

RESEARCH ITEMS

Ancient Metal Objects

THE Research Committee of the British Association engaged in the analysis of ancient metallic objects and their comparison with naturally occurring ores (formerly the Sumerian Committee) prepared a report for the Dundee meeting on its work in 1938-39. The method of micro-analysis has been mainly employed, but recently time and cost have been saved by quantitative determinations by means of the spectrograph. Standard alloys of known composition make it possible to give actual figures, in place of approximations, of an accuracy approaching that of chemical analysis. A further twenty-five specimens from Troy (Prof. Blegen) have been examined, and a large number remains which will be examined spectroscopically. Broadly speaking, the specimens from Troy I-IV are of copper, mostly with high arsenic, but including two bronzes, while from Troy VI and VII bronzes greatly preponderate, and the proportion of arsenic is less, indicating a different source for the copper. Analyses of ores from many of the possible sources of copper are still lacking. Fifteen knives and spears from Cyprus (J. R. Stewart) included only one bronze, which contained several per cent of zinc, as did one of the specimens free from tin. Arsenic and silver were prominent impurities. Nine objects from Tell Duweir were: gold, three; electrum, one; copper, three; and bronze with varying impurities, two. Eleven objects from Hureidha, south Arabia (Miss G. Caton-Thompson) were: copper, six; bronze, three; iron and silver, one each. An axe-hammer from Hungary (H. J. E. Peake) was of native copper. Two fragments of pottery with black glaze (Mr. Peake), one Tell Halaf ware from Arpachiyah, and the other al'Ubaid ware from Nineveh, showed the pigment in both instances to be magnetic oxide of iron.

Kiliwa Indians of Lower California

VISITS on three occasions between 1928 and 1936 paid by Peveril Meigs, 3rd. to the group of Indians in Lower California known by variants of the name Kiliwa in the records of several writers, have added to the records of a people of whom in 1929 only thirty-six individuals, mostly members of five families, were still living (*Ibero-Americana*, 15; 1939). The Kiliwa territory covered an area of some 1,500 sq. miles, with a diversity of natural landscape. The principal inhabited part was a semi-arid area lying between two great forested plateaux. In the southern part of Kiliwa territory is the San Felipe Valley, a wide alluvial floored structural basin some 1,500 ft. above sea-level. The only part occupied to-day is the Arroyo Leon Upland, a rough granitic upland with an elevation of 3,000 ft. The existence of an early population is indicated by rock-carvings or petroglyphs. The Indians have no legends to explain by whom they were made. Descent is reckoned patrilineally, and the sibs or lineages are definitely associated in the minds of the people with specific geographic localities. A taboo on mentioning names of the dead made it difficult to obtain information about the lineages. The principal movements of the Kiliwa consisted of their annual treks to the piñon groves and to San Felipe for food. Feuds with

neighbouring tribes restricted travel. Certain foods were outstanding, at the head of the list being the agave, or mescal, plant, cooked by the usual roasting pit method of the south-west. Rabbit and deer were probably the most important meat animals, and were hunted with throwing sticks or bows and arrows. Large-scale slaughter took place in co-operative hunting, when the game was scared by bush-fires lit by the hunters.

New Breeding Place of Gannet

FOR so many centuries the gannet remained restricted to a few nesting sites that any fresh evidence of the remarkable extension of range now taking place is of unusual interest. In July 1939, the Rev. J. M. McWilliam and Lord David Stuart saw three or four gannets on the Scar Rocks in Luce Bay, Wigtownshire; and on a subsequent visit on August 1 they found a nest containing a young gannet. The Scar Rocks are only about a hundred yards in length and about fifty feet high, but the south-east end is precipitous, and there the birds could nest in security. It is possible, therefore, that the nest of 1939 indicates the beginning of a new colony (*British Birds*, 33, 105, Sept. 1939). We would add that the successful nesting of this small number of gannets lends no support to the suggestion recently made upon rather slender evidence that successful nesting in a new colony is associated with a stimulus due to the group reactions of a considerable number of birds.

