

on the changes desirable in the education of this country. Larger grants for scientific industrial research, though imperatively necessary, will not be enough. What our system of education should be after the war must be inquired into. Our children will have to be taught their duties as citizens of a great Empire, and in relation to our Dominions overseas. Sir Philip Magnus advocated the appointment of an independent and competent committee, such as was suggested by him in the House of Commons on January 26 (see NATURE, February 3, 639), to inquire into the whole question. Scientific education must be made more general and the spirit of our people be made scientific. Science must be given full play in all our activities, and especially must it govern our organisation. Such a committee would be able to effect concentration, and its recommendations should lead to reforms and development of the Board of Education. While it is of the utmost importance that we shall apply science to commerce, to industry, and to other purposes, it is, said Sir Philip, still more important to keep steadily in mind that the highest aim of education is so to develop the character of our people that they shall act as moral human beings.

#### SOCIETIES AND ACADEMIES.

##### LONDON.

**Royal Society**, February 10.—Sir J. J. Thomson, president, in the chair.—Lord Rayleigh: The theory of the Helmholtz resonator. The ideal form of a Helmholtz resonator is a cavernous space enclosed in a thin immovable wall, but communicating with the external atmosphere by means of a small perforation. An approximate theory is due to Helmholtz, who arrived at definite results for apertures the outline of which is circular or elliptic. In the present paper the approximation is carried further for the special case where the wall is spherical, with the aid of the appropriate Legendre's functions.—Sir Norman Lockyer and H. E. Goodson: The oxyhydrogen flame spectrum of iron. A spectrogram of the light emitted when metallic iron burns in the oxyhydrogen flame, notably rich in lines due to the metal, has been studied. Sixty-four lines of iron have been identified in the region  $\lambda\lambda 3856.52-5615.88$ . Fifteen of these lines do not appear to have been hitherto recorded in the iron-flame spectrum, and a number of these latter possess special interest. On the basis of a comparison of the flame spectrogram with a spectrum of the iron arc of approximately similar exposure, it has been possible to separate the flame lines according to the observed variations of intensity into two well-marked groups, whilst a residuum forms an intermediate group. All the flame lines have accordingly been placed in one or other of the following three groups:—

- |         |            |       |          |        |       |      |      |          |
|---------|------------|-------|----------|--------|-------|------|------|----------|
| Group A | containing | lines | stronger | in     | flame | than | arc. |          |
| " B     | "          | "     | "        | weaker | "     | "    | "    |          |
| " C     | "          | "     | "        | nearly | equal | in   | both | sources. |

This division bears close relation to the more minute classification employed by King in the case of spectra obtained at varied temperature levels in the electric furnace.—W. G. Duffield and M. D. Waller: The consumption of carbon in the electric arc. III.—The anode loss. It has already been shown that the rate of consumption of carbon from the kathode of a very short arc is such that the departure of one atom is accompanied by the transfer between the poles of four electronic charges. The above experiment gave a clue to the rôle played by the kathode. Experiments were undertaken to determine the part played by the anode. It appears that the anode loss of carbon is unimportant in the mechanism of the arc, and that the function of the anode is to receive the carriers of the current

produced by the essential process occurring at the surface of the kathode. The formation of a crater in the normal type is not vital to the arc, though it is its most prominent feature. The reduction in potential difference in the arc with rotating anode is probably due to absence of electronic emission on a large scale from its cooler anodes.—C. H. Lander: Surface friction: experiments with steam and water in pipes. The work comprises a verification of Rayleigh's formula connecting resistance with velocity, density, diameter of pipe, and kinematical viscosity of fluid. The results are slightly above those obtained by Stanton and Pannell for water and air in brass pipes, and show similar characteristics. The general results of the work confirm the accuracy of the assumptions made in the derivation of the equation

