

A SCHEME to prepare girls better to undertake the duties of the home was described in a letter to the *Times* of January 24. The communication was signed by Prof. William Osler, F.R.S., Sir Henry Roscoe, F.R.S., and Prof. A. Smithells, F.R.S., with others. Instruction of the kind required is impossible without teachers capable of giving it, and the first step must be, the letter points out, to provide education of an advanced type for those who will hereafter conduct the work in its more elementary stages. It is therefore proposed to provide in London a course of post-graduate instruction in household economics. The course will be given at the women's department of King's College, and will begin next October. A college board, consisting mainly of the professors of the subjects germane to the course, with Prof. Smithells acting as honorary adviser, will control the educational side of the work. It is hoped that it will be found possible to include courses of training for the management of large educational and other institutions, for the duties of factory inspection, and for social work aimed at raising the standard of home life. Donations are asked for in order to raise 3000*l.*, the sum necessary for the effective organisation of the scheme, and may be sent to Miss Soltau, King's College (Women's Department), 13 Kensington Square, W.

The best results are obtained in those technical schools where the students are encouraged to follow a suitable course of training extending over a number of years, and where the instruction provided is suited exactly to the industrial requirements of the district. The latest report of the Board of Education states in this connection:—"Well-considered programmes of instruction within schools and careful adjustment of the relation of school to school in populous areas have become more common. In an increased number of schools we find teachers at pains to urge continuity of study and to order their teaching so as to help towards this end. Opportunities for advanced work are provided more widely than before, and accordingly we find the period of study extending and the number of students of mature years increasing." To mark still more obviously the importance of continuity of study, the Board has given prominence to an arrangement by which the Board and the school authorities join in responsibility for the issue of "technical course certificates" affording suitable records of completed curricula. These certificates are to be given only in connection with courses each approved as providing such a technical education as will have a definite value in relation to the occupation to which it has regard. Each certificate as awarded by the local education authority or the managers of a school and endorsed by the Board will record continued attendance and satisfactory attainments in the several sections of the specified course of instruction. The system thus initiated appears to be capable of considerable development. It may become a valuable feature in the organisation of technical courses—standardising their aims and encouraging the students to persistent attendance and continuity of study. The statistics in connection with the examination of students in evening schools, too, the report points out, reflect both the improvement in the provision of more advanced classes and the increased regularity of the attendance of the students.

### SOCIETIES AND ACADEMIES.

#### LONDON.

**Royal Society, November 7, 1907.**—"The Electrical Discharge in Monatomic Gases." By F. SODDY and T. D. MACKENZIE. Communicated by Prof. J. Larmor, Sec.R.S.

Helium and argon purified by volatilising calcium (Soddy, Proc. Roy. Soc., 1907, lxxviii., A, 429) from traces of common gases show a disinclination to conduct the discharge, and the question arises whether the monatomic gases in a perfectly pure state will conduct at all. The well-known phenomenon of "running out" or exhaustion of spectrum tubes filled with these gases with prolonged use might be due to absorption of the impurities only by the electrodes leaving the pure monatomic gases in a non-conducting state. This question has been exhaustively investigated, and the conclusion is drawn that the mon-

atomic gases conduct in the same manner as common gases, but are relatively electrically, as well as chemically, inert. That is to say, the various stages of the discharge from the X-ray vacuum to the ribbon discharge when considerable quantities of gas are present are produced in the case of helium, for example, at pressures from five to ten times the pressure required to produce the same stage of the discharge in a gas like hydrogen or nitrogen.

The "running out" of spectrum tubes filled with monatomic gases under the discharge is due to absorption of the monatomic gas principally in the film of aluminium volatilised from the electrodes. In one series of experiments six tubes were filled with helium purified by calcium at the initial pressures 1.1 mm., 2.3 mm., 4.9 mm., 8.6 mm., 16.8 mm., and 31.2 mm. The first three became non-conducting—the discharge passing an alternative spark gap of an inch of air, and the tube fluorescing strongly—with less than an hour's running, and the fourth after sixty hours, the residual pressure of pure helium in each case being about 0.7 mm. This was determined by breaking the tube under mercury, and confirmed by the use of a specially designed form of McLeod gauge. In the first case the mercury rapidly liberated the greater part of the occluded gas by dissolving the film of volatilised aluminium. The occluded gases are also slowly evolved spontaneously in the cold, and practically completely when the tube is heated to its softening point for some time.

