

Research Items.

STONE AGE INDUSTRIES OF SOUTH AFRICA.—A new classification of the Stone Age industries of South Africa is suggested by Dr. Van Hoepen in Part I. of the *Archeologische Navorsing* of the National Museum of Bloemfontein. Incidentally, some interesting suggestions are put forward as to the uses of certain of the implements. The classification is typological. The implements of the Stellenbosch, Vaal, and Pniel are equated with Chellean, Acheulean, and Mousterian respectively. The author had previously suggested the substitution of the Pniel culture for the 'Victoria West' culture. In the Koning culture, which is equated with the Aurignacian, a new industry is recognised corresponding with Upper Aurignacian. This is the Poort, so-called from the locality in which it is found, namely, Commissie Poort, Ladybrand district, and characterised by small thumb-nail scrapers and double hollow scrapers, while for the lower Koning culture, corresponding with the lower Aurignacian, is suggested the name Koning industry. Of the remaining cultures the equations are, Stilbay with Solutrean, Mosselbay with Magdalenian, and Wilton with Azilian. In the newly defined Koning industry, the types here described are the trimmer, the disc scraper, and end scraper, flaying knife and curved point. It is pointed out that the term 'scraper' is being applied to implements never used for the purpose of scraping, while they seem admirably adapted for skinning animals, the point being especially well fitted for assistance when the skin holds very tight. The question is raised whether the grey-weathered and red-weathered implements were made by different peoples, or whether worked by the same people at different times, but it is left over for future discussion.

EXPECTATION OF LIFE AND ALCOHOL.—It has frequently been asserted by extreme temperance advocates that even moderate indulgence in alcohol shortens life, and the experience of insurance companies is that abstainers as a whole are longer-lived than non-abstainers as a class, no distinction being made between moderate and heavy drinkers. Prof. Raymond Pearl (*International Clinics*, vol. 3, Series 38, p. 27) has attempted to assess the possible influence of moderate drinking upon the expectation of life by a critical statistical analysis of two groups of individuals. The first group consisted of 5248 persons whose histories had been detailed in Prof. Pearl's Institute records, the second group of 7500 patients who died in the Johns Hopkins Hospital, whose hospital records were abstracted. Both groups were divided on the evidence available into abstainers, moderate drinkers, and heavy drinkers. For both groups the fact emerges not only that the moderate drinking of alcoholic beverages did not shorten life, but that the moderate drinkers had a slightly greater expectation of life than the abstainers (0.36 year—1.25 years for males at different ages, and rather more for females). Heavy drinkers, as might be anticipated, had an expectation of life some eight years less than moderate drinkers at age thirty years, but this difference diminishes with advancing age.

TUBERCULIN TESTING OF CATTLE.—The Medical Research Council has issued a report by Prof. J. B. Buxton and Dr. A. S. MacNalty (*Special Rep. Series*, No. 122. London: H.M.S.O.) on the intradermal tuberculin test in cattle. The tuberculin test by subcutaneous inoculation, which has usually been employed, is subject to many fallacies and entails the taking of the temperature of the inoculated animal on two or more occasions. As a result of a questionnaire addressed

to a number of veterinary surgeons, the intradermal test is recommended in substitution for the subcutaneous and ophthalmic tests. This consists in injecting into the skin with a special syringe and needle 0.1 c.c. of undiluted, 'old tuberculin,' the area of infiltration and thickness of the skin after inoculation being estimated. After forty-eight hours the site of inoculation is again inspected. A positive reaction consists in the appearance of a large diffuse swelling, hot and tender to the touch; if this is the case, the animal is certainly tuberculous. If, however, the swelling consists of a hard pea- or bean-like non-tender infiltration of the derma, the result is inconclusive, and a second similar injection of tuberculin is made into this infiltration. The animal is examined twenty-four hours later, and if negative there is little increase in the swelling; if positive, the swelling becomes large, hot, and tender.

CHINESE FRESH-WATER FISHES.—In the *Bulletin of the American Museum of Natural History*, vol. 58, 1928, Mr. J. T. Nichols gives a provisional check-list of the fresh-water fishes of China ("Article I. Chinese Fresh-Water Fishes in the American Museum of Natural History's Collections." Publications of the Asiatic Expeditions of the American Museum of Natural History. Contribution No. 83), covering material in the American Museum of Natural History up to June 1926. Further collections of considerable importance are expected from the Asiatic expeditions, which have already yielded much that is new. The area investigated is restricted to Old China from the outer limits of Chili Province on the north-east to the outer limits of Yunnan Province on the south-west, and does not include Manchuria, Mongolia, Tonkin, or Tibet. Only strictly fresh-water forms are included in the list, which embraces a very large number of fishes belonging to twenty-four families, of which the Cyprinidæ is the largest with eighty-eight genera and sub-genera and many species. Next in number, but far behind, come the Colobitidæ and the Siluridæ. The list is illustrated by good text figures, including the curiously shaped *Cobitidæ Cobitis*, *Misgurnus*, and *Barbatula*. This should be a valuable help to all those studying Chinese fishes.

