

endowment fund so that workers could carry out their researches without expense. As the numbers increased Prof. Purdie added to the fund, and this prudent measure enabled a steady succession of graduates to remain at the University and acquire training and experience in research. His generous policy has been justified, and, in time, has enabled the St. Andrews laboratory to play an important part in solving many scientific problems arising out of the war.

ON Tuesday, February 18, Dr. C. C. Carpenter, chairman of the South Metropolitan Gas Co., will distribute prizes and certificates at the Sir John Cass Technical Institute, and will deliver an address.

WE are requested to state that the date for the sending in of applications for the Theresa Seessel research fellowships at Yale University has been altered from April 1 to May 1, 1919. Applications, accompanied by reprints of scientific publications and letters of recommendation, together with particulars of the candidate's proposed problem of research, have to be made to the Dean of the Graduate School, Yale University, New Haven, Conn., U.S.A.

REFERRING in NATURE of January 16 to the salaries of university lecturers, Mr. R. Douglas Laurie said: "The Scottish lecturers have been recently granted a graded scale rising to 75*cl.*" Dr. R. J. T. Bell, University of Glasgow, and Mr. J. K. Wood, University of St. Andrews, write to point out that this scale of salaries has not yet been granted, and that the maximum salaries at present are about half the amount stated. The general councils of the four Scottish Universities have recommended the adoption of the scale, but the University Courts, which are the actual executive bodies, have not yet been able to accept the proposal, though it is understood that the recommendation has met with a sympathetic reception. The difficulty in Scotland, as in other parts of the kingdom, is one of funds, and apparently it can be overcome only by largely increased Treasury grants to the universities.

LT.-COL. C. S. MYERS's recent lectures at the Royal Institution came as a revelation to many scientific men of the important *role* which psychology is beginning to play in many departments of practical life. On account of the war the subject has been given special attention, and nobody will dispute the fact of its having made good, both as a source of therapeutic principles in certain types of neurosis and as a means of selecting men for special war service. Long before the war America led the way in showing the applicability of the methods of the psychologist to the problem of selecting the right man for the right job. We now learn that Columbia University is carrying the idea still further. In future, matriculation candidates are to submit themselves to psychological tests with a view to the elimination of those unfit to profit by university studies. Their entrance examinations have apparently not succeeded in excluding candidates who owe their success entirely to special coaching, and for whom a university course is, in fact, a waste of time and effort. We must wait for further information before discussing a scheme which is said to be "based on the Binet formula—whatever that may mean—modified by the tests used in the American War Department." The defects of matriculation examinations as a test of fitness for university work are recognised by all university teachers, and if the Columbia experiment is successful in accomplishing its object the gain will be considerable.

NO. 2572, VOL. 102]

