

Research Items

Ethnology and Cultural History in California

THE quantitative technique in ethnological studies invented by J. Czekanowski in 1911, and since developed by the Polish school of anthropologists, has been applied by Dr. Stanislaw Klimek to the data relating to the Indians of California collected in recent years by A. L. Kroeber and others, supplemented by field studies to supply deficiencies in material essential to the inquiry. The technique makes use of the methods of statistics applied to cultural 'elements' determined not by logic but empirically. Of the elements, more than eight hundred in number, differentiated by Kroeber, four hundred and eleven are selected as conforming to the criteria of the technique. On the results of this statistical study (*Univ. California Pub. in Amer. Ethnol. and Archaeol.*, 37, 1) the author has based a review of racial and cultural succession in California. The most ancient period which can be reached is that of Hokan-Yuki, of which the former is the older. The latter came in from the north along the coast, as is indicated by the importance of the Arctic physical type in their composition. The Hokan-Yuki culture is the most primitive in America, the gathering of vegetable products being the economic basis of life. The Hokan were Palæo-American in physical type. The second historical period begins with the Penutian expansion, of which the local origin cannot be particularised. The coiling technique, the bull-roarer and avoidance of the parent-in-law are characteristic. They shattered the earlier culture. They were followed by the Shoshonean, who introduced no important difference in type, but brought the gabled house and moieties in social organisation. The Athabaskan-Algonkin expansion introduced a profound modification in northern California. The most important components were the brachycephalic central Asiatic element and secondarily the Pacific element. The north-western culture extending from Alaska to the north-west of California in the latter becomes thinner and less marked going inland from the coast. A stratum representing cross-roads of Plains Indians and north-west is the youngest.

Breathing Mechanism in Birds

BAER, in 1896, put forward the suggestion that owing to the importance of rigidity in the thoracic basket, during flight it remained practically unaltered, so that any respiratory movements were confined to the air sacs in the vicinity of the clavicles. This statement has been fairly widely copied. As the result of a detailed anatomical and experimental investigation on the pigeon and crow, Zimmer (*Zoologica*, 33, No. 5, Heft 88; 1935) has come to different conclusions. In flight the sternum is kept relatively still, but in the downstroke the ribs move in such a manner as to raise the back, and at the same time the pectoralis muscle pulls the coracoids apart and so broadens the chest. Those movements are reversed during the upstroke. There is thus no fundamental difference between the method of breathing during flight and while at rest. The frequency, however, is increased about fourteen times. The curves further show that this synchronisation is not compulsory,

and in gliding the same respiratory mechanism is brought into play but its frequency lessened. The independence of wing stroke and respiration is doubtless of importance in birds that sing during flight.

Butterflies of Abyssinia

PROF. G. D. HALE CARPENTER has recently published a comprehensive paper on the above subject (*Trans. Roy. Entom. Soc. Lond.*, Dec. 1935). It is, in the main, a faunistic survey, and the author has derived his material from various sources. These include published records; specimens contained in the British Museum (Natural History) and in the museums of Oxford and Tring; and an extensive collection of butterflies made by Sir Arnold H. Hodson in south-west Abyssinia in 1925-27. As a result of his studies, Prof. Carpenter is able to give an extensive catalogue of the known species of Abyssinian Rophalocera and their distribution. In the general discussion brief summaries are given of work on other Abyssinian invertebrates, mainly from papers on the results of the Omer-Cooper-Scott Expedition of 1926-27. From the geographical aspect, the region, as a whole, presents certain difficulties since the political boundaries embrace territory of diverse faunistic types. The mere record "Abyssinia" is of little value, and altitude is of prime importance. The adoption of the 1,500-metre level allows of the exclusion of the essentially Somaliland type of country while admitting forms characteristic of "Abyssinia". The fauna of the area thus defined comprises many species of butterflies widely spread over Africa, but where division is possible, it shows the character to be predominantly East African. But detailed analysis shows also a Western element and a slight Palæarctic intrusion.

