Research Items

Votive Offerings from Chichen Itza, Yucatan

ACCORDING to a recent announcement of the Carnegie Institution of Washington, D.C., some remarkable votive or possibly foundation offerings were found in the course of recent excavations at Chichen Itza, the famous city of the New Empire of the Maya of Yucatan, which flourished from the middle of the eleventh century of our era almost down to the coming of Columbus and the time of the Spanish conquest. The Carnegie Institution, which is working in co-operation with the Bureau of Pre-Hispanic Monuments of the Mexican Government, has been engaged in the exploration of El Castillo, the pyramid temple of the Maya god Kukulcan. This temple, built on top of a pyramidal structure, encloses completely, it has been found, an earlier temple and pyramid—a method of construction followed elsewhere in Yucatan. Excavation for the purpose of exploring the inner temple has led to some remarkable discoveries. In 1935, for example, a rectangular treasure box of limestone was found at the foot of a stairway. Its lid was a single stone, two and a half feet long by two feet wide. Among its contents were two turquoise mosaic plaques of great beauty, necklaces of coral, turquoise and jade, carved jade beads and pendants, and about 2,000 loose button-shaped beads of turquoise. The later find, made last season, was even more remarkable. In the inner chamber of the buried temple, of which the back wall was studded with the heads of human femora, presumably from sacrificial victims, there was found another box of squared limestone blocks, inside which was a throne fashioned from a single block of stone carved to represent a jaguar and painted a vivid red. The spots of the jaguar are represented by inlays of apple-green jade. The eyes are large hemispherical pieces of jade, the teeth and fangs of hard white stone. Its greatest length is two and three quarter feet, its greatest height to the top of the head, two and a quarter feet. Resting on the jaguar were a turquoise mosaic plaque, a shell necklace and a carved jade pendant. With much wisdom and judgment, the Mexican Government has decided that these finds shall remain *in situ* for the inspection of students and visitors.

Population Study of the Song Sparrow

MARGARET M. NICE has published a study, which extended over eight years, of a song sparrow population ("Studies in the Life History of the Song Sparrow 1. A Population Study of the Song Sparrow", *Trans. Linn. Soc. New York*, **4**, April 1937. 1 dollar 50 cents). Each adult bird was marked individually with coloured bands. The various aspects of the life-history are clearly set out, from which a selection follows. The bird is a partial migrant at Cleveland, Ohio. About half the nesting males are resident, about half migrate. Of the females, only a tenth to a third are resident. A few individuals of both sexes changed status in different years. There was no evidence that the males with the larger territories, more vigorous song or brighter plumage, were more successful than their fellows in obtaining mates. There is not apparently, a reservoir of unmated birds of either sex to fill gaps due to mortality in the breeding season. The influence of warm waves of temperature on the commencement of song, migration and egg-laying is observed, and graphs show that the temperature-threshold at which each occurs is different at different times of year. Young often settled near their parents' territories, of which detailed genealogies are given, and one brother and sister mated. There is a detailed analysis of nesting success and survival of young and adults, and in a discussion of population limitation the importance of local changes in the environment is stressed. Territorial behaviour is considered to prevent over-crowding. There is also detailed information on weight, eggs, feeding times and other aspects of the breeding biology, and one chapter discusses the habits of the parasitic cow-bird. This is an important monograph, and the Linnean Society of New York has rendered a real service to ornithology by publishing it at such a moderate price.

Pituitary Extracts and Gastric Ulcers

A SERIES of papers by Prof. E. C. Dodds, working with various collaborators (*Proc. Roy. Soc.*, B, **123**, 22; 1937), gives a full account of some interesting observations on the effect of extracts of pituitary on the stomach. It has been found that extracts of the posterior pituitary containing the pressor principle produce gastric ulcers when injected in large doses into various animals. This observation provides a new way of studying methods of treating gastric ulcers. The production of ulcers appears to be due to the fact that the extracts inhibit gastric secretion, whether this secretion is due to histamine, insulin, sham feeding or pilocarpine. The action is primarily on the volume of the juice secreted. A continuous secretion of juice is probably necessary to protect the mucous membrane. A method is described for recording the gastric secretion and the blood flow simultaneously in an anæsthetized cat's stomach. Stimuli causing secretion induce increased blood flow and if the increase in blood flow is prevented, secretion does not occur. The injection of pituitary extracts inhibits both blood flow and secretion. In normal animals blood flow and secretion are closely co-ordinated, but after hypophysectomy this co-ordination disappears. The possible significance of these results is widened by the observation that pituitary extracts have a similar action on pancreatic secretion. These facts are possibly related to the action of these extracts on the excretion of urine.

Early History of the Potato

DR. R. N. SALAMAN delivered the Masters Lectures of the Royal Horticultural Society last autumn, on "The Potato in its Early Home and its Introduction into Europe" (*J. Roy. Hort. Soc.*, **62**, Parts 2, 3, 4 and 6; 1937). A mass of archæological material has been marshalled to show that the potato was cultivated in South America at least so early as A.D. 200. Many representations of the tuber as a motif for the pottery of several epochs of South American history are illustrated, and show that the life of the Indian was closely linked with this plant.