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 30.—Sir J. J. Thomson, president, in the chair.—Prof. J. C. McLennan and R. J. Lang: An investigation of extreme ultra-violet spectra with a vacuum grating spectrograph. In this investigation the vacuum grating spectrograph used was designed and constructed by the Adam Hilger Co. The grating had a ruling 2.5 cm. wide and 1.9 cm. in length, of 20,000 lines to the inch. Its radius of curvature was 120 cm. The vacuum arc spectra of mercury, copper, iron, and carbon were investigated. With carbon, wave-lengths were observed and measured down to $\lambda=584 \text{ \AA.U.}$ —Prof. J. C. McLennan and J. F. T. Young: The absorption spectra and the ionisation potentials of calcium, strontium, and barium. In this paper it is shown that the wave-lengths constituting the series $\delta=(1.5, S)-(m, P)$, which are strongly absorbed by the vapours of calcium and strontium, are also strongly absorbed by the vapour of barium. The wave-length of frequency $\delta=(1.5, S)$ for barium has been shown to be $\lambda=2380.56 \text{ \AA.U.}$, and the wave-lengths of the two series $\delta=(2.5, S)-(m, P)$ and $\delta=(3.5, S)-(m, P)$ have been calculated. The wave-length of frequency $\delta=(1.5, S)-(2, p_2)$ has been deduced as $\lambda=7901.11 \text{ \AA.U.}$ Assuming that the ionisation potential for barium is given by the relation $Ve=h\delta$, where $\delta=(1.5, S)$, the value of this magnitude for barium has been calculated to be 5.21 volts.—Prof. J. C. McLennan, D. S. Ainslie, and D. S. Fuller: Vacuum arc spectra of various elements in the extreme ultra-violet. The experiments described were carried out with a fluorite spectrograph the optical train of which consisted of a 60° prism and two biconvex lenses of 15 cm. focal length. The vacuum arc spectra of copper, zinc, aluminium, carbon, thallium, tin, lead, iron, cobalt, nickel, and cadmium were investigated between $\lambda=2400 \text{ \AA.U.}$ and $\lambda=1400 \text{ \AA.U.}$ The measurements obtained for the vacuum arc spectra of copper, zinc, cadmium, and aluminium are well covered by the results for the spark spectrum of these metals, as obtained by previous workers. For tin, lead, and thallium, the results agree fairly well with those given by Saunders from $\lambda=2400 \text{ \AA.U.}$ to $\lambda=1700 \text{ \AA.U.}$ Below the region covered by Saunders's work many new lines were observed and measured. The measurements for the vacuum arc spectra of iron, cobalt, nickel, and carbon appear to be the first obtained for the arc spectra of these substances in the Schumann region. For these spectra nearly all the measurements between $\lambda=2400 \text{ \AA.U.}$ and $\lambda=1850 \text{ \AA.U.}$, as given in the paper, are covered by previous work on their spark spectra. Within the region between $\lambda=1850 \text{ \AA.U.}$ and $\lambda=1400 \text{ \AA.U.}$ a number of new lines were photographed and measured.—R. C. Dearle: Emission and absorption in the infra-red spectra of mercury, zinc, and cadmium. In the investigation described in this communication the absorption spectra of mercury, zinc, and cadmium were studied with a Hilger infra-red spectrograph provided with a rock-salt prism and a linear thermopile, in conjunction with a Paschen galvanometer made by the Cambridge Scientific Instrument Co. With each of the vapours the range investigated lay between 1.0 μ and 1.6 μ . In studying the emission spectrum of mercury vapour bombarded by electrons, it was found that radiation of the wave-length $\lambda=10,140 \text{ \AA.U.}$ was emitted with impact voltages so low as 5 volts, and evidence was also obtained indicating that mercury vapour could be made to emit radiation of this wave-length with impact voltages less than 5 volts. The paper presents

