

RESEARCH ITEMS

Aboriginal Races of India

B. S. GUHA in a racial analysis of the aboriginal peoples of India (*Science and Culture*, 4, 17, June, 1939) points out that of the inhabitants of all India, 22½ millions, in round numbers, are still in a primitive state, living by hunting, fishing and on forest produce, and forming 6½ per cent of the entire population, but that if to these are added the fifty millions and more of the so-called "exterior castes", who are mostly detribalized primitive folk in process of entering the Hindu social system, the proportion becomes twice or even thrice this figure. Regionally these tribes are grouped into three separate zones. (1) A northern and north-eastern division of about three million people, scattered over a very large area of the sub-Himalayan region and the mountainous territory of Assam and north-eastern India, and merging into those of Burma and Yunnan. (2) A central division occupying small hills and plateaux traversing the entire breadth of the country from the Gulf of Cambay to the Orissan coasts, and comprising the Bhil, Gond, Kol, Oraon, Munda-Santal, etc. (3) The southern division, the smallest, containing little more than a hundred thousand people, spread over the hills of southern India, especially the extreme south-western strip. There is a rough parallel between the geographical distribution and the linguistic affinities of these peoples. Among the northern and north-eastern group the languages are of the Tibeto-Chinese family, with certain small exceptions. In the central division the languages spoken belong chiefly to the Munda branch of the Austric family, though certain peoples have adopted Aryan and Dravidian tongues. The southern group now speak entirely Dravidian languages in corrupt forms; and in the absence of a linguistic survey there is no means of knowing whether any traces of their original languages, Austric or other, survive. The same parallelism, however, does not exist in physical features, which show strains of Negrito, Proto-Australoid, a brachycephalic element with two subdivisions, one being more primitive than the other, and fourthly a medium-statured dolichocephalic element chiefly distributed in the Assam hills and mixed no doubt with short-statured Palae-Mongols.

Negro Education in the United States

AN analysis of the statistics of negro education in the United States of America for the years 1933-4 and 1935-6 by David T. Brose and Ambrose Caliver (U.S. Department of the Interior, *Bull.* 1938, No. 13) collects evidence of progress in dealing with one of the vital population problems of the country. Despite the depression, remarkable advance was made between 1933 and 1936, as also in the two preceding decades, more especially in the number of public high schools and their enrolment. In 1915, 58 per cent only of the negro children were enrolled in school; in 1930, the percentage had risen to 84, and in 1936 it is probably greater. This increase represents, among other things, a growing appreciation by the negroes of the value of education in the solution of their problems. It is now recognized among them that "the improvement of the rural

and urban masses in health, honesty, labour and thrift is directly dependent on the public elementary school". Among definite results illiteracy has been reduced from 30 per cent in 1910 to 16 per cent in 1930. The number of elementary and secondary school enrolments in 1935-6 totalled 2,438,981, being 24.2 per cent of the total negro population of 18 States. This is a slight decrease from 24.5 per cent in 1931-2, but represents a slight increase from 81 to 82.8 per cent of the negro child population between the ages of five and seventeen years. The fluctuation between 1917-1936, probably due to economic causes, shows a definite upward trend for six years following on the Great War, a recession in 1924-28, followed by a sharp rise in the boom years 1929 and 1930, with a continued high percentage in the years of depression, due in part to lack of employment, in part to assistance from public funds. The number of schools in 1935-6 is public elementary, 24,405, public high schools, 2,305, the latter a great development from 64 in 1915-16.