X-rays are given out in pure helium at pressures below 0.2 mm. in an X-ray tube 8 cm. diameter, while in hydrogen X-rays are not given out until the pressure is reduced below 0.1 mm. It is probable that the real pressure in an X-ray tube is in no case below 0.01 mm., and the general impression that the pressure is of the order of 0.001 mm. is due to a variety of misapprehensions regarding high vacua. The behaviour of argon, neon, mercury vapour, nitrogen, and carbon dioxide has also been investigated.

The behaviour of helium at low pressures, at which it conducts the discharge with abnormal difficulty, is strictly analogous to its behaviour at high pressures, when it conducts with abnormal facility (Ramsay and Collie, Proc. Roy. Soc., 1896, lix., p. 257). The curves connecting discharge potential and pressure were taken in the same tube for helium and hydrogen. Helium at 60 mm. showed the same discharge potential (7750 volts) as hydrogen at 12 mm. At a pressure of 30 mm. the potential in helium was 3400 volts, and in hydrogen 16,000 volts. Throughout the whole region, both of high and low pressure, one hydrogen molecule is electrically equivalent, so far as its effect on the character of the discharge is concerned, to several helium molecules.

The remarkable observation was made that some new spectrum tubes, as obtained from the maker, generated helium during preparation and the removal of the occluded gases. The only escape from the conclusion that helium was formed under the special conditions to which the tubes had been subjected was that the helium was derived from the aluminium electrodes. Experiments were made with old aluminium electrodes which had been exposed for months to the air after removal from old spectrum tubes in which they had been used with the rare gases. By the help of the calcium method it was proved that helium, neon, and argon can be obtained in this way in quantities sufficient to give a clear spectrum from old aluminium electrodes which have been used with these gases.

All the spectrum tubes used showed strongly Campbell Swinton's effect (Proc. Roy. Soc., 1907, A, vol. lxxix., p. 134) of developing minute bubbles when fused, usually in the areas exposed to the bombardment of particles travelling normally from the surface of the electrodes; but the argon tubes showed the effect to an extraordinary extent, the glass appearing to boil when fused. Experiments are described in which these glasses have been subjected to a temperature of 1300° C. in a vacuum furnace, and all but the inert gases absorbed by calcium. Only the minutest trace of rare gas is ever obtained in this way, and this is quite insufficient to produce the effect. In the case of the glass of a helium tube which showed Campbell Swinton's effect strongly, it was proved that after a preliminary heating in a vacuum, at a temperature below that necessary to produce bubbles, to drive off surface

gas, not the faintest trace of helium was obtained. The view is put forward that the effect is due to a secondary decomposition of the glass under local heating during the bombardment, and that it is not due to the discharge gases being driven into the glass.

**Royal Microscopical Society, December 18, 1907.**—Mr. Conrad Beck, vice-president, in the chair.—Specimens of luminous bacteria: J. E. **Barnard**. On the room being darkened, the light given off by the bacteria was at once apparent, and the contents of the flask when shaken became very luminous. The light produced was nearly monochromatic, lying between the lines F and G of the spectrum. The whole energy of these bacteria seemed to be utilised in producing light, no heat whatever being detected.—Specimens of natural twin-crystals of selenite: E. **Large**. Specimens were also exhibited under special reflecting polariscopes; under some of these were also shown artistic subjects made from selenite, one representing a vase of flowers, and another flowers and fruits, with animals, such as parrots, chameleons, &c., which changed colour when a film of mica below the design was rotated. Mr. Large also exhibited a small double-image prism made from a fragment of Iceland spar and mounted on the nose of an objective, by means of which two images of a suitable object placed on the stage with a selenite plate were obtained in complementary colours.—Gregory and Wright's microscope: E. M. **Nelson**. This microscope was described and illustrated in an old and rare book published by Gregory and Wright in 1786, and was called a "new universal microscope, which has all the uses of the single, compound, opaque and aquatic microscopes." The illustration shows it to be very similar to one presented to the society in 1899 by Dr. Dallinger, which was then thought to have been made by Benj. Martin, but it now seems likely that it was made by Gregory and Wright, who were probably Martin's successors.—A correction for a spectro-scope: E. M. **Nelson**. The paper described a device by which the object-glass of the telescope may be automatically rotated so as always to receive the rays from any part of the spectrum without obliquity.—Some African rotifers: J. **Murray**. The paper described about twelve species of Bdelloid rotifers from Old Calabar, Uganda, and Madagascar, among which were one new species and two new varieties.

