Research Items

Archæological Exploration in Peru: Cañete Valley

IN a third report on the results of an archæological expedition to Peru for the Field Museum, Chicago, in 1925 and 1926, Prof. A. L. Kroeber describes (*Anthropology, Memoirs, Field Museum, Chicago*, **2**, 4) excavations at Cerro Azul and Cerro del Oro, in the valley of Cañete, a large valley, as Peruvian coastal valleys go, but containing no town of much importance. The Cañete River, which has a large catchment area, maintains a considerable flow in all seasons, and the valley contains a number of well-known groups of ruins. Of the two sites under investigation, Cerro Azul is an imposing cluster of pyramidal ruins set immediately at the back of the modern port of Cerro Azul. Only one culture is represented here, belonging to the Late period, more or less synchronous with the Inca dominion, though no doubt partly antedating it. It is very similar to the Late Chincha culture, previously described by the author and other investigators. The Cerro del Oro is a nearly free-standing hill about four kilometres inland. It is connected by a low saddle with hills beyond, but otherwise is surrounded by ditches and cultivated lands. San Luis, a kilometre to the south-east, may represent an ancient settlement of which the inhabitants used the hill for their cemetery. It contains no remains of a non-funerary character. Many thousands of burials represent two cultures. One is the Late Cañete culture; the other, here provisionally called Middle Cañete, is shown to be earlier by its stylistic affiliations and by an established stratification. The Middle Cañete culture is characterized by skulls deformed fronto-occipitally, structures of small cubical hand-made adobe, a scarcity of metal, and by pottery and textiles, which show some Nasca influence, but no direct Tiahuanaco influence. The Nasca elements in the pottery are of Late Nasca type. On the other hand, there are occasional elements which suggest later Peruvian styles of the coast, Late Ica especially. While it has distinctive stylistic elements, the Cañete Middle is post-Early and pre-Late chronologically; but the absence of Tiahuanaco elements makes chronological correlations with other Middle period cultures uncertain.

Horned Ruminants of North America

THE deer, antelopes and other horned ruminants now existing in North America are few in number and give no hint of the vastness of the fauna inhabiting the continent in Tertiary and Quaternary times, of which they are the veriest remnant. This is brought out with great effect in the monograph on the horned ruminants of North America by Childs Frick (*Bull. Amer. Mus. Nat. Hist.*, **69**, 669, 103 text figures; 1937), a worthy companion to the similar volume previously published on Siwalik fossil deer and antelopes. The evidence upon which the account is based consists of more than 7,000 fossil skulls or parts of skulls, horns and limb bones. Most of the still-existing forms have been identified in the superficial deposits of the Ice Age, but so far only the prong-horn and deer groups have been found in the much older deposits of Late and Middle Tertiary. Even in glacial deposits, however, the modern types are associated with distinctive species which must have become extinct long before the advent of white races to America. It is difficult to account precisely for the impoverishment which has taken place since the great assemblage of the Tertiary fauna, but changes in topography and climate, accompanied by the shifting of faunas and the ravages of predators of both the animal and the plant world have played a great part. To these in latter days the destructiveness of man has been added, and the preservation of the remnant of a once magnificent and diversified fauna now lies in his hands.

Biological Races in Fruit-Flies

IN the *Canadian Journal of Research*, **15**, Sec. D, March 1937, Mr. A. D. Pickett gives an account of an investigation of the biological and morphological relations of certain species of flies belonging to the genus *Rhagoletis* of the family Trypetidæ. The author concludes from his observations that the practice of separating species on the basis of very slight morphological characters, which may all be the result of influences exercised by the particular plant host in which any such species has developed, is open to criticism and of doubtful soundness. The forms of the genus in question, which develop in apple, hawthorn and blueberry, were studied extensively with the view of ascertaining their relations to their hosts. The conclusion is reached that one species, namely, *Rhagoletis pomonella*, is involved, and that the female insects show a decided preference for laying their eggs in the plant host in which they themselves have developed during the larval instars.

Anatomy of the Carpel

DR. MABEL S. FRASER has recently published a very thorough study of the vascular supply to the carpels in the follicle-bearing Ranunculaceæ (*Trans. Roy. Soc. Edin.*, **59**, Pt. 1, 1936–7). This study brings into prominence the variations in the vascular supply not only in the different genera but also within the individuals of the species, and shows that caution is necessary in attaching wide evolutionary significance to isolated facts of anatomy. She adduces evidence of a carpellary trace of five vascular strands in many genera, as *Caltha* and *Trollius*, two strands running between midrib and marginal strands, and concludes that the primitive carpel may have been a palmately veined structure with a five-trace supply. The secondary vascular supply in the carpel wall varies widely within the species, but in the majority of genera it arises as a branch system from the marginal veins. In *Trollius* and *Caltha* there is variation in the vascular supply to the style which, in one gynæcium, may be provided by midrib or marginal bundles or both. On the whole, the author's position brings her near to the interpretation of the carpel advanced by Prof. A. J. Eames, but the paper is valuable for its wealth of anatomical data and the conservative and cautious treatment they receive. The author concludes that our knowledge of the putatively primitive angiosperm only suffices to show "the tremendous gap in our knowledge of the probable primitive Angiosperm from which our present-day carpel arose".

