

School of Economics. Among miscellaneous grants made during the year may be mentioned a sum of 1500*l.* to the United Irish Women, and 4000*l.* to the Women's Industrial Council towards the cost of building a nursery training school; and to provide an aquarium for the gardens of the Zoological Society of Scotland 10,000*l.* is to be given.

How unwise it would be if the present demand for national retrenchment led to any reduction of State aid to our modern universities can be gathered from an inspiring article by a special correspondent in the issue of the *Times* for February 9. The impressive array of facts as to the value of the application of research to the purposes of the war which the article provides shows that those nations will take the first rank in peace and war alike which utilise most completely the resources which science has placed at the disposal of mankind. The article deals more especially with the four universities of the North of England, and we select the following instances from the numerous examples cited:—Distillations from coal tar, testing of steel and explosives, calibrating of aeroplane recording instruments, and the production of pharmaceutical drugs are included among the special war enterprises of Manchester University. Liverpool University has given expert advice in the manufacture of explosives, and has undertaken the analysis of explosives in a district extending from Ruabon to Fleetwood. The equipment and *personnel* of the tinctorial chemistry and dyeing department of Leeds University were put at the disposal of the Government in 1914, and the department has done valuable research work in relation to dye-stuffs and raw materials not hitherto made in England. Another department of this University is conducting the recovery of toluene from coal gas in Lincolnshire and Yorkshire, and is inspecting the production of high explosives in Yorkshire. The chemists of the University have furnished a large supply of the anæsthetic novocaine, which we formerly imported from Germany, and have prepared about a hundred antiseptic compounds for the military hospitals. In regard to the University of Sheffield, valuable and confidential work has been done there in relation to the science of steel, and the Scientific Advisory Committee of the University has given local manufacturers expert guidance in their efforts to replace exports from Germany. Thus, advice has been given on the processes of hardening steel, on materials for polishing razors, on the contact process of procuring sulphuric acid, and so forth. Steps have been taken also to encourage the revival of the old glass industry of South Yorkshire.

SOCIETIES AND ACADEMIES.

LONDON.

Mathematical Society, February 10.—Sir Joseph Larmor, president, in the chair.—J. H. Grace: (i) Theorems on straight lines intersecting at right angles. (ii) The classification of rational approximations.—Mrs. G. C. Young: Infinite derivatives.—E. H. Neville: The bilinear curvature and other functions of independent directions on a surface.—Dr. S. Brodetsky: The attraction of equiangular spirals.—J. Proudmán: Additions and corrections to a former paper, "Limiting forms of long-period tides."—R. E. Powers: Certain composite Mersenne's numbers.—Prof. H. F. Baker: Note on a formula connected with the theory of spherical harmonics.—Dr. T. J. P. A. Bromwich: Note on Dr. Baker's formula.—J. Hammond: Notes on the arithmetic of prime numbers.

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Royal Meteorological Society, February 16.—Major H. G. Lyons, president, in the chair.—C. E. P. Brooks: The rainfall of Nigeria and the Gold Coast. The paper dealt with the rainfall on the Guinea Coast and its hinterland for the ten years 1904-13. The driest month is January, with scarcely any rain, the wettest is June, and the monthly maps show how the rainy belt travels inland as the wet season comes on. In August it reaches its northernmost position, and the coast is drier during that month than in July and September. The coast is very rainy, the annual fall averaging 160 in., and reaching 200 in. in wet years at some stations in the Niger delta. The interior merges into the desert, with a rainfall of less than 10 in. annually. The variation of the rainfall from year to year is governed by the development and movements of the equatorial belt of low pressure and the subtropical "highs," while it is the alternation of dry and wet seasons which governs the temperature and humidity, rather than the position of the sun, and the dominant factor in Nigerian climatology is not temperature, but rain.—Dr. J. R. Sutton: South African coast temperatures. This paper dealt with the normal monthly mean temperatures at selected stations on the coast of South Africa, a few miles inland, and on the tableland, and the author endeavoured to connect the retarding of the maximum and minimum temperatures at certain stations with the moderating effect of the temperature of the sea and of the direction and force of the wind.

