

RESEARCH ITEMS

Skin of Rebirth

DR. MAURICE CANNEY has collected a number of examples of the magical significance of animal skins among modern primitive peoples and compares it with belief current in ancient Egypt (*Man*, July 1939). Among the Bantus, children before reaching the age of circumcision had to go through a ceremony, the name of which means "to be born again". The child was invested in part of the skin and skin of the big stomach of a male sheep which had been killed by the father. It then had to go and lie on a bed by its mother and cry like a new-born infant. In funeral ceremonies of the elders, burial was not complete without a skin of a sheep or a bullock if the family could afford it. The corpse was laid out in the prenatal position and the skin, hair upward, laid upon it. Among the Ila-speaking peoples a corpse was first put in three dry skins. A great slaughter of beasts took place at a funeral. Five large oxen were called the wrapping-up cattle, because their skins were laid in the bottom of the grave, and wrapped around the corpse arranged in the prenatal position. Among the Lango it is noted that the corpse was carried to the grave in the sleeping hide of the deceased, and it was buried with him. Over the grave a sheep was killed for the funeral meal. The skin of this was worn afterwards on the head of the nearest relative. This evidence suggests the survival of an idea prevalent in ancient Egypt. In the legend of the Wandering of Isis in the Delta the goddess said to Horus *inter alia* that he was "the son of him that is in Mesqet" this being the name of the bull's skin, in which the deceased was placed to secure for him the new life. In the Egyptian religion the most important of the rites of initiation was one called the mystery of animal rebirth; and in it as depicted in the Theban tombs a priest is shown in a sleigh crouching under a skin in the position of a fœtus. When he comes forth from the skin, he is supposed to be reborn. Skins have the same significance in belief in India.

The Last of the Dinosaurs

THE Smithsonian Institution reports that in Upper Cretaceous rocks in central Utah explorations by palæontologists from the Institution have revealed considerable fossil skeletal remains of titanosaurs. The discovery is interesting because, although the presence of these gigantic plant-eating dinosaurs had been known from a wide area, including India, Indo-China, Madagascar, France and South America, only two bones found in New Mexico in 1921 had indicated their habitation of North America, until the Utah finds of the past two summers. Moreover, they and the horned dinosaurs and 'duck-bills' also represented in the same beds were amongst the latest to survive of the giant reptiles, and although no break has been found in geological conditions between these Upper Cretaceous beds and the succeeding Palæocene sufficient to suggest a cause for their sudden disappearance, there is a possibility that the formation constitutes a bridge between the closing of the great reptilian age and the dawn of the mammalian epoch. It may therefore yet yield a clue to two of the most momentous steps in the evolution of animal life.

Cytology and Taxonomy of *Calochortus*

THE genus *Calochortus* is a difficult one for systematists. By combined cytological and morphological study, J. M. Beal (*Bot. Gaz.*, 100, 528-547; 1939) has defined the limits of some sections of the genus. Of 28 species, those with $n = 10$ and capsules winged on the angles are placed in *Eucalochortus*, while the remainder with a basic chromosome number other than 10 are placed in *Mariposa*, except one, *C. plummeræ*, $n = 9$, which is placed in *Cyclobothra*. Seven is considered to be the basic number of *Mariposa* and possibly of the genus. Evidence is given suggesting ways in which other chromosome numbers have been derived from seven.

Food Value of Broccoli

E. Vanstone and C. E. H. Knapman (*J. Pom.*, 17, 85; 1939) have determined the amounts of nitrogen, phosphorus, potash and lime removed from the soil by Rosecoff broccoli grown in different localities on commercial farms and on experimental plots at Seale Hayne. They found that the composition of the plant was approximately constant regardless of location and manuring. The average amounts of minerals removed from the soil per acre were: potash 240 lb., nitrogen 204 lb., lime 110 lb., and phosphoric acid 70 lb. Good quality curds differed from those of inferior quality ('soft curds') by having a higher percentage of potash and lower nitrogen. Plants sown in April and transplanted in June, grew most rapidly during September, October and November and matured the following April. Minerals were absorbed continuously throughout the growing period. The composition of the dry matter of the curd was compared with that of dried milk and found to be higher in protein (40 per cent), higher in ash (12 per cent) and equal in carbohydrate (36 per cent). The curd is evidently a highly nutritious food, rich in protein and mineral matter but deficient in fat. The leaves of the broccoli plant account for half the total dry weight, and though these are not used for human consumption they represent a valuable food for cattle, especially for dairy stock. They compare favourably in protein, oil and carbohydrate content with palm kernel cake and young grass, and are superior to these in that they contain less fibre and more mineral matter.

Nodule Organisms of the Leguminosæ

THE discovery, towards the end of last century, of the peculiar symbiotic nitrogen metabolism of leguminous plants was quickly followed by the knowledge that each plant species required a particular strain of the appropriate organism, *Pseudomonas radicumicola*. This led in practice to the tabulation of plant-bacteria groups, but certain difficulties arose, and necessitated a re-survey of the whole question. J. K. Wilson undertook this task upon an adequate scale, and his results have recently been published (*Cornell Univ. Agr. Exp. Sta. Mem.* 221, Ithaca, U.S.A., March 1939). More than 12,000 tests were made with about 200 plant species from 70 genera, and 32 strains of the organism, all made under sterile conditions. This imposing volume of experimental

result leads to the conclusion that plant-bacteria groups are likely to be somewhat tentative. They should still be useful in practice, but several plants which had not previously been assigned to a group could be placed in the present investigation, in as many as twelve of them. Other plants, moreover, will symbiose with almost any of the strains. *Phaseolus coccineus* and other species have symbiosed simultaneously with four or five strains of the organism. Morphological studies have also been prosecuted, and it is further suggested that organisms with restricted range of symbiosis are predominantly monotrichic, whereas those with extended symbiosis include also forms with several flagella.