Cytology and Genetics of Cotton

A FURTHER study of the chromosomes and their pairing in various hybrids of *Gossypium* has been made by Dr. A. Skovsted (*J. Gen.*, 34, No. 1). He concludes that the results confirm the division of the genus into three groups: (1) the cultivated New World cottons and certain wild species from America and the Pacific Islands, with $2n=52$ chromosomes; (2) wild species from America and the Pacific Islands having $2n=26$; (3) species from Africa, Asia and Australia, all having $2n=26$. In hybrids between members within each group the chromosome pairing in meiosis is almost normal. In hybrids between groups (2) and (3) the conjugation was incomplete and variable, while hybrids between members of (1) and (2) generally showed 13 bivalents and 13 univalents. From these and other results the inference is drawn that the genus *Gossypium* is monophyletic, with an early separation between the American and the Old World diploids. The New World tetraploids are believed to have originated from a hybrid between Asiatic and American diploid species. From the secondary pairing in American wild species, it is suggested that 13 is a secondary polyploid number from 6, five chromosomes being duplicated and one triplicated. In the same journal, Dr. S. C. Harland has investigated the inheritance of red petal spot in a series of *Gossypium* hybrids. By successively backcrossing plants of *G. purpurascens* heterozygous for spot with a spotless *G. hirsutum*, the spot was progressively weakened in the segregates and the tendency of the spot gene to show somatic and gametic mutation was greatly increased. From these and similar results it is concluded that the species of cotton may possess a complex of modifiers, the general effect of which is to preserve the stability of the genes and prevent them mutating at an excessive rate.

Distribution of Deep-Focus Earthquakes

MR. S. YAMAGUTI has made an interesting study of the distribution of 241 deep-focus earthquakes recorded in the "International Seismological Summary" for the years 1919–30 (*Bull. Earthq. Res. Inst.*, 15, 170; 1937). The epicentres are plotted on a map of the world, and four lines are drawn in various regions surrounding those in which the focal depths are greater than 700, 500, 300 and 100 km. The regions of very deep foci are near Japan, in the middle of South America, the southern part of the Philippines, and the ocean east of Australia. On the Mediterranean coast, deep-focus earthquakes do not exist, while in North America they are rare. By projecting the foci of those in South America on a vertical plane containing the equator, the points obtained tend to lie on a zone through the middle of the continent and inclined towards the Pacific with a slope of one in five from the horizontal.

Troublesome Radio Echoes

IT is well known that radio signals passing between two points on the earth follow great circle paths, the radio energy being confined only by the earth and the ionosphere. There are two directions that a radio signal can take in passing from London to New York. One path extends westerly in the great circle plane and the reverse path extends easterly. As the latter has much the longer distance to travel, it arrives later, and may interfere with the former, causing an 'echo'. Short-wave transmission over long distances depends largely on the reflection of the waves between the earth and the ionized layer high overhead. In a paper by A. C. Peterson on "Around-the-World Radio Echoes" published in the *Bell Laboratories Record* of March, an account of the difficulties that radio engineers have to overcome is given. The altitude of the reflecting layer varies from 60 miles to 150 miles in height. The reflecting behaviour of this layer depends both on the frequency of the waves and on the exposure of the layer to light from the sun. When the layer is in darkness, frequencies greater than 10,000 kilocycles are generally not reflected and so transmission is poor. When the layer is illuminated, these waves are reflected and long-distance communication becomes possible. Observations show that the average intensity of the echoes varies in about the same way as the percentage illumination at different seasons of the year. Owing to the long round-the-world path, the echoes are considerably attenuated, and so a double or a treble echo is difficult to observe. Oscillograph records are given which show the echo plainly. The echo signal is rarely found to have a serious effect on the intelligibility of fixed carrier radio-telephone circuits.

Finite Elastic Deformations

IN the classical theory of infinitesimal deformations a fundamental principle (Hooke's law in its most general form) is equivalent to the statement that, in a virtual displacement of the strained elastic medium, the virtual work of all the forces, both surface and body, acting on the medium, may be obtained by integrating over the medium the scalar product of the stress tensor by the variation of the strain tensor. F. D. Murnaghan (*Amer. J. Math.*, 59, 235; 1937) shows that this principle is merely an approximation, valid in the infinitesimal theory, but not valid in the finite theory, in which the variation of the strain tensor must be replaced by the space derivative of the virtual displacement vector. Fortunately the exact equations for an isotropic solid are sufficiently simple to yield numerical results, which the author compares with the experimental data obtained by P. W. Bridgman, showing a remarkably close agreement. A treatment of the Young's modulus experiment gives a qualitative explanation of the yield point phenomenon, which cannot be explained by the classical theory.

Is τ Tauri a Double Star?

MR. BERTRAND M. PEEK has published a short paper (*J. Brit. Astro. Assoc.*, 47, 6, April 1937), with the title, "Occultation of τ Tauri". On January 22 he observed that the star was occulted with a succession of flickers, the process lasting about 0·4 second. On referring to his notes of February 1929, he found that he recorded the star as going out in two stages. He suggests that it is a double star, the separation not being less than 0·2″. It is worth noticing that Mr. G. F. Kellaway at Yeovil saw a similar phenomenon with this star on January 22, a fainter star continuing to be visible at least 0·5 sec. after the observed time of disappearance. Mr. Peek points out that the star will not be occulted in Great Britain before 1947, but a series of occultations will occur in the southern hemisphere until the end of the present year, and observers are asked to pay particular attention to the manner of disappearance.