

summer of 1916 five new research rooms were equipped. Of these the most important is the new coal-tar products and dyestuffs research laboratory, furnished with a specially constructed electrically heated oven for giving variable and positive degrees of temperature. The increase in the expenditure of the college has been partly met by larger Government grants. In the year 1910-11 the grant received amounted to 11,895*l.*, while that received during 1915-16 was 16,646*l.*, including a special war grant of 1250*l.* Since 1902 commercial tests and investigations which could not be carried out elsewhere in or near Manchester have been undertaken by the college. The financial value of this work in 1914 was 398*l.* 14*s.* 6*d.*, whereas in 1917 it reached 2946*l.* 6*s.* 6*d.*

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 14.—Sir J. J. Thomson, president, in the chair.—A. Mallock: Sounds produced by drops falling on water.—G. H. Hardy and S. Ramanujan: The coefficients in the expansions of certain modular functions.—The Hon. R. J. Strutt: The light scattered by gases: its polarisation and intensity.—Dr. F. Horton and Ann C. Davies: An investigation of the ionising power of the positive ions from a glowing tantalum filament in helium. The ionising power of the positive ions from a glowing tantalum filament in helium has been investigated by a modification of the method due to Lenard. The positive ions were accelerated through a piece of platinum gauze into the ionisation chamber, and were there retarded by an opposing potential difference between the gauze and a movable collecting electrode, this retarding potential being constant during a series of experiments, and always greater than the greatest accelerating potential used in that series, so that none of the positive ions reached the collecting electrode. It was found that an increasing current was obtained in the ionisation chamber (the electrode collecting a negative charge) when the potential difference accelerating the positive ions was gradually raised above 20 volts. This result is similar to that obtained by Pawlow, and by Bahr and Franck, who concluded that helium atoms are ionised by the collisions of positive ions moving with 20 volts velocity. The experiments described in the paper have shown that the observed increasing current, with increasing accelerating potentials above, about 20 volts, is mainly due to the positive ions liberating electrons from the walls of the ionisation chamber which they bombard, and that the positive ions do not ionise the helium atoms even when they collide with velocities up to 200 volts.

Physical Society, October 25.—Prof. C. H. Lees, president, in the chair.—Discussion on the case for the ring electron. Dr. H. S. Allen discussed the arguments in favour of an electron in the form of a current circuit capable of producing magnetic effects. Then the electron, in addition to exerting electrostatic forces, behaves like a small magnet. The assumption of the ring electron removes many outstanding difficulties:—(1) There is no loss of energy by radiation as in the case of a classical electron circulating in an orbit. (2) Diamagnetic atoms must have a zero resultant magnetic moment. This is difficult to account for with electrons in orbital motion. (3) The ring electron gives a good explanation of the facts of paramagnetism, including the experimental results of K. T. Compton and Trousdale, and of A. H. Compton and O. Rognley obtained by X-ray analysis. (4) The asymmetry of certain types of radia-

tion can be accounted for (A. H. Compton). (5) The effect of the magnetisation of iron upon its absorption coefficient for X-rays observed by Forman is explained. (6) The small amount of ionisation of gases produced by X-rays may receive an explanation. (7) Grondahl claims to have found evidence for a magnetic electron in certain thermo-electric effects. (8) Webster has given a method of deducing Planck's radiation formula by making certain assumptions as to the internal mechanism of Parson's "magneton." (9) It is suggested that Bohr's theory as to the origin of series lines in spectra may be restated so as to apply it to the ring electron. The essential points of the quantum theory and Bohr's equations may be retained, even if his atomic model be rejected. (10) If radiation is due to pulsations in a ring electron, the Zeeman effect may be deduced by reasoning similar to that first employed by Lorentz. (11) The scattering of streams of electrons from the sun due to electrostatic forces would be to some extent diminished. (12) Parson has shown that many of the problems of chemical constitution and stereochemistry may be solved by a magneton theory of the structure of the atom. Stationary valence electrons are possible. (13) The forces of cohesion in a solid are similar in nature to chemical forces, both sets of forces having an electromagnetic origin. The questions of the mass and magnetic moment of such a ring electron were discussed. It was pointed out that the adoption of this hypothesis would lead naturally to the acceptance of an atomic model with a magnetic core, as previously suggested by the speaker.