Structure of Proteins

THE picture of the structure of proteins proposed by Emil Fischer regards them as polypeptide chains, and this has been extended by the assumption of hydrogen bonds and other weak interatomic forces acting between chains and their parts. The so-called cyclol hypothesis postulates hexagonal rings resulting from the transfer of hydrogen atoms from secondary amino to carbonyl groups with the formation of single C—N bonds. In a comprehensive paper, L. Pauling and C. Niemann (*J. Amer. Chem. Soc.*, 61, 1860; 1939) review several lines of experimental evidence bearing on this question. X-ray work is not regarded as providing satisfactory evidence for the cyclol theory, and several investigations have provided strong (but not rigorous) evidence for polypeptide chains in fibrous proteins. The great complexity of proteins, however, makes it unlikely that a complete structure determination by X-ray methods is possible. Heats of combustion and bond energies show that the cyclol structure cannot be of primary importance for proteins; a cyclol structure would be considerably less stable than a polypeptide one. Interatomic distances in the cyclol structure have improbable values, and the presence of large numbers of hydroxyl groups postulated in it seems to be negatived by experiments on the acylation and alkylation of proteins. No simple substances with the cyclol structure have been synthesized so far. Among the arguments used in favour of the cyclol hypothesis, that of the total number of amino acid residues per molecule, and a further modification involving imino acids, are said to lack force. Recent evidence shows that proteins in films have the polypeptide structure. The authors give a concise summary of their own views on the protein problem. They believe that the chains or rings contain many amino acid residues, usually several hundred. A native protein molecule possesses a definite configuration involving the coiling of the polypeptide chain or chains in a definite way, brought about mainly by hydrogen bonds. A wide range of configurations is regarded as probable. The number of each individual amino acid residue and the total number of all amino acid residues in the molecule can be expressed as powers of the integers two and three, and there is perhaps some significance in the number 288 of residues in the simple proteins.

Reactions of Methyl Radicals

AN extension of previous work on the reactions of methyl radicals has just been published by H. S. Taylor and J. O. Smith (*J. Chem. Phys.*, 7, 390; 1939). Methyl radicals, produced by the photolysis

of mercury dimethyl, were allowed to react with deuterium, ethane, normal and *iso*-butane, and neopentane, and the amounts of methane and ethane formed were determined. The plot of the logarithm of the rate of formation of methane against $1/\text{temperature (abs.)}$ is a straight line for all the reactions. To obtain a satisfactory mechanism for the reaction between mercury dimethyl and hydrogen or deuterium proved troublesome because of the number and variety of facts which the mechanism was required to satisfy, but it has been successfully accomplished. The most important of these facts are that both in the absence and in the presence of hydrogen or deuterium the formation of ethane remains unchanged; formation of methane increases with temperature and so does the rate of decomposition of the mercury dimethyl; formation of ethane shows first-order dependence on light intensity, whilst formation of methane shows an order between one-half and the first power, tending to the first power with increased temperature; packing the vessel, at 200°, cuts down the amount of methane formed but does not affect the amount of ethane; and the rate of decomposition of mercury dimethyl is independent of its concentration. For the interactions with the hydrocarbons the suggested mechanism is (i) $\text{CH}_3 + \text{RH} = \text{CH}_4 + \text{R}$; (ii) $\text{R} + \text{CH}_3 = \text{RCH}_3$; (iii) $\text{CH}_3 + \text{CH}_3 = \text{C}_2\text{H}_6$. From the rate of formation of methane the following activation energies for the reactions of methyl radicals with hydrocarbons, assuming zero activation for ethane formation, have been deduced: ethane and neopentane, 8.3; *n*-butane, 5.5; *iso*-butane, 4.2 kg.-cal. The differences in activation energies are attributed to differences in bond energies, particularly because of the closely analogous differences observed by Kistiakowsky in the heats of hydrogenation of substituted ethylenes.

Motion Pictures of Small Chromospheric Flocculi

SOME interesting facts on chromospheric phenomena are given by Robert R. McMath in a recent paper with the above title (*Mon. Not. Roy. Astro. Soc.*, 99, 7; May 1939). In August 1938, Mr. H. E. Sawyer was taking motion pictures of a dark hydrogen flocculus at the McMath-Hulbert Observatory, and displaced the second slit one half angstrom towards the violet with the object of registering a portion of the flocculus which showed velocity in the line of sight when examined in the spectrohelioscope. Sufficient exposures were made to provide a run on the screen when the spectroheliograms were shown by means of a motion picture projector. The motions of the small, dark flocculi were clearly seen, and it was obvious that a motion picture of the fine chromospheric detail had been secured. When the experiment was repeated with the second slit displaced one half angstrom towards the red, the pictures showed the same phenomena, but not so definitely. The author describes the surface of the sun seen in these pictures as like "an ocean viewed directly from above, and covered completely with short and choppy billows in a constant progression of irregular growth and recession". Accurate determination of the mean life-period of the flocculi involves careful identification of the markings measured on successive motion picture frames. For this purpose a high speed in taking individual frames is necessary, perhaps as high as eight per second, and it is hoped that sufficient material will be at hand this summer to undertake such research.