soil-inhabiting insects to the food habits of ground-feeding birds.

PARIS.

Academy of Sciences, May 1.—M. Camille Jordan in the chair.—G. Lemoine: The catalysis of hydrogen peroxide in heterogeneous medium. Second part: experiments with platinum. Experiments were carried out with distilled hydrogen peroxide containing 8.6 per cent. of the pure peroxide, in contact with platinum black and platinum sponge, both at a constant temperature. The results are given in graphical form. The velocity of decomposition increases with the weight of the catalyser and with the state of division of the platinum. Comparison of platinum black with the sponge, in approximately the same state of division, shows that the platinum black exerts a special catalytic action, much more energetic, and due to a distinct cause.—H. Le Chatelier: Science in its relations with the economic development of a country.—A. Righi: Experiments relating to the influence of the magnetic field on the charge of a conductor in rarefied air. Details of an experiment which, in the opinion of the author, renders necessary the hypothesis of magneto-ionisation, the action of the magnetic field favouring ionisation by shock.—E. Kogbetliantz: The Sturm-Liouville series simply capable of summation.—G. Vacca: The *Harmonicon coeleste* of François Viète.—G. Bigourdan: Remarks on the preceding note.—A. Bilimovitch: The trajectories of a non-holonomical system.—T. Peczaliski: The determination of the law of integral radiation of a solid from the light yield.—E. Moles: The absolute density of gaseous hydrobromic acid. The gas was prepared by two independent methods, liquefied, and purified by fractional distillation. The figures obtained for a litre of the gas under normal conditions varied between 3.6439 and 3.6447 grams, with a mean of 3.6444 grams.—L. Reutter: The analysis of two resinous masses used by the Incas of South America for embalming their dead. These consisted mainly of Peru and Tolu balsams, with some volatile essences containing menthol.—P. de Sousa: Contribution to the petrographical study of the south-west of Angola.—V. Raymond and J. Parisot: The etiology, prophylaxis, and therapeutics of the affection called trench feet. This affection appears to be due to a pathological fungus, *Scofulariopsis Koningii*.

WASHINGTON, D.C.

National Academy of Sciences (Proceedings No. 4, vol. ii., April 15).—By the committee of the National Academy of Sciences appointed at the request of the President of the United States: Preliminary report upon the possibility of controlling the land slides adjacent to the Panama Canal.—**H. Shapley**: Discovery of eight variable stellar spectra. It appears safe to inter that all Cepheids (including the cluster-type), besides being variable in light and in velocity, vary periodically in spectral class.—**G. M. Green**: The linear dependence of functions of several variables, and certain completely integrable systems of partial differential equations. The theory of linear dependence is generalised to the case of n functions of several independent variables, and is applied to the study of an important class of systems of partial differential equations.—**B. Boss**: Systematic motion among stars of the helium type. There appears to be a strong tendency for the helium stars to move in their own plane, which should therefore be preserved, at least until the next step in the star's evolution. But there are likewise strong tendencies on the part of helium type stars to depart from the plane, so that the tendency for the stars to spread in every direction has its birth in the helium stage of evolution.—**W. D. Harkins**: The abundance of the elements in relation to the hydrogen-helium structure of the atoms. A spiral form of the periodic table is given. The elements are found to arrange themselves in three cycles containing respectively 4^2 , 6^2 , 8^2 elements, the last being incomplete. The even-numbered, or helium-system, elements are very much more abundant in nature than those of the odd-numbered, or lithium, system.—**C. Wissler**: The genetic relations of certain forms in American aboriginal art. The investigation reveals several good examples of the genesis of specific decorative designs growing out of attempts to embellish surfaces of fixed contour and to conceal unobtrusively lines.—**C. E. St. John**: The situation in regard to Rowland's preliminary table of solar spectrum wave-lengths. The general transformation from the system of Rowland wave-lengths to the international wave-lengths is a matter of the greatest difficulty, even though the relative wave-lengths in each system be free from error; and statistical comparison between different systems is a procedure fraught with the possibilities of introducing residuals that may be quite misleading.—**E. P. Hubble**: Changes in the form of the nebula N.G.C. 2261. The nebula appears to be turning about its own axis after the manner of a top, and there is some indication of a helical motion towards the nucleus. The observed shifts seem to be rather of mass than illumination, and are independent of the variability of the nucleus.—**Ruth B. Howland**: The effect of removal of the pronephros of the amphibian embryo. Removal of both pronephroi leads to œdema and death, though the presence of one is sufficient to keep the embryo healthy, bringing about an increase in size in the remaining organ.—**R. Ruedemann**: The presence of a median eye in trilobites. The question of the presence or absence in trilobites of the median eye is of considerable phylogenetic importance. The median eye appears in the majority of cases as a single tubercle, and there is evidence for the visual function of the tubercle.—**W. J. V. Osterhout**: The nature of mechanical stimulation. In this conception of mechanical stimulation the essential things are:—(1) Substances which are more or less completely prevented from reacting by semi-permeable surfaces; (2) a deformation of the protoplasm sufficient to produce in some of these surfaces a rupture which is not at once repaired; (3) a resulting reaction which produces the characteristic response to the stimulus.—

