

Research Items

Blood Group Investigation

RECENT advances in blood group investigation have been reviewed by Prof. R. Ruggles Gates as a contribution to a volume commemorating the work of Miss van Herwerd on blood groups and eugenics in Holland (*Genetica*, 18, 1936. Manuscript received for publication, May 29, 1935). All the evidence indicates that in man the blood groups are mutations forming the mechanism of species modification of the non-adaptive category. The distribution of the blood groups in the anthropoids, when compared with that in man, on the hypothesis that *O* is the primitive condition in man, suggests that the development of the blood groups in both must be regarded as a case of 'convergent evolution'. It seems probable that a particular race in man in a particular locality developed the ability to produce the *A* mutation with sufficient frequency for it to spread without the aid of selection, but through a change in the mutation rate, which would be either gradual or marked and decisive, probably the latter. Recent developments have strengthened the view that the *A* mutation is much older than *B*, of which the occurrence is so low in peripheral peoples as to suggest that it is due to interbreeding with adjacent peoples. This view increases the difficulty relating to the *O* character of the American Indians, unless it be held that they are derived from primitive peoples who were isolated on the chain of islands from Sakhalin to Formosa and the Philippines, while *A* and *B* were spreading on the mainland of Asia. The aboriginal tribes of Formosa are still strikingly high in *O*. The occurrence of a high percentage of *A* in a group of "Blackfeet" can only be accounted for as an independent island of *A* mutations; and the *B* of the Caraja Indians and the Yahgans of Tierra del Fuego must be accounted for in the same way. Recent investigations in Africa suggest the probability that there have been three independent centres of *B* mutation, namely, the African negro, the Hindu and the Mongolian.

Arminghall Timber Monument

THE prehistoric monument at Arminghall, near Norwich, discovered by aerial photography in 1929, and excavated by Dr. J. G. D. Clark immediately before the Norwich meeting of the British Association last year, proves, like "Woodhenge" in Wiltshire, excavated by Mrs. M. E. Cunnington, to have been a circle in which the place of stone uprights was taken by wooden posts. The character of the monument in detail, its purpose, dating, and affinities, have now been made the subject of close study by the excavator (*Proc. Prehist. Soc.*, N.S. 2, 1; 1936). The monument consists of two concentric ditches separated by a bank, and surrounding a central portion, in which had been erected eight wooden uprights in U-shaped formation, and approached by a causeway interrupting the inner ditch. In this central area there was no sign of disturbance, excepting the post-holes and the ramps, by means of which the posts had been erected. The size and depth of the post-holes and the size of the ramps indicate that the posts were of considerable height—oaks,

as shown by the charcoal found in the holes, probably of about a hundred years old. The absence of any burial precluded the idea that the purpose of the monument was sepulchral. The primary material obtained from the inner ditch consisted of 107 flints of indeterminate age, and fragments of hand-made 'rusticated' pottery, that is, pottery decorated with pinches or jabs, of a type to which the specific name 'Arminghall' is here given. On archaeological evidence, this pottery is shown to date the monument as belonging to the Beaker period, as do other 'hengés' in Britain which so far have been satisfactorily dated. Two hypotheses as to the origin of this class of monument are current—one that they are derived from the palisade barrows of the Low Countries, the other that they are degenerate megalithic cairns; but at present there is no decisive argument in favour of either.

Coloration of Nest Linings and Nestlings

DR. JEAN M. LINSDALE has noted a correspondence between the colour and tint of the linings of birds' nests and of the down of the nestlings themselves, especially in the Great Basin of the western United States. Further, these are both correlated with the kind of cover at the nest side and with the general climatic ranges of the birds (*Condor*, 38, 111; 1936). Apparently these species of birds which nest in exposed situations and live in hot regions have pallid nestling plumages and nest linings which reflect and counteract the harmful effect of the sun's rays. Species which live in the opposite conditions have dark colours in down and nest, so that they are able to absorb and take advantage of the warmth of the sun's rays.