January 15.—Mr. E. J. Spitta in the chair.—A new method of showing living bacteria by dark-ground illumination: C. **Beck**. The apparatus consisted of a modified parabolic illuminator, a Nernst lamp, and monochromatic blue light filter.—Some microscopes of new design made by Messrs. Leitz: J. W. **Ogilvy**. The instruments were fitted with Leitz's fine adjustment, the arrangement consisting of a worm wheel and heart-shaped cam, which gives an alternate rise and fall of 3 mm. to the body of the microscope. Mr. Ogilvy said an important feature in the arrangement was that, in the event of the objective being brought into contact with the cover glass when focussing, it simply rested upon the slide, no further downward motion being imparted to the body even if the observer continued to turn the milled head. The coarse adjustment was also provided with a safety arrangement.—The microscope as an aid to the study of biology in entomology, with particular reference to the food of insects: W. **Weesché**.

EDINBURGH.

**Royal Society, January 6.**—Prof. Crum Brown, F.R.S., vice-president, in the chair.—The chairman read a preliminary obituary notice of the late president, Lord Kelvin (see p. 253).—The fossil Osmundaceæ, part ii.: D. T. **Gwynne-Vaughan** and R. **Kidston**, F.R.S. The present part begins with a full account of the synonymy of scorial fern stems of osmundaceous affinity from the Permian of Russia. The internal structure of two of these, *Zalasskya gracilis* and *Z. diploxylon* (the latter a new species), is described in detail. They form a primitive genus of the Osmundaceæ, and are especially characterised by the possession of a broad and perfectly continuous ring of xylem, from which the leaf-traces depart in protostelic manner. The xylem is non-parenchymatous, and most of the tracheæ bear multiseriate pits. The protoxylems of the leaf-traces are shortly decurrent into the stele of the stem

as mesarch strands dying out rapidly below. Two distinctly different regions are to be observed in the xylem, a peripheral zone of normal tracheæ and a central mass of short and wide elements with reticulate markings. In the living plant of *Z. diploxylon* the latter tissue occupied the whole of the centre of the stele, which therefore possessed a solid central mass of xylem. It follows that the central ground-tissue of the recent Osmundaceæ must be regarded as a true pith derived from the modified central xylem of such a stele. The phloem consists of metaphloem only, there being no protophloem or porous layers.

PARIS.

**Academy of Sciences, January 20.**—M. Henri Becquerel, in the chair.—The principal earthquake centres in France, and on the system of seismic stations that should be established: G. **Bigourdan**. Taking into account the stations already existing or now being established, further stations are suggested at Nice, Marseilles, Rennes, and Lille.—Concerning a tooth discovered by MM. Maurice de Rothschild and H. Neuville: Albert **Gaudry**. It is concluded that this tusk, found near Addis-Abeba, belongs to a large unknown African mammal, now existing or recently extinct.—Morphological variations, obtained artificially, of the tubercle bacillus of man and mammals: S. **Arloing**. An account, accompanied by reproductions of photographs, of the modifications produced in human and bovine tubercle bacilli by prolonged cultivation at either a high temperature (45°) or high pressure (2.5 atmospheres).—A differential system of the second degree: L. **Schlesinger**.—The periodic solutions of certain functional equations: Ernest **Esclangon**.—Methodical attempts at a cellular aeroplane: H. **Farman**. A detailed account of the steps by which the author constructed his aeroplane and learnt its use.—The efficiency of screws for propulsion in the air: Louis **Breguet**.—The study of radio-active lead: B. **Szilard**. Radium D, E, and F have been separated from radio-lead. The present paper is concerned with the best methods of effecting this separation.—An exceptional case of Zeeman's phenomenon: A. **Dufour**. It is shown that there exists at least one source of light, a flame in which calcium fluoride is volatilised, giving a spectrum attributed to a compound and not to an element, which, placed in a magnetic field, gives out circular vibrations the sense of which agrees with the hypothesis of the existence of positive electrons.—The calorimetric method applied to the study of slow reactions: Jacques **Duclaux**. A closed Dewar tube is used as the calorimetric vessel, the whole being placed in the water of a thermostat. As showing the accuracy obtainable, an example of the application of the method to the hydrolysis of ethyl acetate by potash is given.—The synthesis of ammonia: M. **Woltereck**.—The catalytic power of silica and alumina: J. B. **Senderens**. The catalytic effect produced by silica or alumina depends upon the state of division and also upon the temperature to which these substances have been raised. Thus precipitated silica, dried by a gentle ignition, at 280° acts upon alcohol giving 99.5 per cent. of ethylene. The same silica, calcined for one hour at a red heat, gives ethylene and 5.3 per cent. of hydrogen. After six hours' ignition, the decomposition takes place only at 390°, and the amount of hydrogen increases to 17 per cent. Alumina behaves in a similar manner.—Some compounds of terbium and dysprosium: G. **Urbain** and G. **Jantsch**. Salts of these elements having been recently isolated in a pure state by the authors, they have studied the properties of some of their compounds with the view of devising less tedious methods of separation. The present note contains an account of terbium peroxide, Tb<sub>2</sub>O<sub>3</sub>; nitrate, Tb(NO<sub>3</sub>)<sub>3</sub>.6H<sub>2</sub>O; sulphate, Tb<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>.8H<sub>2</sub>O; and chloride, TbCl<sub>3</sub>.6H<sub>2</sub>O. Dysprosium does not form a peroxide, but the properties of the nitrate, Dy(NO<sub>3</sub>)<sub>3</sub>.5H<sub>2</sub>O; sulphate, Dy<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>.8H<sub>2</sub>O; and chloride, DyCl<sub>3</sub>.6H<sub>2</sub>O, are described.—The heats of solution of the alkali metals and the heats of formation of their protoxides: E. **Rengade**. On account of the violence of the action of water upon these metals, especially caesium and rubidium, the reaction was allowed to take place in a modified Berthelot bomb. The results are very concordant, and lower than those previously obtained by other methods.—The estimation of sulphide of carbon in

