

Research Items.

PRIMITIVE MURAL DECORATION IN SOUTHERN INDIA.—A paper by the late Dr. Nelson Annandale, published in vol. viii. No. 4 of the *Memoirs of the Asiatic Society of Bengal*, describes a primitive but effective form of art which is found in a Uriya village on Samal Island on the northern shore of Lake Chilka in Orissa. The people of Samal speak the Uriya language, but physically they are a mixed type, some showing traces of aboriginal blood while others present a Mongoloid appearance. Their culture is primitive and nominally they are Vishnuvite Hindus mostly of the Goala or cowherd caste. Some of the houses are composite, sheltering several families under one roof. The walls of the houses are uniformly covered with a wash of red earth forming the background of the decorations. The simplest form of pattern is made by applying the three fingers dipped in chalk and water to the walls. The more elaborate patterns fall into two groups, of which the character is indicated by their names. One is called *janar*, a kind of maize, the other *punjha phareda*, "four coconuts," of which, however, only three can be distinguished as a rule. These patterns are usually executed by men. More elaborate designs also are in use, some made by women, in which birds and fishes appear. Most of the interior decorations were painted in several colours, while some of those used in internal passages were mythological. Outside are certain lucky signs, such as double fish and foot-prints; the object of the decorations seems to be purely æsthetic.

ARCHÆOLOGICAL REMAINS IN NEW ZEALAND.—In vol. ii. No. 4 of the *Records of the Canterbury Museum*, Mr. H. D. Skinner continues his description of the objects found in caves near Christchurch, N.Z., opened in 1889, which were sent to the Otago University Museum in 1922. The material from Monck's Cave, which is situated about a mile east of the Moabone Point Cave previously described, although more interesting than that found in the latter, is scientifically of less value, as no record was kept of its stratification. Sixteen pieces of moa bone were sent to the Museum, eight of which were worked. One of the most interesting articles found was a carved bailer, the only known example from South Island, which, with a paddle, was found immediately the cave was opened. It is therefore probably of later date than the moa-hunter age. Its decorative motif of a bird's head and loop coils was not previously known from this district. An outrigger float is the only New Zealand example which has been preserved. Of a number of adzes, several were Polynesian in form but none of West Pacific types. Among a variety of other articles were a toy canoe and paddle and a toy dog, which confirms the accounts of Maori dogs given by early travellers. One of the most interesting discoveries was a series of cuttings of human hair showing a considerable variation in pigmentation, ranging from dark brown to chestnut. Its very fine plaiting points to Polynesian relationship.

COLOUR FATIGUE IN THE EYE.—In a pamphlet (reprinted from *The Medical World*) Dr. F. W. Edridge-Green, who is special examiner and adviser to the Board of Trade on colour vision and eyesight, quotes the following passage from Dr. Troland on minuthesis (that is, colour fatigue): "The general conclusion to be drawn from the work is, therefore, that minuthesis due to one colour does not alter the luminosity of another colour to a degree differing appreciably from that in which it is altered itself. In other words, the change in sensitivity to brightness

occasioned by stimulation of the retina is independent of the wave-length constitutions of the minuthetic and of the reacting lights. This seems to imply that the luminosity function is not essentially linked with the colour or chromatic function, and stands in contradiction to the views of Abney, Ives, and others, who treat luminosity as the sum of the primary colour values of any stimulus. The present results appear also to be in conflict with experimental data along similar lines published by Abney and by Burch, so that further study of the problem would seem to be required on a larger number of subjects." These conclusions are in agreement with those to which Dr. Edridge-Green himself and co-workers have come (see "Physiology of Vision," p. 248, Proc. Roy. Soc., 1912).

LARVÆ OF DECAPOD CRUSTACEA.—Notwithstanding the strange forms they frequently assume, the larvæ of decapod Crustacea have in recent years received very little attention at the hands of zoologists. This is no doubt due to the great labour involved in linking up unknown forms with parents which often have a widely different appearance, and to a fear that, when all is done, little real advance will have been made in our knowledge of the group. In his report on the larval decapods obtained by the British Antarctic (*Terra Nova*) Expedition (Crustacea, Part IX. British Museum (Natural History). 1924. Price 15s.) Mr. Robert Gurney has shown that such studies may yield indications of great phylogenetic importance. Although the numbers of known larvæ are still few in comparison with adults, it is clear from Mr. Gurney's work that a classification derived from them will sometimes diverge in a striking manner from the system generally adopted. This system, based mainly on the morphology of the adult decapod, is none too securely founded, and there is little doubt that a knowledge of the larval structure will be of great assistance in its revision. Two of the more important conclusions that Mr. Gurney has reached are that the Stenopidea should be removed to the Reptantia, and that the Thalassinidea are not homogeneous, but fall into two divisions—a Homarine series, including the Axiidae and Callianassinæ, and an Anomuran series, including the Laomediidæ and Upogebiinae. A feature that will appeal strongly to every student of the group is that in Mr. Gurney's work he is provided, for the first time, with a systematic presentation of all available information on decapod larvæ. Under most of the family headings the principal larval characteristics are summarised or discussed, and there is a valuable list of references to the widely scattered literature.