Dr. Salaman also shows that the potato satisfied the conditions demanded by the physical setting of the Inca civilization, and provided a supply of food where the cereal grains failed. He agrees with Vavilov, Bukasov and other Russian investigators, that potato cultivation originated in two distinct areas—in the plateaux of Peru and Bolivia, and in Chile and the island of Chiloe. The Russians believe, on botanical grounds, that the southern focus of development supplied the ancestry of our present-day 'Irish' potato; but Dr. Salaman, using arguments provided by history, believes that the Peru-Bolivian source is much more likely. The potato entered Europe by two channels, namely, by way of England, and via Spain. Introduction into England, according to Dr. Salaman, cannot be readily dissociated from the names of Drake and Raleigh, in spite of the modern tendency to deprive these gentlemen of the honourable place in horticulture which tradition assigns to them. Dr. Salaman has ante-dated the first record of potato culture in Europe by fifteen years, with his proof that tubers were grown in the neighbourhood of Seville in 1572. He has also established the documented history of the crop for a very early period.

Fault-movements and the Safety of Reservoir Dams

IN searching for reservoir sites among the coast ranges of California, engineers have found the most satisfactory features in certain fault-line valleys. The major faults of the district—the San Andreas, Hayward and Calaveras faults—have made possible the development of longitudinal valleys along parts of their courses, valleys so narrow that they can be closed by dams of moderate length. Dams have, indeed, been made across each of the three faults mentioned, and the question has been asked: Can a safe dam be built in a fault-line valley of a presumably active fault? Mr. G. D. Louderback has endeavoured to answer the question and to state the conditions that should be satisfied in their construction (*Bull. Seis. Soc. America*, **27**, 1–27; 1937). He shows how the activity of a fault may be determined by mapping the epicentres of recurring small earthquakes, and the map given of the three faults with the centres of the earthquakes of the years 1932–35 clustered along a great part of the course of each, reveals that they are all definitely active faults. The experience of past earthquakes makes it clear that provision must be made for a horizontal displacement of 15–20 ft. and a vertical one of 5–10 ft. The dam should therefore be 60 ft. wide at the crest with slopes of about 2 : 1. To avoid fracture, outlet pipes should be laid parallel to the active fault. Lastly, the dam and all its subsidiary structures should be built so as to resist a strong shock and also the effects of slumping and landsliding.

A Coefficient of Humidity

AMONG the series of papers of the State Meteorological and Hydrological Institute of Sweden is one (No. 11) entitled "A Coefficient of Humidity of General Applicability", by Anders Angström, which sets out certain ideas that were first discussed at the 1936 meeting at Edinburgh of the Union for Geodesy and Geophysics. The author points out the desirability of having some function which will indicate the humidity or aridity of any climate in respect of the soil, that is, which will take into account both the rainfall and the evaporation. A function of this kind was used by Lang in 1920, who took simply the ratio of the annual precipitation to the sum of the mean temperatures of the frost-free months divided by twelve, while Martonne in 1926 took the ratio of the annual precipitation to $10 + T$, where T is the annual mean temperature (in each of these two cases temperature is measured in centigrade). Angström suggests an alternative function, having the advantage over the two cited that it is a continuous function of temperature and can be used in the study of arctic climates. It is represented by the expression $1{\cdot}07^{-t}$, where t is the mean temperature. He finds that this function is closely proportional to the mean duration of precipitation for a month if the latter is measured in hundreds of minutes, and that it is very nearly equal to the humidity function of Martonne for monthly mean temperatures between 0° C. and 20° C. A table is given which enables the new function to be read off quickly in terms of t, and two maps show its distribution in January and July over north-west Europe and adjacent polar regions, including Iceland, Greenland and Spitsbergen.

Monomolecular Films

THE study of the orientation of the molecules in monomolecular films has become of such importance that Messrs. E. Havinga and J. de Wael, of the van 't Hoff laboratory of the University of Utrecht, have worked out a technique for the production and investigation of such films by electron diffraction methods, and have published an account of it in the issue of March 15 of *Recueil des Travaux chimiques des Pays-Bas*. The film in the case described was of barium stearate prepared on the clean surface of water and floated by lowering the water slowly on to a thin solid film of nitro-cellulose or of gold leaf placed below the surface of the water. The film of nitro-cellulose itself was prepared by placing a drop of a solution of nitro-cellulose in amyl acetate on a clean water surface. On evaporation of the solvent, a film of about 300 A. thick was produced. An electron tube producing electrons of about 40 kilovolts path was used, and it was found that in addition to the diffraction pattern due to the support, in each case a hexagonal pattern of spots was produced which is attributed to the barium stearite film. Full details of the most suitable technique are given.

Two Visual Binary Orbits

DR. R. V. D. R. WOOLLEY and L. S. T. Symms have recently published a paper in which they discuss the orbits of OΣ 38 (γ_2 Andromedæ) and β 101 9 Argus (*Mon. Not. Roy. Astro. Soc.*, **97**, 6; April 1937). Both stars have completed at least one revolution, so that the periods can be determined with considerable accuracy. Orbits have been already published, and those given by the authors have been obtained by applying differential corrections to previous orbits. A description of the method for applying these corrections is given in each case. The ephemeris for the first binary shows a very small separation near periastron, and micrometer measures here would be useless. It is suggested that an interferometer might be used in 1946–47 when the separation is $0''{\cdot}02$–$0''{\cdot}03$, as the star is bright. The period is 56 years (a year greater than the period found by Hussey), the eccentricity and inclination being 0·92 and 109·2° respectively. In the case of β 101, the eccentricity and inclination are also high, the values being 0·69 and 77·8° respectively. The period of this binary is 23·18 years.