LANCASHIRE SEA-FISHERIES INVESTIGATIONS.—The Marine Laboratory and Sea Fish Hatchery at Piel, Barrow-in-Furness, is now closed. This involves the abandonment of several pieces of work. With the present arrangements, however, a certain amount of research in connexion with the local fisheries will still be carried on at the Lancashire Sea Fisheries Laboratory in the University of Liverpool. The present report ("Report for 1927 on the Lancashire Sea Fisheries Laboratory at the University of Liverpool and the Sea-Fish Hatchery at Piel," No. 36, 1928, edited by Prof. James Johnstone) contains a preliminary note on the hydrographical data obtained on the Holyhead-Dublin steamer, and a study of the muscles of the mysid *Praunus flexuosus* by Mr. J. R. Daniel, besides a summary by Dr. Johnstone of the results of trawling experiments made by the Lancashire Fisheries Committee since 1892 in various parts of the district. In this last report it is shown that the abundance of some common species of immature fishes runs in cycles—the plaice being usually abundant about 1895, 1910, and 1920—whilst at the present time they are scarcer than usual, as they were about 1915 and 1905. Mr. Daniel's work on the muscles of *Praunus flexuosus* is valuable. It is on the same lines as his former work on *Crangon vulgaris* (No. 35 of the present publication, 1926), and this

subject shows very similar structure, although there are certain differences. The most important point is the concentration on a longitudinal arrangement of the ventral flexor muscles, and with this is correlated "the ability . . . to spring backwards through the water by means of a sudden and violent contraction of the abdomen, whereby the telson is brought rostralwards." Mr. Daniel has also studied the muscles of *Meganyctiphanes norvegica* but reserves the description, with a detailed comparison of those of *Crangon* and *Praunus*, until a future occasion. The longitudinal muscles of *Praunus* are in striking contrast to the transverse type which predominates in *Meganyctiphanes*, in which the abdomen is only incompletely flexed.

ROOT SYSTEM OF APPLE TREES.—The Annual Report of the East Malling Research Station, Supplement 2, Oct. 1928, contains some remarkable photographs of the root systems of ten-year-old apple trees. The same scion apples are growing upon different stocks, and the differences in the root habit and extent of these two stock root systems are most convincingly demonstrated. Messrs. W. S. Rogers and M. C. Vyvyan describe the methods of root examination employed; they are most laborious. For each tree examined, more than sixty tons of soil had to be finely broken up and moved, a task which occupied four men from seven to ten days. The distribution of the roots was also recorded by methods of grading and weighing. One root stock (Malling IX.) proved to be much more deeply rooting than the other (Malling I.). One point of considerable practical importance is that nearly 50 per cent of the fibre of the root system, the absorbing portion, proved to lie outside a circle five feet distant from the trunk. Thus the common practice of applying manure near to the base of a tree would seem to have little justification. Unfortunately, these laborious investigations can only tell us of the final form of the root system when exposed. At the Dutch experiment station at Wageningen there is an underground glass house above which the trees can be planted so that the growth of the root system can be watched throughout the season. Such growth observations would materially add to the value of such data as are presented in this interesting work.

ROSETTE DISEASE OF GROUNDNUTS.—Groundnuts form the staple crop in the Gambia Colony, and the absence of an alternative crop renders its liability to 'rosette' (virus) disease of considerable importance (*Annual Report*, Dept. Agric. for Gambia Colony, 1927-1928). Investigations show that the insect carrier is probably one or both of two new species of Jassidæ which are being determined. This carrier would appear to be most active between mid-July and mid-August, judging by the incidence of disease, and so far no other food plants than groundnuts have been observed. Infection appears to be carried over from year to year by groundnuts left in the soil, and though other means are probable it seems evident that infection is not carried in the seed. The most susceptible period is the first few weeks after germination, but rainfall at this time reduces the incidence of disease, probably by rendering the insect carrier less active. The effect of the disease is to stunt growth, increase empty shells up to 55 per cent, reduce the good nuts to about 36 per cent, or to render the infected plants barren. Control at present consists in destroying all plants showing signs of disease and all groundnuts that germinate between the growing seasons, and also in sowing the crop so as to avoid drought so far as possible during the first few weeks of growth. Fertilisers appear to have no beneficial

effect whatever. Three varieties have been raised which have a high degree of resistance to disease, but so far no fully immune variety has been obtained.