Mineralogical Society, November 5.—Sir William P. Beale, Bart., president, in the chair.—Dr. G. F. Herbert Smith and Dr. G. T. Prior: A plagioclase-like mineral from Dumfriesshire. Specimens of antimony-lead ore collected by Lieut. Russell from Glendinning Mine contained small cavities lined with tiny black crystals, measuring less than 0.4 mm., and mostly less than 0.2 mm., across. Some resembled in habit the crystals of plagioclase from the Hartz Mountains described by Lüdecke. Measurements made on the three-circle goniometer showed the crystals to belong to the semseyite end of the group, and the result of a chemical analysis of the compact material of which the crystals form part corresponded approximately with the formula $5\text{Pb}_2\text{Sb}_2\text{S}_3$. Semseyite has not previously been recorded from the British Isles.—Lieut. A. Russell: The chromite deposits in the Island of Unst, Shetlands. The bottle-shaped mass of serpentine which runs through the centre of the island from north to south contains chromite uniformly distributed, but varying greatly in character, being at times massive, but generally granular. More than thirty quarries are known, but only six of them have been worked to any extent. The associated minerals include kämmererite (abundant in one quarry), uvarovite, copper, hibbertite, brucite, calcite, talc, and magnetite. The rocks other than the serpentine are poor in minerals.—Dr. G. T. Prior: The nickeliferous iron of the meteorites of Bluff, Chandakanur, Château Renard, Cynthia, Dhurmsala, Eli Elwah, Gnadenfrei, Kakowa, Lundsgård, New Concord, Shelburne, and Shytal. The percentage of nickeliferous iron and the ratio of iron to nickel in the several instances were found to be respectively 5, 6½; 8, 0; 8½, 6½; 6, 6; 3½, 3½; 6½, 7½; 21½, 12½; 8, 6; 8½, 7; 10, 8; 10½, 10; 7½, 6½.

Zoological Society, November 5.—Prof. E. W. MacBride, vice-president, in the chair.—Dr. J. F. Gemmill: The cause of the ciliary action in the internal cavities of the Ctenophore (*Pleurobrachia pileus*).—Dr. R. T. Leiper: Diagnosis of helminth

infections from the character of the eggs in the fæces. Dr. Leiper stated that, by examination of the fæces of a living animal, the extent and specific nature of most helminthic infections could be accurately determined, and the method had been applied successfully as a routine practice in the case of man, rabbit, dog, cat, and pig, and was apparently capable of indefinite extension. The eggs of parasitic worms were constant in character and of great systematic importance. The ground-plan of the eggshell indicated the genus, or even subfamily, to which the parasite belonged, and specific differences were found in slight but constant peculiarities in relative length and breadth, and in the conformation of excrescences on the surface of the shell.—Dr. R. T. Leiper: The "new" rabbit disease. Examination of a large number of rabbits shows that the chief cause of mortality is a coccidial invasion of the intestinal wall or of the lining of the bile-ducts. According to Fantham and others, the causal agent in both types of disease is *Eimeria stiedae*, but Dobell holds that the intestinal lesion is due to a distinct species. In many cases changes in the liver attributed to coccidiosis were the result of infection with *Cysticercus pisiformis*, the larval stage of the dog tapeworm (*Taenia serrata*). Large swellings in the region of the head and neck, suspected to be cancerous, were due to *Coenusus serialis*, the larva of the dog tapeworm *Taenia coenurus*. Of relatively small economic importance are infections with the threadworm (*Oxyuris ambiguus*) and the tapeworm (*Ctenotaenia leuckarti*). There is some evidence that a bacterial infection may occasionally be the cause of death. The coccidial infections pass from infected to healthy animals through the fæces. When freshly passed, the coccidial oocysts are not infective. They only become so after a period of delay, in which certain developmental changes take place. These changes proceed more rapidly in dry than in wet fæces. Prevention depends upon the systematic periodical removal and destruction by burning of all pellets and contaminated bedding, and the use of some fluid which will destroy such oocysts as remain in the hutch. Although several cases of coccidial infection in man have been recorded, Dobell maintains that in none of these cases is *Eimeria stiedae* the causal agent. There would appear, therefore, to be no risk of infection to man. The cystic stages of the tapeworms of the dog appear to occur chiefly in those rabbits fed with dandelions and other greenstuffs collected from the roadsides, where the vegetation is especially liable to contamination with fæces of dogs which have acquired their infections from eating uncooked rabbit offal.