some considerations in support of the view that while mercury vapour has an ionisation potential of one type of 10.4 volts, it may also have an ionisation potential of a second type of about 2.5 volts.—**E. Wilson**: The measurement of magnetic susceptibilities of low order. (1) An instrument which has been designed for the measurement of magnetic susceptibility of low order. It depends for its action upon the pull exerted by an electromagnet in accordance with the well-known Maxwell expression for the mechanical force exerted upon unit volume of the substance. This mechanical force is balanced against the force of torsion in a phosphor-bronze strip. (2) The instrumental constant is determined from data obtained directly with the instrument itself, and by the employment of substances the susceptibilities of which had been measured by other methods. A modified method of using a ballistic galvanometer has been devised which leads to greater sensitiveness. Rock specimens and other substances have been used, and some interesting results obtained. It is shown that the susceptibility of 13 per cent. manganese alloy is much smaller than is usually supposed. (3) The susceptibility of powdered rock specimens has been measured and compared with the solid. A very fair agreement has been obtained between the two, and the method has the advantage that powders can be rapidly made. (4) The susceptibilities of varieties of mica have been measured, and it is shown that in certain cases, in a direction parallel with the laminae, the susceptibility may be more than fifty-fold that obtained in a direction at right angles thereto. (5) A series of light aluminium alloys has been tested, and it has been found that, whereas the susceptibility of commercial aluminium is increased by alloying with copper and manganese, it is diminished by alloying with cobalt. (6) It is shown that the balance could be used to determine rapidly the relative amounts of ferrous iron in different specimens of glass. (7) Certain specimens of tourmaline have been examined. The green and dark blue opaque varieties have susceptibilities in the direction of the principal crystallographic axis varying from 16 to 20 per cent. less than in a direction at right angles thereto. The susceptibility of rose-coloured tourmaline is very small in comparison. (8) The paper concludes with a note on the retentivity of rock specimens and its possible influence upon magnetic disturbances in magnetic survey work.—**Dr. F. Horton** and **Ann C. Davies**: An experimental determination of the ionisation potential for electrons in helium. An investigation of the minimum potential difference through which an electron must fall in order to be able to ionise an atom of helium on collision with it has been made by methods capable of distinguishing between ionisation of the gas and secondary effects due to radiation. It has been found that radiation is produced when electrons having a velocity of 20.4 volts collide with helium atoms, and that this is not accompanied by any ionisation of the gas. It has also been found that ionisation of the helium does not occur until the velocity of the electrons is raised to 25.6 volts, and that no other type of radiation is produced at this point.

Linnean Society, January 16.—**Sir David Prain**, president, in the chair.—**Capt. A. W. Hill**: Horticultural work carried out in the military cemeteries in France since 1916. Reference was also made in the paper to the cemeteries in the Italian and other theatres of war. It is intended to make the cemeteries, so far as possible, smooth, well-kept grass-lawns, surrounded by hedges of thorn, beech, or hornbeam, with groups, avenues, or pole-hedges of trees, such as Siberian crabs, limes, hornbeams, willows, etc., and to plant on the graves rose-bushes, iris, and

other dwarf carpeting-plants. Steps are also being taken, where possible, to mark the cemeteries where Canadian, Australian, New Zealand, Indian, and other Overseas soldiers lie buried with plants native to the countries whence they came to the defence of the Empire. Allusion was made to the problems which have to be faced in the matter of soil and site, which often render successful gardening work very difficult. Some of the cemeteries are in very sandy places, others in chalk, whilst a number are in the fenland of the Belgian border.

Geological Society, January 22.—**Mr. G. W. Lamplugh**, president, in the chair.—**C. J. Gilbert**: The occurrence of extensive deposits of high-level sands and gravels resting upon the chalk at Little Heath, near Berkhamsted. In a pit at Little Heath Common, on a plateau of the Chiltern Hills, the following section has been developed:—Surface soil with bleached flint pebbles from the Reading beds, about 2 ft. in thickness; pebbly clay and other Glacial deposits, varying from 2 ft. to 20 ft.; stratified loamy sand, 5 ft. to 6 ft.; stratified coarse gravel, 17 ft.; dark clay, with black-coated, unworn flints and small, well-rounded pebbles, 6 in.; and chalk. The upper Glacial deposit is a pebbly clay. The pebbles are derived from the Reading beds. The clay matrix is tough, and the tints of the clay leave no doubt that it has been derived from the upper part of the Reading beds. The chalk flints are absent, while the small pebbles of white quartz and lydite are seldom met with. On the west side of the pit, underlying the pebbly clay, is a disturbed mass of Glacial sands and clay of miscellaneous character. The whole deposit is suggestive of an englacial origin. Beneath the Glacial beds is a stratified deposit of dark reddish-brown, mottled, loamy sand. The entire deposit is banded with fine lines of grey clay. There is almost invariably a break between the loamy sands and the gravels. The laminae of the loamy sands do not always follow the contour-line of the beach, but are deposited horizontally. The underlying gravel deposit consists of Reading pebbles and water-worn flints in equal quantities, with an occasional pebble of puddingstone from the Reading beds. No rocks foreign to the district have been found. The gravel becomes coarser in depth, the lower sections containing a high percentage of large, water-worn flints. The small stones are mostly Reading pebbles and white quartz. The gravel is homogeneous. Recent researches indicate that the quartz and lydite pebbles in this district have been derived from the Lower Greensand after the final breach of the Chiltern scarp, in the gaps of which the quartz pebbles are found in such abundance. Reasons are adduced in support of the contention that the loamy sands and gravels are marine deposits laid down in a shallow sea, and that they cannot be of Glacial origin.—**G. Barrow**: Notes on the correlation of the deposits described in Mr. C. J. Gilbert's paper with the high-level gravels of the South of England (or the London Basin). The gravels belong to deposits of which the harder constituents have been derived from two areas, one within the chalk escarpment, the other beyond this escarpment, but within that of the Lower Greensand. The constituents of the former are Reading or other Tertiary pebbles, and flint. Pebbles of sarsen are not uncommon. The pebbles in the latter area consist of white quartz and lydite, all small. "Far-travelled" stones, derived from the Bunter, Carboniferous Limestone, Red Chalk, etc., are absent. Outliers of the finer deposits have been met with. The coarser gravels occur on the south side of the Thames up to above 600 ft.; these all rest on the chalk. It has been pointed out that there must be