Recent and Fossil Mollusca of Tonga

IN his paper "Recent and Fossil Marine Mollusca of Tongatabu" (Bernice P. Bishop Museum, Bulletin 131, 1935), Mr. Jens Mathias Ostergaard studies the marine mollusca, both recent and fossil, of the island of Tongatabu, Tonga; his chief purpose being to throw light on the geological age of the limestones of the island and on the climatic and ecological conditions under which they were formed. The formation in question is a comparatively recent one, and living species are well represented by fossils. Of the 38 species of fossil marine molluscs collected in Tonga and identified, 27 were found living in the surrounding waters, and the remainder have been reported as living in the south or central Pacific. None was found to be extinct. Several species found only in the fossil state in the island seem to thrive in the warmer waters of the Pacific, indicating a higher temperature when the fossiliferous limestone was being laid down than at the present time. The resemblance between these deposits and the limestones of Oahu, Hawaii, is striking, and the author is of the opinion that the age of the Tongatabu limestone, like that of Oahu, is late Pleistocene; and it seems that warmer conditions existed in both regions during their formation. The island of Tongatabu,

Tonga, lies almost exactly the same distance south of the equator as the island of Oahu, Hawaii, lies north of it. Similarity in the species of marine molluscs in the two regions is not very close, but a few gastropods, such as *Cypræa caput-serpentis* and *Conus ebraeus*, are abundant in both. Four species of *Cypræa*, *C. lynx*, *tigris*, *vitellus* and *erosa*, which appear to be extinct in Hawaii are common in southern Tonga. *C. erosa* is, however, common as a fossil in Oahu. Probably the principal cause of the difference is that in southern Tonga the temperature of the sea is higher during the warmer part of the year than in Hawaii. It is found that most of the marine molluscs spawn in Hawaii when the water temperature is highest; therefore if the minimum temperature for spawning is infrequently reached, extinction of certain species may result.

Snowdrop Mould

THE hardness of the snowdrop plant renders it proof against the attacks of most fungus diseases; but Mr. D. E. Green (*Gardeners' Chronicle*, February 8, 1936) has shown that the fungus, *Botrytis galanthina*, can actually cause serious trouble. The disease is not new, and was first described many years ago by Berkeley and Broome. It is now found extensively in the northern counties of England. Infected plants produce a shapeless mass in place of foliage and flower, whilst fructifications of the fungus appear quickly upon it. Shining black sclerotia, about half a millimetre in diameter, are also formed, and constitute the real menace of the disease, since they remain in the soil around rotting bulbs, and can infect future plantings. Sterilisation of the soil with formalin solution is the control measure advocated in the paper.

Mutations in Tobacco Mosaic Virus

A REPORT, dated January 27, and issued by Science Service from Washington, D.C., announces the discovery by Dr. H. H. McKinney that the ordinary type of tobacco mosaic often mutates into a yellow type, which can be propagated as a continuous pure strain. A similar capacity has also been recorded for a virus disease of wheat. The report goes on to quote the findings of Dr. W. M. Stanley, who has isolated a protein substance which appears to be the virus itself, and then mentions the paradox of a mutation arising in a non-living thing. This would perhaps seem needless, for lack of demonstration of the protein nature of the virus has been one of the main objections to its inclusion as a living organism. The findings of Dr. McKinney and Dr. Stanley have little value when interpreted as a paradox; but taken together, constitute most welcome evidence towards a vitalistic conception of the nature of the virus.

Geology of Rajputana

A MOST important contribution to the Pre-Cambrian geology of India was presented by Dr. A. M. Heron at the inaugural meeting of the National Institute of Sciences (*Trans. Nat. Inst. Sci.*, 1, pp. 17-33, 1935), when he summarised the results of nearly twenty-seven years' work in Rajputana, mainly on the Pre-Vindhyan systems. The Bundalkhand gneiss, and a complex of migmatites including granites of probably more than one age, are proved to be older than the Aravalli system. The latter comprises an immense thickness of sedimentary rocks which vary from east to west through every degree

of metamorphism up to composite gneisses. Near the base of the system volcanic rocks locally reach great thicknesses, ranging from amygdaloids to garnetiferous hornblende-schists. The Raialo series of quartzite and limestones, followed by mica-schists, is separated from the Aravallis by a major unconformity. Another major unconformity separates the Delhi system from the Raialo series. In the main synclinorium the Delhi system has five sub-divisions: basal grits and conglomerates being followed by quartzites, phyllites and biotite-schists, calc-schists, and calc-gneisses. Above these are the granites and rhyolites of the Malani series. Besides these and the oldest granites of the area, granitic intrusions are known to succeed the Aravalli system and the Delhi system, making at least four different ages of Pre-Vindhyan granites. An important suite of basic and ultra-basic rocks, older than the Malani but younger than the Erinpura (post-Delhi) granite, has been discovered. Dr. Heron is preparing a memoir on the great synclinorium of the Delhis and its environment. Judging from the synopsis now issued, it will be a geological document of unusual interest.