The Four-Eyed Blenny

THE suggestion that the horizontally divided eye of *Anableps* is related to the double function of vision in air and in water, led C. M. Breder and E. B. Gresser to study the four-eyed blenny, *Dialommus fuscus* (*Zoologia*, 24, 239; 1939). The specimens examined were obtained at Indefatigable Island, Galapagos. In outward appearance each eye seems to have two pupils, but this is due to the presence of a vertical band of pigment in the cornea, and the internal structure of the eye, with its single lens, is like that of typical fishes. The purpose of the pigment band is unknown, though it obviously makes vision possible only through a fore and an aft opening. But since the focus of the eye of a fish is altered by back and forward movements of the lens, it is just possible that the four-eyed blenny might be able so to adjust the lens that the anterior portion was in focus for aerial vision while the posterior portion was in focus for vision in water. This suggestion could hold only if the fish was in a vertical position, and it has been observed that a habit of the blenny is to climb out of steep-sided pools by scaling the vertical walls of rock. Clearly a decision about the function of this curious eye arrangement must await further observation and experiments in an aquarium.

Adaptation in a Dolphin's Backbone

IN his very thorough description of the skeleton of *Prodelphinus graffmani*, a species which he himself first described in 1934, Einar Lönnberg directs attention to the varying stability of the backbone in its different regions (*Ark. Zool.*, 30, No. 20; 1939). From the arrangement of the articulations of the

vertebral elements and the angle of the spinous processes it would appear that the anterior three fifths of the backbone has almost no power of bending in a dorsal direction up to the 32nd vertebra. From that point to the 40th vertebra, in the lumbar region, vertical mobility has been gained by modifications in the articulations. Then follows a second less movable area, in the proximal part of the caudal region, which is succeeded by the terminal half of the tail region which is capable of strong movements in any direction. The total number of vertebrae in the specimen examined was 77.

Blowfly Research in Australia

THE sheep blowfly problem is well known to be one of major importance in Australia. A considerable amount of valuable research has been carried out by the staff of the Federal Council for Scientific and Industrial Research. These investigations come under two main categories, namely, the collection of information on these insects and their relation to their environment, and the study of the susceptibility of sheep to blowfly strike. An essential requirement for much of this work is a large and regular supply of blowfly larvae. This in turn involved the development of a simple synthetic medium as the food supply for the larvae. The Council's Pamphlet No. 90, 1939, by F. G. Lennox, is entitled "The Development of a Synthetic Medium for Aseptic Cultivation of Larvae of *Lucilia cuprina*". The basal medium contains only yeast and sodium chloride, in addition to agar, which is added to give a suitable gel consistency. While the larvae attain their full size on this medium, their growth is more rapid on one in which the agar is replaced by fresh egg-white. The production of fully grown blowfly larvae on a yeast medium has, it seems, rather upset preconceived ideas as to their supposed nutritional requirements. The author states that he knows of no previous record of the successful rearing of "flesh-fly larvae" in the total absence of animal protein.

Genetics of Streptocarpus

W. J. C. Lawrence, R. Scott-Moncrieff and V. C. Sturgess (*J. Gen.*, 38, 299-306; 1939) make an interesting comparison between the history, the genetics and chemistry of plant pigments in the genus *Streptocarpus*. The acaulescent group of species differ in morphology and geographical distribution from the caulescent group. The former group has 32 chromosomes and the latter group has 30 chromosomes. All the species contain anthocyanins derived from delphinidin, except *S. Dunnii* which contains cyanidin. In 1886 *S. Dunnii* flowered (brick red) at Kew and was hybridized with the species of the blue and ivory series. From these crosses called \times *kewensis* and \times *Watsoni*, new colours combining the red of *Dunnii* with the blue-flowered species were obtained. The genetics of garden hybrids agree with this historical account. Gene *A* is necessary for anthocyanin formation and alone gives salmon colour (pelargonidin derivatives). *RA* produces (rose) anthocyanins derived from cyanidin while *AO* gives (mauve) anthocyanins derived from delphinidin, *AD* (blue) produces the 3-5 dimonoside of pelargonidin in place of pentoseglycoside-dimonoside. *ARD* should and does give magenta (peonidin + cyanidin 3-5 dimonoside). *AR* is derived from *S. Dunnii* and *O* and *D* from the remaining species (for example, *S. Rexii*).