corresponding coarser gravels also resting upon the chalk on the north side of the Thames, and the occurrence described by Mr. Gilbert now shows that this is the case.

CAMBRIDGE.

Philosophical Society, February 3.—E. H. Neville: The Gauss-Bonnet theorem for multiply connected regions of a surface.—L. J. Mordell: The representations of a number as a sum of an odd number of squares.—N. M. Shah and B. M. Wilson: Certain empirical formulæ connected with Goldbach's theorem.—G. H. Hardy and J. E. Littlewood: Notes on Messrs. Shah and Wilson's paper entitled "Certain Empirical Formulæ Connected with Goldbach's Theorem."

MANCHESTER.

Literary and Philosophical Society, January 21.—Mr. W. Thomson, president, in the chair.—Discussion on the means by which the society may promote most effectively the advancement and application of learning in Manchester. Among the suggestions put forward were the following:—(1) That while the society should retain its present functions as a learned society, its members might meet with others interested in the advancement of science for informal discussion in the rooms of the society; (2) that special lectures by eminent men on scientific subjects of general interest should be arranged from time to time; (3) that addresses on the practical applications of science by scientific men engaged in industry should be invited; (4) that the presidents of the various scientific societies in Manchester might be made associate or honorary members during their period of office, and that such societies should be invited from time to time to hold special meetings of general interest in the society's house; and (5) that facilities might be arranged for members to consult the library in the evenings, and that arrangements might be made whereby members of other societies should be able on certain terms to use the library.

PARIS.

Academy of Sciences, January 27.—M. Léon Guignard in the chair.—L. Mangin: The harmful action of the emanations from the Chedde factory. The fumes from this explosives works are finally converted by the action of moisture into hydrochloric acid. The zone affected is an ellipse ten kilometres by four kilometres. Trees in this area are unequally affected; *Epicea* is severely damaged and ultimately killed. *Pinus sylvestris* is attacked, but less severely; firs are only slightly injured. Yews and larches show no alteration.—C. Guichard: The deformation of quadrics.—E. Ariès: Formula giving the latent heat of evaporation of a liquid.—H. Parenty: Regulator and meter for the yield of a spring collected by a horizontal or slightly inclined gallery.—M. Wilfred Kilian was elected a non-resident member in succession to the late M. Pierre Duhem.—J. Drach: The algebraical solutions of differential equations of the first order.—P. Montel: Polynomials of approximation and the existence of differentials.—E. Maillet: Determination of the integral points of algebraical unicursal curves with integral coefficients.—C. Rabut: Scientific rules and principles for driving long tunnels under a sheet of water. The author's suggestions are summarised under ten headings, everything being subordinated to the prevention of inundation. The apparent economy of the usual method has been proved in practice to be illusory.—J. Guillaume: Observations of the sun made at the Lyons Observatory during the third quarter of 1918. Observations were possible on eighty-six days, and tables are given showing the surfaces of the sun-spots, their distribution in latitude, and the distribution of the faculæ in latitude.—G. A. Le Roy: Fires