Linnean Society, February 17.—Prof. E. B. Poulton, president, in the chair.—Miss C. Herring-Browne: John Bartram, the pioneer American botanist. Bartram was born on March 23, 1699, near Darby, in County Delaware, Pennsylvania. In 1731 his friend, James Logan, procured a copy of Parkinson's "Theatrum" from England as a present for Bartram, and this decided him to make excursions after plants into Maryland and Delaware. To receive and grow his discoveries he began before the end of the year to lay out the garden, the charm of which was felt by Washington, Jefferson, and Franklin. Many of the American trees were first sent to Europe by Bartram, amongst them being the *Taxodium distichum*, still extant at Mill Hill, in Collinson's old garden. An even finer specimen, which died a few years ago, was 150 ft. high, and 27 ft. in girth; the trunk still stands in the Bartram Garden Park, Philadelphia. Bartram died on September 22, 1777. His life was shortened by the apprehension that his cherished garden might be laid waste by British troops, but his fears were not realised. This garden is now the property of the city of Philadelphia, and is supported as a public park.—E. P. Stebbing: The infestation of bamboos in tidal waters by *Balanus amphitrite* and *Teredo navalis* in Tenasserim. The rapid destruction of bamboo piles is a serious loss, and investigation shows that up to now no species of bamboo is immune; research is to be continued.

Institution of Mining and Metallurgy, February 24.—Sir T. K. Rose, president, in the chair.—E. T. Mellor: The conglomerates of the Witwatersrand. Of the various theories which have been from time to time advanced to account for the association of the gold with the conglomerates of the Rand, two now hold the field: the infiltration theory and the theory which regards the conglomerates as placer deposits modified by subsequent recrystallisation of many of the constituents. In view of recent extensive developments in prospecting by boreholes and mining, and the evidence accumulated as the result of a survey of the Witwatersrand system during the past five

years, the author submits certain geological aspects of the question which he thinks may assist in forming a conclusion as to the precise nature of the conglomerates and the origin of the gold associated with them. After reviewing the position in the light of these recent investigations, which have, he claims, seriously disturbed the even balance of previously adduced evidence favouring opposing theories, the author considers that the evidence in favour of regarding the conglomerates as "fossil placers" is convincing and is increasing continually with the extension of opportunities for collecting information. The importance of establishing such a theory as fact can scarcely be overestimated from its bearing upon the future of the Rand goldfields, which have now for some years had a yearly output to the value of approximately 40,000,000l. sterling.—H. E. Nicholls: A pioneer bucket dredge in northern Nigeria. The chief interest in this account of the installation of the first bucket dredge in northern Nigeria relates to the fact that the dredge in question was, to the author's knowledge, the first to be operated by internal-combustion engines of the semi-Diesel type. The choice of this type of motor was enforced by the local absence of firewood and the then existing prohibitive cost of coal, which seemed to render the use of steam power quite out of the question. The paper gives a full description of the dredge and its engine, and there are also details of the costs of operating and other particulars which should be useful to engineers confronted with similar problems.—A. S. Wheeler: Antimony production in Hunan Province, South China. In view of the importance of this metal at the present juncture, and the fact that China is the world's largest producer—Hunan being, moreover, the chief source of the Chinese supply, this paper makes a timely appearance. It would seem that, as in most Chinese mining, the processes adopted are of a crude and sometimes even primitive nature, but despite this the production is of great economic value, and of the output it is computed that at least 90 per cent. (about 25,000 tons in the year 1914) is exported to other countries.

MANCHESTER.

Literary and Philosophical Society, February 8.—Prof. S. J. Hickson, president, in the chair.—Prof. G. Elliot Smith: New phases of the controversies concerning the Piltdown skull. Prof. Elliot Smith considered the different views that had been recently expressed; (1) that the canine belonged to the upper and not the lower jaw; (2) that the mandible was not human, but that of a hitherto unknown species of chimpanzee, which by some unexplained means made its way into England in the Pleistocene period; (3) that the features differentiating this mandible from that of modern man had been unduly exaggerated; (4) that the canine tooth could not have belonged to the same individual as the skull and the jaw because it differed from them in age, according to one authority being definitely *older*, and to another distinctly *younger*, than the other fragments. These widely divergent views tend to neutralise one another. In considering the possibility that more than one hitherto unknown ape-like man or man-like ape expired in Britain side by side in the Pleistocene period, and left complementary parts, the one of the other, the element of improbability is so enormous as not to be set aside except for the most definite and positive anatomical reasons. The evidence submitted in support of each item of the arguments for the dissociation of the fragments was examined, and it was maintained that none of it was sufficiently strong to bear the enormous weight of improbability which these hypotheses imposed upon it. The author directed special attention to the implied inference that