Habits of American Sunfishes

THE American sunfishes excavate nests in shallow places, usually on sandy shores, which are familiar objects in late spring and early summer. Mr. C. M. Breder in his paper "The Reproductive Habits of the North American Sunfishes (Family Centrarchidae)" (*Zoologica. Scientific Contributions of the New York Zoological Society. Part I, Nos. 1 and 2, 21, 1936*) brings a large amount of material together with special reference to reproductive behaviour of these fishes, which is closely similar in all genera. The male constructs the nest and guards the eggs. The female is only concerned with their deposition, her behaviour being very characteristic as she approaches the nest when sex recognition takes place. The primitive forms make the most elaborate nests, and there is more parental care in these than in the higher forms, the nests of which are much simpler. Broadly speaking, the annual cycle of habit in the family shows an interesting series of items of behaviour largely controlled by temperature, and the position and form of the nest depend on a variety of purely physical factors in the environment which include temperature, sunshine, depth of water, rate of flow, nature of bottom and proximity of protecting objects. This is a very interesting study embracing much previous work as well as a great deal of first-hand information.

The Chordate Head

THE problem of the constitution of the head region in the Chordates is discussed in a fully illustrated article by de Lange (*J. Anat.*, July 1936) based upon three lectures delivered at King's College, London. The vertebrate embryo is regarded as consisting of two portions: a non-metameric part, the gut, splanchnopleura, ventral body wall, brain region and the anterior cephalic mesoderm, arising in a similar manner to the three-layered, unsegmented larva of the invertebrates; and a dorsal, more or less segmented portion, the episome, having no homologue in invertebrates. The episome is pushed in a caudal direction in the Urochordata, in an anterior direction in the Cephalochordata, and in the true vertebrates it penetrates into the posterior part of the head region. This superimposed, axial episome has arisen and become segmented in conjunction with the need for locomotor efficiency. The axial musculature spreads over the trunk and into the head region. The branchial mechanism is afterwards formed, but it is in no way dependent upon the original metamerism of the episoma. As the head constitutes a structure for the gathering of sense organs, for presenting a firm front to the resistance of the water during locomotion and as a base from which the undulatory locomotor movements can take origin, its episomatic constituents lose their segmental structure. Some evidences of it remain, however, in the histological and functional character of the musculature. The hypobranchial muscles retain the metameric character of the invading episomatic mesomeres and of their cranial nerves.

A New Type of Apospory in Ferns

MISSSES I. ANDERSSON-KOTTÖ and A. E. Gairdner (*J. Genetics*, 32, No. 2), investigating the inheritance of apospory in the hart's tongue fern, describe a form known as *peculiar* which arose from spores of the variety *crispum muricatum*. This peculiar type of sporophyte only attains a height of 8 cm. and may bear twenty-five fronds at one time. There is a complete absence of sori, sporangia and spores, the fronds producing aposporous prothalli which bear sex organs and undergo fertilization. As there is no meiosis, the chromosome number increases from $n = 30$ (normal) to a maximum of about 110. Various lines of evidence indicate that the chromosome number is frequently diminished in some way at the formation of the sex organs, but no cytological indication has yet been found as to how this takes place. In crosses between peculiar and normal, the former type of life-cycle is shown to be controlled by a single recessive gene. Heterozygous sporophytes are thus normal in appearance, but they sometimes show a feature which is new in ferns, namely, sori containing some normal sporangia and others which produce spermatozoids. The heterozygotes thus show incomplete dominance as regards the time of sex differentiation, which takes place both in sporangia and in the gametophytes. The conclusion is reached that the sporangial stage in normals is represented by the sexual stage in peculiars, and that a reduction division is therefore attempted at the sexual stage in the peculiar. These results have a bearing on various questions of apogamy, apospory and life-cycles in plants.

