

## Research Items.

BRUNO'S METAPHYSICS AND GEOMETRY.—"La Doctrine Métaphysique et Géométrique de Bruno," by Dr. Xenia Atanassievitch (Paris: Les Presses Universitaires de France), is not only a fascinating historical study of the great sixteenth-century pioneer of modern science but it is also of first-rate present scientific interest. Dr. Atanassievitch would appear to be a pupil or a colleague of Dr. Petronievics, the professor of philosophy at Belgrade, recently in Great Britain working at the reconstruction of *Archæopteryx*, and advocate of a finitistic theory of space, that is, the theory that space is composed of discrete units and is not continuous. Dr. Petronievics holds that only by means of such a theory is it possible to reconcile the paradoxes of Zeno, and we may discover the original form of his argument in this study of Bruno. Like Lucretius, Bruno set forth his philosophical arguments in metrical form, and there can be no doubt that his writings influenced very definitely the mathematical and physical sciences in the seventeenth century. The change which took place in the method of scientific research under the lead of Galileo and Descartes was largely to the credit of mechanical inventions,—the telescope and the microscope,—and it is of extraordinary interest to compare the unaided speculations of Bruno with the new form the theories assumed under the control of experiment. All the distinctions which exercised the philosophers of the seventeenth century—the distinction between the mathematical, the physical, and the metaphysical unit, the geometrical difficulty Descartes encountered in his conception of subtle matter and his rejection of the void, the difficulty for physics which Malebranche discovered in the idea of a minimum sensible, the metaphysical difficulty Leibniz met with in relating God to the monads—are expounded in Bruno, mixed up indeed with much fantastic mythology. In the valuable criticism which follows her able exposition, Dr. Atanassievitch claims for Petronievics that his reconstitution of Bruno's idea is the only satisfactory solution of modern fundamental physical problems.

AN ETHNIC THEORY OF CASTE.—Dr. S. Ghurye makes an important contribution to the discussion of the question of caste in India, in a paper appearing in Vol. 4 of *Man in India*, in which he considers the bearing of the anthropometric data upon this problem. If endogamy is taken as the distinctive feature of caste, arising from a desire of the Aryans to keep themselves free from aboriginal blood, anthropometry should show that the physical type of their representatives in Hindustan proper approximates to what may be assumed to have been the original physical type of the Aryans. This is the long-headed and fineness type found among the castes of the Punjab and Rajputana regions. These regions, from their geographical position, must have been the site of Aryan settlements. The aboriginal type, on the other hand, may be deduced from the Musahar who, not being within the pale of Hinduism, are like the jungle tribes of Southern India, their chief characteristics being the broad nose and a head which is frequently long but is distinguished from the Aryan head in its absolute measurements. As a result of a comparison of types in the castes, it appears that the Brahman of the United Provinces has essentially the same physical type as the Punjabis and the ancient Aryans. In physical affinity to the Brahman the castes show a gradation corresponding with social status, and there is a similar state of affairs in Bihar. In Bengal and Bombay,

however, there is no correspondence between social gradation and physical differentiation. As one section—the Brahmans—kept itself free from aboriginal blood, while there are intermediate types between it and the representatives of the aborigines, it would appear that the immigrant Aryans of Hindustan tried to impose upon themselves endogamous rules; but only a section carried them out, while others mixed with the aborigines to a greater or less extent.