the cranium itself was not sufficiently simian to be associated with the jaw; and emphasised the fact that the skull itself revealed certain features of a more primitive nature than any other known representative of the human family.—W. J. Perry: The geographical distribution of terraced cultivation and irrigation. Attention was directed to the stupendous efforts made by various populations in the past, whereby whole mountain-sides were laboriously built up into series of great steps, which in many cases were watered by gigantic irrigation works, so that thousands of acres of what otherwise would have been sterile land were made to produce crops and maintain large populations. Such methods were (and in some instances still are) used in Great Britain and Ireland, Spain, Italy, Switzerland, and South Germany, many of the Mediterranean islands, Phoenicia, Mauretania, Canary Islands and Nigeria, Darfur, East Africa, British Central Africa, Rhodesia, Madagascar, Southern and Central Arabia, India, Ceylon, Burma, Assam, Western China, Sumatra, Nias, Java, Madura, Bali, Lombok, Sumbawa, Luzon, Formosa and Japan, New Guinea, Melanesia, Pelew and Caroline Islands, Marquesas Islands, Hawaii, Lesser Paumotu, Easter Island, Peru, Mexico, Honduras, New Mexico, Western Texas, Arizona, East California, and Haiti. These methods, applied in the same way in this peculiar geographical distribution, and irrespective of whether such highly laborious measures were necessary or not, afford the most positive tokens of the migration of primitive culture along the same routes and probably at the same time as the stone-using, mine-working peoples first intruded into the same localised spots on the surface of the globe.—J. W. Jackson: The geographical distribution of the shell-purple industry. One of the most curious uses of shellfish is that of their employment for the production of a purple dye, known to the ancients as "Tyrian purple." The invention of this dye has usually been accredited to the Phoenicians, but Bosanquet has recently shown that it was known to the Minoans of Crete in 1600 B.C. The Phoenicians, however, appear to have been instrumental in spreading the knowledge of the art far and wide; the search for purple-shells was probably one of the motives which led these people to explore areas further afield than their own immediate surroundings. Throughout the Mediterranean, stations for the manufacture of purple were established by these ancient mariners, and evidence is also available of the early practice of the art on the coast of N.W. Africa and in the British Isles (Cornwall and west of Ireland). Eastward of the Mediterranean the knowledge of the art seems to have spread through the Malay region, China, and Japan, as far as Mexico and Central America. In the latter region it was certainly practised in pre-Columbian times, and still survives among the Indians.—J. W. Jackson: Shell-trumpets and their distribution in the Old and New World. The employment of shells as horns and trumpets is of very ancient origin. The sites of the past and present uses of these trumpets form a continuous chain from the Mediterranean region, through India and the Pacific Islands to the American continent. As in the case of shell-purple, Crete figures very prominently in the early use of the conch-shell trumpet, it having been associated with Minoan religious worship. From Crete the cult spread, doubtless through Phoenician influence, to numerous places in the Mediterranean, to India, Tibet, China, and Japan, through Indonesia and the Pacific Islands, to the central parts of America. In the Mediterranean, Triton trumpets have been found in Ligurian caves, said to be of Neolithic age. In India the chank-trumpet is used in connection with Hindu temple worship and special sanctity is associated with

the chank itself. The shell-trumpet enters into ceremonies in Malabar, Siam, etc.; and signal-horn shells are used in Japan. In certain of the Pacific Isles their uses are many. In the New World the shell-trumpet was known in pre-Columbian times, and entered into the religious ceremonial of the Aztecs. Ancient Mexican manuscripts provide evidence of its use in temple worship in precisely the same way as in India. The shell-trumpet was also employed by the Incas and other ancient peoples, and survives to-day in several places.

DUBLIN.

Royal Irish Academy, February 14.—Rev. J. P. Mahaffy, president, in the chair.—J. G. Leatham: Periodic conformal curve-factors and corner-factors. The paper deals with the repeated conformal representation of the doubly connected region which is bounded internally by a closed curve or polygon and is externally unbounded, upon successive semi-infinite strips of a half-plane. Smooth curves are dealt with by means of periodic conformal curve-factors; and the properties of such curve-factors and some comprehensive formulæ for them are discussed. Periodic corner-factors are defined, and it is shown how they give the required transformation in the case in which the internal boundary is polygonal. The periodic curve-factor is exhibited as the limit of a product of periodic corner-factors, and special types are deduced. The results are interpretable in terms of two-dimensional fields of liquid or electric flow, or electric induction. Fields with logarithmic singularities (sources, vortices, electrodes, etc.) are then discussed, and it is shown how, by a double transformation, such fields can be specified for any region the conformal representation of which has been formulated. Thus the field due to a line-charge in presence of a charged conductor in the form of an elliptic cylinder or a polygonal prism is readily determined, and the method is equally applicable to many other problems of similar type.—G. H. Carpenter: The Apterygota of the Seychelles. The collection described was made by members of the Percy Sladen Trust Expedition, and comprises thirteen species of Thysanura and eighteen of Collembola. As only three Apterygota were hitherto recorded from the Seychelles, most of the species now enumerated are regarded as new, and three remarkable Machilids are referred to a new genus. Structural details of the jaws of *Isolepisma*, *Lepidospora*, *Lepidocampa*, *Heteromuricus*, and *Cremastocephalus* are given, together with an account of the genital appendages in *Lepidospora* and *Lepidocampa*. The presence of the latter genus in the Seychelles is of considerable geographical interest; together with some of the Collembolan genera it indicates Malayan and Indian affinities for the fauna of the granitic islands of the Seychelles proper, while the species from the coral islands of the Farquhar and Aldabra groups have on the whole Malagasy and African relationships.