Linnean Society, November 7.—Sir David Prain, president, in the chair.—The late Dr. E. A. Newell Arber and F. W. Lawfield: The external morphology of the stems of Calamites, with a revision of the British species of Calamophloios and Dictyocalamites of Upper Carboniferous age. This paper dealt with the external morphology of Calamites and their reception into the new form genus—Calamophloios—previously erected by Dr. Arber. No systematic endeavour to differentiate specimens showing the external surfaces of Calamites has previously been made, although the attempt was long overdue. By further inquiry it was hoped to correlate the various species of Calamophloios with those species restricted to pith-casts, and a beginning had already been made in this paper.—Mrs. Arber: The "law of loss" in evolution. It appears to be a general rule that a structure or organ once lost in the course of phylogeny can never be regained; if the organism afterwards has occasion to replace it, it cannot be reproduced, but must be constructed afresh in some different mode. The author proposes

to term this principle the "law of loss." This law is obviously not susceptible of direct proof, but an attempt is made to show that, if used as a working hypothesis, it throws light on a number of structural features the interpretation of which presents difficulties on other theories. Some time after the author had deduced the "law of loss" from a comparative study of living plants, she learned that zoologists had already arrived at very similar conclusions regarding vertebrates from a study of their palæontological history. Dollo's "law of irreversibility" covers much the same ground as the "law of loss." The fact that the same principle has been recognised independently for plants and for animals—in one case through a study of comparative morphology, and in the other through a consideration of actual historical evidence derived from fossil records—seems to be an indication of the validity of the law.

Mathematical Society, November 14.—Annual meeting.—Prof. H. M. Macdonald (retiring president) and afterwards Mr. J. E. Campbell (new president) in the chair.—Prof. H. M. Macdonald (retiring president): Presidential address.—Prof. M. J. M. Hill: The use of a property of Jacobians to determine the character of any solution of an ordinary differential equation of the first order, or of a linear partial differential equation of the first order.—Prof. H. J. Priestley: The roots of a certain equation in spherical harmonics.—J. Hodgkinson: A detail in conformal representation.—T. A. Broderick: The product of semiconvergent series.—Dr. W. P. Milne: A simple condition for co-polar triangles.

EDINBURGH.

Royal Society, October 28.—Dr. Horne, president, in the chair.—The president delivered an opening address on the endowment of scientific and industrial research.—Dr. T. S. Patterson and Mr. K. L. Moudgill: Researches in optical activity: the temperature rotation curves for the tartrates at low temperatures. By the piecing together of evidence of different kinds, general temperature-rotation curves for the tartrates have been arrived at. These graphs show maxima and minima, and also a region of intersection. The influence of temperature changes, or of change of solvent, or of change of concentration, or of change of constitution appears to be to displace the whole series of graphs in one direction or the other, with, of course, accompanying minor alterations. The present paper describes the investigation of the temperature-rotation curves for tartrates at the low temperature end of the diagram, where a deep minimum is shown to exist.—Miss M. G. Haseman: Amphicheiral knots. This is a continuation of a former communication on amphicheiral knots, and contains, among other things, the description of two amphicheiral knots of twelve intersections which had formerly escaped notice.—Dr. C. G. Knott: Further note on the propagation of earthquake waves. Following up the investigations given in a former paper (see NATURE, February 21, 1918), the author directed attention to the curious sinuous form of seismic rays which emerge at an arcual distance of from 60°–80° from the epicentre, and reach a depth of about a quarter of the earth's radius. This sinuosity proves that in the neighbourhood of that depth the velocity of propagation, after increasing with the depth, begins to diminish, but this diminution does not seem to continue to greater depths.

MANCHESTER.

Literary and Philosophical Society, October 29.—Mr. W. Thomson, president, in the chair.—Prof. C. A. Edwards: The hardness of metals. Prof. Edwards gave an account of various methods of making hard-

ness determinations, and described a new apparatus which was designed for making hardness tests at high temperatures. He also gave data showing that the hardness of pure solid elements is a periodic function of their atomic weight.

SYDNEY.

Royal Society of New South Wales, September 4.—Mr. W. S. Dun, president, in the chair.—W. G. Woolnough: The Darling peneplain of Western Australia. The physiographic feature in Western Australia called by Jutson the Darling peneplain repeats in many respects the characters of the Blue Mountain uplands of New South Wales. It extends as a monotonous, laterite-covered plateau from the steep escarpment twelve miles east of Perth for nearly four hundred miles through the eastern goldfields. The monotony of the surface is interrupted by occasional hills representing residuals of a pre-existing plateau from which the Darling peneplain has been eroded, and by long, shallow valleys, forming the great wheat-belt of the State, which have been carved out of its surface by rivers.—Prof. C. E. Fawsitt and A. A. Pain: Experiments on the behaviour of iron in contact with sulphuric acid. The very slow action of concentrated sulphuric acid on steel is only accelerated to a moderate extent by dilution with several per cent. of water. For instance, 85 per cent. of acid has only a very slightly greater action than 94 per cent. of acid. The rate of action increases rather suddenly when diluting from 85 per cent. to 80 per cent. of acid, and again from 70 per cent. to 65 per cent. of acid. The electrical potential of iron with respect to concentrated sulphuric acid falls noticeably after the iron has been lying in the acid for a few minutes. The original potential is largely restored by exposing the iron for a few minutes to the air.—H. G. Smith: The resinous earth occurring at the head of the Nambucca River, N.S.W. This paper records the results of an investigation of the earth from two localities. It is shown that the ready ignition is due to the presence of the resin the earth contains. That it is of organic origin is indicated from the results of the analysis. The presence of nitrogenous products, as well as of phosphoric acid and a small amount of benzoic acid, also supports the conclusion.

