

## Research Items.

THE SEQUENCE OF TYPES IN STONE IMPLEMENTS IN RHODESIA.—Stone implements in South Africa exhibit two definitely demarcated periods of human habitation, one characterised by hand axes of Chellean or Acheulean type, the other by flake implements of Aurignacian facies. In many localities the hand axes are associated with flakes, some showing unmistakable evidence of design and secondary chipping; but there is no evidence whether they indicate two distinct periods. Mr. Neville Jones, in vol. 54 of the *Journal of the Royal Anthropological Institute*, describes implements from Sawmills, Rhodesia, showing two distinct periods of human activity which can be differentiated by geological evidence. This is the only site in Rhodesia as yet known on which this is possible. Hand axes of pointed and oval form are found in a bed of coarse gravel on rising ground near the Umguza River. A lower terrace resting on alluvium and largely derived from the older terrace is the site of a factory of implements made from flakes struck from pebbles of various forms of silica. Most are worked on one side only, and show an exquisitely fine retouch. By some it is thought that these latter are the work of early Bushmen, though, as a rule, Bushmen implements are smaller and lack the same definiteness in form.

THE ORIGIN OF AMERICAN MAN.—In the *Quarterly Review* for April, Mr. Lewis Spence surveys and discusses the evidence bearing upon the origin and antiquity of man in America. His conclusion is that the New World received its main human stock from Asia at a period when the Eastern portion of that Continent had developed only a slender degree of culture at the closing stages of the glacial period or possibly at one of the recurring intervals of mildness; but there were later accessions. European influence, apart from the Norsemen, may be seen in the banner stones and the stone gouge of New England and farther north; and there is also the tradition of Madoc's expedition from Wales. The architectural remains of Central America and south-eastern Asia present close similarities in certain features, though the correlation of Mayan dating with our system precludes influence much later than two thousand years ago. The cult of Quetzalcoatl in his earlier forms exhibits analogies to Buddhism. Polynesian influences have been discerned in several customs and forms of artistic endeavour in South America. The extreme view of the entirely indigenous origin of American culture is untenable, but America probably was visited by a number of bands or units who brought with them the knowledge of an alien culture which only partially affected that of the older settlers from north-eastern Asia.

RUSSIAN INVESTIGATIONS OF THE FAUNA OF ASIA.—While expeditions of the American Museum of Natural History have been for several years exploring the past and present fauna of Mongolia, where, apparently, a large proportion of Palaearctic forms originated, the same problems have been attacked by Russian workers from the north. Prof. P. P. Sushkin made a study of the fauna of Altai mountains and of northern Mongolia during his expeditions in 1912 and 1914, results of which were so rich that he has only recently been able to arrive at some conclusions published in the recent issue of the *Comptes rendus* of the Russian Academy of Sciences. An analysis of the present ornithological fauna, in connexion with the geological history of the country, enables P. P. Sushkin to reconstruct the history of the fauna in the

following way. In the palæolithic, the Eastern, or Trans-Yenissean, Siberia formed a continuous mass of land together with Mongolia (the Angara-continent of geologists), while western Siberia was covered by sea. The ancient endemic elements which are numerous in the eastern Siberian fauna are relics of the Angara fauna. The fauna of western Siberia is very poor in endemics, and it bears, on the whole, European characters; this results from the fact that the country became dry land only at the beginning of the neolithic, when it was populated by the animals driven from Europe by the glaciation, which began in Europe earlier than in Siberia. The glacial period in Siberia was followed by a dry and hot period when steppes and deserts extended very far to the north. After the desert period came a more moist one, continued until the present time, and it resulted in the extensive development of forests which have driven the steppe and desert forms southwards, while a few desert "islands" remained surrounded by forests. Prof. Sushkin is at present in the United States completing his studies and comparing his results with those attained by the American zoologists; he is also making arrangements for publication in English of his results in book form.

DIMORPHISM IN EARWIGS.—Ever since the work of Bateson and Brindley on the length of the forceps in the common earwig, *Forficula*, this has been quoted as a typical case of dimorphic variability. In a posthumous paper D. M. Diakonov (*Journ. Genetics*, vol. 15, No. 2) has made an elaborate experimental and biometric study of this dimorphism, from Russian specimens living under the bark of tree-stumps. The dimorphic condition is confined to the males, and is known in several species. Other features of body-size vary continuously, but there is some correlation between body-size and length of forceps. The relative frequency of the two types, *brachylabia* and *macrolabia*, varies greatly with the conditions, and there is other evidence that these modes or types are non-inherited modifications. Under unfavourable conditions, a larger number of *brachylabia* occurs. The reaction-norm is not a linear but a more complex function of the environmental conditions. Various similar cases in plants, such as the *Zwischenrassen* of de Vries, are cited.