benzenes: Isidore **Bay**. The carbon bisulphide is precipitated by phenylhydrazine, the precipitate washed with pure benzene, and dried *in vacuo*.—The transformation of the  $\alpha$ -oxyacids into aldehydes by boiling their mercuric salts in aqueous solution; application to the preparation of *l*-arabinose by means of mercuric gluconate: Marcel **Guérbet**.—Some cases of the simultaneous production of the 1:6- and 2:7-dimethylantracenes: James **Lavaux**.—Syntheses by means of ethyl and methyl adipates: L. **Bouveault** and R. **Locquin**.—The action of nascent hypiodous acid (iodine and sodium carbonate) on some acids of the general formula  $R.CH:CH.CO_2H$ , R being  $C_6H_5$  more or less substituted: J. **Bougault**.—Some mineral salts which can act as peroxidases: J. **Wolff**.—A new type of polychætal annelid: Ch. **Gravier**.—The oculo-reaction in its relation to previous treatment with tuberculin: H. **Vallée**.—A bacilliform piroplasmiosis observed in cattle in the neighbourhood of Algiers: H. **Soulié** and G. **Roig**.

GÖTTINGEN.

**Royal Society of Sciences**.—The *Nachrichten* (physico-mathematical section), part iv. for 1907, contains the following memoirs communicated to the society:—

January 12.—Seismic waves. (1) Theory of the propagation of seismic waves; (2) seismic time-curves: E. **Wiechert** and K. **Zoopritz**.

July 6.—The uniformisation of algebraic curves: P. **Koobe**.

July 20.—Researches from the Göttingen University chemical laboratory, xviii. (1) The synthesis from nopinone of a hydrocarbon related to  $\beta$ -pinene; (2) the synthesis of homologous compounds of the dipentene series; (3) syntheses in the terpinene series; (4) the synthesis of anethol from anise-aldehyde, and of isosafrol from piperonal; (5) the occurrence of sabinene in Ceylon oil of cardamoms and majorana oil; (6) isomeric camphenes and a new camphene-camphor acid; (7) condensation products of cyclic ketones with aromatic aldehydes: O. **Wallach**.

August 6.—A contribution to our knowledge of the light-sense in chickens: D. **Katz** and G. **Révész**.

The official communications (part ii., 1906), just published, include a report by E. **Klein** on the progress of the issue of Gauss's works.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 30.

ROYAL SOCIETY, at 4.30.—On the Observation of Sun and Stars made in some British Stone Circles. Third Note: The Aberdeenshire Circles: Sir Norman Lockyer, K.C.B., F.R.S.—On the Non-periodic or Residual Motion of Water moving in Stationary Waves: Mrs. Ayrton.—The Refractive Index and Dispersion of Light in Argon and Helium: W. Burton.—On the Generation of a Luminous Glow in an Exhausted Receiver moving near an Electrostatic Field, and the Action of a Magnetic Field on the Glow so produced: Rev. F. J. Jervis-Smith, F.R.S.

FRIDAY, JANUARY 31.

ROYAL INSTITUTION, at 9.—Recent Researches on Radio-activity: Prof. E. Rutherford, F.R.S.

MONDAY, FEBRUARY 3.

VICTORIA INSTITUTE, at 4.30.—The Southern Alps of New Zealand and their Glaciers: C. D. Fox.  
ARISTOTELIAN SOCIETY, at 8.—The Religious Emotion; Some Results of Inductive Enquiry: Dr. A. Caldecott.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—Nitro-glycerine and its Manufacture: Lieut.-Col. Sir Frederick Nathan and W. Rintoul.

