

Research Items.

THE EARLY RACES OF AMERICA.—Dr. Etienne B. Renaud has published in the *University of Colorado Studies*, vol. 16, pt. 1, the results of an examination of two small series of skulls, one from La Plata (Colorado) and one from Cañon del Muerto (Arizona), and a comparison with other skulls from the south-west United States and from South America. The skeletal material in question is of the highest importance, not only because examples are few, but also because of its relation to the results which are now emerging from the study of the archaeology of the area on scientific lines. The skulls belong to the second of the three phases in culture into which archaeologists are differentiating the Indian civilisation of the south-western area of North America. These are, first, the earliest nomadic population, of which practically nothing is known, representing a late palæolithic stage; secondly, the basket-makers, representing the mesolithic culture; and, thirdly, the pueblo cliff-dwellers, a full neolithic phase, whom the Spaniards disturbed in their normal development. Of the two latter, the basket-makers were a dolichocephalic people with undeformed head, the pueblos a brachycephalic people who deformed artificially the back of the head. The two series of skulls under review belong to the basket-makers, and, apart from certain local variations, agree sufficiently in their ten characteristics here examined to warrant their being regarded as of the same race—a race which further comparison with other skeletal material reveals as a common south-western type for which as an ethnical and cultural entity the name basket-maker is suggested provisionally. The significance of this conclusion is enhanced when it is shown that this type is sufficiently cognate to warrant inclusion with the Lagoa Santo group of South America, for which Dr. Rivet and others have suggested a kinship with Melanesia and Papua—a kinship for which Dr. Rivet has argued further on linguistic grounds.

A MAGDALENIAN SITE IN THE DORDOGNE.—Excavations in La Grotte Bâtie (Crozo-Bastido) at Saint-Sosy (Lot), on the right bank of the Dordogne, are described in *L'Anthropologie*, vol. 37, Nos. 5-6, by M. Armand Viré and l'Abbé Clement Teuliere, by whom the investigations were carried out. The cave or rock shelter is situated 10 metres above a path which runs precariously along a cornice on the cliff face at an altitude of 135 metres, the height of the Dordogne at this point being 105 metres. A low wall of unknown purpose has at some time been erected at the entrance. Hence the name. The remains here described were found in the lowest of four strata, which at the centre of the cave reached a minimum depth of 1.50 metres. They include teeth and bones of reindeer which had been used as food, and a number of objects made from the antler, including a series of harpoons, mostly fragmentary or incomplete, one of them, fairly flat, resembling an Azilian type without hole. A number of bone needles were found, of which six had eyes. There were also a few piercers, but none intact. Several engravings on bone were found, of which the finest was a well-engraved horse's head showing part of the neck and chest. A shaped object with an eye on each side may be a fish or serpent. The stone implements were exclusively of flint, of varied coloration, but only rarely patinated. Scrapers and burins predominated, with scraper-burins and flakes à *dos abattu* of all sizes. One implement in particular is interesting in its resemblance to Aurignacian or early Solutrean forms. The evi-

dence of the remains in general, but especially the harpoons, points to an Upper Magdalenian date.

OCEANIC ANGLER-FISHES.—The British Museum (Natural History) has added to its collection of post-cards two sets, each of five cards, representing some of the oceanic angler fish, mostly collected by Dr. John Schmidt, and described by Mr. C. Tate Regan (Series 1 and 2, Set M3 and M4). These are printed from beautiful drawings made by W. P. C. Tenison and are extremely interesting. The first series depicts some of the remarkable free-swimming forms, all of which are females, the males, illustrated in the second series, being parasitic on the females. These oceanic anglers are some of the most wonderful of all fishes, having the first ray of the dorsal fin modified into a lure. They live near the bottom in the deep sea where there is little or no light, the body being a uniform black colour and the lure luminous to attract the fishes on which they feed. Most of them are quite small, the female of the Atlantic *Melanocetus Johnsoni* being only 3 in. long, but it is so extremely voracious that it is sometimes found extended with fishes many times its own size. *Photocorynus spiniceps* is 2½ in. long, the male, attached to the top of its head above the right eye, being only ⅔ in. On the other hand, we have *Ceratias holboelli* trawled off Iceland, 42 in. long, the two males attached to the abdomen being a little more than 3 in. The ceratioids are unique amongst vertebrates in having the dwarf males, which actually fuse with the skin of the females, and are unlike all other animals in having the male nourished by the female's blood system.