GOLGI APPARATUS.—In a summary account of the form and function of the Golgi bodies in cells, Mr. Leslie A. Harvey (*Sci. Progress*, April 1925) points out that they have now been found in practically all vertebrate tissues, and also in many tissues of invertebrates and plants. First discovered in 1898 in vertebrate ganglion cells, the demonstration of this apparatus in cells has resulted from the fact that it reduces osmic acid, and can be impregnated with silver salts—a technique developed by Cajal, Da Fano, Kopsch, and others. In many tissues it takes the form of a network of threads, but in invertebrates it is in rods or vesicles, and it has been seen in the living cell. It takes various other forms, and there is much evidence that it is concerned in secretion. Its history has also been traced in spermatogenesis, and it is believed to have a lipoid constitution. It is suggested that in the living cell it exists in the form of a system of vesicles each surrounded by a fluid membrane.

THE VOLCANIC ROCKS OF BANKS PENINSULA.—A petrographic and chemical study of these interesting New Zealand rocks has been carried out by R. Speight, and is described in the *Records of the*

Canterbury Museum, N.Z., vol. 2, No. 4. Most of the rocks present features which make their nomenclature and classification a matter of difficulty. According to the silica percentage they would be called basalts, and by some petrologists this classification would be confirmed by the usual presence of olivine. On the other hand, the ratio of felsic to mafic minerals would lead other authors to regard them as andesites. The plagioclase rarely affords a conclusive test, as the phenocrysts are frequently labradorite, while the groundmass feldspars are oligoclase. Petrologically, however, the rocks are much more closely related to the basalts of the Pacific Islands and the Brito-Arctic region than to the typical andesites of the circum-Pacific belt. This is shown by the high percentage of titanium dioxide and the generally under-saturated character of the lavas, and is confirmed by the association of dykes of trachyte and trachytoid phonolites. The succession of magmas in the region appears to be as follows: (a) rhyolites and andesites of Cretaceous age (these being Andean in type, and not referred to above); (b) olivine "andesites" and basalts of Middle Tertiary age; (c) dykes of trachyte and dolerite, nearly contemporaneous with (b); and finally (d) basalts, of which some are definitely alkaline, of late Tertiary or early Pleistocene age.

EVAPORATION AND TEMPERATURE CHANGES IN THE ENGLISH CHANNEL.—A paper by Mr. H. W. Harvey in the March number of the *Journal of the Marine Biological Association* describes a series of observations of temperature and salinity of the sea carried out since April 1921, at a station 20 miles south-west of Plymouth, where the depth is 70 metres. There was an inflow into the area surrounding the station of warm highly saline water during 1921, after which there have been no marked movements of water, but an irregular decrease in salinity. A diagram shows the monthly averages of the mean temperature of the whole column from top to bottom. The yearly minimum occurs in each year in March, and the maximum in September or October. From the changes of temperature from month to month is derived the net daily loss or gain of heat of a column of 0.1 square cm. cross section. From this and the solar radiation recorded at South Kensington, a calculation is made of the difference between the net gain or loss of heat and the incoming radiation. This difference is attributed to evaporation. The result arrived at is that the water gains heat from the spring to the autumn equinox, and loses heat from the autumn to the spring equinox, and that the loss by evaporation overshadows the loss by radiation, the loss due to direct heating of the atmosphere being relatively small. It is concluded that the changes in temperature of the sea were controlled to a marked extent by evaporation. A very interesting observation was that, in the absence of windy weather and consequent mixing by waves, the upper layers may be heated by solar radiation in early May, giving a shallow warm layer separated from the cold water below by a sharp surface of discontinuity. Several days of rough sea are necessary to disturb materially this distribution of temperature. It is also pointed out that in fine clear weather with only light winds the upper inch or two of water become very hot. The normal method of sampling sea water in a bucket represents the surface 6 inches, more or less, so that the sample is considerably cooler than the actual surface temperature of the sea. The records discussed appear to show that there is no correlation between wind during the month and either the fall in temperature or the loss of heat

due to evaporation, and it is concluded that, in the open sea, vapour pressure is the major factor controlling evaporation, and overshadows the effect of wind. It is possible that a clearer relation between wind and evaporation might have been obtained if the observations had been discussed in two separate classes, according as the air is warmer or colder than the sea surface.

