

Research Items.

RELATIVE VALUE OF FACTORS INFLUENCING INFANT WELFARE.—In Parts 3 and 4 of the first volume of *Annals of Eugenics*, Miss Ethel M. Elderton concludes her exhaustive study of data from Rochdale, Bradford, Blackburn, Preston and Salford on infant viability and summarises her conclusions. These, both positive and negative, are of fundamental importance. The factors, which are shown to be more or less closely associated with viability, are the health of the mother, the health of the baby at birth and, of much less significance, the maturity of the mother and the position of the child in the family. The evidence is conflicting; but in some towns there appears to be a rather heavier death-rate among the infants of women under twenty-three years of age. Miss Elderton has also formed the opinion that there is a higher infant death-rate among the first-born which may be concealed during epidemics of diarrhoea. Association with the habits of the parents and the occupation of the father is small; so is that with all other environmental conditions, e.g. poverty, whether judged by the income of the family or the wage of the man, and housing; while no evidence is afforded that children born at the end of a large family suffer in vitality, or that bottle-feeding in itself causes a high infant mortality. Nor, so far as infant mortality is concerned, has indoor sanitation any advantage over outdoor sanitation. The whole trend of the evidence is in favour of the view that the infant death-rate is selective. From the point of view of the race, also, the success of health visitation and inspection is in the right quarter, tending to assist chiefly the better portion of the community. Miss Elderton urges very strongly the need for fuller information to decide whether parental health and habits cause environmental conditions or whether these are responsible for parental health and habits. Much of the available evidence favours the first of these alternatives.

TEARS.—Prof. Maurice Canney, in the *Journal of the Manchester Egyptian and Oriental Society*, No. 12, points out that there is a curious resemblance in birth and death ceremonies which may be due to the fact that birth, marriage, and death all mark a change of state, and the ceremony may be one of initiation into new life. Though it may be natural to express grief by howling, wailing, and weeping, much depends upon how things are done. Though black is sometimes stated always to have been a symbol of death, it seems frequently to have been of life-giving significance, as, for example, in the use of antimony and henna as applied to new-born babes in Egypt. In the case of tears, two ideas have intermingled, but in a civilised community tears are almost exclusively connected with grief and pain, excluding the idea of life-giving, which is really the more primitive. The ceremonial weeping and bawling, which is a feature of mourning ritual in, for example, China, Africa, and elsewhere, clearly has a special significance, its object being not to express grief, but to awaken and reanimate the dead. Tears may be compared to the shedding of blood. The ceremony of cutting oneself for the dead renewed the bond of union with the living. Further, tears being creative, they are potent to produce fertility and ensure good crops. Hence in a number of instances in human sacrifices, the victims are frequently tortured to make them shed tears.

PREHISTORIC EARTHWORKS IN NORTH CARDIGANSHIRE.—A regional survey of the prehistoric earthworks of North Cardiganshire by Mr. I. T. Hughes in vol. 4 of the *Transactions of the Cardiganshire*

Antiquarian Society gives a summary description, with plans, of 28 earthworks which can be classified as true 'hill-top' camps. They are confined to a region north of a line drawn from the sea near Llanrhystyd along the Wyre Valley to Trawscoed, then towards Ystrad Meurig and along the valley of the Upper Teifi. There is, however, an important group along the Aeron Valley. North of the Wyre—Upper Teifi line they are isolated from the camps of western Montgomeryshire by the Plynlimon Range. No camp is below the 300 ft. contour and four are above the 1000 ft. range. The upward limit of camps coincides with that of cultivation and modern habitation. Some of the camps are situated in proximity to the sea and defend inland routes, and the distribution suggests that Llanrhystyd was a port of some importance, probably connected with the south coast of England by the conjectural Bronze Age route Southampton—Harlech with a branch from Evesham, "aiming probably at Aberystwyth or some port south of that town." The chief metalliferous areas of Cardiganshire are characterised by groups of camps. Place names associated with the camps near the sea, the valleys and the mining areas suggest Irish affinities which are supported by finds of a halberd, a flat celt, and a palstave of Irish design. The camps, therefore, would appear to be the centres of a community of Goidelic lead lords with close connexions with Ireland. Without the evidence of the spade it would be unwise to offer an opinion as to their age.

SOIL PROBLEMS IN COTTON-GROWING IN THE SUDAN.—The Sudan Government has published (Khartoum, January 1926) the report of a meeting of the chemical section of the Wellcome Tropical Research Laboratories, held at Wad Medani, in which the problems of cotton-growing in the Sudan Gezira were passed in review from the point of view of chemist, physicist, and biologist. This review is particularly noteworthy on account of Dr. E. M. Crowther's discussion of the effect of the nitrogen supply. It appears that, after the water supply, the most important soil factor in the Gezira is the nitrogen supply. Cotton cultivation in the Gezira in this respect shows an essential difference from the conditions prevailing in Egypt.

