

## Research Items.

**EDUCATIONAL STATUS AND FECUNDITY.**—There is a widespread belief that a correlation exists between education and sterility, and this belief has had some support from statistics gathered in America and dealing largely with college alumni. It is important, therefore, that due weight should be given to analyses which give another aspect to the relationship between education and fecundity. In the *Journal of Heredity* (vol. 19, No. 7, 1928) N. J. Butt and Lowry Nelson discuss in this connexion data obtained by the survey method from the homes in two Utah communities, one with a population slightly more than 2000, the other slightly more than 3000. In both, agriculture is the basic occupation, although all the chief occupational divisions as used by the United States Census are represented. Comparison was made of the families of parents with no education, with various grades of elementary and high school education, and with college education. The authors realise that the data are not comprehensive enough to warrant dogmatic statements, but they consider that their method should bear at least as much weight as statistics gathered from highly selected groups. Their results indicate that the families in Utah, men and women, who have had higher education, are not committing race suicide. The correlation secured ( $-0.09$ ) shows that education has very little influence on the size of the families, which average about 5 children born, of which more than 4.5 survive until after the parents are past the child-bearing age.

**THE GIBRALTAR SKULL.**—Anthropologists and others interested in the early history of man now have an opportunity to study in detail and at their leisure the evidence relating to the new Gibraltar skull discovered by Miss Garrod two years ago at the Devil's Tower. A full report on this relic of Neanderthal man appears in the recent issue of the *Journal of the Royal Anthropological Institute* (Vol. 58, Pt. 1), and may also be obtained separately. In addition to the very full and detailed account of the discovery and of the archaeology and geology of the cave by Miss Garrod herself, the report contains the results of the examination of the specimen itself and of the attendant conditions and associated finds by various specialists. It is, of course, generally agreed that the skull is that of a child, probably male, of about five years old. Mr. L. H. Dudley Buxton, in the course of his anatomical report, compares it with the skulls of other immature Neanderthal specimens, as well as the modern child. Prof. Elliot Smith's description of the endocranial cast brings out certain differences between it and those other children of Neanderthal age, but regards these differences as variations within the type. Miss Dorothea M. Bate deals with the very interesting series of animal remains. In addition there are reports on the sands by Mr. R. C. Spiller, on fossil voles by Mr. Martin A. C. Hinton, and on fossil mollusca by Paul Fischer. Even a captious critic must agree that the collaborators have used every effort to cover all aspects of the evidence which a reasonable degree of foresight may regard as likely to be of value to the future historian of man.

**THE OUTRIGGER CANOE.**—In *Man* for August, Mr. J. Hornell describes and illustrates some South American balanced canoes which appear to exhibit a stage in the invention of the outrigger. While lying off the coast of Gorgona, an island in the Pacific off the coast of Colombia, in 1927, his ship was visited by a number of dugout canoes from the mainland. These canoes were graceful dugouts with terminal platforms fore and aft, and with rounded bottoms without ves-

tige of a keel. The dimensions varied considerably, especially in length. A medium size was 18½ ft. over all. Paddles were used for steering and propulsion, but some of the canoes were fitted with a sail, the mast passing through a hole in a board lashed athwart the gunwales well forward of amidships. The characteristic feature, however, was the outrigger balance fittings. These were fitted to boats with a low freeboard and consisted of a log of the extremely buoyant *balsa* wood, approximately one-half of the total length of the canoe. The log was lashed to one side of the dugout by cords close to the fore and aft ends, the lashing passing through a hole bored in the side of the boat. In the centre it was fastened, not to the side of the canoe, but to a short projecting pole, with a piece of wood inserted between it and the pole to keep it depressed at the proper depth in the water. Afterwards, in the course of a trip inland, it was found that these canoes were one of several types, of which the final stage was a double outrigger. In one type the logs were tied in true outrigger fashion to stout outrigger booms laid athwart the hull, while in another type, a small local coaster, the dugout had superimposed upon it built-up strakes of one, two, or three planks. Although not previously recorded off the coast of Colombia, similar canoes were noticed early in the last century in Chile. As regards their origin, apart from independent invention and in view of the unlikelihood of a Polynesian source, it is probable that they were introduced by Spaniards from Manila, where a similar balanced canoe has been recorded.

