

## Research Items

**Lea Valley Mesoliths.** A mesolithic site at Broxbourne has been described by Messrs. Hazzledine Warren, J. G. D. Clarke, W. A. MacFadyen and H. and M. E. Godwin (*J. Roy. Anthropol. Inst.*, 64, pt. 1). The industry lies above the deposits of the Tundra stage, which is to be correlated with the Magdalenian, and below the peat of the Boreal Forest epoch. The site is situated in Rikof's Pit in the Lea marches, east of Broxbourne railway station. The flints described come from one only of a number of sites identified. This site was small, not exceeding 15 ft. in diameter, and could have been occupied by few people only. The surface below the peat was sand. Owing to the conditions of examination, the flints may be regarded as a completely representative series, with the debris of manufacture, sealed by a peat deposit soon after manufacture. A number are calcined by fire. Five types of point, including micro-burins, are identified. There are also cores, burins, scrapers, axes and hammerstones. As regard its cultural affinities, Broxbourne belongs to the Forest Culture A, which correlates with the Boreal climatic period. Typologically, Broxbourne falls into the group of axe, burin and non-geometric microlith industries of south-east England, which represents an extension of the mesolithic forest cultures of Baltic lands; while by the pollen analysis, here described, it can be dated independently of typological considerations as belonging to Boreal times. Owing to the fortunate circumstances of its discovery and examination, and the incomplete character of the evidence from other similar sites in Britain, Broxbourne must be considered the type site of Forest Culture A in Britain. The Continental sites with which it may be compared are Svaerdborg, Mullerup, and Holmgaard in Sjaelland and Duvensee near Lubeck, all dated on botanical evidence to the Boreal period.

**The Ovimbundu of Angola.** Mr. Wilfrid D. Hambly, as leader of the Frederick H. Rawson-Field Museum Ethnological Expedition to West Africa, undertook research in Nigeria and Angola from February 1929 until February 1930, and made a study of the Ovimbundu of Portuguese West Africa and their culture contacts (Field Museum of Natural History, Chicago, *Anthropol. Ser.*, 21, No. 2). The Ovimbundu live on the central plateau of Angola, the Benguela Highlands, which rise in places to an altitude of 6,000 ft. Their villages are built on the hillside, and the nature of the ground affords them a natural protection from their enemies. There are two main physical types, one having a brown skin colour and slender build, while the other is a shorter, darker and more sturdy type. The Ovimbundu are Bantu negroes, who possibly result from a crossing of Hamites and true Negroes. This would account for both types. Topography and climate fix certain conditions, which favour agriculture and cattle-keeping on an extensive scale; while a sufficient rainfall favours the growth of timber serviceable for the craftsman. One of the fundamental factors in their economic life is the division of labour on a sex basis. In recent times, the loom and the conical furnace for smelting iron have disappeared, owing to the increasing importation of foreign cloth and the facilities for obtaining scrap iron. Bark cloth is no longer made. Drum signalling has declined with the decrease of warfare,

and for the same reason the double gong is now rare. Originally the Ovimbundu were cannibals. This practice was intimately associated with slavery, as only slaves were eaten in the ceremonial feasts; but with the discouragement of inter-tribal warfare under the Portuguese, the capture of slaves became obsolete. There are numerous resemblances between the cultural pattern of the Congo region and that of the Ovimbundu of the present day. A number of cultural identities support the thesis that the Ovimbundu are of the central African matrix of culture.

**American Opossums.** A thorough revision of the genus *Marmosa* has been made by G. H. H. Tate (*Bull. Amer. Mus. Nat. Hist.*, 86, 1933), so that, with the new forms described, the genus now includes 49 species and 100 recognisable sub-species, all belonging to five well-marked groups. The bulk of the work, of 250 pages, is taxonomic, but the introduction contains much of general interest. Colour bears a relationship to environment parallel to that shown by some other groups of mammals and birds: the species of the humid Andean region are nearly all dark brown, the forest forms grey tinged with brown, the natives of the dry areas of Ecuador and Peru are grey. Certain definite trends suggest to the author that orthogenesis has been at work: there is a tendency for the pouch to disappear and the mammae to spread to the pectoral region, for the primitive arboreal habit to be replaced by terrestrial or aquatic habits and for the development of a food-storage mechanism, as in the thickened tails of some southern genera.

