

Research Items.

EXCAVATIONS IN THE PIN HOLE CAVE, CRESWELL.—In a paper read before the Royal Anthropological Institute on Nov. 20, Mr. A. Leslie Armstrong described the work proceeding in the large inner chamber of this cave. The total depth of the deposit is 15 feet and consists of an upper and a lower cave-earth. Evidences of casual human occupation occur throughout the upper cave-earth and the dominant culture has been proved to be Upper Aurignacian with considerable Proto-Solutrean elements and some traces of intrusive Magdalenian near the top. Upper Mousterian artefacts of quartzite and flint occur at the extreme base. A recent find of outstanding importance to English archaeology is that of an engraved drawing of a masked human figure, executed upon a rib, probably of a reindeer. In general character and technique the figure resembles those of Hornos and Altamira, which are of Aurignacian date. It was found in association with Proto-Solutrean implements and was encrusted with breccia. The present specimen is the first Palæolithic drawing of a human figure to be found in Britain, and, being of a type which is rare even in the rich caves of France and Spain, it is of the greatest scientific interest. The engraving was found beneath stalagmite, 3 feet 6 inches below the floor of the cave, on an ancient occupation level, together with Proto-Solutrean and Aurignacian flint implements, and is therefore attributable to the dawn of cave art. The lower cave-earth contains two definite zones of occupation, the lowest at 12 feet. Implements of quartzite and tools of bone and mammoth ivory occur in both zones, the technique of which is Mousterian. Evidence of submergence of the lower cave-earth on two occasions and of climatic changes are well marked, and the occupation zones are separated by sterile layers of fallen roof slabs.

BIRDS AT SEA.—It is well known that in tropical seas many strong fliers amongst birds, such as frigate-birds, spend the greater part of their life at sea far from land, but it is interesting to learn that even in far northern waters there is also a goodly bird population far from the shore. During a voyage along an unusually far northern route—to Greenland—E. M. Nicholson made several counts over 10 sea miles, at distances about 300 miles from land (*British Birds*, November). They yielded numbers varying from 34 to 170 birds, leaving the impression that the oceanic bird population in about 60° N. lat. ranged from 5 to 10 per square mile. The majority of the birds observed were great shearwaters, fulmar petrels, and, in lesser numbers, terns and puffins.

VARIATION AND CORRELATION.—Messrs. W. W. Alpatov and A. M. Boschko-Stepanenko have made a study of variation and correlation in certain serial organs of insects, birds, and fishes (*Amer. Naturalist*, Oct. 1928). In the Hemipteran *Pyrhocoris apterus* the biometrical constants for length of joints in the antennæ were determined. The length of the phalanges was studied in the raven, the goose (*Anser albifrons*), collected on Novaya Zemlya, and in domestic fowls from Central Russia. The fish was *Boreogadus saida* from Barents Sea, which has several dorsal fins. A relation was found between absolute size and variability in fin characters, the larger ones being less variable. The wild birds were also less variable than the domestic ones. Pearson's 'rule of neighbourhood' concerning the intercorrelations of serial organs was found to hold in nearly every case.

MUSSEL GROWTH IN SUBMARINE SHAFTS AND TUNNELS.—An interesting report by Dr. James Ritchie, dealing with this subject, appears in the *Transactions of the Royal Scottish Society of Arts*, vol. 19, 1914–25 (Edinburgh, 1927). In 1919, before erecting the new Electricity Generating Station at Portobello, the Committee of Edinburgh Town Council and its consulting engineers foresaw that difficulties might arise from the accumulation of mussels and other organisms in the large tunnels through which water for condensing purposes was to be conducted from the sea. Dr. Ritchie was then asked to carry out experiments in order to prevent such growth, the research, carried on over a period of two years, resulting in the discovery of a successful method of dealing with the obstruction. Whilst other organisms were liable to accumulate in the tunnels, the mussels only were of considerable importance, and it was shown by preliminary experiments that these certainly could accumulate to such an extent as to interfere in no small degree with the flow of water. The mussels enter in the free-swimming larval stage and settle down when only $\frac{1}{16}$ of an inch long, therefore it is practically impossible to prevent their entry. A way had to be found which killed them when once in the tunnel. Dr. Ritchie has now found a suitable method which consists in sending a reversed current or outflow of heated sea water into the tunnels and shafts at stated intervals, at such a temperature and for such a time that all the young mussels will be killed. A suitable minimum temperature is 110° F., the current to be passed through every four weeks during the spatting season, reckoned from the beginning of March until the end of October. These measures have proved to be very effective and have resulted in the entire clearance of the larger mussels from the tunnel. In practice, the raising of the temperature to such a height has proved to be expensive, therefore the alternative method of raising the temperature to 90° F. for a longer period has been adopted.