INSECT FAUNA OF THE BRITISH ISLES.—In the issues of the *Entomologists' Monthly Magazine* for April, May and June there are records of several interesting additions to the fauna of the British Isles. In the April number of that journal, Prof. E. V. Theobald describes seven new species of aphides from various parts of the country. In the same issue, Mr. E. G. R. Waters records three species of small tineid moths, which although known previously from Germany and other countries, had not until recently been detected as British. The species *Brachmia lutatella* H.-S. occurs on the Dorset coast; *Coleophora antennariella* H.-S. was found in beech woods in Oxfordshire; and *Phyllocnistis tremulella* (F.R.) Zell. seems to be more widely spread and has been apparently confused in collections with an allied species. There is also an article by Mr. J. Edwards recording the capsid bug *Miris trispinosus* Rent. as British. In the May and June issues, Mr. G. T. Lyle enumerates several parasitic Hymenoptera of the family Braconidæ as new to the British Isles. The June number of the journal also contains a paper by Mr. J. V. Pearman, who brings to notice four species of "book lice" (Psocoptera) which have not previously been known as British, and one of these, *Embidotroctes vectivenis*, is described as new to science. In the same issue, also, Mr. K. J. Morton records a caddis fly (*Mystrophora intermedia* Klap.) not previously known as British—the species being found in the Lake District. It is not a little remarkable that so many additions to our well-worked fauna should have been recorded in such a short period; there are evidently still many species in the more obscure groups awaiting recognition.

THE SWARMING OF ANNELIDS.—L. Fage and R. Legendre continue (*Comptes rendus Acad. Sci. Paris*, t. 180, p. 1373, May 1925) to give results of their experiments in fishing for swimming annelids in the sea by attracting them to strong lights hung in the water. In the present communication, they describe the swarming of the mud-burrowing worm *Scalibregma inflatum* Rathke in the Bay of Concarneau. The worms were sexually mature and swollen with eggs and spermatozoa, the latter being discharged into the water by the bursting of the body wall. The worms gathered round the submerged light and maintained constant and very active revolving and serpentine movements. They were found in October, November and December 1923, but the observations were not sufficiently frequent to determine whether in this case there was any lunar periodicity in the swarming of the sexual shoals, such as the authors had previously shown to exist for certain other annelids.

LOCATING HERRING SHOALS BY AIR-CRAFT.—A series of experiments was undertaken during the month of July 1924, by the Scottish Fishery Board, with the co-operation of the Air Ministry, to ascertain the practicability of locating herring shoals in Scottish waters by means of air-craft. An account of these experiments, prepared by the two observers, Messrs. Henry Wood and George McGee, has now been

published by H.M. Stationery Office (Fishery Board for Scotland, Scientific Investigations, 1925, No. 1. Edinburgh and London: H.M. Stationery Office, 2s. 6d. net.). Three flying boats were used, based on Invergordon, and repeated flights were made over the whole area of the Moray Firth. The weather conditions were on the whole favourable, but only on one evening (July 31) during the course of the experiments was a shoal of herring definitely observed, playing at the surface. Although the experiments were pursued with great diligence and care, and many observations of interest were made, the report shows clearly that the use of air-craft for the purpose of locating fish in these northern waters cannot be considered as a practical commercial proposition.

FLORA OF THE MALAY STATES.—The first local flora for the Federated Malay States is that recently published for Taiping by I. H. Burkill and M. R. Henderson in the *Gardens' Bulletin*, vol. 3, Nos. 9-12, for March 1925. In 1894 C. Curtis published a list of plants and ferns for the Island of Penang, and in 1900 H. N. Ridley published his flora of Singapore, both these appearing in the *Journal of the Straits Branch of the Royal Asiatic Society*; the present authors point out that the fact that Sir Hugh Low was Resident at Taiping from 1877 until 1889, coming there from Borneo, from whence he had already introduced many interesting species into cultivation, has had the natural result that the materials are already available for a relatively complete account of the flora of this area in the Federated Malay States. In the flora, 1980 species of flowering plants are recognised, 41 of these have been introduced, 1939 are natural to the country. The authors contribute a brief account of the habitat and ecology and an analysis of the probable sources of the flora with a very interesting discussion of the 860 species endemic to the Malay peninsula.