**ASIATIC BIRDS IN ALASKA.**—The proximity of north-western America to the north-eastern coast of Asia and the probability that in earlier days the relationship of the two continents was still closer, suggests that there may be a more or less regular migration of birds from one side of the narrow sea to the other. It is known that certain Asiatic birds habitually cross Bering Sea, and Harry S. Swarth now adds a few more to the Asiatic forms which have been found in Alaska (*Proc. Calif. Acad. Sci.*, vol. 17, July 1928). These include the Japanese pipit (*Anthus spinoletta japonicus*) a former American identification of this race having proved to be erroneous; Middendorff's grasshopper warbler (*Locustella ochotensis*), and a Siberian hedge-sparrow (*Prunella montanella*), the former belonging to a genus new to North America and the latter to a family (Prunellidæ) hitherto unrecorded from that continent.

**SEX STUDIES ON SCHISTOSOMA.**—A. E. Severinghaus (*Quart. Jour. Micr. Sci.*, vol. 71, p. 653-702; April 1928) records observations on the stages in the life cycle of *Schistosoma japonicum*. The adults are dimorphic, but no dimorphism is apparent in the miracidium, primary and secondary sporocyst, and cercaria. The hamster was the mammalian host employed. The incidence of infection of the snails (*Oncomelania*) with the miracidia of *S. japonicum* in the Soochow region was found to be about two per cent, and owing to this low incidence it was found possible to plan mammalian infections by cercariae from a single snail, and to be reasonably sure that practically all such snails would have been infected with a single miracidium. Exactly half of the snails harboured cercariae which produced female flukes, while the other half produced male flukes. All the flukes recovered from the mammals infected by cercariae from one snail were of the same sex. Male flukes alone develop in the mammal normally as regards size, form, and the production of mature



germ cells, but if female flukes develop in the mammal in the absence of males they reach only one-fifth the normal length and the reproductive organs fail to develop with the exception of a blind tube (the uterus) and an aggregate of germ cells resembling early oogonia. It is suggested that the male produces hormones without which the female will not develop. New points in the anatomy of the reproductive system in both sexes are noted. The male is heterozygous; one half of the spermatids receive eight chromosomes and the other half six. There are two X-chromosomes, and sex is determined in the fertilised egg. The oogonial cells have 16 chromosomes (diploid), and though the maturation stages were not observed, there is little doubt that the female is homozygous and that the haploid number in each egg is eight. The life cycle exhibits the interesting condition that male-determined individuals produce parthenogenetic eggs at one stage and spermatozoa at another.

INDIAN TERTIARY MOLLUSCA.—An appendix to Cossmann and Pissarro's "Mollusca of the Ranikot Series" (noticed in NATURE, Aug. 20, 1927, p. 275) has now been published by the Geological Survey of India (*Pal. Ind.*, New Series, vol. 10. No. 4). It was the work of the late E. W. Vredenburg and has been edited with notes by Dr. G. de P. Cotter. The author discusses the types of the specimens described by d'Archiac and Haime in their "Description" (1853-54) now preserved in the Natural History Museum at South Kensington, of which, unfortunately, the exact localities "cannot now be ascertained from want of record or other reason. Some of the original diagnoses have had to be revised, while some new species from more lately obtained material are added. The memoir extends to 75 pages and there are 9 plates that are excellently reproduced from photographs by the Survey itself.

BUFUMBIRA VOLCANIC ROCKS.—The annual report of the Geological Survey of Uganda for 1927 contains a preliminary account by Mr. W. C. Simmons of the volcanic rocks of that part of the Bufumbira area which lies in the extreme south-west corner of Uganda. The region was geologically explored by Mr. Combe during 1925 and 1926. Of the three large volcanoes on the border, Sabinio is the oldest; its older lavas are basaltic or andesitic, while the later flows consist of olivine-basalts and leucite-basanites. These two rock-types also make up many of the investigated flows of Muhavura and Mgahinga. In some of the rocks of the latter, which is the youngest of the three, radiating groups of plagioclase laths occur giving a very characteristic appearance to the lavas. Numerous small craters are scattered over the country to the north, between the great volcanoes and Lake Mutanda. Their lavas range in composition from basalt or trachy-basalt to leucite-bearing types, some of which contain conspicuous biotite. It is noteworthy that felspar-free rocks are not restricted to the area outside Uganda to the extent that was thought likely by Finckh, but so far the variation in rock-types found in Uganda has a narrower range than that recognised by Finckh in his work on the collections made by the Mecklenburg expedition of 1907-8. Nevertheless, the Bufumbira volcanic field is evidently one of the world's most extensive areas of leucite-bearing rocks.