**Reduction of Carapace in Chelonians.** It is a remarkable fact that although reptiles usually possess more ribs than other vertebrates, those reptiles—the Testudinates—in which the bony skeleton is most exaggerated have fewer ribs than the majority of mammals. Reduction of the carapace may be due to atrophy of some parts owing to hypertrophy of others, or it may be due to an inhibition of growth (P. E. P. Deraniyagala, *Spolia Zeylanica*, 18, May 1934, p. 211). Where the species is a land-living form, the inhibition affects only the bony corselet of the carapace but not the scales or scutes, but in aquatic forms both components of the carapace are reduced. Indeed, in pleurodirous forms, loss of scales and scutes precedes osseous inhibition. The loss, necessarily associated with aquatic habit, seems to proceed as follows. The marginals act as guards to the free ends of the ribs, and form a rim to support the dermal carapace which they raise off the plastron. These requirements are essentially terrestrial. In aquatic forms, inhibition of the costal plates isolated the costal marginals and, no longer necessary as a rim support in the new medium, they were the first to disappear. In water, the carapace no longer presses down upon the plastron, and since also the ribs, shortening in proportion to the length of the inhibited costal plates, could no longer be protected at their tips by marginals, all the remaining marginals became functionless and disappeared.

**Cytogenetics of *Digitalis*.** The genus *Digitalis* shows several interesting genetic and cytological features. Six European species, including *D. ambigua*,

*D. purpurea* and *D. dubia*, have  $2n = 56$  chromosomes, while three species, *D. eriostachya*, *D. lutea* and *D. obscura*, belonging to southern Europe, are tetraploid, having  $2n = 112$ . A new constant tetraploid species, *D. mertonensis*, was produced a few years ago from a fertile  $F_2$  plant derived from a cross between *D. purpurea* and *D. ambigua*. Messrs. B. H. Buxton and S. O. S. Dark (*J. Genetics*, 29, No. 1) record the results of various crosses between these species. The hybrids are generally matroclinous, and differences occur in the reciprocal crosses. In crosses between the diploid species the  $F_1$  is completely sterile, as are also the hybrids between *D. mertonensis* and *D. lutea* or *D. eriostachya*. Although the last two tetraploid species are indistinguishable in their flowers, which are very small, yet their hybrids with *D. mertonensis* are markedly different. This appears to be due to genes expressing themselves in the hybrid but not in the parent species. In these hybrids there is much more pairing of the chromosomes than in crosses between *purpurea* and *ambigua*, from which it is concluded that the wild tetraploid species have originated in the same way as *D. mertonensis*. By crossing the latter with diploid species, various triploid tri-hybrids were produced, all of them sterile. It is concluded that in the evolution of the genus there was differentiation into at least two groups of diploid species with quite unlike chromosomes.

**Researches on *Euchaeta norvegica*.** This is one of the largest known copepods, and has a wide range of distribution in northern waters. It is a very important fish food in America, but in Loch Fyne in the Clyde sea-area where it occurs in abundance it is never found in the stomach of the herring, which is surprising, for it is rich in oily matter. It probably, however, serves indirectly as herring food as *Meganctiphanes* eats *Euchaeta* and is eaten by the herring. Mr. A. P. Orr, in his paper "The Weight and Chemical Composition of *Euchaeta norvegica*, Boeck" (*Proc. Roy. Soc. Edin.*, 54, Part 1, No. 5), describes the analyses of material taken from catches made in Loch Fyne in October and November 1931. The values of fat and protein differ considerably from those hitherto recorded for marine plankton which last were, however, based on mixed plankton catches and with smaller organisms. The present results show *Euchaeta* to be a very rich food for fish, the fat content of adult males being about 23 per cent of the dry weight and that of non-ovigerous adult females 21 per cent, and the ovigerous females much fatter (36 per cent). The average value of the protein was 36 per cent. Dr. A. G. Nicholls in No. 4. of the same part of the *Proceedings* describes the developmental stages of *Euchaeta norvegica*, reared by him in the Millport Laboratory. This is a very beautiful piece of work and those who understand the difficulties involved in rearing the young stages of any copepod will appreciate the care that must have been taken to attain the desired results. The six nauplii and first copepodite stages were successfully reared; good descriptions and figures are given and the growth and development compared with that of *Calanus*. It appears that *Euchaeta* passes through its nauplius stages without feeding, being dependent on its large supply of yolk.

