

## Research Items.

**ILLEGITIMACY AND RACIAL INVASIONS IN BRITAIN.**—Dr. John Brownlee has published in *Man* for October an interesting note on the distribution of frequency in illegitimacy in the north of England and Scotland, and its relation to and bearing upon the evidence for racial migration. In the north of England there is a sufficiently close correspondence between the distribution of the round barrow and that of illegitimacy to suggest that this custom was introduced at the beginning of the Bronze Age, and that the invasion of Angles was not sufficient to do more than introduce a new racial element into this part of the country without modifying the custom. Information on illegitimacy in Scotland has been studied in more detail. The range of variation is much greater, the highest percentage of illegitimacy occurring in Aberdeenshire and in the southern districts of Scotland, especially Dumfries and Galloway. The Aberdeenshire district contains a larger proportion of broad-headed persons than any other part of Scotland; but the broad-headed population of the Aberdeenshire tombs is more closely allied to the type of central Europe than is that of Yorkshire and southern England. The percentage of illegitimate to legitimate births is 12 to 15, a rate comparable with that of central Europe. In Dumfries and Galloway there is no broad-headed association, the population being the most narrow-headed in Scotland; but here a close association with a certain type of hill-fort appears. This type of fort belongs to some period about the beginning of the Christian era. In the Norse settlements, Orkney, Shetland, and the western islands, the illegitimacy rate is low, but there are pockets in the north, chiefly adjacent to the coast, where the rate is high.

**FOSSIL APES AND MAN.**—In the recent issue of the *Bulletin of the Geological Society of China* (Vol. 4, No. 2) Dr. Davidson Black reviews our present knowledge of the distribution of the primates, living and extinct, with special reference to the ancient geography of Asia and its bearing on the ancestry of man. He accepts the principles enunciated by Dr. W. D. Matthew in his well-known essay on "Climate and Evolution" published in 1915, and refers to them repeatedly in his discussion of the subject. He especially emphasises the fact that at any one time the most advanced members of a group of animals must be nearest the original centre of its dispersal, while its lowest or most conservative members are farthest from this centre. Dr. Black then shows on a series of maps the present distribution of the several groups of primates, with the few known records of their extinct representatives. Central Asia, north of the Himalayas, is thus suggested as the region in which they successively originated and from which they were dispersed. Finally, Dr. Black shows the distribution of the known fossils on six maps which represent the continental lands of the successive Tertiary periods, according to Dr. A. W. Grabau. A discussion of these maps leads to the same conclusion, and Dr. Black looks most hopefully to an exploration of the Tertiary sediments in the southern foothills of the Tian-Shan mountains for the discovery of remains of the immediate ancestors of man. Both geologists and anthropologists will await the result with great interest.

**FERTILITY IN THE COMMON MULE.**—Dr. E. Warren (*Ann. Natal Mus.*, vol. 5, pt. 3, 1926) records an interesting case of fertility in a mule about the authenticity of which there appears to be no doubt. The mule is the result of a cross between a jack

donkey and a dark chestnut mare, and was in foal to a hackney stallion. It was eight years' old when it first foaled and is believed to be in foal again. It produced abundant milk and suckled its foal in a perfectly normal manner. Dr. Warren describes the sire, the mule dam, and the foal in some detail with special reference to the degree of likeness of the latter to each parent. He finds that the extent of the prepotency of the parents, and the dominance of the characters, with respect to features which are diagnostic of the two species, horse and ass, vary within wide limits and range from nearly complete dominance to perfect blending.

**AUSTRALIAN BIRDS.**—The second edition of the official check-list of the birds of Australia has now been issued by the Royal Australian Ornithologists' Union. It has been published only after considerable deliberations on questions of nomenclature by a representative committee of Australian ornithologists and adheres fully to the code of the International Commission. The list gives for each bird the accepted generic, subgeneric, specific, and vernacular name, the range in Australia and beyond, references to the original use of the accepted name and to the standard works of Gould, Mathews, and other workers on Australian birds. A very useful appendix gives the derivations, pronunciations, and origin of all the scientific names used. The work appears to have been very thoroughly and completely done, and, as it has been compiled after due consultation with Mr. G. M. Mathews, who has worked intensively in this field of late years, the list may be regarded as authoritative. As such, it will prove invaluable to ornithologists generally and to museums in particular.