THE TANNING QUALITIES OF MANGROVES.—In *Indian Forest Records*, vol. x. part x. for 1924, Mr. J. A. Pilgrim has an interesting account of the mangroves of Tenasserim as a possible source of supplies of tannin. The writer was appointed tannin expert to the Government of India with the idea of surveying from this point of view the mangroves of Burma, but as delay was caused in this project through the War, he has in the meanwhile carried out an investigation of the mangroves of the Sundarbans of Bengal, and thus is able to compare his Burmese results with further data obtained in more northern latitudes. Pilgrim points out that whilst on the whole the mangroves of the Sundarbans and of Tenasserim show no noteworthy differences, yet on the whole, (1) the best of all the mangrove tans, and (2) the commonest of these tans, both show themselves richer in tannin in the more southern

latitude. The best source of tannin is said to be *Carapa moluccensis*, the commonest *Rhizophora mucronata*. This latter species has been widely collected, and Pilgrim points out that it has shown itself richer in Borneo than in the Philippines, whilst chemists in Sarawak, S. Borneo, get somewhat higher yields of tannin than Pilgrim from N. Borneo, and now the Burma material proves more valuable than that from Bengal. The writer concludes that his present results seem to support the general thesis that mangroves increase in tannin content as they approach the Equator.

OVERSEAS TRANSPORT OF APPLES.—Early in 1923 a scientific expedition, consisting of Dr. Ezer Griffiths, Mr. A. J. Smith, and Mr. Edgar A. Griffiths, was sent by the Food Investigation Board to study problems involved in the transport of apples from Australia to England. Special Report No. 20 of the Board, entitled, "The Problems of Apple Transport Overseas," by Drs. Kidd and West (H.M.S.O., price 9d. net), is a general survey and summary of the results obtained. The investigation originated in an inquiry as to whether the disease known as "brown heart" could be correlated with the atmospheric conditions in the holds in which the apples were carried. Four boats, representative of the different systems of marine refrigeration in use, were studied and a complete record obtained of the carbon dioxide content of the atmosphere of the holds, and of the temperature distribution in the interior of the cargo of apples. One surprising result observed was the magnitude of the accidental ventilation which takes place due to leakage; calculations based on the estimated rate of production of carbon dioxide by the respiration processes of the apples and the periodic measurement of the amount of gas present in the hold show that, in one of the boats studied, about 300 cubic feet of air per day per ton of apples finds its way into the hold. This was the case of a boat equipped with forced circulation of the cooled air. In a boat depending on convection currents from cold brine pipes for the cooling effect, the leakage was considerably less and the accidental ventilation was only just sufficient to keep the carbon dioxide concentration below the danger limit of about 10 per cent. Another important result of the expedition was to show that none of the present systems employed for the stowage of the apple cases produced a uniform temperature distribution throughout the mass. This is a problem which is now being studied at the National Physical Laboratory by the aid of scale models. The expedition also afforded an opportunity for observing under marine conditions the behaviour of various types of physical apparatus used in the investigation, such as electrical thermometers, carbon dioxide indicators, hygrometers, and anemometers.