Properties of Oak

No. 11 of *Research Records* (Timber Series No. 3) contains a pamphlet on "The Properties of Home-grown Oak" (London: H.M. Stationery Office, 1936). It is stated in the pamphlet that in the past there has been much difference of opinion as to the merits of the timber, and this is largely attributable to its properties varying considerably with the conditions under which the trees are grown. The writer of the pamphlet appears to consider that there is little difference between the timber of the pedunculate and sessile oaks. By the purely practical test of felling and conversion in the forest, many hold the opinion that the timber of the sessile oak is more easily workable than that of the pedunculate. During the Napoleonic Wars, the finer lines of the French ships captured and the more artistic nature of their fittings were attributed to their having been constructed of the sessile oak, whereas the English ships were most usually constructed of the pedunculate or robor oak, a more stubborn and rugged grower. The pamphlet deals with the general properties and structure of the wood, seasoning, mechanical properties, durability and working qualities. A comparison of home-grown oak and American oak is made, and insect and fungus pests are discussed.

Inheritance in Cotton

INHERITANCE of form and size play a large part in the improvement of commercial cottons. Dr. J. B. Hutchinson (*J. Genetics*, 32, No. 3) has summarized some of these results. He finds in Asiatic cottons a series of five multiple allelomorphs affecting leaf shape. Broad, lacinated and narrow leaf types occur in *Gossypium arboreum* in different crops, narrow leaf being absent from South India and rare in Burma; it occurs in Assam. Leaf shape is associated with corolla colour. Broad leaf is primitive, and two allelomorphic genes have arisen causing progressive narrowing of the leaf lobes. Both are widely distributed in the species, and in some circumstances one of them has a selective advantage over the broad. Another set of genes affects all foliar organs and not merely the leaves. The habit of the plants is determined by the length of the vegetative period, that is, the number of nodes on the main stem. This is followed by the formation of sympodia with a flower at every node. Wild cottons have a high primary node number, with late flowering. Interaction is indicated for various node number factors, some of which are linked with corolla colour and some with anthocyanin production.

Carolina 'Bays'

THE 'bays' of the Carolina coastal plain are great oval depressions, usually well-timbered, each of which is rimmed with a sand-ridge that is highest on the south-east side. Their peculiar and uniform shape, the prevalent orientation of their longest axes in a north-west to south-east direction, and the immense number of examples, suggested to Melton and Schriever that the bays had been caused by the fall of an immense shower of meteorites, during or possibly before the Pleistocene. In a recent issue of *Science*, Prof. D. Johnson has pointed out several objections to this hypothesis. The rims of the 'bays' are not composed of material thrown out of the bottoms by explosive impact, but consist of clean sand, such as might border a lake-beach. The major

axes of some of the depressions follow a north to south direction, and at least a few trend from north-east to south-west. Such departures from the prevailing orientation are inconsistent with the meteoritic hypothesis. The area is underlain by thick beds of limestone in which caverns and sink-holes are common. Johnson considers that the 'bays' started as lakes in sink-hole basins; these afterwards drained, leaving their old beach-ridges where the prevailing winds had piled them. A book on the 'bays' from the pen of Prof. Johnson is in course of publication.

The British Earthquake of April 6, 1580

LITTLE has so far been known about this earthquake, one of the strongest ever felt in Great Britain, and in some ways not unlike the North Sea earthquake of June 7, 1931. Mr. R. E. Ockenden, however, has lately reprinted "Thomas Twyne's Discourse on the Earthquake of 1580" (Pp. 40 + 1 plate. Oxford: Pen-in-Hand Publishing Co., 1936. 5s.), the original of which is now very rare, though copies are to be found in the British Museum, Bodleian and Emmanuel College libraries. He has also given a most useful introduction and a bibliography of contemporary pamphlets and other works. From these, it appears that the earthquake was felt throughout the south-east of England, and so far at least as Oxford and Norwich, also in Flanders and the north-east of France. In Great Britain, several churches near the coast of Kent were damaged. Even in London, stones were shaken from St. Paul's Cathedral and the Temple Church, and an apprentice was killed by the fall of a stone from the roof of Christ's Hospital Church. Except perhaps at Calais, little damage to buildings occurred in France and Belgium. The sea was greatly disturbed, and it is probable, as Mr. Ockenden remarks, that the earthquake was of submarine origin, and that its epicentre was not far from the east coast of Kent.