**PLANT GROWTH IN THE SEA.**—The third number of the *Journal of the International Council for the Exploration of the Sea*, edited by Dr. E. S. Russell and published in Copenhagen in August, keeps up the high standard of interest and utility of the first two numbers. The present issue contains an article on chemical factors concerned in plant growth by W. R. G. Atkins, and original papers by P. Jespersen, Oscar Sund, and C. H. Roberts, whose observations on the rate of absorption of atmospheric oxygen through thin films of fuel oils show how rapidly this may occur, and indicate that oil pollution does not markedly slow down the oxygenation of sea water, although it may be directly harmful to marine animals, since all the oils tested were found to be toxic to fish. In the first article, Atkins correlates a large amount of information concerning chemical factors, most of which has been obtained during the past ten years, as may be seen from the bibliography of more than fifty references. The information has not been brought together previously, and compilations of this kind are much wanted. A point of general interest which has arisen from these researches is the great fertility of the sea; from changes in alkalinity and hydrogen ion concentration it is calculated that the suspended vegetable organisms in the open water of the English Channel every summer use sufficient carbon dioxide in photosynthesis to produce 3 grams of dextrose from every cubic metre of water, or 250 metric tons of dextrose over an area of 1 square kilometre. This corresponds to the annual production of 1400 metric tons wet weight of vegetable plankton organisms per square kilometre in this district, a value which is confirmed by the amount of phosphate utilised annually.

**STARCH FORMATION IN THE PRESENCE OF DIFFERENT SALT RATIOS.**—The real complexity presented to the investigator by 'calciphobe' and 'calciphile' vegetation is probably well indicated by some recent experiments by Dr. V. S. Iljin upon starch synthesis in the presence of salts of calcium and sodium (*Bulletin de l'École supérieure d'Agronomie, Brno, 1925*). Leaves of plants were immersed in weak solutions of maltose or glucose in the presence of varying concentrations of chlorides of sodium or calcium and the concentration noted which brought starch formation to a standstill. Plants growing on soils of high calcium content still continued to form starch in the presence of high calcium concentration; on the other hand, even low concentrations of sodium salt prevented synthesis. Halophytes, on the other hand, continued to form starch in concentrations of sodium up to 0.35-0.5 M. Some species reacted in this respect at definite salt concentrations quite irrespective of the nature of the soil on which they were previously growing, whilst other species behaved quite differently when taken from soils rich or poor in calcium. Iljin concludes that we may not speak of 'phily' or 'phoby,' but only of the degree of tolerance of the plant to the injurious action of some salt. A plant particularly resistant to such injurious action may be placed at a considerable advantage in the struggle for existence in a soil in which the salt in question is present in a relatively high concentration.

**INHERITANCE OF MELANISM IN LEPIDOPTERA.**—Heslop-Harrison (*Journ. of Genetics, 17, 1, 1926*) continues the description and discussion of his remarkable experiments upon the inheritance of wing colour and pattern in the lepidopteran genus *Tephrosia*. He finds that, in interspecific crosses between *T. crepuscularia* × *T. bistortata*, melanism, introduced by the latter, remains, as it does within the limits of a species, a Mendelian recessive; that the progeny carrying two female characters (♀ ♀) out of a *bistortata* (female) × *crepuscularia* (male) mating are non-viable; that in back-crosses between *bistortata* (♀ ♀) and the two possible of the F<sub>1</sub> generation carrying two male characters (♂ ♂), one half of the ♀ ♀ dies; and that in the reciprocal *crepuscularia* (♀) × *bistortata* (♂ ♂) crosses, the sex-ratio among the offspring is undisturbed.

**THE INFECTION OF TREE ROOTS BY *ARMILLARIA MELLEAE*.**—This root rot is one of the most serious of tree parasites and is usually assumed to enter through a wound. Considerable interest therefore attaches to the observation of S. M. Zeller (*Phytopathology, 16, 479-484, July 1926*), who gives grounds for thinking that if an infected root runs across a healthy root, even when both are of considerable age, infection gradually spreads to the healthy from the diseased root, layers of dead flakes being sloughed off the surface of the healthy root as new cork layers are formed in the bark parenchyma. With prune trees, evidence has also been obtained of the entry of the fungus through the little collar around the base of the emergence of a branch root, presumably as the result of the rupture of the bark parenchyma of the parent root during the emergence of the lateral.

**THE POSSIBLE IDENTITY OF DIFFERENT MOSAIC DISEASES.**—An important paper upon this subject by M. N. Walker appears in *Phytopathology* (16, 431-458, July 1926). Cross inoculation with the mosaic diseases of cucumber, tomato, and physalis confirms other accounts as to the difference in behaviour of the virus in the expressed juices of these plants; thus tomato and physalis juice withstand

ageing, drying, dilution, etc., whilst the virus of cucumber juices is much less resistant to such treatment as drying. On the other hand, the disease on tomato produced by injecting with cucumber mosaic shows the usual properties of tomato mosaic, and, conversely, the disease on cucumber obtained after inoculation from either physalis or tomato shows the usual great susceptibility of the extracted virus in cucumber juice. The conclusion would appear to be that the infective principle in each case was the same, and the differences in the properties of the extracted virus are to be attributed to the properties of the juice of the host plant.

