

RESEARCH ITEMS

Peruvian Pottery

THE gap between the Early Chimú (or Mochica) and Late Chimú pottery has long troubled students of Peruvian archaeology, though Kroeber in particular has made great efforts to indicate the probable characteristics of a Middle Chimú style. Jorge C. Muelle (*Univ. California Pub. Amer. Arch. and Ethnol.*, 39, No. 3. 35 cents) despairs of finding pottery which may bridge the gap, and suggests instead that the Late Chimú pottery developed from metal prototypes, most of which have, for obvious enough reasons, disappeared. He points out many metallic features in the Late Chimú bucchero ware, and illustrates some interesting parallels between pottery and metal forms. The theory is ingenious, but it is difficult to regard it as altogether satisfactory. There are many points of similarity between Early and Late Chimú, and it seems improbable that lost metal forms can be the only link between two cultures so rich in pottery. Until the northern part of the Peruvian coast is more thoroughly explored, the possibility of finding an intermediate pottery style cannot be excluded. In support of his theory, the author makes a suggestion that the heavy stirrup-spouted "coastal Chavin" vessels were derived from metal forms, which were in their turn copied from Early Chimú stirrup spouts. In so doing he disregards the general belief that the coastal Chavin, or Cupisnique, style is earlier than Early Chimú, a belief which recent excavations by Rafael Larco Hoyle have done much to uphold.

Blood Urea Clearance of Indians

THE 'blood urea clearance' is widely used in clinical medicine as a measure of kidney function. The normal standards usually adopted are those of van Slyke for healthy Americans calculated to a standard body area of 1.7 m.². The figures are 54 c.c. for the standard clearance and 75 c.c. for the maximum clearance. C. Srikantia and D. Shamanna (*Proc. Ind. Acad. Sci.*, 19, 121; 1944) have found that the corresponding average figures for healthy Indians from the Province of Mysore are 36 c.c. for the standard clearance and 47 c.c. for the maximum clearance. Grokhale (*Ind. J. Med. Res.*, 3, 627; 1941) found very similar figures for Bombay Indians. The figures suggest that the Indian kidney has only about two thirds the efficiency of its American counterpart; but whether this is true or not, it is obvious that a new and lower 'normal' standard will have to be adopted for clinical work on Indians. The first authors suggest that the lower clearance of Indians is related to the lower protein content of their diet.

Utilization of Metabolic Water in Insects

IT has often been suggested that insects developing on substances with low water-content such as flour, grain, wool, etc., obtain their necessary water from the products of food combustion. Growth in insects normally living on such dried foods is faster and higher than at low humidities. Experiments were carried out by G. Fraenkel and M. Blewett (*Bull. Entom. Research*, 35; July 1944) with the flour moth *Ephestia kuehniella* and two beetles, namely, *Tribolium confusum* and *Dermestes vulpinus*. It was found that at lower humidities more food is eaten to produce a given unit of body weight, because part of the food is utilized as water. As a consequence of this, the

larva grows more slowly and its final size is smaller. It is shown for *Dermestes* at 30 per cent R.H. and *Ephestia* at 1 per cent R.H. that less than 32.9 and 7.6 per cent of the water in the pupæ can be derived from water ingested with the food. The authors consider that they have established beyond doubt that the insects in question, which normally live on very dry food, acquire a substantial, or, at extremely low humidities, the greater part of the water ultimately found in the body, from oxidation of food.

Heritable Wildness in Turkeys

IN a field study conducted in the Ozark region of Missouri, A. Starker Leopold has endeavoured to assess the ingredients which make up the adaptive condition of wildness in turkeys (*Condor*, 46, 133; 1944). His method was to compare various characteristics of the native wild turkey (*Meleagris gallopavo sylvestris*), of which free populations are notably successful in the Ozarks, with characteristics of hybrid and domesticated turkeys (derived from the Mexican race, *M. g. gallopavo*) the populations of which are partially or entirely unsuccessful there. Differences which appear to be directly or indirectly connected with relative wildness and domesticity are described under these heads: (1) wariness and tolerance of disturbance; (2) age of attaining sexual maturity, and the related development of secondary sex characters in males; (3) timing of the breeding cycle; (4) behaviour of hens and chicks in response to threatened danger, and the differential behaviour of chicks in the laboratory; (5) extent of moult in young birds; and (6) the relative size of the brain and endocrine glands. The original domestication of *M. g. gallopavo* was probably a gradual selective process by which the genetic constitution of the wild bird was modified to bring about a physiological adaptation to existence with man; while the wild condition of native turkeys is effectively maintained by a different set of selective factors in a natural environment.

Are Genes Related to Antigens?

A. H. Sturtevant (*Proc. U.S. Nat. Acad. Sci.*, 30, 176; 1944) and Sterling Emerson (*Proc. U.S. Nat. Acad. Sci.*, 30, 179; 1944) have published a most important hypothesis of a relationship between genes and antibodies. It was suggested by Haldane in 1935 that there might be a similar molecular configuration of the antigens to that of the gene which produced it. Hence the antibodies produced in reaction to the antigen might react also with the gene. The classic experiment of Guyer and Smith with the lens of the rabbit would be explained on the new hypothesis as follows: The antibodies to lens protein are free in the circulation of injected rabbits, and some combine with the genes in the germ track which are responsible for the specific lens-antigens. By so combining, the antibodies inactivate these genes, leading to the observed lens deficiency of the progeny. Thus a mutation is produced, but not in a manner analogous to a Lamarekian induction. S. Emerson treated *Neurospora crassa* with antisera from rabbits treated with mycelial filtrates of this fungus. Of 270 controls from untreated cultures crossed with a standard line *N. crassa* cultures none produced a detectable mutation; among 695 cultures from treated cultures crossed with the standard line there were 25 mutations. The author suggests that the mutations were direct results of reaction between the gene and its specific antibody. The far-reaching

effects of the hypothesis necessitate further experimentation on a large scale. Might it not be valuable to irradiate antibodies and to test their reactions with the originating genes?

