Research Items

Stone Age Culture from Kenya Colony

A STONE age culture, for which the name 'Kombewa culture' is suggested from the name of the locality in which it occurs, is described by the Venerable Archdeacon W. E. Owen in *Man* of December 1938. Kombewa is the name of a subsection of the Location of Seme in the Central Kavirondo District of the Nyanza Province, Kenya Colony. It lies about halfway up the escarpment on the north of the Kavirondo Gulf and about eight miles from it. Between 1932 and 1938, four workshop sites were discovered, and single specimens have been found over a wide area. Three sites were hill-top sites and showed no stratification, but stratified rubbles, carrying both rolled and unrolled hand-axes of Acheulean type, flakes and cores, were found at Aringo and Ng'ira in Karungu on the east coast of Lake Victoria, and subsequent search revealed the fourth workshop site on the slopes of Nyandwat Hill, near Ng'ira. The raw material in every instance is the local rock, large, medium or small flakes being struck from a selected block. In the majority of instances care had been taken to prepare the area from which the butt of the flake tool was removed, so that many tools show a faceted or trimmed butt. The peculiarity of the tool is its perfectly plain upper surface. The struck cores are classified under four heads with reference to the butt area into natural butts, faceted butts with central ridge, faceted butts with trimmed ridge, and rounded butts. The majority of cores show only one tool removed. Finished tools are small in number compared with cores. The outline is approximately rectangular with rounded corners, ovate and nearly round to semicircular. The butts are generally as wide as the widest part of the flake. Some of the cores seem to have been used as scrapers. One large flake seems to have been a chopper, and two hammer stones were found. The suggested date is Middle Stone Age; but at the present stage it suffices to remember that at Ng'ira specimens occur in a horizon carrying rolled and unrolled Acheulean tools.

Formation of Pronephric Duct

Two views have been put forward regarding the method of formation of the pronephric duct in the urodele Amphibia. First, that it is produced by a backward growth from the pronephric rudiment, and secondly that it is a composite structure resulting from the fusion of a series of segmental units. By means of *intra vitam* staining with Nile blue sulphate and by means of operative interference, R. J. O'Connor has thrown light on this problem (*J. Anat.*, Oct. 1938). The types chosen were *Ambystoma tigrinum* and *Triton tœniatus*. It was shown that when the caudal end of the rudiment of the duct is stained and then development allowed to proceed, the stain is carried on by the growing rudiment right down to the cloaca in the walls of the duct when formed. Also that if a piece of some other tissue is interposed caudal to the end of the rudiment, it prevents the backward extension of the rudiment and so prevents the formation of a pronephric duct. From this, it is concluded that the duct is developed from a backward extension of the pronephric rudiment.

New Type of Hereditary Behaviour in Fishes

Mollienisia is a genus of cyprinodont fishes. *M. sphenops* occurs around the Gulf of Mexico from Florida to northern Mexico. *M. latipinna* is found in southern Mexico and Central America. Where these species overlap is found an intermediate form known as *M. formosa*, which is evidently of hybrid origin but occurs exclusively as females. This peculiar situation has been investigated by Mr. Henry Meyer (*J. Genetics*, **36**, No. 3). When *M. formosa* is mated to either species, the offspring are all females of maternal type. But this is not parthenogenesis, since unmated females produce no young. The two species and the laboratory hybrid between them all had 36 chromosomes, and nuclear size suggests that the *M. formosa* females are also diploid. There was no differential death-rate either before or after the birth of the young which would account for the absence of males. There is no tendency to hermaphroditism, and sex reversal is improbable. To account for the purely matroclinous inheritance, the following explanation is suggested. The eggs of *M. formosa* are fertilized by the other two species, but the paternal chromosomes remain inactive in the foreign cytoplasm. In maturation of the eggs of the hybrids, the paternal chromosomes are all eliminated into the polar body. This condition is compared with meiosis in *Œnothera* hybrids and in the homopteran *Pseudococcus nipæ*. Further cytological investigation should settle whether this explanation is correct.

Double-grafted Apple Trees

THE ancient problem of the reciprocal influence of scion and stock is further complicated by the increasing use in various parts of the world of fruit trees with two or more graft unions and composed of more than two varieties. Trees are frequently built up *ab initio* with a third variety used as an intermediate stem piece between stock and scion, whilst it is a common practice with established trees to graft shoots of a new variety on to the framework branches of an existing scion. M. C. Vyvyan (*J. Pom. and Hort. Sci.*, **16**, 251; 1938) has investigated the effect on a given scion of stock varieties used both as rootstock and intermediate stem piece. The scion was always Stirling Castle, the stocks and intermediate pieces being *M* IX and *M* XII combined in all four possible ways, namely, XII/XII, IX/XII, XII/IX and IX/IX. The trees of type XII/XII were largest and those of type IX/IX the smallest. IX/XII trees, that is IX as intermediate and XII as rootstock, were intermediate in size, whilst XII/IX trees were only slightly larger than IX/IX trees. Trees with vigorous (XII) root systems or intermediate pieces produced more wood growth and fewer fruit buds per metre of wood than those with dwarfing (IX) root systems or intermediates, and in this respect the root system tended to have a greater influence than the intermediate piece. Swellings at some of the graft unions indicated that obstruction at the union may be in part responsible for some of the effects observed, but it is noted that an unworked *M* IX tree becomes dwarfed and precocious though no graft union is present.