Human Schistosomiasis and its Intermediate Hosts

DR. ALAN MOZLEY (*Trans. Roy. Soc. Edin.*, 59, No. 26; 1939) has described twenty-six species of freshwater molluscs from Zanzibar, Pemba and Tanganyika Territory as a preliminary to the study of the species concerned with the transmission of the parasite causing schistosomiasis in man. Although the infection is slight when compared with conditions in Egypt, yet its effects are considerable, and might, in the opinion of the author, be brought under control by extermination of the molluscs over infected areas. In Zanzibar and Pemba, 10-70 per cent of the natives are infected with *Schistosoma hæmatobium*, while in Tanganyika *S. mansoni* is the prevalent parasite. Mozley suspects that *Physopsis globosa* (Morelet) transmits *S. hæmatobium*, and was able to prove experimentally that *Biomphalaria pfeifferi* carries *S. mansoni*. He describes the general ecological conditions governing the life and distribution of freshwater molluscs in the area, noting that as a result of these conditions the distribution is strictly limited to a small proportion of the ponds, lakes and streams. He discusses control methods involving destruction of the molluscan intermediate host, recommends drainage, flushing and chemical means, but considers that plant poisons and biological control methods are not yet fully worked out. He is optimistic, however, that the disease could be stamped out in Zanzibar within five years, and over the whole area in a somewhat longer period.

Pleiotropic Gene-effects in the Rat

H. Grüneberg, 1938, and H. B. Fell and H. Grüneberg (*Proc. Roy. Soc.*, B, 125, 123-144, and 127, 257-277; 1939) have investigated the effects of a gene in the rat which, in the homozygous condition, causes the death of the individual. About the time of birth the rib cartilages become abnormal (formation of thick capsules around the cartilage cells, and a very active cell proliferation). These abnormalities give rise to secondary symptoms the intensity of which

differs in different individuals. The abnormal thickening of the rib cartilages leads to a distortion of the thoracic basket and internal organs. Respiratory rib movements become impossible. As a consequence, emphysema of the lungs and sometimes compensating collapse in some regions of the lungs develops. Heart trouble occurs regularly as a consequence of the emphysema. Death occurs suddenly or slowly, depending on the type of cardiac failure which is induced, and not infrequently due to hæmorrhages into the lungs. Other deaths are caused by an inability to clean dirt from the nose which is normally brought about by sneezing. The presence of dirt prevents effective suckling, and starvation results. By reciprocal transplantation and tissue culture methods, it is shown that the abnormality of the cartilage is self-differentiating in post-embryonic life.

Vegetative Propagation of a Fern

THE number of vascular cryptogams which can be propagated vegetatively is remarkably small, but a recent short paper by E. E. Kemp (*Gard. Chron.*, July 15) describes an unusual method of regeneration from isolated, swollen leaf-bases of the fern *Marattia fraxinea*. These organs, which persist on the plant after the leaves have fallen, were placed on the surface of a coco-nut fibre rooting medium in a propagating case with a bottom temperature of 80° F. Buds then formed on the abaxial surface, either upon the leaf-base itself, or upon one of the stipules. When the buds had produced several roots from the base, they were removed and grown separately, still in the propagating case. The method offers one of the most economical means of vegetative propagation, since the old leaf-base will continue to produce additional buds until its stores of food become exhausted.

Smut Fungi of India

A PAPER by B. B. Mundkur (*Trans. Brit. Mycol. Soc.*, 23, Pt. 1, 86-121, May 1939) gives the results of a critical re-investigation of forty-four collections of Indian smut fungi in the Herbarium Cryptogamæ Indiæ Orientalis of the Imperial Agricultural Research Institute at New Delhi. Only twenty-five species are represented in the collections, but seven of these are now described for the first time, and five are new taxonomic combinations. The new species are *Ustilago polytoceæ*, *U. barberi*, *Sorosporium penniseti*, *S. azmatii*, *Sphacelotheca dinebræ*, *S. sahayai* and *Tilletia ajrekari*. The collections are not exhaustive, for 110 species of smut fungi are recorded for India. These new species are, however, parasitic upon plants which are peculiar to that region, and it is gratifying to see such progress in their critical determination as is revealed by the paper under review.

Solubility of Cements

A PUBLICATION by the Department of Scientific and Industrial Research, "The Solubility of Cements", (Building Research Technical Paper No. 26. London: H.M. Stationery Office, 1939, 6d. net), describes some investigations made for the Joint Sub-Committee on Special Cements of the Institution of Civil Engineers and the British Committee on Large Dams. The report deals with the deterioration of cements when exposed to certain types of waters, especially soft waters common in many mountain areas, and tests made

with five types of cement show that the extraction tests on ground set cements, developed originally in Sweden, afford a simple measure of their susceptibilities to attack adequate for practical purposes.