Virus Disease of Lupins

D. O. NORRIS (*Aust. Coun. Sci. and Indus. Research Bull.* No. 170) describes the symptoms of a virus disease upon several species of lupin. The reactions of *L. varius* are peculiar in that the first stage of infection affects the leaves, which become distorted and lighter in colour and develop necrotic areas. In the second stage, which occurs after a resting period of a fortnight or more, a large number of spindly shoots arise to give a 'bunch-top' closed appearance. The main vector is *Myzus Persicae*, and infection may be carried over the hot dry season on *Cassia corymbosa*, peas, broad beans, and sweet peas. The degree of attack on five species of lupin is inversely correlated with the alkaloid content. This may be due to the unpalatability of high alkaloid plants, but *L. luteus* is low in alkaloid and is less susceptible to this mosaic disease.

Equation of State for Solids

BRADBURN'S equation of state for a solid cubic crystal of identical atoms uses the postulate that the mutual potential energy of a pair of atoms follows a law of the form $\phi = -ar^{-m} + br^{-n}$. R. Fürth (*Proc. Roy. Soc., A*, **183**, 87; 1944) has developed a method for determining the exponents m and n in the force law for a given element from measurements of the sublimation energy, the compressibility, the thermal expansion coefficient, and the dependence of these quantities on pressure and temperature. For many elements the predicted values of compression and thermal expansion are in satisfactory agreement with measurements up to very high pressures and to temperatures near the melting-point. The relation between melting and mechanical instability of the lattice is discussed, and a rule connecting the two phenomena is found to be closely related to Lindemann's law.

A 700-kV. D.C. Electrostatic Generator

A PAPER by J. F. Smee (*J. Inst. Elec. Eng.*, **91**, Pt. 1, No. 47, November 1944) covers in some detail the construction, development and operation of a Van de Graaff type of electrostatic generator, which was originally designed to give an output of 1 mA. at 700 kV., operating at atmospheric pressure. Under certain conditions, however, this current and voltage may be considerably exceeded. Assuming that a machine can be designed *ab initio* for a given output, an allowance must be made for certain factors which cannot be precisely predicted. It appears that in all probability each generator of the Van de Graaff type which differs from others in the details of its design and construction will have its own set of special problems, which must be solved empirically for that particular machine. As the generator was originally intended for research on nuclear physics in a restricted space, the overall dimensions were reduced to a minimum. The main advantages of this type of machine in connexion with acceleration-tube apparatus of any kind are its relative cheapness of construction and maintenance, the ease with which the polarity can be reversed, and its constant current characteristic, the latter being especially valuable in its avoidance of damage to the tube or associated apparatus in the event of accidental short-circuit, failure of vacuum, etc.

Wave Mechanics in Chemistry

IN his presidential address to the Chemical Society (*J. Chem. Soc.*, 340; 1944), Dr. W. H. Mills pointed out some of the simpler aspects of wave mechanics as they may most usefully be applied to chemical problems. The implications of the exchange integral and the broad theory of resonance are very clearly stated, and a detailed consideration of many actual examples shows that the ground-states of aromatic compounds may be represented as resonance hybrids in which the conventional structure is stabilized by contributions from electromeric modifications. Such matters as aromatic substitution, and the relation of five-membered heterocyclic compounds to the aromatic series, are dealt with in an interesting manner.

Titan's Atmosphere

THE March issue of *Sky and Telescope* has a brief note on Gerald P. Kuiper's discovery in January of the composition of Titan's atmosphere. The same subject is dealt with at greater length by Charles A. Federer, jun., in *Science Service*. It was known several decades ago that Titan had an atmosphere, but the difficulty of obtaining satisfactory spectra prevented any statement regarding its composition. Dr. Kuiper, of the McDonald Observatory of the Universities of Chicago and Texas, has photographed its spectra and has shown that it contains methane and ammonia, like Saturn. Although the gravitational pull of this satellite is only about one seventh that of the earth, and hence we should not expect it to retain an atmosphere, yet, owing to its great distance from the sun, it receives only about one per cent of the solar radiation which our moon receives. As a consequence, its temperature is very low, probably about -160°C ., and everything except methane must be frozen to the surface of the satellite. It is believed that clouds or droplets of ammonia are suspended in the methane atmosphere of Saturn, and probably the same is true of the atmosphere of Titan. A common origin for the satellite and its primary is indicated by the similarity of their atmospheres, in spite of the fact that the density of Titan is about five times that of Saturn. The low density of Saturn is easily explained, however, by assuming that a great portion of what we see is its atmosphere.

Orbit of Melb. 4 AB

W. P. HIRST has given revised elements for the two brighter components of this triple star (*Mon. Not. Roy. Astro. Soc.*, **103**, 6; 1943): These are compared with Voûte's elements, and it is shown that Voûte's eccentricity is too small, 0.551, as contrasted with 0.574 obtained by Hirst. Some of his other elements are also capable of improvement to a small extent. The corrections to all the elements, except the semi-axis major, were based on the angles only. Distances were not used because the earlier ones, especially those used by northern observers, occasionally show large residuals which appear, among certain observers, to be systematic. On the whole, the angle residuals are fairly satisfactory, though, as the table shows, between 1934.21 and 1934.62, there is a run of residuals of the same sign, and these (all by Voûte) have a systematic appearance. There is a long run of distance residuals from 1917.58 to 1928.53, and it is suggested that this is due mainly to low altitude or small aperture.