THE POLAR FILAMENT OF THE SPORE OF NOSEMA.—K. Ohshima (*Annot. Zool. Jap.*, vol. 11, No. 3, 1927) has investigated the polar filament of the spore of *Nosema bombycis*. The extrusion of the filament was brought about by placing the spore in hydrogen peroxide solution, but the action was too rapid to permit determination of the method of extrusion, *i.e.* whether by eversion of the filament (as in the case of nematocysts) or by shooting out the filament from the extremity of the spore. The addition of 5 per cent. to 10 per cent. salt solution decreased the rate of extrusion, and the author was able to observe that the contents of the filament issue from its tip as soon as extrusion is accomplished and form a spherical droplet 3μ to 6μ in diameter. The substance of the droplet is colloidal and strongly adhesive, so that it fixes the spore to the slide. The filament is a long, fine tube of even diameter, and the author concludes that its extrusion is not due to a process of eversion. Spores examined in the digestive fluid from silkworms discharged their viscous contents from their respective filaments. The viscous material no doubt serves to fix the filament to the digestive epithelium. The digestive fluid was found to dissolve the filament in from two to five seconds. A further account is promised of the nature of the enzyme in the digestive fluid and of the nature of the proventricular fluid of the silkworm moth which causes extrusion of the polar filament but does not dissolve it. The author suggests that the viscous material discharged from the spore weakens the digestive epithelial cells and produces a condition more favourable for infection.

A NEW PARASITIC GASTROPOD.—S. Hirase describes (*Annot. Zool. Jap.*, vol. 11, No. 2, 1927) a new parasitic gastropod—*Sacculus okai*, n. g., n. sp., found in

colonies imbedded in gall-like swellings of the test of tunicates in the north-western Pacific. 19 examples were found in one swelling in *Ascidia prunum* and 11 in *Boltenia ovifera*. Each of the gastropods is globular in form and about 3 mm. long and 2 mm. broad, and lies free in the lumen which communicates with the exterior by a small slit-like opening in the test. A brief account of the anatomy of Sacculus is given and the genus is placed in the Tænioglossa, though the presence of a well-developed proboscis and a bipectinate osphradium distinguish it from the other members of the sub-order. The radula is not reduced, and there is a monopectinate ctenidium with a well-developed osphradium.

NEW VARIETIES OF HOPS.—A large number of new varieties of hops have recently been raised in the Experimental Hop Garden at Wye College, and established at the East Malling Research Station. Some of the recent work, which was carried out under the auspices of the Institute of Brewing Research Scheme, is summarised by Prof. E. S. Salmon in the *Journal of the Institute of Brewing*, 33, 488; 1927. The 112 varieties tested included new and commercial types, of which 74 cropped at the rate of at least 20 cwt. to the acre, whilst one of the former yielded 32½ cwt. to the acre. Although in all the early, mid-season, and late classes certain new varieties had higher preservative properties than any of the commercial varieties tested, the panel of experts which judged the hops favoured certain of the latter in preference to any of the former. Comparison with the results of previous seasons, however, have shown that one new mid-season variety is gradually being regarded more favourably by the judges, and as it has high preservative properties, hopes are expressed that it will ultimately prove of value. Excellent results have been obtained in brewing trials with certain of the new varieties which have been under observation for from five to nine years. The paper also contains the scheme of manuring employed, together with notes on the diseases of the hop (cf. NATURE, 117, 67; 1926).

SEASONAL CHANGES IN CONIFER LEAVES.—Several observers have recorded the disappearance of starch and the increase of sugars in leaves of evergreens during the winter season. The special interest of these changes lies in the possible protective action against frost. By increasing sugar concentration by 'feeding,' Lidforss succeeded in rendering glass-house plants resistant to a temperature of -7°C ., and claims that sugar prevents the precipitation of the proteins on freezing. He explains the well-known phenomenon of death from frost in spring of the leaves on the sun side of trees such as *Abies*, as due to earlier regeneration of starch, and the resulting lessening of the sugar content on the sun side. Prof. J. Doyle and Miss Phyllis Clinch have now taken the problem further and published (*Proc. Royal Irish Acad.*, vol. 37, B, No. 26) the results of some investigations on seasonal changes in conifer leaves with reference to enzymes and starch formation. Their observations on the autumnal disappearance and spring regeneration of starch lead them to conclude that these phenomena cannot be related to assimilation or environment changes, and that the starch-sugar equilibrium is determined in winter by protoplasmic change. They take exception to the claim of Chapman (see *Biochem. Jour.*, vol. 18, No. 6, p. 1388) that three enzymes at least—amylase, dextrinase, and maltase—must be present before starch formation can go on, and consider his experimental data insufficient to support his conclusions. Maltase seems absent from *Tsuga Albertiana*, which also lacks dextrinase and probably amylase in winter.