**Insects and Spike-Disease of Sandal.** Part I of vol. 20 (May 1934) of the *Indian Forest Records* consists of a paper by Messrs. Cedric Dover and M. Appanna on insect transmission of the above disease. These

authors state that field investigations and biological analyses strongly support the conclusion that spike-disease is transmitted by insects. Experiments with 31 species of Hemiptera appear to confirm the theory previously advanced that *Moonia albimaculata* is a very possible vector. Suggestive symptoms have occurred in five well-defined cases, as the result of infection with viruliferous individuals of this species. Cytological study of the plants involved have, furthermore, revealed the presence of characteristic intracellular inclusions. In a single case an apparent infection by an aphid (*Macrosiphum*) is recorded as the result of transmission experiments. Their observations lead to the conclusion that mandibulate insects are not vectors of the disease. In a postscript to the above paper, Dr. C. F. C. Beeson, forest entomologist at Dehra Dun, mentions that the special grant subsidising spike-disease expired in 1933, and the investigation has had to be closed down. Further experiments dealing with the transmission of the disease by *M. albimaculata*, which were then in progress, had to be abandoned. While the various papers on the subject, so far published, will form a useful basis for any future research, the Board concerned with the investigation is not wholly agreed that the available evidence, so far obtained, affords conclusive demonstration that spike-disease has been experimentally transmitted by any species of insect.

**Root Systems of Apple Trees.** Messrs. W. S. Rogers and M. C. Vyvyan have recently reported the results of their continued studies on the extent and character of root systems of apple trees (*J. Pomol. and Hortic. Sci.*, 12, No. 2, 110-150, July 1934). The present investigation relates to twenty-six trees on various clonal root-stocks growing on three types of soil—loam, sand and clay. In all cases, the roots spread further than the branches, and fine roots grew in all directions. The ratio of the weight of stem to weight of root was 2-2.5 in loam soil, about 2.1 on clay, and 0.7-1 in sand. The ratio was comparatively constant for a given soil, and did not vary appreciably for trees of markedly different vigour. The deepest roots (9 ft. 6 in. below the surface) were found on Stock No. IX (very dwarfing), and generally speaking, the more vigorous stocks had shallower root systems. Earlier statements about the extent of root systems of apple trees are substantiated with further data, but the possible modifying influence of a water table is discussed. A useful appendix, describing the methods of excavation and grading, is added.

**Plant Disease in Great Britain.** The Ministry of Agriculture and Fisheries has recently issued Bulletin No. 79, "Fungus and other Diseases of Crops, 1928-1932" (London: H.M. Stationery Office, 2s. June 1934). The publication is a useful survey of fungus and virus diseases which have occurred in England and Wales during the last five years. Thirty-three plant pathogenic bacteria and fungi which are either new to science or have not been previously recorded for Britain, and twenty-eight uncommon species, are enumerated. Brief introductory chapters on weather conditions, progress in control measures, and scheduled plant parasites form a useful prelude to the descriptions of diseases. Host plants are subdivided under the following headings: cereals, potatoes, roots and fodder plants, pulse, pasture and forage crops, vegetables, fruit, hops, mushrooms and flax, ornamental plants, and bulbs, corms, etc. Extensive

indexes of parasites and of non-pathogenic and virus diseases enable the reader to review the latest findings on any particular problem in plant pathology. As knowledge expands, it becomes increasingly difficult for one worker to review the whole field even of his particular study, and the volume under notice is an excellent collection of up-to-date knowledge. Dr. G. H. Pethybridge, Mr. W. C. Moore and Dr. A. Smith are the joint authors, though much of the subject matter has been contributed by collaborators in all parts of the country.

**Correlation by Radioactive Minerals.** The age of the metamorphic rocks of eastern Connecticut has long been an unsolved problem. An important contribution towards its solution has been made by W. G. Foye and A. C. Lane (*Amer. J. Sci.*, August). Three analyses of uraninite by F. Hecht show that the Strickland pegmatites date back some 280–290 million years, indicating that they were injected during the Acadian orogenesis of late Devonian time. The Bolton schist, which is intruded by the Strickland dykes, can be correlated with the Brimfield schist of Massachusetts, and since both must be older than the Carboniferous, they cannot be correlated with the Worcester phyllite, which is known already to be of Upper Carboniferous age. The pegmatites are associated with the Monson granodiorite, and the Dedham granodiorite of Massachusetts is of the same age. Both igneous masses may therefore be reasonably referred to the Devonian. An important by-product of the investigation shows that the factor  $k$  in the lead-ratio  $Pb/(U+k.Th)$  is about 0.36, as adopted in "The Age of the Earth" (Bull. 80, National Research Council, 1931), and not 0.25 as advocated by Kirsch. Fenner's analysis of a monazite (free from uranium) from the same Strickland quarry gives an age of 278 million years when the factor 0.36 is used. This result corresponds very closely with those for the uraninites, which are poor in thorium. Had the smaller estimate for  $k$  been used in calculating the age of the monazite, the latter would have been only 221 million years.