OXYGEN REQUIREMENTS OF FISH.—Data have been presented concerning the oxygen requirements of different kinds of fish at various temperatures by J. A. Gardner (Min. of Agric. and Fisheries Fishery Invest., Ser. I. vol. 3, No. 1, 1926: Report on the Respiratory Exchange in Freshwater Fish, with Suggestions as to Further Investigations. Pp. 17. London: H.M. Stationery Office, 1926. 2s. net). At ordinary limits of temperature, the respiratory quotient varies between 0.6 and 1, but the majority lie round 0.8. Trout appear to be more sensitive to rise in temperature than the coarse fish examined. Even 25° C. proved fatal to a large trout, though smaller specimens could be acclimatised to stand 25° for some hours. Goldfish can endure 30° C., but not 35° C.

ASIATIC AND AMERICAN ELEMENTS IN THE LEPIDOPTERAN FAUNA OF POLAR EUROPE.—The well-known Russian lepidopterist Prof. N. I. Kuznecov has been working for many years on the problem of the distribution of lepidoptera in the Polar regions. While a comprehensive work on the subject is in preparation, he publishes some preliminary results of outstanding interest (*Comptes rendus Acad. Scien.*, Leningrad, 1925). Many species of butterflies are characterised

by a discontinuous distribution, being present in polar Europe and in eastern Siberia, but not occurring in the wide area between the Yenisei and the Ural Mountains. This area, corresponding to the West Siberian plain, can only be explained by the West Siberian Sea, which existed in the Oligocene and extended as far southwards as the Aral Sea. This means that the age of the European circumpolar faunal elements, as well as of the Holarctic ones, must be estimated in any case as pre-glacial, or, more precisely, as pre-oligocenic. These pre-oligocenic circumpolar elements are probably autochthonous, which leads to the conclusion that the Arctic faunistic region may be considered as independent of the Palearctic region. On the problem of possible origin of these ancestral Holarctic elements, which since the Palæogenic times have populated the whole northern zone of both Eurasia and America, Prof. Kuznecov is of the opinion that they originated in the Angaro-American continent, which embraced eastern Siberia and north-western America down to Colorado and the Great Lakes, stretching westwards across northern Siberia to the White Sea.

MEDITERRANEAN STERNOPTYCHIDÆ.—MESSRS. P. Jespersen and A. V. Tåning ("Report on the Danish Oceanographical Expeditions, 1908-1910, to the Mediterranean and Adjacent Seas." No. 9, Vol. 2 (Biology). A. 12: "Mediterranean Sternoptychidæ," by P. Jespersen and Å. Vedel Tåning. Copenhagen: Andr. Fred. Høst and Søn, 1926. 35s.) continue the systematic account of the fishes belonging to the Sternoptychidæ taken by the Danish Oceanographical Expedition in 1908-1910 under the leadership of Dr. Schmidt. Together with Jespersen's previous report in this series on the genera *Argyropelecus* and *Sternoptyx* (Reports, vol. 2, A. 2), it forms a valuable account of the post-larval, adolescent, and where necessary, of the adult stages belonging to the species of this family occurring in the Mediterranean. Many cases of doubtful synonymy are cleared up and a new species of the genus *Cyclothone* described. Much attention is given to the comparison and identification of the species, and numerous clearly executed figures accompany the text; maps are also given showing the horizontal distribution for each species. The information relating to seasonal, diurnal, and ontogenetic vertical migrations, as well as that relating to the horizontal distribution, is interesting and important. Very young larval forms seem not to have been found except in isolated cases; this being due in the authors' opinion to their small size and delicate nature, and to their destruction by the net. Post-larval forms are generally taken close to the surface, whilst typical metamorphosis stages are found in much deeper water, mainly from 500 to 1200 m.w., depending upon season and geographical locality, and varying for each species; it seems, moreover, that the change in depth of living takes place suddenly, as intermediate stages have not been found at intermediate depths. Diurnal vertical migrations are undertaken by most of the adults, and, generally speaking, they are higher in the water in the summer than in the winter.