PETROLEUM IN THE LOST SOLDIER-FERRIS DISTRICT, WYOMING.—Messrs. A. E. Fath and G. F. Moulton, of the United States Geological Survey, have recently completed their work in this interesting area of south central Wyoming, an area in which there has been active oilfield development since 1916. The results of the survey are contained in Bulletin 756. The geology conforms with that characteristic of the Big Horn Basin as a whole, and, as would be expected, Cretaceous beds constitute the most important stratigraphical and economic formations. In this area of about 600 square miles, the authors have described nine domes and anticlinal folds with which oil and gas are associated; these local structures, regarded as being post-Oligocene in age, are superimposed on what is known as the Rawlins Uplift, a regional

structure of early Tertiary or even older achievement. Some difficulty was experienced in mapping the district owing to the outcropping formations being much concealed by alluvial wash and blown sand, but two of the domes, Lost Soldier and Bunker Hill, are indicated topographically, especially the first, which accounts for its earlier development as an oilfield. Faulting has affected the structures considerably, most dislocations cutting across the flanks of the folds; this naturally has a marked influence on the distribution of the oil-sands involved. In 1921 the Lost Soldier field produced 380,811 barrels of oil from 28 wells; in the same year the Ferris Dome produced 16,740 barrels, and what is known as the "G.P. Dome" yielded 74,199 barrels from 3 wells. On another, the Mahoney Dome, a rich gas sand was encountered with an open-flow yield estimated at 50,000,000 cubic feet of gas per day; lightning ignited the gas and the well burned for 27 days before being extinguished, which was accomplished by exploding a 25-pound charge of dynamite close to the well-mouth, taking advantage of the momentary slowing down of the gas flow and then snuffing with steam. These and other significant facts indicate that the area has decided commercial possibilities, though accessibility and questions of transport and marketing of the oil are problems which apparently are only just being solved.

WIND DIRECTION, CLOUD AND VISIBILITY.—The Meteorological Office, Air Ministry, in Professional Notes, Vol. 3, No. 36, gives a discussion "On the inter-relation of wind direction with cloud amount and visibility at Cahirciveen, Co. Kerry," by Mr. L. H. G. Dines and Mr. P. I. Mulholland. The object is to ascertain whether there is a statistical relation of sufficient magnitude to aid in forecasting the amount of cloud and visibility at night from observations in the afternoon and evening. The data for cloud cover a period of ten years from 1911 to 1920. South winds are the most common, followed by south-west and west. The outstanding feature is the excessive amount of cloud with south winds in each season and at different hours of the day. The clearest skies occur with calms in spring and north-east winds in winter and autumn; a clear sky may be expected, with either, once in 5 or 6 times on the whole, as against once in 77 for south-west winds. For the inter-relation of wind direction and visibility the data employed are for about two years, 1919 and 1920. As a rule, visibility at Cahirciveen is good, the best occurring with northerly winds, the poorest with southerly, the latter being due to the generally damp conditions prevailing with such winds. The authors deal with the Beaufort letter "v," unusual visibility, as a sign of coming rain, and so far as Valencia Observatory is concerned, observations there do not support the old theory. Much more proof than observations at this special observatory will be required substantially to disprove its general applicability. As a standard for normal humidity, the observations for 1886-1910 are used; it must not be overlooked that a good many years ago the position of Valencia Observatory was shifted from an island to the mainland.

METAL-CLAD ENCLOSURE OF CONDUCTORS.—The tendency of modern electrical engineering is to devise automatic operation to replace manual operation, and so provide "mistake-proof" plant. As the voltages of transmission, owing to the large amounts of power that have to be transported, are continually being raised, it is necessary also to devise methods of making contact with a "live" conductor a practical

impossibility. Mr. H. W. Clothier, in a paper read to the Institution of Electrical Engineers on January 22, gives a very able discussion of these and similar problems. He points out that the ideal arrangement is to enclose metallically every conductor so that it is completely inaccessible when alive. These metallic covers are connected with the earth, and if they be used over the whole supply system from the generators to the load, they provide practical immunity from burns and shocks. If this method is carried to its logical conclusion, overhead lines would have to be replaced by underground cables. The initial cost, however, of high-tension underground cables is at present in most cases prohibitive, and so compromises have to be arranged. It is also of importance that faults occurring in a transmission system should be rapidly cleared, as in several cases high-frequency currents are set up in the system, and these produce very serious electromagnetic interference with neighbouring telephone and telegraph lines. Shocks and fires from this form of interference are an appreciable "risk," and have to be taken into account. The author concludes that, for safety of the operators and continuity of the supply, the use of universal metal-clad enclosure is highly desirable. There should always be a stable neutral point on the network maintained at earth potential, and all operating mechanisms should be thoroughly trustworthy and be periodically inspected.