**Specification of Optical Glass.** It has been customary in the past to specify the properties of an optical glass by its refractive index  $n_D$  for the middle of the  $D$  lines of sodium and by its reciprocal dispersion,  $v = (n_D - 1)/(n_F - n_C)$  now called its constringence, where  $n_F$  is for the blue and  $n_C$  for the red line of hydrogen. This specification entailed three determinations of refractive indices. In a review of an extensive series of glasses available in Great Britain by Mr. T. Smith of the National Physical Laboratory (see *NATURE*, April 16, 1932, p. 584), it was pointed out that if the constringence were defined as  $(n_F - 1)/(n_F - n_C)$ , only two determinations would be necessary. Mr. Smith also urged glass makers to publish charts in which each glass was represented by a point on  $n, \log v$  scales. He showed also that for many glasses the change of  $n$  was proportional to the change of a power, not differing much from unity of the wave number of the transmitted light. In a new list of nearly 80 optical glasses, Messrs. Chance Brothers adopt the  $n, \log v$  chart, but the logs are from 0.40 to 0.88 instead of from 1.40 to 1.88. They adopt  $n_D - 1$  where  $n_D$  is the refractive index for the yellow line of helium, for the numerator of the constringence and give the values of the partial dispersions throughout the spectrum in preference to using the suggested wave number power relation. An improvement

which will be much appreciated by designers is the substitution of the specification of each type of glass by a number, the first three digits of which are the excess of the refractive index of the glass over unity and the remaining three the constringence, for the former method of using random letters or numbers.

**Electric Waves in Insulators.** The variations of the dielectric constants of insulating media with the wave-length of the oscillations they are propagating, and in particular the great decrease in value which takes place as the wave-length decreases from 1000 to about 1 metre, have been explained as due to conduction, which gives a 'normal' dispersion, to free periods of the molecules giving resonance, and to the existence of dipolar molecules the orientation of which is influenced by the electric field. Dr. Werner Ziegler has examined the experimental results available to determine to what extent the last two theories will explain 'anomalous' dispersion (*Phys. Z.*, June 15). For pure liquids—water, alcohols and ethers—the dipolar theory affords an adequate explanation, but for glycerine and insulating oils it is not satisfactory, nor is the resonance theory any better. For the oils, conductivity appears to play the most important part. For solid insulators, both conductivity and polar theories must be appealed to, while for gases the data available are not yet sufficient to show whether the resonance theory is adequate. References to more than a hundred recent papers are given.

**Flow of Water under Structures on Sand Foundation.** There has been issued from the Punjab Irrigation Research Institute in two parts (*Research Pub.*, 2, Nos. 3 and 4. Government Printing Office, Lahore. 5d. each) a dissertation by Dr. E. McKenzie Taylor, the director of the Institute, and Mr. Harbans Lal Uppal, assistant research officer, on the nature and lines of flow of water through sand under models which have been designed to give the effect of standard methods of construction. A full description of the apparatus is given in Part 1; it consisted of an experimental tank, 3 ft. 10 in. long, 2 ft. 6 in. deep and 2 ft. wide, with pipe connexions for draining away the water and providing an outlet for the sand. The model, made in teak, having been inserted in the tank, with watertight jointing at the sides, the stream flow was studied by means of the reaction between solutions of potassium chromate and silver nitrate, each of 1 per cent strength. The sand was first saturated with the potassium chromate. Silver nitrate was then introduced at intervals into the sand on the upstream side by means of a series of tap funnels the points of which were drawn out so as to give a fine stream. The silver nitrate reacted with the potassium chromate and gave a red precipitate along the line of flow, which was then photographed through the glass plate with the aid of suitable illumination. A number of photographs are reproduced in the pamphlets showing the stream lines under an impervious floor and under various types of foundations of sheet piling and impervious aprons. It is stated that probably the most important result obtained from the experiments is the observation that 'creep' (that is, a major line of flow in contact with the work) is non-existent. This may have an important bearing on future design. It is added that a floor protected by upstream and downstream sheet piles and aprons appears to be the most stable form of work possible.