Physics Research at Harvard

VOL. 4 of Series 2 of *Contributions from the Physical Laboratories of Harvard University* for the year 1937 includes fifty-four papers which have appeared in the *Physical Review* and other scientific periodicals up to March 1938. About 18 per cent of them are from the high pressure laboratory of Prof. Bridgman in which the physical properties of substances at pressures of the order of 45,000 atmospheres are being investigated; about 11 per cent from that of Prof. Van Vleck which deal with magnetic susceptibilities and dielectric constants; 9 per cent from that of Prof. Pierce which deal with vibrations and supersonics, and others from the laboratories of Profs. Bainbridge, Oldenberg and Street dealing with mass spectra, molecular spectra, radioactivity and cosmic rays respectively. In addition, there are papers by other members of the staff and by seven fellows either of Harvard or national research fellows, and Dr. E. H. Hall has two papers on the four transverse magnetic effects which he has measured with greater accuracy than has been possible hitherto. With the staff available at Harvard a wide field of research can be covered, and the amount of work done is impressive.

The Absolute Ampere

SINCE the decision of the International Committee on Weights and Measures in 1927 that the material standards for all electrical units should approximate as closely as possible to the absolute theoretical units, the standardizing laboratories of the world have been determining with the precision now available the values of their concrete standards in terms of the absolute units. The International Ampere was defined at the London International Conference in 1908 as depositing 0.001118 grams of silver per second. The precise measurement of current depends in practice on the use of a potentiometer, a standard ohm and a standard cell, which each laboratory possesses. The comparison between the ampere so measured and the absolute ampere as measured by some form of current balance has been made in several of the most important national laboratories. That made recently at the Bureau of Standards by H. L. and R. W. Curtis and C. L. Critchfield is described in Research Paper R.P. 1200 of the Bureau. By means of an improved form of Rayleigh balance, they find that the Bureau International Ampere is 0.99986 absolute amperes, which agrees exactly with the result obtained at the National Physical Laboratory three years ago for the N.P.L. International Ampere.

Balloon Experiments in High Latitudes

H. Carmichael and E. G. Dymond (*Proc. Roy. Soc., A*, 171, 321; 1939) have now published the results of their balloon experiments made near the geomagnetic pole in North-West Greenland (see *NATURE*, 141, 910; 1938). The primary object of the experiments was the determination of cosmic ray intensities at high altitude, and two forms of apparatus were used: a coincidence counter set which transmitted wireless signals during its flight and which did not need to be recovered, and a photographic recording

version of the 'ticking' quartz fibre electroscope. The balloon technique was based on that of Regener, and several flights were made with both sorts of apparatus up to about 20 km. The results, when compared with those of other workers at lower latitudes, indicate that there is practically no increase in the cosmic radiation incident at the top of the atmosphere between geomagnetic latitude 50° and the geomagnetic pole. Since cosmic rays of low energy, between $3 \cdot 10^7$ and $2 \cdot 10^9$ ev., would be admitted in increasing numbers by the earth's magnetic field in this region, it must be concluded that no rays of low energy reach the earth from outer space. They may, perhaps, be cut off by some external magnetic field such as that of the sun. The expedition obtained a good deal of aerological data from the flights made by the apparatus and incidentally with pilot balloons. The stratosphere wind speeds found on this summer expedition were very low and the apparatus often descended near its starting point. The tropospheric wind speeds showed a well-defined maximum at about 9 km., probably just below the tropopause. A meteorograph flight showed a well-marked tropopause at 11.2 km. and an unusual rise of temperature in the stratosphere.

Reflectivities in the Ultra-Violet

G. B. SABINE (*Phys. Rev.*, 55, 1064; 1939) has made an investigation of the reflecting power of a number of evaporated metal films in the wave-length region from the visible to $\lambda 450 \text{ \AA}$. Aluminium has a high reflecting power down to $\lambda 2000 \text{ \AA}$, which falls off steadily at shorter wave-lengths. Below 1200 \AA . it is exceeded as a reflector by several metals. Silver, as is well known, reflects very little in the neighbourhood of 3000 \AA . Below this its reflectivity rises again. Its value in the region of 1000 \AA . is about 10 per cent, and is higher than that of most metals. Platinum is the best mirror found for wave-lengths less than 1200 \AA ., and its reflectivity from 1200 \AA . to 400 \AA . varies from about 15 per cent to about 8 per cent. Data are also given in the form of reflectivity curves for Pb, Mn, Be, Fe, Pd, Ni, Ti, Au, Cd, Zn, Te, Mo, Zr, Bi, Mg, Cr, Sb, Cu.