Genetics of Blackarm Resistance in Cotton

Bacterium malvacearum causes serious damage to Sakel cotton in the Sudan. R. L. Knight and T. W. Clouston (*J. Genetics*, 38, 133-160; 1939) have artificially infected Sakel cotton and hybrids with other strains. The authors have clearly shown that two factors $B_1 B_2$ control resistance. Sakel cotton has the constitution $b_1 b_1 b_2 b_2$. In the authors' grading of twelve classes of susceptibility, different genotypes give characteristic and definite results. B_1 is dominant and confers "10·1" resistance on Sakel cotton, which is normally "12", while B_2 confers "7" resistance. Together $B_1 B_2$ give grade "5". More resistance is given to the variety Uganda B31 by B_1 and B_2 than to Sakel and it is shown that this is due to a difference in modifying factors.

Peneplanation of South Africa

IN a very detailed paper on "Some Observations in the Physiographical Development of Central and Southern Africa" (*Trans. Geol. Soc. South Africa*, 41; 1938), F. Dixey contends that the erosion of southern Africa did not advance steadily from early Jurassic until Tertiary times with the production of one great peneplain. He believes that the evidence he adduces points to two main stages each followed by a minor stage that was effective only in the softer formations and around the coasts. Furthermore, he suggests that in Cretaceous times there was a prolonged depression to the extent of several thousand feet, and that the uplift of late Tertiary and post Tertiary times did little more than restore southern Africa to its early Cretaceous level. He thinks that the Cretaceous transgression of the sea was due not to depression of the land but to a gradual rise in the level of the sea which was possibly due to continental drift changing the shapes of the ocean basins. On this interpretation, after the great late-Jurassic uplift, any continued slow elevation was more than counterbalanced by the rise in sea-level that caused a flooding of the coastal peneplain and the lower courses of the larger rivers. As the rise in sea-level waned in early Tertiary times, the continental uplift gained a slight lead, with the result that the Eocene and uppermost Mesozoic sediments were base levelled with the older rocks.

Melting of Granodiorite by Andesite

E. S. Larsen and G. Switzer describe (*Amer. J. Sci.*, August 1939) an obsidian-like rock that has been formed from the natural melting of granodiorite. The granodiorite occurs as an inclusion about 50 ft. long and 40 ft. wide in a Tertiary volcanic plug of andesite near Carlsbad, San Diego County, California. The product of melting looks very like a porphyritic obsidian. The glass is rhyolitic in composition, but contains 4·57 per cent of water. The addition of water was apparently necessary to bring about the fusion. The crystals that remained unmelted are about those which normally occur as phenocrysts in a groundmass such as this rhyolitic glass. The alkali feldspar is completely resorbed, but some quartz remains. Biotite and hornblende, in spite of the high water content, have been changed to augite. The melting of an igneous rock, supplied with the appropriate mineralizers, should follow the reverse course of that of crystallization. The early material to become liquid should be the same as the late material to crystallize. The composition of the glass shows

that this is true for the inclusion under discussion. The lack of any inversion of quartz to tridymite indicates that the temperature of melting was below 870° C.

Helium Ratios of Igneous Rocks

IN an effort to extend the scope of geological age measurements based on the accumulation of helium in igneous rocks, researches were initiated at the Massachusetts Institute of Technology which have revealed serious errors in previously published results. Co-operative investigations undertaken by Evans, Goodman, Keevil, Lane and Urry (*Phys. Rev.*, May 15, 1939) show that the radium determinations on which the previous helium time-scale was based are incorrect by a factor of more than two. The magnitude of the downward revision of ages varies according to the thorium-uranium ratio of the individual specimens. The new age determinations have been made by two entirely different techniques, the alpha-helium method and the radon-thorium-helium method. The former is independent of radioactive standards and its results are in agreement with the new measurements by the radon-thorium-helium method. Precision radium standards in the region of 10^{-12} gram have been verified. These researches represent the first comparison of helium age-measurements on the same specimens by two or more observers. While the ages of many individual geological horizons are lowered by these new results, the total span of geological time remains unreduced. A Pre-Cambrian norite from the Stillwater Complex gives a helium age of 1850 ± 300 million years by the alpha-helium method and 1800 ± 200 million years by the radon-thorium-helium method. The reason for the remarkable discrepancies between helium ratios and lead ratios at lower ages remains unknown.