THE THEORY OF FERROMAGNETISM.—An important advance in magnetic theory has been made by W. Heisenberg, in a paper in the *Zeitschrift für Physik* of July 16, which deals with the nature of Weiss's intermolecular forces. The use of these has always been

unsatisfactory from the fact whilst they accounted for ferromagnetism formally, it was impossible to refer them specifically to electric or magnetic interactions between the magnetic molecules. In the present analysis they are derived from a quantum resonance phenomenon between electrons moving in different places with otherwise equivalent paths, a procedure which has already proved useful in other connexions. The new theory is to some extent approximate both in its assumptions and development, but it leads to equations for the magnetic moment which are identical in their main features with those of Weiss, and has the additional merit of predicting two further conditions which must be satisfied for ferromagnetism to occur. One is that the space-lattice must be such that each atom has at least eight neighbours, and the other is that the total quantum number of the electrons responsible for the magnetism must not be less than three, both conditions being satisfied by iron, cobalt, and nickel, although not to the exclusion of other substances. The author proposes to extend the theory to the case of a more complicated atomic model.

THE UNIMETER.—In the *Chemiker-Zeitung* of June 20, Messrs. Bloch and Frühling describe a new instrument, the unimeter, which is designed for the rapid examination of the optical properties of materials of most diverse types. The instrument is likely to prove extremely useful in laboratories and factories, since transparent, translucent, and opaque objects can all be examined with equal ease and there is usually no necessity to detach samples for the purpose. It can be used for the examination of such objects as paper, metals, coloured glass, solutions, powders, gelatine, textiles, painted surfaces, etc., or for the comparison of the intensities of light from different sources. The unimeter, which is manufactured by the firm Franz Schmidt und Haensch of Berlin, is mounted like a microscope, its essential feature being a polarisation-photometer. The two halves of the circular field consist of the object under examination and a comparison-plate of dull milk-glass respectively. By rotating the photometer about its axis the dividing line between the two halves vanishes when the latter are equally illuminated. The eyepiece carries a rotating diaphragm, which is also fitted with three coloured glasses for use in examining coloured objects. The necessary calculations are greatly simplified by the attachment to the graduated circle of a scale showing the squares of the tangents of angles of rotation. Both daylight and artificial light can be employed, and various accessories can be screwed into position if desired for the purpose of widening the range of application of the instrument.

MAGNETOSTRICTION OSCILLATORS.—In the *Proceedings of the American Academy of Arts and Sciences* for April 1928, Prof. G. W. Pierce has published an important paper on 'magnetostriction' oscillators. He describes a newly discovered method of using magnetostriction to produce and to control the frequencies of electrical and mechanical oscillations ranging from a few hundred to several hundred thousand cycles per second. The method is based on the interaction of the mechanical vibrations of a magnetostrictive rod and the oscillations of current in an electric circuit. By a phenomenon called magnetostriction the oscillating electric currents cause the rod to vibrate longitudinally and the vibrations of the rod react on the electric circuit maintaining the frequency constant. The constancy of frequency obtained compares favourably with that obtained by using the piezo-electric oscillator. The construction and adjustment of the



magnetostriction vibrators is so simple that large numbers of standards of frequency can be made at little cost. In particular these new oscillators will be most useful for the range of frequencies below twenty-five thousand cycles per second, for at these low ranges crystal control is impracticable owing to the prohibitive cost of sufficiently large crystal vibrators. For frequencies between twenty-five thousand and three hundred thousand cycles per second the magnetostriction oscillators and the crystal oscillators will have a common field of usefulness. For higher frequencies the present make of magnetostriction oscillators do not work well, although they function up to two million cycles per second. It was observed that a rod of nickel when magnetised shortened by about one millionth of its length for a magnetising field of one gauss. When, however, it is magnetised by a force that increases and decreases in an oscillatory manner at a period resonant with its free mechanical oscillation, the shortening and lengthening may be more than a hundred times as great. Methods of calibrating these new oscillators for use as wave-metres are given. Very interesting data are also given on the velocity of sound in various metallic alloys.