THE POLYMORPHIC FORMS OF IRON.—The issue of December 5, 1924, of *Die Naturwissenschaften* contains an interesting summary by F. Wever on the physics of the technical varieties of iron. The remarkable variation of properties of this material which makes it so valuable a substance depends essentially on the fact that iron can be obtained in several polymorphic forms, the behaviour of which towards carbon, which invariably accompanies such iron, is very different. The author reviews the properties of the polymorphic forms of pure iron, of which there are four, namely, α , β , γ , δ . The lattice forms of α -, β -, and δ -irons are the same and are those of a body-centred cube, while that of γ -iron is a face-centred cube. The maximum solubility for carbon is possessed by γ -iron and corresponds to 1.8 per cent. at 1140°. δ -iron, which only exists between 1535° and 1410°, can dissolve 0.38 of carbon at the latter temperature. In contrast with this the solubility of carbon in β - and α -iron is extremely small. The properties of iron carbide and the relations between iron and carbon are discussed in the latter part of the paper, which concludes with a brief summary of the theory of hardening. The author favours the theory of Maurer, according to which carbon is in a condition of atomic dispersion in α -iron, the volume of which is thereby decidedly increased. The condition of strain thus induced is regarded as the cause of the exceptional hardness of such steel.

THE SILICA OF PLANTS.—D. R. Nanji and W. S. Shaw have recently found (*Chemistry and Industry* Trans., Jan. 2) that about 90 per cent. of the total silica occurring in plants is present as free silicic acid, probably in the colloidal state. The remaining 10 per cent. is in a form from which it can only be extracted after preliminary treatment with acid, probably as an ester-like combination with a polysaccharide constituent of the plant.

THE IDENTITY OF GEBER.—E. J. Holmyard, in an article on the present position of the Geber problem in *Science Progress* for January 1925, considers it definitely established that Geber is Jābir ibn Hayyān.

The Latin works ascribed to Geber are probably not literal translations from the Arabic, but are works based on Arabic knowledge. There is not sufficient evidence at present definitely to state that these Latin works are genuine. A study of the works of Jābir confirms his reputation as the greatest chemist of Islam.

THE ULTRA-CENTRIFUGE.—Svedberg and Rinde, in the *Journal of the American Chemical Society* for December 1924, describe a new instrument, the ultra-centrifuge, for the determination of the size and the distribution of size of particles in amicroscopic colloids. It enables particles which are invisible in the ultra-microscope to be measured. The theory of the instrument is given in detail; measurements of the radius of the particles of gold sols (average radius 2.3-11.6 $\mu\mu$) made with this instrument give values 11-38 per cent. higher than those obtained by Zsigmondy's nuclear method. The nature of the protective action of gelatin upon fine-grained gold sols is also studied, minimum and maximum values for the thickness of the gelatin layer adsorbed around the gold particles being obtained.

CRYSTAL FORMATION.—The development and formation of crystals is the subject of a paper by Dr. T. V. Barker in *Chemistry and Industry* for January 16. Among the topics discussed are: lattice structure; polymorphism and isomorphism; mixed crystals; chemistry of the crystalline condition. The main lines of advance in the X-ray examination of crystals are outlined. The section on crystal mixtures is somewhat detailed. The equilibrium relations between a mixed crystal and its mother liquor are most simply illustrated by leaving out of account the variable amount of water (or other solvent) requisite for solution, and then plotting percentage composition by weight of the two constituents of the mixed crystal against their relative proportions in the solution. Two types can then be distinguished, the first of which is illustrated by mixtures of cobalt and ferrous sulphates, and the second by mixtures of potassium permanganate and perchlorate (Muthmann and Kuntze). The complete equilibrium diagram of ferrous and magnesium sulphate mixtures is given for the first time; the system belongs to the second type.

LOW TEMPERATURE TREATMENT OF BITUMINOUS MATERIALS.—T. W. S. Hutchins, at a joint meeting of the Chemical Engineering Group and the London Section of the Society of Chemical Industry on January 16, gave an account of the low temperature treatment of bituminous materials. He set out by cataloguing the conditions which must necessarily be fulfilled if such a process is to be technically successful. It would seem that these conditions are extremely stringent, for the number of such "points" (in the Wilsonian sense) reached twenty-two. He described the development of the "fusion" retort and its construction as at present used. It consists of a horizontal, revolving, externally heated retort through which the comminuted material passes. The retort contains a series of paddles on a free horizontal shaft, so that when the retort revolves, these paddles roll over in such a way as to churn up the charge, facilitating the escape of vapours and at the same time preventing the growth of accretions on the walls of the retort. It would seem that the plant is designed primarily for the recovery of liquid distillation products, and the yields obtained from a number of bituminous materials are given, but without data to indicate how far the processes are commercially successful.