Theory of Coacervation

AN interesting paper by Dr. Irving Langmuir (*J. Chem. Phys.*, 6, 873; 1938) deals with a new theory of coacervation. Unipolar coacervation results from micelles of similar charge, and bipolar coacervation from micelles of unlike charge. The formation of tactoids from thixotropic sols, of Schiller layers from ferric oxide sols, the separation of tobacco virus solutions and bentonite sols into two liquid layers, and the crystallization of proteins are regarded as being typical of unipolar coacervation, and involve attractive forces. The previous ideas about Coulombic attraction are shown to give an excessive attractive force between micelles and oppositely charged ions which must be compensated by repulsive forces and by the dispersive action of thermal agitation. Long-range van der Waals forces are discarded and a new theory of coacervation, based on the Debye-Hückel theory of the osmotic pressure of electrolytes, is developed mathematically. The limitations of the Debye-Hückel theory are discussed. A theory of relaxation of birefringence has also been worked out in which dilute thixotropic sols of bentonite are assumed to be arranged normally in a cubic lattice, and temporary shear in the liquid orients the micelles and produces birefringence although the lattice remains cubic. In bipolar coacervation, the electric fields and the charges on the micelles increase as the molecular concentration increases until at a certain concentration the field attains a value so high as to cause increased hydration which keeps the micelles apart and confers stability to the coacervate.

Wind Speed by Kites

THE considerable altitudes to which Japanese humming kites can ascend without their notes becoming inaudible on the ground seemed to provide a convenient method of determining the speed of the wind at these altitudes, and S. Suzuki and Z. Miduno of the University of Hukuoka have investigated the effects of wind speed on the pitch and amplitude of the stretched ribbon which hums (*Proc. Physico-Math. Soc. Japan*, Nov. 1938). The ribbon used was of metal about 80 cm. long, 0·3 cm. broad and 0·011 cm. thick stretched horizontally in a wind tunnel and its motion determined by light reflected from a small mirror. The wind stream was parallel to the breadth of the ribbon. The oscillations are principally torsional and their fundamental frequency is that of the transverse oscillation, a thin round wire of the same length and mass per unit length under a stretching force exceeding that used by $16nb^3/a$, where n is the rigidity of the material of the ribbon, a half the breadth and b half the thickness. The speed of the wind has very little effect on the pitch of the fundamental note but a considerable effect on the amplitude and on those of the harmonics, and it is these effects which the authors hope to use as means of measuring the wind speed.

Corpuscular Eclipse of October 1, 1940

A RECENT paper (*Mon. Not. Roy. Astro. Soc.*, 98, 9, Supplementary Number, Oct. 1938) gives a description of the application of the occultation machine in the Nautical Almanac Office to the prediction of the corpuscular eclipse. The velocity of the corpuscles emitted from the sun is about 1,000 miles a second and large 'aberration' terms are necessarily introduced into the positions of the sun and moon, the values corresponding to corrections representing 'light-times' of 1·0706 days and 221 seconds for the sun and moon respectively. There is some doubt regarding the manner in which the corpuscles leave the sun. If they are expelled radially it is obvious that the sun must be treated as a point-source, but this assumption does not accord with observation. There are no reliable data, however, to show the most suitable diameter to adopt, though it is certain that it must be considerably less than that of the visual sun, and about the order of one fourth of its apparent diameter. A table supplies the corrected times of beginning and end of the corpuscular eclipse at all points in the network covering South Africa. A map shows the track of the corpuscular eclipse for a height of 300 km.—the height of the upper ionized layer of the atmosphere, from which wireless waves are reflected. There is very little difference in the times of beginning and ending between the 300 km. height and the 100 km. height at which the lower ionized layer exists, except, as might be expected, near the end and edges of the track. In addition to the assumed speed of 1,000 miles a second, Besselian elements have been computed and predictions made for a speed of 1,100 miles a second. The general effect of this increased speed of propagation is to displace the track towards the south and west and the times are later by 10–16 minutes. It is hoped that much useful information will be derived from this corpuscular eclipse. The paper is communicated by the Astronomer Royal.

Polar Aurora and Night-Sky Light

PROF. H. H. PLASKETT has recently published a paper with the above title (*Occas. Notes, Roy. Astro. Soc.*, No. 2, Oct. 1938), in which he gives a summary of the methods for studying these two phenomena. It may be mentioned that the object of these *Occasional Notes* is to provide a fairly simple and non-technical description of various astronomical matters which can be followed by the general astronomical reader, and for this reason many non-astronomers will find the paper very interesting. Dufay's night-sky photometer, described very briefly in the paper, has been found the most satisfactory for the study of the night-sky light, and Brunner has accomplished some valuable work by means of this apparatus. He has found that the increase of surface brightness with zenith distance to a maximum at 70° can be represented if two main sources are postulated—a low-lying layer at a height of 5 km. which contributes more than half the surface brightness, and upper layers at heights of 1,000 km. or more, the contribution of the latter being variable with time: on the average it is the equivalent of one first magnitude star every 66 square degrees. Brunner attributes the low-lying component to diffuse reflection by the lower atmosphere of light already reflected off the surface of the earth. The origin of the upper component and also of the aurora is discussed and a brief reference is made to the various theories which have proved acceptable for a time but which are open to serious objections. Hulburt and Maris have recently abandoned the solar-stream hypothesis, and they believe that the charged particles responsible for the aurora are produced in the earth's atmosphere from ionization by the ultra-violet light of the sun. The theory has not, however, been generally accepted, and more research is necessary before it is possible to make any definite pronouncement on the causes of the night-sky light and of the aurora.