THE EFFECT OF DRYING ON THE SYSTEM NITROGEN PEROXIDE-NITRIC OXIDE-OXYGEN.—The influence of intensive drying on the reaction between nitric oxide and oxygen was studied some years ago by Baker, who found that the dry gases did not combine. Later workers have obtained different results, and a further investigation carried out by J. W. Smith is described in the *Journal of the Chemical Society* for July. It was found that when nitrogen peroxide is heated with phosphoric oxide it dissociates to a greater extent than the moist gas, and the nitric oxide and oxygen do not recombine on cooling. The nitric oxide also decomposes into its elements at about 300° more readily than in the presence of moisture, but this reaction may be catalysed by the large surface of the phosphorus pentoxide. The formation of an addition compound between nitrogen peroxide and phosphorus pentoxide above 200°, as observed by Hartung, was also noticed. Nitrogen peroxide after intensive drying at the ordinary temperature only decomposed slightly even at 550°, but if heated to 620° and then cooled, it behaved normally. This effect may be due to partial decomposition of the glass surface at the higher temperature. Polymerisation of nitrogen peroxide to the tetroxide occurs less readily when the gas is dry.

PREPARATION AND PROPERTIES OF SELENOPHEN.—Although a few of its complex derivatives have been described, selenophen, the selenium analogue of thiophen, has apparently remained unknown. Foa (1909) claimed to have obtained it in small quantities, but his product had properties very different from those of the selenophen now isolated by H. V. A. Briscoe and J. B. Peel. Their method of preparation and many of the properties of this interesting substance are described in the *Journal of the Chemical Society* for July. Selenophen was obtained by passing acetylene over selenium heated to about 400° in a silica tube and condensing the reaction products in a cooled receiver. Several hydrocarbons were produced, but much of the brown oil formed consisted of selenophen, which was purified by careful fractionation. In the pure state it is a colourless, highly refractive liquid, freezing at about -38° and having a slight odour. Molecular weight determinations showed that it is unassociated. Chemically, selenophen resembles thiophen in being inactive and very stable. It is not reduced by ordinary reducing

agents and yields no methiodide even when heated with methyl iodide at 160° for twenty-four hours. At the boiling-point it readily dissolves sulphur. Treatment with bromine or chlorine in carbon disulphide yielded the tetrabromo or tetrachloro derivative, but the corresponding iodine compound could not be isolated.

A THERMIONIC VOLTMETER.—It is well known that in general, when the electric stress between two electrodes in air attains a definite value, a spark will ensue or brush discharges will begin. This limiting value of the stress depends on the magnitude and shape of the electrodes. If alternating pressures be employed, then in computing the electric stress the peak value of the voltage and not the voltmeter reading has to be taken. In the August number of the *Journal of the Institution of Electrical Engineers*, E. B. Moullin describes a thermionic voltmeter which can measure both the peak and the mean value of an alternating voltage. The dial has two scales corresponding to peak and mean values respectively, and a change-over switch converts the voltmeter from one reading to the other. The peak value is measured by the mean grid current of a cumulative grid rectifier. It is shown by experiment that the mean grid potential is practically proportional to the peak value, no matter what the wave shape may be. The accuracy of the measurements is about the same as that obtained from oscillograms. The mean value measurement is made by omitting the grid condenser. The author discusses the accuracy of the method analytically and gives experimental results in support of it. The use of the voltmeter is illustrated by giving curves which show the distortion produced by a four-stage thermionic amplifier.

A 500 KV. TESTING TRANSFORMER.—The great advances that have been made in high tension technique during the last few years have led to continually increasing high pressure tests being specified for insulating materials. A 500 kilovolt testing plant which has been installed by the A.E.G. (Allgemeine Elektrizitäts Gesellschaft) at the Enfield Cable Works, Brimsdown, is described in *AEG Progress* for August. Unlike other firms, the A.E.G. produces the high pressure by a single transformer erected in a plain boiler plate tank filled with oil. This tank can be earthed, and so there is little danger to the operator. In view of the large charging current taken by the cables during test, it was necessary to have a large continuous output. The transformer can supply at 450 kv. single phase or 260 kv. three phase continuously. The maximum pressure is only to be applied for five minutes. The spark gap is between two spheres each of 75 cm. diameter placed horizontally. The length of the spark gap is adjusted electrically by means of a motor driving a worm shaft. The maximum distance apart of the two spheres is 50 cm. and it takes four minutes before the spheres touch one another. The exact distance between the spheres is read by both mechanical and electrical indicating devices. The former is in the shape of a clock dial which can be read from a considerable distance. The voltage can also be read by means of an electrostatic voltmeter shunting the two condenser plates which are nearest the earth of a chain of condenser plates. Very elaborate safety devices and interlocks are employed. The test generator can only be excited after all the doors of the wire netting enclosure are closed. A number of red lamps are arranged round the enclosure and automatically light up when the main switch is closed. It is stated that the set is not required simply for practical purposes but also for impressing visitors and customers with the thoroughness of the methods of testing adopted.