MODERN COLOUR PROBLEMS.—In recent years, considerable attention has been directed to the problems involved in the perception and measurement of colour. The solution of these problems is not only a matter of academic interest, but is also of considerable practical importance. In the series of Cantor Lectures, delivered before the Royal Society of Arts on November 24 and December 1 and 8, 1924, and recently published in the *Society's Journal*, Dr. L. C. Martin gave a critical review of the present position of colour theory and standardisation. The selective effects of transmitting and reflecting materials were discussed, and the early attempts to produce artificial daylight described. Modern developments in this direction have resulted in the production of corrected units which, when properly applied, are fairly satisfactory and efficient for most of the requirements of commerce and industry. An interesting fact in this connexion is that retinal reflex actions exercise an important influence in enhancing visual sensitiveness and discrimination. Since the reflex action is much greater at the violet than at the red end of the spectrum, the deficiency in the violet in artificial daylight may result in a relative diminution of retinal sensitiveness, and therefore a somewhat greater intensity than is necessary in the case of real daylight may be called for if the same facility in colour matching is to be attained. In the third lecture of the series, the various methods of colorimetric measurement were described. In this branch of the subject rapid advances are being made. The study of the action of the visual receptor mechanism, its fatigue, adaptation and response characteristics, is placing the operations of photometry and colorimetry on a new and sounder basis. For the development of the more utilitarian applications of colour measurement, further study is required of the phenomenon of diffuse reflection and of the transmission and scattering of light in relation to the measurement of the surface colours of material objects.

EFFECT OF ALTERNATING MAGNETISM ON HÆMATITE.—A lecture given by Mr. W. M. Mordey to the Royal Institution on May 18, 1923, on "Some New Effects of Alternating Magnetism" has just been published. Mr. Mordey discusses the anomalous behaviour of specular hæmatite, a black crystalline form of ferric oxide in the form of powder, when placed in an alternating magnetic field and in a rotary magnetic field. On sprinkling iron filings on a glass plate placed over an alternating current magnetic pole, the filings lie on radial lines of force proceeding from a point. When, however, specular hæmatite is sprinkled on the plate a very small amount of the material is attracted to the pole, but most of it is repelled briskly in all radial directions, forming a large ring round the pole. On slightly raising the plate the small amount of attracted material is repelled to the other particles forming the ring. The particles when in a very strong field are attracted, but when in a weaker field are repelled from the pole. For a certain strength of field there appears to be neither attraction nor repulsion. The phenomenon is analogous to the electrostatic actions which take

place between two conductors having unequal but like charges of electricity. In this case, as Snow Harris showed many years ago, they attract one another when close together, but repel one another when they are far apart, the neutral position where neither attraction nor repulsion takes place being well defined. If a heap of the ore containing the hæmatite be placed on the glass plate, then the hæmatite is driven out of the heap and deposited in the feebly magnetic regions, leaving the inert material behind. When polyphase magnets are used, we get rotary magnetic fields produced, and the motions of the particles become much more complicated, especially those which exhibit strong magnetic hysteresis. The field is an inviting one for experimenters, but there are too many variables in it to make it attractive to the theoretical physicist.

**ZIRCONIUM ORES.**—The examination of a large number of zirconium ores, described by G. Hevesy and V. T. Jantzen in the *Chemical News* for March 20, shows that there is no connexion between density and hafnium content, whereas there is a rough relationship between the latter and the radioactivity. In minerals of nepheline syenitic origin (*i.e.* products of alkaline residual crystallisation) the ratio  $\text{HfO}_2/\text{ZrO}_2$  is about 0.015; in minerals of granitic origin this ratio is probably about 0.03.