ORIGIN OF PETROLEUM.—Strong evidence in support of a micro-biological origin of petroleum emerges from the results of a recent geological survey of a large district occurring to the west of Los Angeles, California. Both Eocene and Miocene shales here abound in the remains of minute organisms which at death sank to the bottom of the sea and formed oozes composed essentially of their own remains. Of these organisms, diatoms with their characteristic siliceous tests are the most conspicuous; calcareous tests of foraminifers, together with a few siliceous radiolarian skeletons, have also been identified. The oozes thus formed are, according to Mr. W. S. W. Kew (*Bulletin* 753, United States Geological Survey), probably comparable to the diatom, globigerina and radiolarian oozes now in process of formation in the ocean, though not necessarily in deep water. The process of formation of petroleum from the organic matter from within the siliceous and calcareous tests is bound up with chemical change influenced by geological conditions of pressure and moderate heat. An indirect proof of such an origin of oil in this region is furnished by the fact that commercial quantities are recoverable from sandy reservoirs which overlie or are associated closely with these diatomaceous shales, and in the case of the Sespe formation (Eocene-Oligocene) oil is never found unless the Eocene shales are present beneath it. In view of the enormous quantities of petroleum recently produced from the Los Angeles region, it is noteworthy that the author is of the opinion that a first essential to the accumulation of oil "over all of California" is that the mother-rock of the oil is present; in other words, that oil has not migrated from great stratigraphical or geographical distances. In most cases in this region,

the mother-rock is involved in the very structures from which petroleum is ultimately obtained.

SIZES OF CRYSTAL UNITS.—Recent redeterminations of the sizes of the crystal units of caesium triiodide and dibromo-iodide by R. M. Bozorth and L. Pauling, recorded in the *Journal of the American Chemical Society* for June, are not in agreement with the values determined by Clarke and Duane (1923). The latter authors used a new method of crystal analysis which they had devised; since Bozorth and Pauling adopted the spectrum and Laue photographic method, the above discrepancy in results is of some importance.

THE ACTION OF RADIATION ON GASEOUS MIXTURES.—It has been shown by Franck and Cario that, when hydrogen containing mercury vapour is illuminated with light from a mercury arc lamp so as to excite the mercury atoms, the hydrogen becomes dissociated by a secondary reaction due to collisions of the second kind. In the *Zeitschrift für Physik* of June 30, Dr. H. Senftleben describes an investigation in which this fact is made use of to study the change in heat conductivity of hydrogen when dissociated. A mixture of dry hydrogen and mercury vapour is introduced into a glass tube with a quartz window, or into a quartz tube, through which passes a wire heated by an electric current to about 100° C. above room temperature. The resistance of the wire is measured while the heating current flows, and the tube is illuminated with a mercury arc lamp. Owing to the increase in heat conductivity of the illuminated hydrogen, the temperature of the wire fell, as indicated by a drop in its resistance. The results are of a preliminary nature, but show that the observed effect is really due to alteration in the thermal conductivity of the hydrogen, due to dissociation produced by the incident light. Theory shows that the coefficient of thermal conductivity depends on the number of degrees of freedom of the gas molecule, the mean molecular velocity and the molecular diameter. All these are altered when dissociation takes place, and the effect of alteration of the last quantity is the most important, since conductivity varies inversely as the square of the molecular diameter, so that dissociation results in an increase in conductivity.

HIGH FREQUENCY INDUCTIVE ELECTRIC FURNACE.—M. G. Ribaud describes in the *Comptes rendus* of the Paris Academy of Sciences for June 8, an electric furnace with which temperatures above 3000° C. can be obtained, which can easily be opened when hot and can be used repeatedly without renewal of parts. It consists of a cylinder of graphite, which is heated inductively by means of a high-frequency current, and a cylinder of porous carbon made of large grains, only slightly compacted, and forming a very poor conductor both for heat and electricity. This cylinder forms a continuation of the graphite one, and is closed by a plug of the same porous carbon with a central piece, closed by a glass plate, through which a current of inert gas circulates to remove all fumes and facilitate photometric pyrometry. If the portion of the furnace composed of porous carbon is long enough, at least 8 cm., it is possible to remove it by hand, even when the interior of the furnace is at a temperature of 3000° C. Temperatures higher than this have been obtained using 10 kilowatts, with a volume of 100 c.c., 2500° with 500 c.c., and 1800° with 3000 c.c. As compared with this, a resistance furnace formed of rings of graphite piled one on another, studied at the National Physical Laboratory by Rosenhain and Pryor, gave 1700° C. in a volume of about 500 c.c., with 10 kilowatts.