Atomic Weight of Uranium Lead

THE atomic weights of several samples of radiogenic lead, including several for mixtures of radium G and actinium D obtained from thorium-free minerals, have been determined by G. P. Baxter and C. M. Alter (*J. Amer. Chem. Soc.*, 57, 467; 1935).

Source of lead	Atomic weight
Uraninite, Besner, Parry Sound, Ontario	206.05
Pitchblende, Great Bear Lake, Canada	206.06
Cyrtolite, Hybla, Ontario	206.20
Cyrtolite I, Bedford, New York State	205.93
Cyrtolite II, Bedford, New York State	206.07
Curite, Katanga, Belgian Congo	206.03
Galena, Yancey Co., North Carolina (common lead)	207.21

The value for Great Bear Lake lead agrees with that found by Marble. When corrected for slight contamination with ordinary lead the value is reduced to 205.99. Since the source mineral is about 1,400 million years old, this result constitutes strong evidence against the contention of von Grosse that the rate of production of Pb^{207} is higher than that of Pb^{206} , and supports the conclusion of Holmes (*NATURE*, Sept. 6, 1930, p. 348) that the periods of uranium I and actino-uranium are of the same order. Baxter and Alter point out that the atomic weight of uranium lead does not appear to vary systematically with the age of the mineral source. The result—206.027—for Katanga curite (age c. 600 million years) agrees with that obtained simultaneously by Hönig-schmid—206.030—from another portion of the same sample. The very low atomic weight of the lead from the first sample of Bedford cyrtolite remains puzzling. The four original determinations averaged 205.924; a fifth determination gave the value 205.938; and the sixth, now recorded, gave 205.954; the average of all is 205.931. It should be noted in view of the wide 'spread' that only a very small amount of the Bedford I material was available.

Map of the London Area

A MAP of the London area on a scale of half an inch to the mile has been published (Southampton: Ordnance Survey. 3s. 6d. net) in one large sheet. This map is designed to show the boundaries of various administrative areas, counties, parliamentary divisions, metropolitan and municipal boroughs, urban and rural districts, civil parishes, the

Metropolitan Police District, the Metropolitan Traffic Area, the London Transport Board, the London Traffic Area and catchment areas. On a grey groundwork of the usual topographical details the boroughs and urban districts are shown in colour shading, and other divisions by various colour lines. The whole is intricate but as clear as such a maze of varied boundary lines can be. Names of administrative areas are overprinted in colour. The grey background showing faintly through the colour is sufficiently clear to locate the boundaries. The margin has grid references and mileage to important towns.

Snow and Rime Crystals

In the *Journal* of the Faculty of Science of Hokkaido Imperial University, 1, No. 7, some interesting papers are published on snow, rime and frost crystals. The first paper, by U. Nakaya and T. Terada, gives a record of simultaneous observations of the mass, falling velocity and form of individual snow crystals. When the weather is not cold, snow falls in the form of flakes, each flake consisting of many crystals. The authors' research was carried out at a cottage half-way up a mountain at an altitude of 1,030 metres. There is little doubt that snow grows as crystals at a high altitude and falls a considerable distance before becoming a flake. It was found that the thickness of a plane dendritic crystal of snow was about 0.01 mm. and was independent of its dimensions. Its falling velocity in air (30 cm./sec.) was practically independent of its dimensions and so also was the velocity of powder snow (50 cm./sec.). In the case of 'needles', the longer needle falls more rapidly than the shorter one, the velocities ranging between 30 cm. and 70 cm. per second. The second paper, by U. Nakaya, suggests that the formation of a type of snow crystal may be inferred from the formation of the corresponding rime crystal. It was found that a dendritic plane crystal takes on an average about one hour to fall a kilometre, if we make the assumption that the crystal keeps throughout the final shape observed on the earth's surface. The main difficulty in artificial production is how to suspend the crystal in air for such a long time. The delicate form and design of a snow crystal must have been developed step by step while it is falling through various strata of the atmosphere, and the authors consider that a study of the crystal may lead to a knowledge of the structure of the atmospheric layers. All the papers are illustrated by photographs.