BIOMETRIC WORK ON VARIABILITY.—The *Izvestia Buro po Genetik i Eugenik*, No. 4, recently issued by the Russian Bureau of Genetics and Eugenics, contains five biometrical studies on variability, with short summaries in English or German. The longest paper, by Prof. J. Philiptschenko, on the variability of quantitative characters in twelve pure lines of soft wheats, considers the conditions under which relative

values or indices are more suitable than absolute values for certain measurements. The resulting correlations are classified as (1) intrabiotypic, depending on reaction-norms within a biotype; and (2) intrapopulative, depending on the relations of the biotypes within a population. T. Liepin, in a study of variability in a Chrysomelid beetle, *Phædon cochleariæ*, finds by measuring larval stages that the variability gradually decreases with age, this decrease being due to internal factors, while unfavourable conditions are shown unexpectedly to cause increased variability. G. Pchakadze finds in *Daphnia pulex* that the young from fertilised eggs are nearly twice as variable as those from parthenogenetic eggs. He also claims that adult parthenogenetic *Daphniæ* are more variable than adults from fertilised eggs, and that while variability decreases with age in *Daphniæ* from fertilised eggs, it increases with age in parthenogenetic individuals. D. Diakonov shows briefly that bimodal variation need not necessarily mean genetic dimorphism. A. Zuitin deals with similar problems of variability in the grasshopper, *Dixippus morosus*, which is also parthenogenetic. He finds a decrease of variability during post-embryonic development, but concludes that if environmental conditions over-balance the internal regulatory processes within the animal, an increase of variability with age may result.

SOME PERIODS IN AUSTRALIAN WEATHER.—A discussion, by Dr. Edward Kidson, Assistant Director, Commonwealth Bureau of Meteorology, is published by the Bureau of Meteorology, Melbourne, Commonwealth of Australia, as Paper 1—extract from Bulletin No. 17. Mr. Hunt, the Commonwealth Meteorologist, in the introductory note states that Dr. Kidson has put into more precise form much that has for many years been common knowledge to Australian meteorologists, and he considers the discussion should lead to an advance in our knowledge of meteorological processes in the Australian region. The author has dealt with weather charts for more than thirty years. The close relationship shown between the annual latitude range of anticyclones and the Wolfer sunspot numbers is one of the results.

EARLY POLARISATION APPARATUS.—The issue of *Die Naturwissenschaften* for May 28 contains over the signature Kpl. an illustrated account of an apparatus for investigating the polarisation of light by reflection shown by J. Tobias Mayer to the Gesellschaft der Wissenschaften of Göttingen on November 21, 1812. It consisted of two parallel glass plates the back surfaces of which were blackened; the upper one received sunlight and reflected it vertically downwards to the second, which could be rotated about a vertical axis. It was, therefore, the apparatus now known as Norremberg's, although there appears to be no record of Norremberg having constructed his apparatus before 1842. Mayer's paper will be found in *Commentationes Soc. reg. scien. Göttingen*, 1813, No. 9.

THE ATOMIC NUCLEUS.—The most recent of the suggestions as to the constitution of the atomic nucleus is that made by S. Ono in the April issue of the *Proceedings of the Physico-Mathematical Society of Japan*. He suggests that the nucleus consists of two parts, an inner and an outer. In the inner portion each proton or positively charged elementary particle is accompanied by an electron, while in the outer part each pair of protons has an electron. The volume occupied by the outer combination is on the average 1.1 times that occupied by the inner, and the combinations are uniformly distributed, the inner through the volume of a sphere, the outer through the shell surrounding the sphere, its outer radius

being on the average 0.6 times the diameter of an outer combination greater than that of the sphere. On this supposition the relation between the atomic numbers and the atomic weights of the heavier elements comes out in close agreement with the facts, but the number of possible isotopes is in excess of those found. Two groups projected from the outer nucleus constitute an α -ray, and the disturbance of the equilibrium of the atom results in the emission of two electrons from the rings outside the nucleus—the β -rays, which it is known are emitted in pairs.

PROTECTION AGAINST IGNITION BY PERFORATED PLATES.—It is rather astonishing to read of and more astonishing to see red flames—several inches in height—emerging through perforations in a metal plate into an explosive mixture of gases without igniting the mixture. Nevertheless this may be seen in the laboratories of the Safety in Mines Research Board at Sheffield, and the description of the experiments may be read in the second report on flameproof electrical apparatus with perforated-plate protection (Mines Department: Safety in Mines Research Board. Paper No. 21: Flameproof Electrical Apparatus for use in Coal Mines. Second Report: Perforated Plate Protection. London: H.M. Stationery Office, 1926. 1s. 3d. net). Messrs. Wheeler and Grice have shown experimentally that by allowing the escape of burning gases (produced by the explosion of fire-damp and air in a bomb) through suitably spaced holes in a metal plate, the escaping gases—still visibly burning—may be so cooled down by conduction and expansion as to be incapable of igniting a 10 per cent. methane-air mixture surrounding the bomb. When two suitably perforated brass sheets, such as are manufactured commercially, are superposed—with a small interval between them—as part of the cover of a switch-box, an explosive methane mixture can be fired inside the box without igniting a similar mixture outside.