Maltase seems also to be absent from *Pinus parviflora* in winter. The presence of amylase in winter is also doubtful in *Pinus laricio*. Yet in all these cases starch can be formed either naturally in summer or by artificially increasing the sugar concentration in winter.

TIME OF APPLICATION OF SPRAYS FOR FRUIT TREES.—Modern work on the control of pests and diseases of fruit trees lays emphasis on the importance of applying the spray fluids at a particular stage in the plant's development. A recommendation for 'spring' or 'winter' treatment is no longer considered a close enough definition. H. R. Briton-Jones and A. H. Lees, realising the inadequacy of verbal instructions for describing the necessary stages, have published a paper (*Jour. Min. Agric.*, 34, p. 814) with numerous photographs of various types of commonly grown fruit trees in the condition when spraying will be most effective. The successive stages illustrated are roughly classified as dormant, swelling, bursting, green-flower, and pre-flowering respectively. Information concerning the various pests which may be successfully dealt with at the various stages depicted, and the most suitable type of spray for use in each case is given, and cautions are included where treatment at any stage may be useless or dangerous. Such work in achieving better standardised methods must ensure a greater degree of reliability in the employment of spray fluids, and consequently extend their use to the benefit of fruit growers.

MOVEMENTS OF THE NORTHUMBRIAN FAULT BLOCK.—The tectonic conceptions of Argand have been applied with conspicuous success to the structures of the Northumbrian fault block by Mr. H. C. Versey (*Proc. Yorkshire Geol. Soc.*, pp. 1-16, 1927). He considers the block to be a fractured *pli de fond* of Hercynian orogeny. The effect of the uplift was to develop a saddle-shaped structure in the rigid substratum, as a result of which the thin covering of carboniferous rocks was folded into small *plis de couverture*. The most northerly of these folds trends to the north-east across Teesdale and Weardale, and appears to be related genetically to the thickening of the Whin Sill. The latter is thus regarded by Mr. Versey as being locally phacolithic in its mode of emplacement. The fault block acted as a horst to the folds produced in the deposits of the Pendle trough to the south. Thus various types of virgations are exemplified in the fold-lines between the rigid areas of the Northumbrian and Midland blocks. The tectonic interpretation of the region is thought to be in good accord with the characters of the Permian rocks east and west of the block, but it should be pointed out that totally different views have recently been expressed by Mr. J. S. Turner (*Proc. Geol. Assoc.*, pp. 339-374, 1927). Both writers appeal to the composition and distribution of the Brockrams in support of their respective readings. Prof. Holmes's discovery of a pebble of Whin Sill rock in the upper Brockram near Appleby, recorded briefly in Gilligan's "Geology of Appleby," is, however, strongly in favour of the validity of Mr. Versey's conclusions.

MAGNETIC DETECTION OF MINERALS.—The economic applications of geophysical science are rapidly growing in importance, and recently led to the publication, for a time, of a *Zeitschrift für angewandte Geophysik*. An interesting account of magnetic methods of investigation of underlying minerals is contained in a lecture by Dr. L. Palazzo, published in the *Memoria d. Pont. Accad. d. Scienze—I nuovi Lincei*, Ser. 2, vol. 10, pp. 271-308, 1927. The various instruments

devised for such purposes are described and illustrated, with their mode of employment. A brief account is given of the theory of local magnetic disturbance by magnetic masses below ground, and various researches on actual disturbed regions, at Kursk in Siberia, and in certain parts of Italy, are described.

THE STEREOSCOPE IN AIR SURVEY.—The need for the use of the stereoscope in plotting surveys from air photographs is now recognised and makes the publication of a simple explanation of the process most opportune. "The Stereoscopic Examination of Air Photographs," by Lieut. M. Hotine, forms No. 4 of the Professional Papers of the Air Survey Committee (London: H.M. Stationery Office. 3s. 6d.). This small volume begins with an explanation of the principles underlying stereoscopic measurement, and goes on to explain machine plotting and to describe the topographical stereoscope. A final chapter on stereoscopic training and testing should also prove valuable.

ELECTRICAL RESISTANCE MEASUREMENTS.—When an electromotive force E applied to a circuit drives a current I through it and I is proportional to R , so that in the equation $E=RI$, the resistance R of the circuit is a constant, the quotients E/I and dE/dI have the same value R , while if R is not a constant but varies with I , the second quotient has the value $R+I(dR/dI)$, and has generally been called the 'differential resistance' of the circuit. In the December issue of the *Journal of the Franklin Institute*, Mr. H. Nakamura, of the Research Laboratory of the Tokyo Electric Company, shows that some of the methods of measurement of resistance in common use determine the ordinary resistance and some the differential resistance.