SEA-URCHINS OF THE INDIAN OCEAN.—An account of the Regular Echinoids forms the third and concluding part of Prof. R. Koehler's memoir on the Echinoidea of the Indian Museum, Calcutta. This part was, says Prof. Koehler, ready in manuscript in 1922; it bears the date of publication, November 1927, but was not received by us until the end of last October. It describes some 50 species, of which 14 are new, and two of these represent new genera, namely, *Printechinus* in the Temnopleuridæ, and *Prymnechinus* in the Echinidæ. An appendix describes two prosobranchiate gastropods parasitic on some of the Echinoids. They belong to the family Eulimidæ, many members of which are already known to infest various Echinoderms. One of them is a *Mucronalia* which settles on an ambulacrum of a *Stereocidaris* and extends its proboscis through one of the pores for the tube-feet; this gives rise to many anomalies in the structure of the test. The mollusc is readily shaken off the test, leaving little direct trace, and it may be that some abnormal Echinoids, both recent and fossil, which have been described, may have owed their peculiarities to a similar cause. The other parasite, which belongs to the allied genus *Megadenus*, is quite small, and lives on a *Dorocidaris*. It attacks one of the main radioles while the urchin is still young, checks the normal growth of the radiole, and becomes enveloped in a gall-like thickening, usually with an opening through which the spire of

the tiny shell can be seen. This shell is that of a female; but in the same cavity there also lodges a yet smaller male. This then represents a stage on the way to the dwarf rudimentary males already known in the Endoparasitic gastropod *Entocolax*.

'DIE-BACK' OF PLUM TREES A BACTERIAL DISEASE.—For many years growers have noticed the occurrence of stunted shoot growth in plum and cherry trees, with foliage pale in colour which withers or falls prematurely. Such 'die-back' has been described as due in many cases to a fungus *Diaporthe pernicioso*, which has been very fully examined by Miss Cayley (*Ann. Applied Biology*, 10, No. 2; 1923). Mr. H. Wormald has had a disease of this type under observation amongst the plum trees in the experimental plots at East Malling. Fungus fructifications often appeared upon the dead bark in the diseased region, but Wormald noticed that numerous bacteria were often present at the upper and lower limits of the diseased area. This aroused suspicion that the fungi might be a secondary result, and that the causal agent in producing the disease might be bacterial in nature. Isolation and cultural experiments were therefore carried out with the bacteria, and subsequent inoculation experiments with the cultured organism supply evidence that these bacteria can in many cases produce 'die-back' as the result of their introduction through a wound. These observations are briefly described in the *Gardener's Chronicle* for Nov. 10.

PROPAGATION OF RUBBER PLANTS.—A little while ago, the Right Hon. W. Ormsby Gore placed some very interesting data before the fellows of the Royal Colonial Institute, which are reproduced in *Tropical Life* for November 1928. In the old Botanical Gardens of Ceylon, at Heneratgodda, is a group of rubber trees which have been grown from the original seed brought by Sir Henry Wickham from the Amazon. Amongst them is a famous tree which, over a continuous period of five years, gave an average annual yield of 96 lb. of dry rubber. The average annual yield per tree on an ordinary plantation is about 4 lb. Unfortunately, seedlings from the high yielding tree have not possessed a yielding capacity much above the average, and the only possible method to obtain a plantation of high yield from a single plant with these qualities would appear to be by some method of vegetative propagation. Cuttings do not root successfully, so that bud grafting, now practised for some time in the Dutch plantations of Java and Sumatra, seems worthy of very extensive trial in British rubber-growing plantations. Planting Manual No. 2 of the Rubber Research Institute of Malaya (Kuala Lumpur, 1928), which contains an account of the budding of *Hevea* in modern plantation practice by Dr. Summers, is therefore a very timely publication. Dr. Summers makes it clear that the evidence at present available does not justify a complete abandonment of seedling propagation in favour of the new method. Mr. Ashplant has recently claimed (*NATURE*, June 30, p. 1018; *Tropical Life*, November 1928) that yield of latex is closely correlated with the diameter of the latex tube as determined under certain specified conditions, and states that by this method a reliable guide to future yield is provided which can be employed upon six-month-old seedlings. If further work should substantiate this claim, it may yet be possible to select seedlings of high yielding trees from the nursery beds and build up a plantation of high average yield from seedlings even more easily than from vegetatively propagated clones.