Disintegration of Light Elements by Slow Neutrons

NITROGEN disintegrations produced by neutrons have been observed in a cloud chamber by Bonner and Brubaker (*Phys. Rev.*, February 1). The reactions ${}^7\text{N}^{14} + {}_0^1\text{n} \rightarrow {}_6\text{C}^{14} + {}_1\text{H}^1$ and ${}^7\text{N}^{14} + {}_0^1\text{n} \rightarrow {}_2\text{He}^4 + {}_4\text{He}^4 + {}_3\text{Li}^7$ were observed, but most of the collisions observed were to be attributed to ${}^7\text{N}^{14} + {}_0^1\text{n} \rightarrow {}_6\text{B}^{11} + {}_2\text{He}^4$. This reaction was observed with both fast and slow neutrons. When produced by slow neutrons, the two particles recoil in opposite directions and look like a single track. The energy given out is estimated from the length of these tracks as 2.33×10^6 volt, and the mass of the nitrogen nucleus is calculated to be 14.0085. When the disintegration is produced by fast neutrons, a difficulty arises in that kinetic energy is not conserved. Some energy may disappear as a γ -ray or as excitation energy of the B-nucleus. The disintegration of boron by slow neutrons, previously known from ionisation chamber

work, has been studied by D. Roaf in a cloud chamber containing boron trifluoride (*Proc. Roy. Soc., A*, February 1). The energy of the reaction ${}_{10}\text{B}^{10} + {}_0^1\text{n} \rightarrow {}_3\text{Li}^7 + {}_2\text{He}^4$ was found, and the mass of B^{10} calculated.

State of Helium at Low Temperatures

HELIUM is peculiar in that the solid state can exist only under a pressure greater than about 25 atmospheres. At lower pressures a liquid state persists down to the lowest temperatures, though at 2.19°K. there is a discontinuity in the specific heat. F. London (*Proc. Roy. Soc., A*, February) shows that the liquid below this temperature goes into an ordered state which is probably such that the statistical distribution of the atomic distances is nearly that of a diamond lattice. The atoms cannot, however, be definitely localised in a spatial lattice. The reason for this peculiar behaviour lies in the zero-point energy of the helium. London calculates the zero-point energy by applying quantum mechanics to a system of rigid spheres representing the atoms. At low pressures the diamond lattice has the lowest energy, while when the molecular volume is reduced by pressure the most stable arrangement is a face-centred cubic one.

Colloidal Fuel

A COMPREHENSIVE survey of the available information on this subject is contained in a paper entitled "Colloidal Fuel", read at a recent meeting of the Institution of Chemical Engineers by Dr. A. B. Manning and Mr. R. A. A. Taylor. The authors point out that these fuels are the most compact fuels known, in that their potential heat content per unit volume is a maximum, that they are not liable to spontaneous heating and that, as their density is greater than one, they can be prevented from catching fire by means of a light water seal. Although colloidal fuels have not so far been put to serious use, the results of the few large-scale tests which have been carried out indicate that their combustion does not present any special difficulty. It appears that the economic size to which the coal can be reduced without incurring excessive grinding costs is about the same as that normally used when firing with pulverised fuel, and that the problem is to produce a suspension which will be stable over a period of several months. One method is by admixture of small quantities of sodium stearate with the warm oil, when a gel structure is obtained, the gel acting as an elastic solid towards the coal particles and supporting them indefinitely. High-boiling tar oils possess the property of dispersing bituminous coals more or less completely when the powdered coal and oil are heated together. Petroleum oils do not exhibit this effect, although it may be produced by the addition of tar oils to the suspension. More recently, it has been found that by blowing air through the heated oil, certain oxidation products are produced which stabilise the suspension. Descriptions are given of methods developed at the Fuel Research Station for assessing the stability of a suspension, a settling tube containing the suspension being used as a compound pendulum, and also for detecting oils capable of developing the gel structure referred to. The authors conclude that the use of colloidal fuels is likely to be considered seriously with the advent of higher fuel oil prices; and that, though numerous means have been tried, proposed or indicated for making otherwise unstable oils stable, at present the simplest means is probably to select a suitable oil.