

Research Items

Early Man in New Mexico

IN view of the discovery by Mr. E. B. Howard of stone artefacts attributed to Folsom man in association with the fossil remains of extinct mammals in what he termed "blow-outs" near Clovis, New Mexico, it is essential for chronological purposes that the geological character of these formations and the conditions in which the remains and artefacts were deposited should be clearly understood. This question was investigated by Messrs. Chester D. Stock and Frances D. Bode of the California Institute of Technology (*Proc. Acad. Nat. Sciences, Philadelphia*, 88, 1936). The "basins"—a term preferable to either "blow-out" or "lake", which are misleading—are depressions, usually several hundred feet in diameter and two to ten feet in depth, in a long shallow trough, the Black Water Draw, from five to ten miles wide, which originates some thirty miles south-west of Clovis. The basins have been formed by wind-action, which has scoured the soil and underlying sediments of the centre, piling it up as sand dunes on the periphery, down to the Blue Sand (a blue-grey sandstone), which forms a smooth flat unbroken floor. As the Blue Sand is cut away—in the centre to a depth of four or five feet—flat benches with steep vertical banks develop. Residual areas capped by Blue Sand are left standing on the floor like islands. Erosion does not proceed beyond the Blue Sand. Probably the Blue Sand underlies the entire floor of Black Water Draw near Clovis. Masses of broken bones are found weathering out of the Blue Sand. These include bison, horse, elephant and camel. Flint chips are abundant on the floor of every basin, and several types of artefacts are associated with them. Artefacts of the Folsom or Yuma type occur only where the Blue Sand has been dissected. Convincing association with fossil mammal material was demonstrated in at least two basins, the Gravel Pit and Anderson Lake. Charcoal suggests a fire, but not necessarily of human origin, as it may be due to spontaneous combustion. The stratigraphic and physiographic relations of the Blue Sand to the present landscape suggest that it is possible to assign a very recent age to the deposit. It dates back to a pluvial period when the rainfall was greater than it is to-day; but this period does not necessarily fall into Pleistocene times.

Apparent Transformation of one Virus into Another

THERE are two inoculable tumour-diseases of rabbits, somewhat similar in appearance, and both caused by ultra-microscopic filterable viruses. One, rabbit myxoma, is malignant and always fatal; the other, rabbit fibroma, is never fatal and ultimately ends in recovery. A curious fact recently observed is that animals that have recovered from an attack of fibroma are unsusceptible to myxoma, and cannot be inoculated with it. According to Science Service, Dr. George Berry has reported at the meeting of the American Association for the Advancement of Science at Rochester, N.Y., that when active fibroma virus is mixed with myxoma virus killed by heating and the mixture injected into rabbits, the animals develop the deadly myxoma and die. That is to say, the benign fibroma virus by admixture with dead

myxoma virus is apparently transformed into the myxoma virus. Controls with the dead myxoma virus alone had no effect. Further details respecting this important observation, which has been repeated many times, will be awaited with interest.

Microbiology of Australian Soils

THE results of a study, at different ranges of temperature, of the rate of decomposition of organic matter in soil in relation to the numbers of micro-organisms present are detailed in a recent paper by Mr. H. L. Jensen (*Proc. Linn. Soc. N.S.W.*, 61, 27-55; 1936). The decomposition rate was measured by the carbon dioxide production. In soils to which there had been no addition of organic matter, the carbon dioxide production was generally 100 per cent stronger at 28° than at 15° C., and some 50 per cent stronger at 37° C. than at 28° C. At each temperature, there was a significant correlation between daily yields of carbon dioxide and direct counts of bacteria. Growth of fungi was more extensive in sand soils than in loam soils, but no correlation was found between density of mycelium and yield of carbon dioxide. Decomposition of the soil's own 'humus' seems to be carried out almost entirely by bacteria, the accelerating influence of increasing temperature being due to stimulation of the metabolic activity of the bacteria. In soils to which various undecomposed plant materials (straw, hay, fungal mycelium) had been added, the rate of carbon dioxide production increased steeply with rise of temperature from 5° C. to 37° C. Significant correlations appeared between daily yields of carbon dioxide and densities of mycelium, and also between yields of carbon dioxide and direct counts of bacteria, but not between carbon dioxide yields and plant counts. The efficiency of the organisms decreased rapidly with advancing time. The fungi appeared to be important agents of decomposition during the earlier stages when the most intensive destruction of organic matter takes place. It is suggested that, especially at 28° C., their carbon dioxide production may considerably exceed that of the bacteria; with advancing degree of decomposition they cease to be of importance. The decreasing rate of decomposition of added organic materials, together with the increasing accumulation of microbial substance, seems to offer an explanation for the increasing accumulation of 'humus' with decreasing soil temperature.

Californian Shrimps of Commerce

MR. HUGH R. ISRAEL'S researches on the commercial shrimps of California are interesting and instructive ("A Contribution Towards the Life Histories of Two Californian Shrimps, *Crago franciscorum* (Stimpson) and *Crago nigricauda* (Stimpson)"). Division of Fish and Game of California. Bureau of Commercial Fisheries. Fish Bull., No. 46, 1936). Both species move towards the ocean as the spawning season approaches, and the eggs hatch in water of high salinity, the young shrimps migrating farther inshore into less saline water, and as they grow larger gradually moving into deeper water. Both species breed at the end of their first year, and soon afterwards disappear from the commercial catch, the main

breeding season being December–May or June for *Crago franciscorum* and April–September for *C. nigricauda*. A very large catch of *C. franciscorum* in 1932 was made after the breeding season had ended, and one of *C. nigricauda* corresponded exactly with the breeding season. It is suggested that as in May and June 1933 the expected increase of this species did not occur, the heavy inroads made during the spawning season of the year before may be responsible. Very little is known about the planktonic larval stages of their shrimps, although it is presumed that they are similar to those of *C. vulgaris*. The latter species, however, may breed close inshore, and it would be useful to make a careful survey of the larvæ of these two Californian shrimps. The post-larval stages are taken at a considerable distance from the ocean in the shallow water of tidal flats and shoals.