GOLD COAST SURVEYS.—The annual report of the Survey Department of the Gold Coast for 1927-28

shows that the topographical map is nearly complete from the coast to lat. 7° N. The necessity of concentrating work on boundary surveys delayed topographical work during the year. The western boundary is nearly completed, and the eastern, which is the division between British and French mandated territory in the former Togoland, is making good progress. The new survey school at Accra is growing, and turning out annually a number of competent surveyors.

MAGNETIC MAP OF ENGLAND AND WALES.—The Ordnance Survey has published a layer coloured orographical map of England and Wales on a scale of 1 to 1,000,000 on which the lines of equal magnetic variation are drawn at 15-minute intervals (Southampton: Ordnance Survey, 2s.). Their approximate courses in the English Channel and the Irish Sea are also shown. The position of magnetic observatories is also clearly shown, with the value of each station for the year 1927. No other names except those of physical features are given. The map is a fine example of colour printing and clear typography.

GEOLOGY OF THE SALT RANGE.—A first-hand contribution to the geology of the Punjab Salt Range is published by Dr. C. S. Fox in the *Records Geol. Surv. India*, p. 147, 1928. In recent years the hypothesis of a Tertiary age for the salt, and of considerable thrust faulting in the Range itself, have been fashionable; Dr. Fox, however, returns to the view already advocated by Murray Stuart that the Saline series lies beneath beds of Cambrian age, and that the Kohat deposits are probably of the same age. He shows that the Tertiary deposits do not provide any evidence of deserts, or of any period of desiccation. On the other hand, the Cambrian beds suggest a prolonged period of arid conditions over a very wide area during which the salt beds could readily have been formed. Similar beds in Persia—also associated with similar volcanic material—are considered to be of Cambrian age, and to belong to the same climatic province. The anomalous position of the salt marl in the Salt Range can be easily and satisfactorily accounted for by simple solution and isostatic settling, while the foliated character of the Kohat salt is a consequence of flowage under the great pressures accompanying mountain folding.

CLIMATE OF JAVA.—The Royal Meteorological and Magnetical Observatory of Batavia continues its publications on the climate of the Dutch East Indies. In the most recent (*Verhandelingen*, No. 6) Dr. C. Braak deals with the climate of Java and Madura. The volume is in Dutch, with a lengthy summary in English. It includes a number of photographs of cloud forms, and two maps showing the wind direction during the east and west monsoons. After a general account of the winds there follows a description of the climate of certain places that have characteristic features. For other stations the full data will be given in the statistical volumes which have yet to be published. Sumatra was treated in a previous volume, which contained a general account of the rainfall. Java contrasts with Sumatra in having a sharp distinction between the wet and dry season. In east and much of central Java there is a rainless season of several months. In west Java this is marked only in exceptional years. Another peculiarity of east and central Java is the persistence of the föhn winds during the dry season. Night frosts occur in Java at great heights. These are unknown in Sumatra. They occasionally do considerable damage to plantations.

ATMOSPHERIC POLLUTION.—The work of the Meteorological Office Advisory Committee on Atmospheric

Pollution was transferred to the Department of Scientific and Industrial Research last year. That Department is responsible for the thirteenth report on observations of atmospheric pollution, although it deals with observations made in the year ending March 1927, prior to the transfer and reorganisation. The form of the report remains unaltered. It includes among several other studies of more than theoretical interest, an analysis of the deposit of atmospheric impurity at eighty different stations in the British Isles, which reveals the fact that between 1914 and 1927 the percentage of stations falling within the two categories with least deposit out of the four into which the range of pollution is divided, has increased from 15 to 87 per cent. It appears that for carbonaceous matter Newcastle-on-Tyne gives the highest figure, while for sulphates Burnley heads the list. In spite of the general improvement, the small percentage of stations in the class with the largest deposit remain unaltered at the end of the period under review. The general conclusion that appears to emerge from these statistics, and from a more detailed study of the relative proportions of carbonaceous pollution and of that due to sulphates, is that in the industrial regions where impurity is derived largely from factory smoke, any improvement is very small compared with the change in residential districts, where the increasing use of gas fires in place of the open hearth makes itself increasingly felt. The report concludes with a short study of the relationship between the degree of impurity of the air in London and the figure for ultra-violet light derived by Dr. Leonard Hill's acetone blue method. This shows that the amount of ultra-violet light received becomes so sensitive to the degree of impurity over a certain range of the scale for impurity, that the fixing of a standard for what may be regarded as hygienically 'clean' air will probably not prove difficult.