$$R = \rho v^2 F \left( \frac{vd}{\nu} \right)$$

for fluids differing as widely in their properties of viscosity, density, etc., as steam and water.—T. R. Merton: The structure of broadened spectrum lines. It is considered improbable that the broadening of spectrum lines which occurs at high pressures and under conditions of powerful electric discharge can be referred to the movement of the atom as a whole, but rather to processes more intimately connected with the problem of radiation. Stark has suggested that the broadening is closely related to the electric resolution of the lines. On this assumption the distribution of intensity to be expected in the lines  $H\alpha$ ,  $H\beta$ , and  $H\gamma$  of hydrogen, broadened by powerful discharges, is discussed. A method of investigating the distribution of intensity in these broadened lines has been found. This method is not affected by the eccentricities of the photographic plate and is adapted to quantitative measurements. The results for the hydrogen lines show that  $H\alpha$  consists of a strong maximum falling off rapidly and regularly on either side,  $H\beta$  falls off much less rapidly and shows a minimum at the centre of the line, and  $H\gamma$  shows a strong central maximum with very diffuse "wings" on either side.

##### PARIS.

**Academy of Sciences**, January 24.—M. Camille Jordan in the chair.—L. Maquenne: The comparison of the action of saccharose and of invert-sugar on alkaline copper solutions. Supplementing an earlier note on the same subject, details are given of the influence of temperature and time on the reduction by invert sugar and by cane-sugar.—Boris Delaunay: The general solution of the equation  $X^3\rho + Y^3 = 1$ .—Gaston Julia: Positive quadratic binary forms.—Maurice Fréchet: The deviation of any two functions.—A. Liljeström: The difference between the centre of gravity and centre of inertia.—G. Mouret: The flow of liquids over a thin edge.—Ernest Esclangon: The trajectories of projectiles in air.—J. Dejust: The determination of the rational surface of the blades of a hydraulic turbine.—M. Mesnager: The problem of the fixed thin rectangular plate.—Thadée Peczański: The mechanical equivalent of the light of an incandescent lamp.—Stanislas Meunier: New observations on the structure of the meteoric irons of the Diablo Canyon (Arizona): consequences relating to the circumstances of the fall of these meteorites. The author's interpretation of the structure of the meteorite agrees with the view put forward by Barringer and Tilghmann, that the crater of Coon Butte was excavated by the shock of the meteorite (see NATURE, January 27, p. 595).—M. Dalloni: The Senonian of Oran (Algeria).—M. Marage: The measurement of the sharpness of hearing in real and simulated deafness. A discussion of the

importance of quantitative measurements of deafness in connection with the army.—P. Bazy: Delayed tetanus. The immunity given by the antitetanus serum lasts only fifteen days, and under certain conditions tetanus may develop as long as fifty days after infection. Injections every eight days for a month are suggested as a safeguard.—A. Policard, B. Desplas, and A. Phélip: Biological researches on wounds received in battle. The microbial flora and its relations with the clinical evolution and the characters of the wound.

### BOOKS RECEIVED.

Anatomic des Clausilies Danoises. By C. M. Steenberg, i., Les Organes Génitaux. Pp. 44 (Kobenhavn: Bianco Lunas.)

The British Journal Photographic Almanac, 1916. Pp. 984. (London: H. Greenwood and Co., Ltd.) 1s. net.

Transactions of the Geological Society of Glasgow. Vol. xv., part 3. Pp. 297-437. (Glasgow: Geological Society.) 7s. 6d.

Mathematical Papers for Admission into the Royal Military Academy and the Royal Military College. September-November, 1915. Edited by R. M. Milne. Pp. 30. (London: Macmillan and Co., Ltd.) 1s. net.

Wisconsin Geological and Natural History Survey. Bulletin xlii. Educational Series, No. 5: The Geography of the Fox-Winnebagoo Valley. By Prof. R. H. Whitbeck. Pp. 105. (Madison, Wis.)

A Bird Calendar for Northern India. By D. Dewar. Pp. 211. (London: W. Thacker and Co.) 6s.

Forerunners and Rivals of Christianity, being Studies in Religious History from 330 B.C. to 330 A.D. By F. Legge. 2 vols. Vol. i., pp. lxiii+202. Vol. ii., pp. ix+425. (Cambridge: At the University Press.) 2 vols., 25s. net.

Commerce and Industry. By Prof. J. R. Smith. Pp. viii+596. (New York: H. Holt and Co.) 1.40 dollars.