Cercospora Leaf-Spot of Tobacco

A DISEASE of tobacco caused by the fungus *Cercospora nicotianæ* has attained severe proportions in the tropical areas of Queensland, Australia, the Dutch East Indies, Rhodesia and Nyasaland. The organism may produce spots upon leaves of the host at any stage of growth, and if it occurs in epidemic form shortly before the harvest, it results in a very destructive 'barn spot' during the process of curing. Mr. A. V. Hill has made a thorough study of the disease (*Bull.* 98, Coun. Sci. and Ind. Res., Australia, Melbourne, 1936), and shows that it can attack twelve species of *Nicotiana*, in addition to the thorn apple and *Nicandra physaloides*. The optimum temperature for growth of the fungus is 26° C., and outdoor temperatures of this order, combined with rainy periods, greatly aggravate the effects of the malady. Seed from infected capsules is capable of transmitting the disease to a subsequent crop grown from it, and the main control measure lies in the use of healthy seed. Many other aspects of the problem are discussed in the paper, which has also seven excellent plates illustrating symptoms and the causal organism.

The Angiospermic Carpel

DR. I. V. NEWMAN has published (*Proc. Linn. Soc. N.S.W.*, 61, 56–88; 1936) details of his studies of the floral apex of *Acacia longifolia* and *A. suaveolens*, which have induced him to champion the old theory of the origin of the carpel, and to criticize theories advanced in recent years by a number of investigators. After discussion of the evidence he concludes that (i) the legume is a lateral structure, (ii) the legume is a single, folded structure, (iii) the legume is not a foliar structure; and considers that in the two species dealt with there is no reason for doubting that the legume is of foliar nature and that it is reasonable to interpret the flowers of these species as modified leafy shoots. The subject has recently been under notice in the columns of NATURE (137, Jan. 11; March 14, 1936).

Lunar Periodicity of Earthquakes

OF the three laws that Perrey stated as governing the lunar frequency of earthquakes, the third, according to which earthquakes are more frequent when the moon is near the meridian than when it is at a distance of 90° from it, has suffered most from recent criticism. Mr. M. W. Allen (*Bull. Amer. Seis. Soc.*, 26, 147–157; 1936) urges, however, that this criticism depends on statistics obtained from large areas, and takes no

account of the strike or hade of the faults concerned. He has, therefore, considered the earthquakes during about forty-five years that originated within five or ten miles from three great faults in California. The earthquakes were grouped in different intervals of time, and harmonic analysis was applied to the numbers of shocks within lunar hour angles of 30°. Mr. Allen shows that, for the second harmonic alone, that associated with the semi-diurnal lunar effect, does the epoch incline towards constancy. Moreover, the amplitudes of this harmonic are more prominent than the others, ranging about 0.25 and being in some intervals nearly four times as great as that required by Schuster's test. It is thus difficult to escape the conclusion that "the semidiurnal lunar tidal forces have in some manner acted to determine the moment of occurrence of a significant number of the shocks of the region of the San Jacinto, Agua Caliente, and Elsinore faults".

Cosmic Rays

THE July issue of the *Journal of the Franklin Institute* devotes 81 pages to the report of the work of the Bartol Research Foundation 1934–35, made to the members of the Institute by Dr. W. F. G. Swann, the director of the Foundation. Almost the whole of the work during that period has centred around cosmic rays which have been investigated at ground-level, and at various altitudes up to 4,300 metres in Peru, Panama, Mexico and at stations in the United States up to 45° N. latitude. The 45 figures given enable the general reader to follow with ease the descriptions of the apparatus used and the results obtained. So far as they relate to the variation of the radiation with the latitude of the place of observation and angular distance from the zenith of the point from which they emanate they confirm the results of other observers, and they supply new facts as to the efficiencies of radiations from different directions in producing the secondary effects known as cosmic ray bursts. Dr. Swann concludes that the primary cause of the rays as measured is in the main an electrically charged particle of which the energy and the energy of the radiation measured is absorbed more rapidly when it is small than when it is large by its passage through the atmosphere.

The Compton Effect

IN the June issue of the *Review of Scientific Instruments*, Prof. E. L. Hill, of the University of Minnesota, reviews the recent work on this effect, and shows that the simple quantum theory of it, hitherto thought adequate, requires revision. That theory gives when a photon impinges on an electron: (1) the angle of deviation of the photon and its change of frequency, (2) the angle of recoil of the electron and its recoil energy, (3) that the three momenta concerned are coplanar and that the angles of deviation and recoil are related in a certain way. While conclusions (1) and (2) have been verified experimentally, the recent work of Dr. R. S. Shankland in Prof. Compton's laboratory has cast doubts on the simultaneous production of a photon deviation and an electron recoil which (3) assumes, and a revision of our corpuscular theories of radiation will be necessary. Dirac (*NATURE*, 137, 298; 1936) has expressed the opinion that most of the present quantum mechanics may be retained, but that the quantum theory of the electro-magnetic field will probably have to be sacrificed.