CLASSIFICATION OF COAL.—Scientific investigators have long struggled with the problem of devising some rational system of classification of coals, but the extreme diversity of the properties has made the task difficult. One of the best-known efforts is that of Prof. S. W. Parr, of the University of Illinois, who proposed his scheme twenty years ago. He has republished in the *Bulletin* of the University Engineering Station, No. 180 (pp. 62; 35 cents), his system applied to a large number of analyses of coal from all parts of the world. His method is, briefly, to plot the heating value of the 'unit coal' substance, that is, the pure coal substance free from extraneous or adventitious matter, against the percentage of volatile matter of the 'unit coal.' Classification depends on the area of the chart into which fall the points for individual samples. The results of such classification can be correlated with those obtained by Seyler's method, but confusion results from the different terminology adopted. The *Bulletin* contains a bibliography of the subject and should be of great interest to geologists and chemists interested in the study of coals.

CARBONISATION TESTS.—At the Fuel Research Station, Greenwich, a series of tests has been made on the 'Parkfield Large Gas' coal from the Bristol and Somerset Coalfield (Physical and Chemical Survey of National Coal Resources, Paper No. 12. London: H.M.S.O. 1s. 6d.). This forms another of the tests made on typical coals from various coalfields in full scale plant. Carbonisation tests were conducted in Glover-West retorts with moderate steaming, when the coal proved a satisfactory fuel, if due allowance was made for its highly swelling character. Satisfactory tests were made with horizontal retorts also. The yields of products were comparable with those previously recorded with a well-known Yorkshire gas coal. In the vertical low temperature iron retorts, the tests again show that modifications were needed to allow for the caking properties. The cokes produced were tested as fuel for a Lancashire boiler, gas producer, and a water gas generator. In all cases trouble ensued owing to the fusible character of the ash. This again shows how important a factor is the ash of coal and how desirable it is to perfect the methods of cleaning coal and applying them when practicable.

FOSSIL ISOPOD CRUSTACEA.—Although probably abundant in past times, isopods are rarely found fossil. An account of all the forms previously known, with descriptions of some new species, is given by V. van Straelen (*Mém. Acad. roy. Belgique*, 9; 1928). The earliest isopod known is from the Middle Trias of Alsace, but its relationship to existing forms is uncertain. A freshwater form occurs in the Rhaetic of New South Wales and is referred to the living genus *Phreatoicus*. Marine types belonging to the families Cymothoidæ and Sphæromidæ are found first in the Bathonian. The best-known genus in England is *Archæoniscus*, found in the Purbeck of Wiltshire, which is related to the Sphæromidæ. That family is also represented in the Purbeck by *Cyclospheroma*. Terrestrial isopods begin in the Upper Eocene. At present palæontology gives no evidence concerning the origin of the Isopoda.

CORRELATION OF THE CAINOZOIC OF VICTORIA, AUSTRALIA.—The richly fossiliferous Cainozoic deposits of Victoria, Australia, have from time to time received the attention of palæontologists in that quarter of the world. It has been found more difficult

there to zone the series from Oligocene to Lower Pliocene than has been the case in Europe and America. This is due mainly to the equability of conditions of sedimentation and climates in the Australian region compared with that of other countries. One forward step towards the correlation of these beds in various localities is made with the conclusion of an examination of the material of the bore cores at Sorrento by Frederick Chapman, Commonwealth Palaeontologist, at the National Museum, Melbourne. The work has been in hand since 1912, involving the determination of 10,000 specimens of the larger shells and many thousands of microzoa (Foraminifera and Ostracoda). The description of new species has been the conjoint work of the general author and Miss Irene Crespin, resulting in sixty-one forms new to science. In the earlier part of the work assistance was given by R. A. Keble, of the Geological Survey of Victoria, and now of the National Museum. The spot where the bore was put down is ideal for giving a great thickness of strata, for it is on the downthrow side of the great Cape Schanck fault. It is to be regretted, however, that the boring was not continued farther, for it ended at 1696 feet, still in Cainozoic material, correlated with the Balcumbian. Taken side by side with the results given in Chapman's monograph on the borings in the Mallee, there is now every prospect of the general and detailed zoning of the Australian Cainozoics being placed on a surer basis. This will prove of great value in the work now going on under the Commonwealth, of defining stratigraphical horizons with the view of ascertaining geological structure in the regions investigated by scout-boring in oil research. The work, which has been issued in the *Records of the Geological Survey of Victoria* (vol. 5, Part 1), is well illustrated by twelve plates of drawings and photographs by the author and his daughter.