Memoirs of the Geological Survey of India. Palæontologia Indica. New Series. Vol. vi. Memoir No. 1. Supplementary Memoir on New Ordovician and Silurian Fossils from the Northern Shan States. By Dr. F. R. C. Reed. Pp. vii+100+xii plates. (Calcutta: Geological Survey; London: Kegan Paul and Co., Ltd.) 4s.

### DIARY OF SOCIETIES.

#### THURSDAY, FEBRUARY 17.

ROYAL SOCIETY, at 4.30.—The Action of Cobra Venom: Prof. A. R. Cushny and S. Yagi.—Gametogenesis and Sex D-termination in the Gall-fly, *Neuroterus lenticularis*. III.: Dr. L. Doncaster.—The Structure and Development of the Skull and Larvæal Cartilages of Perameles, with Notes on the Cranial Nerves: Philippa C. Esdaile.—Physiological Investigations with Petiole-Pulvinus Preparation of Mimosa Pudica: J. C. Bose and S. C. Das.

ROYAL INSTITUTION, at 3.—Variable Stars: Sir F. W. Dyson.

ROYAL GEOGRAPHICAL SOCIETY, at 5.—A Synthetic Method of Determining Geographical Regions: Dr. J. F. Unstead.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Kelvin Lecture: Terrestrial Magnetism: Dr. C. Chree.

ROYAL SOCIETY OF ARTS, at 4.30.—The Saints of Pandharpur: C. A. Kincaid, C.V.O.

LINNEAN SOCIETY, at 5.—John Bartram; the Pioneer American Botanist: Miss C. Herring-Browne.—Acorn Producing Twin Plants: Miss M. Rathbone.—Winter and Summer Coloration of the Ermine, *Putorius ermineus*: E. S. Goodrich.—The Infestation of Bamboos in Tidal Waters by *Balanus amphitrite* and *Teredo navalis* in Tenasserim: E. P. Siebbing.

#### FRIDAY, FEBRUARY 18.

ROYAL INSTITUTION, at 5.30. Polarised Light and its Application to Engineering: Prof. E. G. Coker.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Annual General Meeting.—Chisels: H. Fowler.

#### MONDAY, FEBRUARY 21.

ROYAL SOCIETY OF ARTS, at 4.30.—National and Historic Buildings in the War Zone; their Beauty and their Ruin: Rev. G. H. West.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Valley of Mexico: A. P. Maudslayi.

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TUESDAY, FEBRUARY 22.  
ROYAL INSTITUTION, at 3.—Nerve Tone and Posture: Prof. C. S. Sherrington.

ZOOLOGICAL SOCIETY, at 5.30.—Studies on the Anoplura and Mallophaga, being a Report upon a Collection from the Society's Gardens. I.: B. F. Cummings.—Further Observations on the Intestinal Tract of Mammals: Dr. F. Chalmers Mitchell.

ILLUMINATING ENGINEERING SOCIETY, at 8.—Discussion: Some Future Possibilities in the Design of Instruments for Measuring Illumination (with Special Reference to Photometers Depending on Physical and Chemical Methods).

INSTITUTION OF CIVIL ENGINEERS, at 5.30.—The Main Drainage of Cairo: C. C. James.

#### WEDNESDAY, FEBRUARY 23.

ROYAL SOCIETY OF ARTS, at 4.30.—Serbia as seen by a Red Cross Worker: Miss H. B. Hanson.

GEOLOGICAL SOCIETY, at 5.30.—The Origin of some River-Gorges in Cornwall and Devon: H. Dewey.

#### THURSDAY, FEBRUARY 24.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Mathematical Contributions to the Theory of Evolution. XIX. Second Supplement to a Memoir on Skew Variation: Karl Pearson.—The Relative Combining Volumes of Hydrogen and Oxygen: F. P. Burt and E. C. Edgar.—Speed Effect and Recovery in Slow-speed Alternating Stress Tests: W. Mason.

ROYAL INSTITUTION, at 3.—The Milky Way and Magellanic Clouds: Sir F. W. Dyson.

CHILD STUDY SOCIETY, at 6.—Psychological Problems arising out of the War: C. Bart.

#### FRIDAY, FEBRUARY 25.

ROYAL INSTITUTION, at 5.30.—The Commerce of Thought: Sir A. Quiller Couch.

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