**LUMINOUS PAINTS.**—An article on luminous paints and enamels is published in the *Chemical Trade Journal* for March 27. In the latter part of the sixteenth century, Vincenzo Cascariolo, a cobbler and alchemist of Bologna, experimented with some specimens of heavy spar which he obtained at Monte Paterno. On calcining the mineral with charcoal he obtained a substance "which absorbed the rays of the sun by day and emitted them by night." This power is shown by sulphides of barium, calcium, strontium, magnesium, zinc and other metals, though the actual cause of the phosphorescence is apparently the presence of minute quantities of certain impurities, which govern the colour of the glow, and in the absence of which no luminescence is observed. Highly luminous products, suitable for practical use, are now obtained by heating mixtures of alkaline earth oxides or carbonates with sulphur, to which small quantities of lithium carbonate, and in addition traces of bismuth nitrate, rubidium nitrate, lead acetate or other metallic salts, have been added. This addition is usually made in the form of a standard alcoholic solution. The article describes the manufacture of typical luminous bodies and gives several formulæ. The effective life of such substances and their practical applications are considered in full detail.

**CADMIUM.**—Dr. N. F. Budgen describes the production and commercial uses of cadmium in an article in the *Chemical Age* for March 7. The metal was first isolated in Stromeyer's laboratory from the oxide (1818); several names were proposed for it (*e.g.* melinum), but the present name, suggested by Stromeyer, was finally adopted. Cadmium is always found associated with zinc in its ores, but more recently lead and copper ores containing considerable amounts of the metal have been found. Cadmium can only be profitably produced as a by-product in the treatment of ore for the main metal; the cadmium always concentrates in the flue-dusts, condensed fumes, etc., and it is obtained from these either by direct distillation or by solution followed by chemical or electrolytic precipitation. The chemical properties of cadmium are described in detail and a good account

of the uses of the metal in alloys is given. "Stain-resisting" silver contains cadmium. The electro-deposition of the metal and its alloys is also described.

**DECAY AND PRESERVATION OF STONE.**—The decay of stone and preservation of buildings are the subjects of a paper by Dr. A. P. Laurie in the *Journal of the Society of Chemical Industry* for February 27. The rapid disintegration of stone is caused mainly by the formation of calcium sulphate crystals within it, which by persistent growth in certain layers or pockets ultimately break up the stone. Analyses of decaying stone from various cathedrals show, however, that a stone can carry considerable quantities of calcium sulphate without breaking up. The results of experiments described in the paper lead the author to propose a complete change of policy with regard to our public buildings. He suggests they should be washed down three or four times in summer so as to ensure rapid evaporation. The purpose of this is to help the rain to dissolve out as much calcium sulphate as possible. A new cement for repairing decaying stonework is mentioned, namely, "silicon ester," prepared by the action of alcohol on silicon tetrachloride. When exposed to air and moisture it deposits transparent silica. It is suggested that sandstone with a binding material of silica is most suitable for buildings in modern cities.

**GAS TURBINES.**—In a recent paper before the N.E. Coast Institution of Engineers and Shipbuilders, Mr. M. König surveys the attempts to produce a gas turbine and gives an interesting account of current work on this difficult problem. A gas turbine might compare favourably with an internal combustion engine of the ordinary reciprocating kind by an improvement in thermal economy, by a reduction in weight per horse-power, or by a reduction in harmful vibration: but in the author's view the temperatures required for high efficiency are beyond the capabilities of materials at present available, and it is only for certain specialised purposes that the second and third possible merits are of importance. Holzwarth's work on the gas turbine has for long been a source of interest to English engineers, but little was known of details of the progress which had been made. Mr. König quotes over-all efficiencies of 16.8 and 17.8 per cent. for the Holzwarth 300 kw. and 700 kw. turbines respectively, and states that a large unit of 5000 kw. at 1000 r.p.m. has been built and is now ready for testing. This large unit has a single turbine wheel of 10 ft. in diameter and 12 tons in weight. The maximum gas temperature is given as "almost 3000 deg. F." The field in which the gas turbine has won its way already to the front is in the compounding of the petrol engine used in aircraft by the employment of an exhaust turbine to pump air into the engine intake and so overcome the disadvantage of diminution in atmospheric pressure at altitude. It is stated, for example, that in January 1924 the General Electric Company of America gave particulars of such a supercharger turbine which ran at 33,000 to 41,000 r.p.m. and fed its engine, when the aircraft was at 35,000 ft. altitude, with air at sea-level pressure. The weight of this turbine plant is given as 140 lb. and the additional power delivered under these conditions by the engine as 280 h.p. The author points out that this aeronautical development may lead the way to progress in other fields, and he instances the work being undertaken in this direction by Brown, Boveri and Co., by the English Electric Co., and by the Curtis Gas Turbine Co. of America.