BOOKS RECEIVED.

A Manual of Chemistry. Theoretical and Practical. Inorganic and Organic. By Dr. A. P. Luff and H. C. H. Candy. Sixth edition. Pp. xix+745. (London: Cassell and Co., Ltd.) 12s. net.

Petrol and Petroleum Spirits: A Description of their Sources, Preparation, Examination, and Uses. By Capt. W. E. Guttentag. Pp. xi+135. (London: E. Arnold.) 10s. 6d. net.

Surgery at a Casualty Clearing Station. By C. Wallace and J. Fraser. Pp. xi+320. (London: A. and C. Black, Ltd.) 10s. 6d. net.

Folk-lore in the Old Testament: Studies in Comparative Religion, Legend, and Law. By Sir J. G. Frazer. 3 vols. Vol. i., pp. xxv+569; vol. ii., pp. xvi+571; vol. iii., pp. xviii+566. (London: Macmillan and Co., Ltd.) 37s. 6d. net.

Civic Biology. By Prof. C. F. Hodge and Dr. J. Dawson. Pp. viii+381, with plates. (London: Ginn and Co.) 7s. net.

Projective Geometry. By Profs. O. Veblen and J. W. Young. Vol. ii. Pp. xii+511. (London: Ginn and Co.) 21s. net.

Industrial Electrical Measuring Instruments. By

NO. 2560, VOL. 102]

K. Edgcombe. Second edition. Pp. xvi+414. (London: Constable and Co., Ltd.) 16s. net.

Junior Grade Science. By G. A. Watson. Pp. ix+181. (London: Macmillan and Co., Ltd.) 3s. 6d.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 21.

ROYAL SOCIETY, at 4.30.—W. Stiles and Dr. F. Kidd: (1) The Influence of External Concentration on the Position of the Equilibrium attained in the Intake of Salts by Plant Cells; (2) The Comparative Rate of Absorption of various Salts by Plant Tissue.—G. Marinisco: Recherches Anatomico-Cliniques sur les Névroses d'Amputations douloureuses: Nouvelles Contributions à l'Etude de la Régénération nerveuse et du Neurotrophisme.

LINNEAN SOCIETY, at 5.—E. S. Goodrich: A Fatherless Frog, with remarks on Artificial Parthenogenesis.—Miss Musiel Bristol: A Review of the Genus Chlorochytrium, Cohn.—A. S. Kennard and B. B. Woodward: The Linnean Species of Non-marine Mollusca that are represented in the British Fauna, with Notes on the Specimens of these and other British Forms in the Linnean Collection.

ROYAL SOCIETY OF ARTS, at 4.30.—Sir Everard im Thurn: The Present State of the Pacific Islands.

INSTITUTION OF MINING AND METALLURGY, at 5.30.—R. R. Kahan: Refining Gold Bullion with Chlorine Gas and Air.—A. Yates: Effect of Heating and Quenching Cornish Tin Ores before Crushing.—R. J. Harvey: The Development of Galena Flotation at the Central Mine, Broken Hill.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—J. H. Shaw: The Use of High Pressure and High Temperature Steam in Large Power Stations.

INSTITUTION OF MINING AND METALLURGY, at 5.30.

MONDAY, NOVEMBER 25.

ROYAL GEOGRAPHICAL SOCIETY, at 8.—Arnold Hodson: Southern Abyssinia.

TUESDAY, NOVEMBER 26.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 5.—F. G. Parsons: Anthropological Observations on German Prisoners of War.

WEDNESDAY, NOVEMBER 27.

ROYAL SOCIETY OF ARTS, at 4.30.—Lord D'Abemort: Drink Control in Various Countries.

THURSDAY, NOVEMBER 28.

ROYAL SOCIETY OF ARTS, at 4.30.—Bhupendranath Basu: Some Aspects of Hindu Life.

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