Radio and the Sunspot Cycle

L. C. YOUNG and E. O. Hulburt (*Phys. Rev.*, 50, 45) have examined the correlation of radio transmission with sunspot activity over the years 1923-36. They find that the optimum radio-frequency for short-wave daylight transmission over a given long distance increases with the sunspot activity, and they derive a semi-empirical formula connecting these quantities. The correlation of the radio data with sunspot number is much better than with terrestrial magnetic activity or with the solar constant. The last fact suggests that the visible and infra-red radiation from the sun, on which the solar constant is based, does not vary in close accord with the ultra-violet radiation which ionizes the upper atmosphere.

Structure of Benzene

ALTHOUGH the essential correctness of Kekulé's hexagon formula for benzene, with alternate single and double linkages, has been established by intensive chemical and physical investigation since its enunciation in 1867, and crystal analysis has shown that the ring is very approximately a plane, yet there are several other alternative formulæ (Dewar, Claus, Ladenburg, Thiele, Baeyer). The quantum-mechanical treatment of the problem has been dealt with by Hückel (1931-32) and by Pauling and Wheland

(1933). Certain difficulties, however, were encountered in the comparison of the results with those of lines of experimental investigation. One of the most important was the apparent discrepancy between theory and experiment in the comparison between infra-red and Raman spectra. In a series of eight papers (*J. Chem. Soc.*, 912-987; 1936), C. K. Ingold and several collaborators have re-examined the matter in the light of the results of long-wave spectroscopy, which includes a study particularly of the infra-red and Raman spectra and the vibrational structure of bands arising from electron transitions. An important extension of the experimental method consisted in the substitution of hydrogen by deuterium, which does not alter the electron wave functions, so that the effect on vibration frequencies arises solely from changes of mass. Most of the coincidences in frequency in the infra-red and Raman spectra are shown to be the result of using liquids, in which cohesive forces disturb the conditions of symmetry, and the conclusion is reached that there is no need to assume the absence of a centre of symmetry in the benzene and hexadeuterobenzene molecules. The D_{6h} model (plane regular hexagon) is supported, whilst the D_{3h} (Kekulé) model fails to show itself in any spectroscopic features, and there is no indication of the D_{3d} (puckered) model.

Automatic Control of Road Traffic

IN the *G.E.C. Journal* of August, F. A. Downes gives a brief exposition of the elements of traffic flow and the requirements of automatic mechanism for controlling traffic. In the United States, traffic engineers have recently formed an Engineering Institution to study traffic problems. In Great Britain, the problems are studied by the engineer of the Ministry of Transport and by the staff of engineering works manufacturing traffic control apparatus. Of these engineers, there is probably no one who devotes his whole time to a theoretical and mathematical study of the subject. The design of modern traffic integrators requires a special knowledge of the mathematics of probability, and much useful work is being done in this direction. Theoretically, the only limit to the amount of traffic that can be dealt with by a single lane of traffic is that set by the limiting speed of the vehicles. For given road friction, and for a given average brake-power, it can be shown that there is a clearly defined optimum speed at which the greatest amount of traffic will be passed in a single lane per hour. The generally accepted figures lie between 12 and 18 miles per hour. At the lower speed, vehicles have 15 feet headway but at the higher speed of 18 m.p.h. a headway of so much as 30 feet may be required. An optimum speed of 15 m.p.h. is often given, but this refers to dry roads of average surface. Unless a non-skid road surface is provided, this figure may be considerably increased. At intersections the first essential is means of indicating 'stop' and 'go'. Interesting suggestions are made for indicating how soon change over of colour may be expected. The full green indication, for example, consists of three concentric luminous rings; when one third of the time of the green signal has elapsed there are only two rings visible, then after two thirds only one. Another device embodies a dial divided into two portions, one of which is painted red and the other green, the indication being given by a large hand travelling in the clockwise direction.