PARIS.

Academy of Sciences, February 14.—M. Camille Jordan in the chair.—G. Bigourdan: A work of F. Viété, supposed to be lost, "l'Harmonicon cœleste."—B. Baillaud: Remarks concerning the determination of the difference of longitude between the Observatories of Paris and Washington. An account of the work of the French-American Committee commencing October, 1913, in which wireless signals between Arlington and the Eiffel Tower were utilised. The final result adopted is 5h. 17m. 36.67s.—Henry Le Chatelier: The law of solubility. A reply to M. Colson.—T. H. Gronwall: Deformation in conformable representation.—Echsner de Coninck and M. Gérard: The atomic weight of bismuth. By the reduction of

bismuth chloride in hydrogen the value 208.50 was obtained for the atomic weight of bismuth.—L. Fernandez Navarro: The discovery of a basalt outcrop in the Sierra de Guadarrama (Spain). This is the only known volcanic outcrop in the centre of the *massif*.—M. Deprat: The stratigraphic series in North Tonkin.—Ph. Glangeaud: The volcanic Pliocene of the Saut de la Pucelle (Puy-de-Dôme).—V. Vincent: The circulation of manganese in natural waters. Manganese is probably present in natural waters as the bicarbonate. The oxides of manganese, in presence of carbon dioxide, do not dissolve to the same extent as the carbonate.—G. Bourguignon: The stimulation of nerves by discharges from condensers.—E. Colardeau and J. Richard: A stereoscopic arrangement for the examination of radiographic proofs, either with normal or pseudoscopic relief.—Ch. J. Gravier: The madrepores collected by S.A.S. the Prince of Monaco in the great depths of the North Atlantic.—A. Vayssière: A Notochiton and some Gasteropods from the second expedition of Dr. Charcot.—J. Bounhiol and L. Pron: A case of complete hermaphroditism in *Chrysophrys aurata*.

BOOKS RECEIVED.

The Mathematical Theory of Probabilities and its Application to Frequency Curves and Statistical Methods. By A. Fisher. Translated and edited with the assistance of W. Bonyng. Vol. i., Mathematical Probabilities and Homograde Statistics. Pp. xx+171. (New York: The Macmillan Company; London: Macmillan and Co., Ltd.) 8s. 6d. net.

Macmillan's Geographical Exercise Books. iv., The Americas. With Questions by B. C. Wallis. Pp. 48. (London: Macmillan and Co., Ltd.) 6d.

Thomas Alva Edison. By F. Rolt-Wheeler. Pp. ix+201. (New York: The Macmillan Company; London: Macmillan and Co., Ltd.) 2s. net.

Board of Agriculture and Fisheries. Fishery Investigations. Series ii., Sea Fisheries. Vol. iii., No. 2. Report on Sexual Differentiation in the Biology and Distribution of Plaice in the North Sea. By A. E. Hefford. Pp. 73. (London: H.M.S.O.; Wyman and Sons, Ltd.) 4s.

National Health Insurance. Medical Research Committee. Report of the Special Advisory Committee upon Bacteriological Studies of Cerebro-spinal Fever during the Epidemic of 1915. Pp. 64. (London: H.M.S.O.; Wyman and Sons, Ltd.) 6d.

Napier Tercentenary Memorial Volume. Edited by Dr. C. G. Knott. Pp. xi+441. (London: Published for the Royal Society of Edinburgh by Longmans and Co.) 21s. net.

Wireless Transmission of Photographs. By M. J. Martin. Pp. xi+117. (London: Wireless Press, Ltd.) 2s. 6d. net.

Harvey's Views on the Use of the Circulation of the Blood. By Prof. J. G. Curtis. Pp. xi+194. (New York: Columbia University Press; London: Oxford University Press.) 6s. 6d. net.

The Athenæum Subject Index to Periodicals, 1915. Science and Technology, with Special Reference to the War in its Technological Aspects. Pp. 79. (London: Athenæum Office.) 2s. 6d. net.

Woburn Experimental Fruit Farm. Fifteenth Report of the Woburn Experimental Fruit Farm. Pp. 83. (London: Amalgamated Press, Ltd.) 2s. 3d.

British Fungi and How to Identify Them. By J. H. Crabtree. Pp. 62. (London: C. H. Kelly.) 1s. net.

Instincts of the Herd in Peace and War. By W. Trotter. Pp. 213. (London: T. Fisher Unwin, Ltd.) 3s. 6d. net.