TUESDAY, FEBRUARY 4.

ROYAL INSTITUTION, at 3.—Roman Britain: (6) Its Interior Civilisation: Prof. F. J. Haverfield.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Further discussion: Experimental Investigations of the Stresses in Masonry Dams subjected to Water Pressure: Sir J. W. Ottley, K.C.I.E., and Dr. A. W. Brightmore.—Stresses in Dams; an Experimental Investigation by Means of India-rubber Models: J. S. Wilson and W. Gore.—Stresses in Masonry Dams: E. P. Hill.

ZOOLOGICAL SOCIETY, at 8.30.—Cinematograph Demonstration of Results of Natural Colour Photography with Zoological Subjects: F. Martin Duncan.—The Duke of Bedford's Zoological Exploration in Eastern Asia. VII. List of Mammals from the Tsu-shima Islands: O. Thomas.—On the Presence of Gonadial Grooves in *Aurelia aurita*: T. Godvey.—The Duke of Bedford's Zoological Exploration in Eastern Asia. VIII. A Collection of Freshwater Fishes from Corea: C. Tate Regan.

WEDNESDAY, FEBRUARY 5.

GEOLOGICAL SOCIETY, at 8.—On Antigorite and the Val Antigorite, with Notes on other Serpentine containing that Mineral: Prof. T. G. Bonney, F.R.S.—The St. David's Head "Rock Series" (Pembrokeshire): J. V. Elsdon.

ENTOMOLOGICAL SOCIETY, at 8.—On Diaposematism, with Reference to

some Limitations of the Müllerian Hypothesis of Mimicry: Guy A. K. Marshall.

SOCIETY OF ARTS, at 8.—War Balloons: A. E. Gaudron.

THURSDAY, FEBRUARY 6.

ROYAL SOCIETY, at 4.30.—*Probable Papers*.—On the Weight of Precipitum obtainable in Precipitin Interactions with Small Weights of Homologous Protein: Prof. D. A. Welsh and H. G. Chapman.—Nitrication in Acid Soils: A. D. Hall, N. H. J. Miller, and C. T. Gimingham.—A Criticism of the Opsonic Theory based upon Studies carried out by Means of Melanin: S. G. Shattock and L. S. Dudgeon.—A Contribution to the Study of the Mechanism of Respiration, with Especial Reference to the Action of the Vertebral Column and Diaphragm: J. F. Halls Dally.

ROYAL INSTITUTION, at 3.—The Story of the Spanish Armada: Major Martin Hume.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Protective Devices for High Tension Transmission Circuits: J. S. Peck.

LINNEAN SOCIETY, at 8.—Fruits and Seeds from the Pre-Glacial Beds of Britain and the Netherlands: Clement Reid, F.R.S.—On a Method of Disintegrating Peat and other Deposits containing Fossil Seeds: Mrs. Reid.—On a Botanical Expedition to Fokien: S. T. Dunn.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Some Devices for the Absorption of Shock on Wheeled Vehicles: F. G. Woollard.

CHEMICAL SOCIETY, at 8.30.—The Metallic Picrates: O. Silberrad and H. A. Phillips.—Organic Derivatives of Silicon. Part V., Benzylethylsilicone, Dibenzylsilicone and other Benzyl- and Benzylethyl-derivatives of Silicane: R. Robison and F. S. Kipping.—Some Physico-chemical Properties of Mixtures of Pyridine and Water: H. Hartley, N. G. Thomas, and M. P. Applebey.—The Constitution of Umbellulone, Part III.: F. Tutin.—The Residual Affinity of the Coumarins and Thio-coumarins as shown by their Additive Compounds: A. Clayton.—The Influence of Foreign Substances on Certain Transition Temperatures, and the Determination of Molecular Weights: H. M. Dawson and C. G. Jackson.—The Bromination of  $\beta$ -Hydroxydiphenylamine: Miss A. E. Smith and K. J. P. Orton.—Colour and Constitution of *az*-Methine Compounds, Part I.: F. G. Pope.—The Decomposition of Ammonium Bichromate by Heat. Preliminary Notice: W. M. Hooton.

FRIDAY, FEBRUARY 7.

ROYAL INSTITUTION, at 9.—Napoleon and the Louvre: Humphry Ward.

SOCIETY OF ARTS, at 8.—The Hygiene of the Pottery Trade: W. Burton.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Electric Hardening and Annealing Furnaces: P. T. Steintal.

GEOLOGISTS' ASSOCIATION, at 8.—Presidential Address: The Centenary of the Geological Society: R. S. Herries.

JUNIOR INSTITUTION OF ENGINEERS, at 8.—Aerial Navigation: H. Chatley.

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