**A TERTIARY INTER-BASALTIC FLORA FROM WESTERN AMERICA.**—Dr. F. H. Knowlton has studied the fossil flora of the beds of clay and shale, named the Latah formation and found in Washington and Idaho (*U.S. Geol. Survey Prof. Paper 140-A, 1926*). These beds were formed by the obstruction of the drainage due to the advance of the great lava flows of the Columbian plateau, and are in places overlain by a later series of flows. The plants are unusually well preserved and are of interest as affording evidence bearing on the age of the lavas. Ninety-five forms are recognised, of which 51 are regarded as species new to science, 25 as species found in other areas, and 18 are not named specifically. As a whole, the flora is very modern in appearance, the oaks, elms, maples, and poplars being similar to certain living forms. Taxodium was one of the most abundant forms, and a Sequoia is also common, while Ginkgo is represented by a few specimens. Most of the new species are founded on remains of leaves, but a considerable number of remains of reproductive structures are present, some of which have not been specifically identified. The floras are regarded as showing affinities with those already described from beds of Miocene age. The diatoms of the deposit are described by Dr. A. Mann, who describes 11 new species and some interesting twin forms.

**NEW THEORIES OF THE MOTHER-ROCK OF CALIFORNIAN PETROLEUM.**—In any oilfield the point of chief theoretical interest is the original source of the oil and the character of the organic matter whence it was derived. Since 1907 the generally accepted theory ascribed the bulk of Californian oil to Miocene diatomaceous shales, and the example has been used repeatedly to illustrate an almost ideal mother-rock, and further in advancement of the hypothesis of marine organic origin of petroleum. With the development of the great oilfields of the Los Angeles Basin, however, there has latterly been some doubt raised as to the validity of the diatomaceous shale theory; in fact, in one case, that of Santa Fé Springs, it would seem to be established definitely that the oil originated in younger formations, namely, the clay-shales of the Fernando group (Pliocene), since the deepest well, drilled to 7215 feet, was not abandoned until it was 2500 feet below the top of the rich oil-bearing sands, the last 1000 feet being barren beds; at the bottom of the well some fossiliferous Fernando beds were proved, thus showing that the Miocene (Puente) shales had not been reached. It is reasonably argued that the great thickness of barren beds present in the lower part of the Fernando formation inhibits the theory of a Miocene mother-rock for the Santa Fé Springs oil, since, had this older horizon been competent in this respect, the Fernando sands would have been successively richer in depth. The fact that Santa Fé Springs has been one of the largest oil-producing fields in the world (for many months in 1923 it was giving a daily production of more than

42,000 tons of oil), is further significant. Recent papers of G. C. Gester, J. E. Eaton, G. E. Cunningham, and T. F. Stipp in *Bulletins of the American Association of Petroleum Geologists* have done much to create the doubt of alleged oil-source in this region, in fact throughout California; but with the appearance of W. A. English's *Bulletin* (No. 768) on the Puente Hills Region (which includes part of the Los Angeles Basin), recently to hand from the United States Geological Survey, the alternative theory receives official support, and it is clear that we must prepare to modify considerably our faith in diatom-shales as ideal mother-rocks. Foraminifera, not Diatomacea, are the prominent organisms of the Fernando beds, especially of the oil-measures.

**COEFFICIENTS OF EXPANSION AT LOW TEMPERATURES.**—An accurate knowledge of the coefficients of expansion of solids at low temperature is necessary for testing theories of the solid state, and R. M. Buffington and W. M. Latimer have obtained expansion data for aluminium, copper, silver, rock salt, quartz parallel to the optical axis, and pyrex glass between 90° and 315° K. The Fizeau interference method was used, and a full description of the investigation is published in the *Journal of the American Chemical Society* for September. The coefficients of expansion of the crystalline solids, which change slightly more rapidly than do the specific heats, approach zero at low temperatures, in agreement with the prediction of Nernst. It was possible, from the data on aluminium, copper, and silver, to introduce terms depending on the constraints between the atoms into the equation for the entropy of solids, and the entropies of six monatomic solid metals are shown to be satisfactorily represented by the new equation.