R. E. Clausen and **T. H. Goodspeed**: Hereditary reaction-system relations: an extension of Mendelian concepts. The mechanical Mendelian theory of Morgan is applied in the study of Nicotiana, and it is suggested that by the application of such conceptions to *Gnethera* the occurrence of mutants and their subsequent behaviour admit of logical interpretation.—**A. B. Coble**: Point sets and allied Cremona groups (part ii.). Theorems such as the following:—A pencil of plane cubic curves can be transformed by ternary Cremona transformation into only 960 projectively distinct pencils of cubics—are proved.—**M. B. Porter**: A theorem of Lucas. A simple proof is given for Lucas's theorem that the zeros of any polynomial $F(z)$ lie inside any closed convex contour inside of which the zeros of $F'(z)$ are, and the theorem is extended to give information concerning the distribution of zeros of the derivative of certain relational or transcendental functions.—**E. J. Wilczynski**: Interpretation of the simplest integral invariant of projective geometry.—**W. E. Castle**: Size inheritance in guinea-pig crosses. Preliminary studies published in 1909 showed that size and weight in rabbits do not follow the Mendelian rules of dominance and segregation as unit-characters. A large amount of material being now available upon guinea-pigs, attention is invited to the nature of the growth curves observed for the races crossed and to non-genetic, as well as genetic, factors affecting size. From these crosses there is no evidence showing either the existence of numerous multiple Mendelian factors, or of a few Mendelian factors, or of a single Mendelian factor affecting size.

BOOKS RECEIVED.

- Subtropical Vegetable-Gardening. By P. H. Rolfs. Pp. xviii+309. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 6s. 6d. net.
- The Mechanical Engineers' Pocket-Book. By W. Kent. 9th edition, revised, with the assistance of R. T. Kent. Pp. xlv+1526. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 21s. net.
- Theory and Applications of Finite Groups. By Profs. G. A. Miller, H. F. Blichfeldt, and L. E. Dickson. Pp. xvii+390. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 17s. net.
- Modes of Research in Genetics. By Raymond Pearl. Pp. vii+182. (New York: The Macmillan Company; London: Macmillan and Co., Ltd.) 5s. 6d. net.
- The Chemists' Year Book, 1916. Edited by F. W. Atack. Vol. i., pp. 354. Vol. ii., pp. 355 to 990. (London and Manchester: Sherratt and Hughes.) 10s. 6d. net.
- Union of South Africa. Report of the South African Museum for the Year ended December 31, 1915. Pp. 12. (Cape Town: Cape Times, Ltd.)
- Canada. Department of Mines. Geological Survey. Memoir 58, No. 48, Geological Series: Texada Island, B.C. By R. G. McConnell. Pp. v+112. Memoir 72, No. 60, Geological Series: The Artesian Wells of Montreal. By C. L. Cumming. Pp. v+153. Memoir 76, No. 62, Geological Series: Geology of Cranbrook Map-Area, B.C. By S. J. Schofield. Pp. vii+245. Museum Bulletin No. 22, Geological Series, No. 31: The Age of Killarney Granite. By W. H. Collins. Pp. 12. (Ottawa: Government Printing Bureau.)
- British Mycological Society. Vol. v., part 2: Transactions for the Season 1915. (Worcester: Baylis and Son.) 10s. 6d.
- The Drink Problem of To-day in its Medico-Sociological Aspects. Edited by Dr. T. N. Kelynack. Pp.