produced by Hertzian waves. The investigation of several cases of fire, after careful examination of the facts, has led to the conclusion that probably Hertzian waves were responsible. An instrument is figured and described by which this incendiary action of the Hertzian waves upon various materials has been investigated experimentally. In practice a compressed bale of cotton held by a steel band might be fired by wireless messages in two ways: a band might be broken, leaving the broken ends close together but not in contact, or such bales might be piled in such a manner that short sparks could pass between the rings and set fire to the cotton.—V. Cremieu: Experimental researches on gravitation.—M. Swyngedaew: The energy losses in the dielectrics of armoured cables.—F. Bourion and Ch. Courtois: The conditions of utilisation of Schilling's apparatus for the control of industrial hydrogen. For use in ballooning, a direct measure of the density of the gas is the most useful experimental figure, and this is rapidly measured by Schilling's apparatus. The necessity for correcting the indications for moisture is emphasised, and a formula introducing this correction given.—J. Jolibois and A. Sanfourche: The constitution of nitrous fumes. If air and nitric oxide are mixed in the ratio required to form N_2O_3 , the combination is instantaneous; if in the ratio to form N_2O_4 , the N_2O_3 stage is rapidly attained, and a further 100 seconds is required to form 92 per cent. of N_2O_4 .—J. Repelin: A point of history of the Pacific Ocean. The islands of French Polynesia are generally regarded as of entirely volcanic or coral origin. The island of Makatea contains Tertiary deposits, and details of the fossils found are given.—E. Mathias: Rain in France. Calculation of the anomalies and of the altitude coefficient. It is shown that in France the altitude coefficient is constant at all points on a geographical parallel.—J. Pantel: Calcium, a form of reserve in the female of the Phasmides: its forms of elimination in the two sexes.—C. Delezenne and H. Morel: The catalytic action of snake-poison on the nucleic acids. Nucleic acid from yeast and thymonucleic acid were treated in neutral solutions with various snake-poisons. Phosphoric acid is produced, 50° – 52° C. being the best temperature for the reaction. The snake-poisons vary in their action, the greater toxicity corresponding with greater hydrolytic action towards the nucleic acids.—A. Vernes: The graphics of the syphilitic subject. It is impossible to make a certain diagnosis of syphilis from a single examination of serum, since it is only from the form of the curve obtained from a series of successive examinations that a decisive conclusion can be drawn.—R. Douris: The use of heated sera in the Vernes sero-reaction (sero-diagnosis of syphilis).—A. Berthelot: Biochemical researches on war-wounds. Searching for the presence of micro-organisms in wounds analogous with *B. aminophilus*, and capable of forming the ptomaine β -imidoazoethylamine from histidine, such bacilli were discovered in cases of gas gangrene and large crushed wounds.—Em. Bourquelot and M. Bridel: Simultaneous biochemical syntheses of gentobiose and two β -glucosides of glycol by emulsin.—F. Diénert and A. Guillard: Aqueous autolysed yeast for the culture of *B. coli*. The continuous rise in the price of peptone has led to a search for more economical media, and a method is described starting with pressed yeast. It has been found that peptone broth costing 3 francs per litre can be perfectly replaced by autolysed yeast broth costing 20 centimes per litre.—A. Paillot: Pseudo-fatness, a new disease of the larva of *Lymantria dispar*. The disease is caused by a new coccobacillus, which has been isolated and named *Bacillus lymantricola adiposus*.