Volcano-seismic Activity at Montserrat (1933-1937)

COMPLEMENTARY to the publications of the 1936 Royal Society expedition to Montserrat there has now appeared a monograph by Frank A. Perret, the well-known volcanologist ("The Volcano-Seismic Crisis at Montserrat 1933-1937", Carnegie Institution of Washington Publication, No. 512; 1939). Montserrat is known to be one of a long chain of islands of volcanic origin, being really a mountain standing half drowned in the sea. Each of the mountain islands of the chain is thought to be connected by a common fissure system to a single parent magma. The surface sub-volcanic phenomena in the 1933-1937 period consisted of abnormal activity in pre-existing soufrières, being chiefly confined to the chemical intensity of the exhalations. In addition to the usual sulphurous and sulphuretted hydrogen emanations, there appeared a dangerous higher sulphide of hydrogen, probably the persulphide, which caused Mr. Perret considerable trouble and necessitated his taking medical treatment. Perret's hypothesis is that the whole of the geophysical phenomena were due to the efforts of the magma to re-establish old vents in supposedly extinct volcanoes and that much may be made of a conception of a "gas-sheated magma in horizontal subterranean fissures" two of which were distinguishable in the region. The soufrières of Montserrat are considered as having been caused mainly by the penetration of meteoric water to a subterrain of sulphided limestone that had been reheated intensively by uprising magma. A time chart showing soufrière activity,

earthquake activity, and the possible "lunisolar influences" has been drawn up. We are pleased to note the mention by Mr. Perret that the scientific work initiated on the island is being continued by local effort.

Cosmic Rays at High Altitude

T. H. Johnson and J. G. Barry (*Phys. Rev.*, 56, 219; 1939) have investigated the distribution in direction of the cosmic rays near the top of the atmosphere. The apparatus was carried by small balloons and radio signals were transmitted corresponding to the passage of a single ray through a system of counter tubes arranged at an angle of 30° to the horizon. As the balloons rotated slowly about the vertical, the azimuth was signalled to the ground station by an arrangement including a photocell on which the sun's rays fell. The experiments were made in equatorial latitudes. It is well known that the cosmic rays at sea-level show an asymmetry between east and west directions which at the equator amounts to several per cent. This asymmetry is ascribed to the hard component of the rays, and shows that the primary particles responsible for the hard rays are deflected in the earth's magnetic field and possess predominantly positive charges. No asymmetry was observed at the top of the atmosphere, so it appears that the incoming particles which give rise to the 'soft' radiation predominant at high altitude have positive and negative charges in equal numbers. It follows that these 'soft' particles, which are presumably electrons and positrons, cannot be the primaries for the 'hard' cosmic rays at sea-level, and the authors suggest that these primaries are probably protons.

Solar-Terrestrial Relationships

THE fifth report of the International Commission for the Study of Solar-Terrestrial Relationships (Firenze: Tipografia Barbera) contains summaries relating to the present state of knowledge in this direction and to the results of recent collective and individual research. The subject matter falls under seven general headings: (1) researches in terrestrial magnetism; (2) solar phenomena; (3) propagation of wireless waves and phenomena of the ionosphere; (4) polar auroras; (5) the earth's upper atmosphere; (6) cosmic radiation; (7) meteorological phenomena. A number of contributions deal with the various aspects of the recently recognized relationship existing between bright eruptions in the sun's chromosphere and sudden disturbances in the ionosphere (ionospheric irruptions) which are especially evident in the D-layer at a height of 100 km. It is pointed out that the study of the effects of bright solar eruptions on the ionosphere does not support the ultra-violet theory of magnetic storms. Advances in geomagnetism have been made, but the precise location of the electric current-systems to which magnetic storms can be attributed cannot yet be inferred with certainty from observations of the magnetic changes at ground-level. Among the summarized results of investigations between solar and meteorological phenomena (1936-38) is stated the conclusion that no clear case has yet been shown for a close and persistent correlation between the variations of the levels of the great lakes and the sunspot cycle. Hitherto, the apparent correlation found between these phenomena has been considered one of the most promising in solar-meteorological relationships.