COMBUSTION UNDER DIRECT ELECTRICAL DISCHARGE.—In an interesting paper published in a recent number of the *Proceedings of the Royal Society*, Messrs G. I. Finch and L. G. Cowen describe their experiments on the combustion taking place when a direct discharge is maintained between metallic electrodes in electrolytic gas at pressures between 20 mm. and 100 mm. of mercury. In the inflammation of gases there is a pre-flame period of slow combustion when chemical combination begins; this process usually increases automatically in intensity until the normal flame appears. But it is possible to maintain the flameless regime under special conditions. Some twenty years ago, Kirkby found that when a direct discharge was maintained in electrolytic gas under low pressures, the water formed (without flame) was proportional to the quantity of electricity passed, and that the combustion was independent of the nature of the electrodes and occurred at all points of the discharge. Later workers have chiefly studied ignitions by high-tension discharges from a coil or by capacity-discharges from a condenser. The present authors have sought to eliminate so far as possible all 'capacity' effects, and to maintain a perfectly steady discharge with a glow free from striations and flickering—so that the combination might be related only to ionisation and not be due to high temperature. Under the conditions maintained by the authors, the rate of formation of water was found to be directly proportional to the current. By limiting the current, the combination may be confined to the glow round the cathode, when it is independent of the gas temperature and pressure, but varies with the nature of the electrodes.

DIRECTION FINDING BY RADIO.—The Department of Scientific and Industrial Research has just issued the third part of the report on the variations of the apparent bearings of radio transmitting stations. This report gives the results of observations carried out by Dr. Smith-Rose between November 1922 and March 1924 on ship and shore transmitting stations. (Department of Scientific and Industrial Research: Radio Research. Special Report No. 4: Variations of Apparent Bearings of Radio Transmitting Stations. Part 3: Observations on Ship and Shore Transmitting Stations, November 1922-March 1924. London: H.M. Stationery Office, 1926. 2s. 6d. net.) The previous report describes observations using wave-lengths varying from 2000 to 9000 metres. In the experiments now described, special attention was given to a wave-length of 450 metres as this was the length in general use for every day direction finding during this period. Two land stations were mainly used for the test, the Admiralty station at Orford on the east coast of England and the Radio Research Board's station at Slough. Tests were also made on board ship. It was observed that with the short wave-length of 450 metres there was a tendency for the occurrence of 'blurred' minima which annoy observers. From the point of view of navigation an important result was proved. It was found that the existence of fog had little or no effect in producing errors. On one occasion in particular, although the fog was spread over Great Britain and a large portion of western Europe, yet the directional effects showed only the usual day and night variations. As it is chiefly during foggy weather that direction finding stations are called into action, this result is most satisfactory. Again, when the weather was cloudy and overcast, no special phenomena were noticed. It seems probable therefore that the cause of the variations is not due to any effects produced by solar radiation on the lower strata of the earth's atmosphere. The report concludes by reference to two recent papers communicated by the author and Mr. Barfield to the Royal Society. In one of these a direct determination of the effective conductivity of the earth is made at radio frequencies. This result is of importance in the general study of wave propagation. In the other and later paper, it is stated that some of the radio waves have travelled through the upper regions of the earth's atmosphere before reaching the detector.

TRANSLUCENCY OF PORCELAINS.—With the view of the improvement of the ceramic industry in the United States, an investigation of the causes of translucency has been carried out by Messrs. C. W. Parmelee, professor of ceramic engineering, and P. W. Ketchum, research assistant in the University of Illinois, and the results are given in Bulletin 154 of the Engineering Experimental Station. The measurements of translucency were made by eye with the aid of a Lummer-Brodhun photometer or by the use of a photo-electric cell, the current from which when illuminated was measured by the change of deflexion of an electrometer. The two methods give relative values in fair agreement with each other, although owing to the reddish colour of the transmitted light the absolute value of the translucency by the cell method is less than that obtained by photometer. Increase of thickness of the specimen decreases the transmitted light in the usual exponential way. High felspar content produces high translucency, while flint has a less marked effect in the same direction. High clay content diminishes translucency. Fine grinding of the constituents raises the translucency in a striking way, and increase of firing temperature produces a further improvement.