AN ELECTRICAL MODEL OF THE HEART.—Some two years ago, Dr. B. van der Pol suggested that the heart-beat was a biological example of the so-called relaxation oscillations the properties of which he had been studying. This idea has now been developed in detail by him and J. van der Mark in a paper which appears in the supplementary November number of the *Philosophical Magazine*. The mathematical treatment of the electrical circuits used in illustration of the theory is involved, but they are essentially systems in which a decay phenomenon repeats itself, the terms in the equations corresponding to the resistance term for mechanical motions being negative for small amplitudes, instead of positive, as is usually the case. The sinus, the two auricles, and the two ventricles are represented respectively by three flashing neon lamps, which are connected in such a way that the order of discharge is that which occurs in the natural heart; the link between the auricles and ventricles—the bundle of His—is another neon lamp. Electro-cardiograms have been taken from the model, and are similar to those of a natural heart, showing not only the main features of the normal beat, but also, when the appropriate additional stimuli are applied, such phenomena as auricular and ventricular extrasystole, partial and complete heart block, and the refractory period. Of special interest is the reproduction of the biological law of 'all or nothing': a stimulus has either no effect at all, or it causes the complete response. The success of their model has prompted the authors to predict from it a number of new phenomena which might be met with in the natural heart, and they state that by elaborating it in another direction they have arrived at a model of a striated muscle upon which they hope to report later.

DETERMINATION OF CELLULOSE BY OXIDATION WITH CHROMIC ACID.—In the cellulose industries the problem of determining the amount of cellulose in a solution containing no other organic material frequently arises. The method of precipitation of the cellulose followed by direct weighing is tedious, and it is much quicker to effect the quantitative oxidation of the material to carbon dioxide and water by means of a mixture of chromic and sulphuric or phosphoric acids. The latter method is described in detail by Constance Birtwell and B. P. Ridge in the *Journal of the Textile Institute* for October. The use of phosphoric acid instead of sulphuric acid is to be preferred, unless the cellulose content of the solution is very low, in order to avoid the possible formation of sulphur dioxide. Instead of measuring the volume of carbon dioxide formed, the amount of chromic acid used may be determined by titration.

GLYCERIN.—The *Journal of the Society of Chemical Industry* for Oct. 19 contains an interesting account by W. F. Darke and E. Lewis of the methods of manufacture and applications of glycerin and some of its substitutes. The chief sources of glycerin are oils and fats, which on saponification yield glycerin and soap or fatty acids. During the War, glycerin was made in Germany by the fermentation of beet sugar, but this and various synthetic processes that have been suggested are not now employed. In medical and pharmaceutical practice, glycerin is used on account of its softening action on the skin, its solvent properties, and especially because of its antiseptic powers. It destroys bacteria much more rapidly than tissue cells, and should therefore be of great value in surgery. It also forms a constituent of certain infant and invalid foods. The industrial uses of glycerin depend chiefly upon the low freezing point of its aqueous solution and its dehydrating properties, although large quantities are consumed in the explosive, adhesive, and ink industries. Many substances have been proposed as glycerin substitutes, such as magnesium butyrate, but their application is limited. Ethylene glycol is sometimes used in place of glycerin as an anti-freeze medium and as a lacquer solvent, but its production is more costly.

DETERMINATION OF PENTOSANS.—The classic method for the determination of pentosans, due to Tollens, and consisting in distilling the material with hydrochloric acid of density 1.06 and weighing the furfuraldehyde thus formed as phloroglucide, is known to be subject to various sources of error. In the *Rendiconti del Reale Istituto Lombardo di Scienze e Lettere*, Parts 6-10 (1928), Dr. C. Antoniani gives the results of experiments made to ascertain the extent to which the values obtained by this method are influenced by the presence of carbohydrates with a 6-carbon atom basis. In the case of fodder, the effects of hexoses or hexosans are not, as a rule, sufficiently large to invalidate the conclusions drawn from the pentosan content with regard to the value of the fodder. From the purely analytical point of view, such admixtures do, however, exert an influence, this being least for cellulose and appreciably greater for starch and hexoses in general. The discrepancies are due, only in slight degree, to the formation of extra quantities of furfural, and depend mainly on the presence in the distillate of hydroxymethylfurfural, which is derived from the dehydration of the hexoses and is, under the conditions employed, only partially converted into levulinic acid. This hydroxy-compound may be removed by redistillation of the first distillate, but allowance must then be made for the diminution of the furfural originally present by 7 per cent. The experimental results indicate that the furfuraldehyde phloroglucide obtained is not always of exactly the same composition.