General Analysis

THE striking analogies between apparently unrelated branches of mathematics led the late E. H. Moore to assert that there must be a general theory, which he called general analysis, underlying these particular theories and unifying them. His first attempt to develop such a theory was of a postulational nature. This is fully accessible in his published papers. His second attempt, of a more constructive type, occupied him from 1915 until his death in 1932; but it has hitherto been described only in fragmentary form and in scattered papers. The American Philosophical Society has now undertaken to present a full account of the theory. The first part appeared in 1935, and dealt with the algebra of matrices. The second part, the fundamental notions of general analysis, appeared this year. There are two more parts still to come, generalized Fourier series and modular spaces, and the characteristic value problem in general analysis. The work has been carried out by R. W. Barnard, who has revised Moore's notes and provided an introduction to each chapter, so as to render as easy as possible the comprehension of what must, in view of its generality, necessarily be a highly abstract theory.

Fission of Rotating Bodies

R. A. LYTTLETON has published a paper (*Mon. Not. Roy. Astro. Soc.*, 99, 7; May 1939) replying to K. E. Edgeworth's criticism of some of his views (see NATURE, July 8, p. 81). Lyttleton points out several inaccuracies in certain dynamical principles in Edgeworth's paper, and a few of these are worthy of notice. Edgeworth believes that in the rapid and continuous transition of a satellite from a circular to a parabolic orbit the kinetic energy at a selected point on the latter orbit must be considerably greater than that possessed in its original circular orbit. Lyttleton shows that this is incorrect; the energy of escape varies inversely as the distance apart of the components and the kinetic energy in circular motion is half the kinetic energy in parabolic motion at the same distance. Using the figures which were given in Edgeworth's paper, the amount of energy possessed by the satellite in the circular orbit is about four fifths the energy that it has in the parabolic orbit—not a great difference and considerably less than Edgeworth estimated. In addition, it is shown that the direction of the force required to produce parabolic velocity should be nearly perpendicular to the direction drawn by Edgeworth in his paper. This force is actually radial in direction and is due to pressure, and no mention of this pressure is made by Edgeworth. Lyttleton next shows that the process of fission described by Edgeworth is open to serious doubt. When Jeans suggested the mechanism of the initial development of the pear-shaped figure in 1928, it was not then generally recognized that the pear-shaped figure is ordinarily unstable, and in point of fact the pear-shaped series of figures does not come into existence. Irrespective of this, the details of the process of fission developed by Edgeworth are open to doubt. In particular, why should the spiral arm just extend to Roche's limit, and why should the velocity be such that the tip of the arm does not come within the limit again and suffer disruption? These and other objections seem to impair very seriously the validity of Edgeworth's criticism of certain views advocated by Lyttleton.

Twelve New Southern Variables

MR. J. B. G. TURNER has given a brief description of his discovery of twelve southern variables with the Victoria 24-inch telescope, Cape of Good Hope (*Mon. Not. Roy. Astro. Soc.*, 99, 7; May 1939). The plates taken for parallax determination consist of upwards of twenty-five, divided nearly equally among five epochs of observation, an epoch representing at least four weeks. A plate of good definition was selected as standard, and the remaining plates were in turn superposed upon it so that the star images of the upper plate were brought into proximity to, but not exact coincidence with, the corresponding images of the standard plate. The resulting pairs of images were then examined for evidence of variation. When a star was suspected of variability, comparison stars were selected as close to it as possible, and when their magnitudes were established, the magnitude of the variable was determined from a comparison of the size and density of its image on each plate with those of the comparison stars on the same plate. A description is given of the method finally adopted for the determination of the magnitudes of the comparison stars, which proved very satisfactory.