**PHOTOGRAPHY AT LOW PRESSURES.**—The May issue of the *Memoirs of the Kyoto College of Science* contains a paper by Osamu Masaki on the effects of low pressure on the sensitivity of the photographic plate. Two pieces cut from the same plate were enclosed in two compartments in a glass-fronted brass box. The pressure in one of the compartments could be reduced to that of 0.005 cm. of mercury. The box was placed behind a rotating Hurter and Drifffield wheel, the openings in which exposed strips of the plates for times in the ratio 1, 2, 4, 8, 16, etc. to the light of a 50-watt incandescent electric lamp of milky glass placed a metre away. The density of the film after development for 3 minutes was measured by means of a photo-electric cell and electrometer. In almost all cases the plates were more sensitive under reduced pressure, the effect being greater for slow than for fast plates. The reduction of pressure also reduced the tendency to fog. The greater part of these effects appears to be due to the drying of the emulsion, but some part is played by the removal of occluded gases under the reduced pressure.

**VELOCITIES OF DIFFUSION IN GELS.**—The *Science Reports of the Tôhoku Imperial University* for July 1926 contain a paper by M. Watanabé on the relation between the diffusion velocity and the concentration of the diffusing substance. The equation  $K = m \log C + n$ , in which  $K$  is the value of  $d/\sqrt{t}$  at the beginning of diffusion ( $d$  being the distance of the diffusion in time  $t$ ),  $C$  the original concentration of the diffusing substance, and  $m$  and  $n$  constants, was found to hold at the beginning of diffusion of a salt from solution into a gel containing a reacting substance. O. von Fürth and F. Bubanovic consider that the equation holds if  $K = \log d/\sqrt{t}$ . For a limited range of concentrations it is clear that both formulæ apply, and Watanabé

shows that this is due to the diffusion of the substances dissolved in the gel, which renders the results inaccurate. When a colloidal reactant was used the formula  $d/\sqrt{t} = m \log C + n$ , was found to apply over a wide range of concentration, while Fürth and Bubanovic's expression is limited to a few concentrations. In a further paper in this journal the formula is applied to the results of experiments on the diffusion of mixtures of copper and zinc sulphate solutions.

**THE RATE OF REACTION OF NITRIC OXIDE AND OXYGEN.**—H. B. Baker has shown that carefully purified and dried nitric oxide and oxygen do not react; but under ordinary conditions combination takes place rapidly, and W. A. Patrick and R. L. Hasche have studied the effect of increased glass surface on the reaction velocity. In the *Journal of the American Chemical Society* for September, Hasche describes further experiments in which the influence of a paraffin-coated reaction chamber, and moisture, sulphur dioxide, and nitrogen tetroxide have been measured. It was found that moisture increased the speed of combination, and the decrease in velocity caused by the paraffin surface is thought to be due to a decrease in the amount of moisture. In the absence of water vapour, a period of induction of about 10 sec. was noticed at initial partial pressures of less than 14 mm. The effect of sulphur dioxide and nitrogen tetroxide was negligible.

**HEAT LOSS AND FRICTIONAL RESISTANCE IN AIR CURRENTS.**—The relation between the heat lost by a hot surface when cooled by a current of air passing over it, and the frictional resistance experienced by the surface, has been subjected to investigation by many research workers. So early as 1874 Osborne Reynolds examined this question. That such a relation may exist appears clear from the fact that both the frictional resistance and the heat transference occur in association with the passage of momentum in the air in the neighbourhood of the surface. A further contribution to this subject has appeared in the Aeronautical Research Committee Report, R. and M. No. 1004 (H.M. Stationery Office, 1s. net). In this paper Miss D. Marshall has recorded two distinct series of tests. In the first place a short heated section of pipe, 5 in. in diameter, was cooled by a current of air forced through it, the heat transmitted being estimated from the rising temperature of the air. In the second test, thin rings of nickel heated electrically were supported in a wind channel, the transmitted heat being measured from the energy supplied to the ring. In this latter case the effect of artificially roughening the surface of one of the rings was specially investigated. In common with previous experiments, a considerable discrepancy is found to exist between the observed heat transmission and that calculated from the measured surface friction, a difference of 20 per cent. being found in the case of the smooth rings. In the case of the roughened rings, however, fairly close agreement is found over a considerable range of speed. Thus it will appear that the effect of surface roughness is much greater than would be anticipated, the dimensions and form of the irregularities constituting quite an important factor. The investigation must prove of considerable interest in its bearing on the surface friction of thin plates in the neighbourhood of the leading edge, for these results are in fairly good agreement with the law of surface friction deduced by Blasius from Prandtl's theory of the boundary layer. This agreement extends both to the law of variation of frictional resistance with speeds and the actual value of the forces.