THE CRITICAL POTENTIALS OF TUNGSTEN.—The erratic records usually obtained of the secondary emission of electrons from metals bombarded by cathode rays have been shown by H. E. Krefft to be connected with the presence of adsorbed films of gas. His experiments, which are described in the *Annalen der Physik* (vol. 84, p. 639), were made with a tube built entirely of metal and glass, in which a vacuum of 10^{-8} mm. mercury could be maintained, containing a tungsten target which could be heated to 1500° C. by radiation from an auxiliary filament. At the higher temperatures the breaks in the secondary emission curves were reproducible, and ratios of the secondary current to the primary current were obtained which were consistent to less than one per cent., under favourable conditions. At lower temperatures, and in general when gas was known to be present, new breaks appeared; and finally, when the gas-content became relatively large, the curves were smooth. The main critical potentials agree well with those found by Prof. O. W. Richardson and Dr. Chalklin from the study of soft X-rays, but one persistent break at about 16 volts has had to be attributed to ionisation of molecular oxygen, from which it appears impossible to free the metal, even above 1000° C.

A POLARISATION COLOUR SCHEME.—A useful miniature booklet for the waistcoat pocket has been issued by Messrs. James Swift and Son, Ltd., entitled "Polarisation Colour Scale." The contents have been drawn up as an aid to mineralogists by Drs. W. R. Jones and A. Brammall. On the inside of the cardboard cover is given a table of the birefringencies of seventy-eight mineral crystals, and two polarisation colour scales (in colour, a very good attempt at reproduction of the natural colours), one for crossed Nicols

and the other for parallel Nicols, each for the first four orders of spectra. In the four little pages of text, explanations are given of the practical meaning of birefringence and of the numerical scale-values attached to the colours, and instructions are detailed for using the scale to determine the thickness of rock-sections and the birefringence of mineral crystals, either in rock-sections or in mounted grains. The method recommended for finding the thickness of a rock-slice is, first, to select some familiar colourless mineral of low birefringence, such as quartz (birefringence 0.009), represented in the slice by numerous sections; then, to evaluate in $\mu\mu$ the highest interference colour given by these sections, by reference to the scale; for thickness = (interference colour value)/(birefringence \times 1000). The thickness thus given (in microns) can then be used to determine the birefringence of an unknown mineral; for the birefringence = (interference colour value)/(thickness \times 1000). If the mineral be itself a naturally coloured one, allowance must obviously be made for the modification this causes in the polarisation colours.

MOLECULAR STRUCTURE IN SOLUTION.—Various physical properties of solutions of cobalt chloride with increasing hydrochloric acid content and of hydrochloric acid alone have been determined by O. R. Howell in an attempt to investigate the change of state of the cobalt atom with increasing concentration of acid. The November number of the *Journal of the Chemical Society* contains conductivity values for such solutions, and the conclusions drawn from these results are in agreement with those obtained from previous work on other properties. As acid is added to a cobalt chloride solution, the red colour changes to blue, owing to the cobalt atom being forced out of association with six molecules of water, $\text{Co}(\text{H}_2\text{O})_6$, in order to unite with four atoms of chlorine, CoCl_4 . Hill and Howell, in 1924, showed that in blue compounds the cobalt atom is surrounded by four other atoms or groups, whereas when it is surrounded by six atoms the compound is red. Howell points out that these facts can be utilised to predict, to a certain extent, the crystal structure not only of compounds containing cobalt but also of those in which a metallic atom can be replaced by cobalt. Several predictions made in this way (for example, with zinc and magnesium orthosilicates) have been verified by determination of the crystal structure.

IONISATION AND CHEMICAL CHANGE DURING SLOW COMBUSTION.—The work of Dixon and others has shown that before the main combustion of a gaseous mixture occurs, there is an induction period during which slow combustion proceeds. Bennett and Mardles, in the *Journal of the Chemical Society* for December, have attempted to investigate the nature of the changes occurring during this period. They found that in the case of a system containing liquid drops (e.g. *n*-hexane and air) more ionisation took place and a considerably lower temperature was required for spontaneous ignition than with the corresponding vapour mixture. It is questionable whether ionisation accompanies all gaseous reactions, but ionisation was detected with various systems, although it did not occur below the temperature of initial oxidation. During the period of slow combustion, the main changes appear to be due to thermionic emission followed by the formation of centres of chemical change around the liberated ions. The presence of various 'antiknocks' (e.g. lead tetraethyl, iron carbonyl) causes a decrease in electron emission and in the initial chemical change, thereby delaying spontaneous ignition and also lowering the temperature at which slow combustion begins.