NUMBER OF α -PARTICLES FROM RADIUM.—H. J. Braddick and H. M. Cave, working in the Cavendish Laboratory at Cambridge, have made a new determination of the number (Z) of α -particles emitted from one gram of radium in a second (*Proc. Roy. Soc., A*, 121, Nov. 1). They have used the indirect method of finding the total charge carried by the α -particles from radium C, the charges collected as the particles were received in shallow copper boxes being measured by the aid of a Compton electrometer. The strength of the sources was found from their γ -ray activity, and in any one experiment the ratio of the α -ray activity of the radium C to its γ -ray activity was constant to within less than one per cent. As the result of sixteen sets of observations, they found that Z has a value of 3.68×10^{10} , their estimated error being plus or minus one per cent. This is in close agreement with what would be expected from recent measurements of the heating effects of radioactive preparations, and it therefore appears that there is no need to invoke the existence of any hitherto unrecognised heat-producing mechanism in these processes.

BANDED STRUCTURES IN METAL CRYSTALS.—In a letter to NATURE last year (vol. 120, p. 259), Dr. C. F. Elam pointed out that banded structures can be observed in copper and aluminium, which have the appearance of twins but do not have a correct relationship for the normal type. She has now carried out further investigations on these, and has been able to show that, contrary to what had been believed previously, aluminium does form twins, of a spinel type (*Proc. Roy. Soc., A*, 121, Nov. 1). She also suggests that they are much more common than is imagined, but that they are frequently overlooked because they do not exhibit straight boundaries. Another similar structure which she has studied has been shown, on the contrary, not to be of this type; she has described it as 'mechanical twinning.' It appeared when a

crystal of aluminium in the form of a round bar was pulled in tension, and deformed non-uniformly, with the production of parallel planes running vertically along the specimen, and it seemed most likely to be formed when two possible planes of slip were inclined equally to the axis of strain. In an appendix to Dr. Elam's paper, Prof. G. I. Taylor has pointed out that her observations of the latter phenomenon are consistent with the laws previously recorded regarding the distortion of aluminium crystals. Dr. Elam's observations were made by the usual crystallographic and X-ray methods.

ARC SPECTRUM OF CÆSIUM.—D. A. Jackson, working in the Clarendon Laboratory at Oxford, has made an investigation of the hyperfine structure of the arc spectrum of caesium (*Proc. Roy. Soc., A*, 121, Nov. 1). The difficult problem of obtaining the metallic vapour in a suitable form for excitation was solved by mixing it with helium, and carefully regulating its partial pressure. The containing vessel was exposed to a high frequency oscillator, and the light from it analysed by the well-known method of combining étalons of quartz—by Adam Hilger—with a spectrograph of the Littrow type. The lines of the principal series were found to be close doublets, their separation being about 0.30 per cm. The details of the structure do not appear to be explicable as a result of the interaction of the electrons alone, and to explain this the suggestion is made that it is connected with a spin of the atomic nucleus of one-half quantum, the ratio of the magnetic moment of the latter to its mechanical moment being twice as great as for the electron. The results agree well with those obtained by other workers for the hyperfine structure of some lines due to bismuth, and it has been found possible to devise a selection principle which applies to both elements. The physical meaning of the rule is straightforward—"the greater the change in the relative orientations of the nucleus and electron during the transition, the less probable the transition."

NUCLEAR DISINTEGRATION.—The issue of the *Zeitschrift für Physik* for Nov. 2 contains the reply of Dr. Kirsch and Dr. Pettersson to the criticism of the Viennese experiments upon artificial disintegration that was made recently by W. Bothe and H. Fränz, as the result of their independent researches at Berlin (*Die Naturwissenschaften*, Mar. 23). It is maintained that β -particles do not affect a zinc sulphide screen in any way which would lead to them being mistaken for α -particles or swift protons, and it is further shown by new experiments, that the reputed disintegration protons still appear when possible stray β -particles would have been swept away by a magnetic field. The suggestion of Bothe and Fränz that certain effects were due to a strongly abnormal scattering of α -particles is also apparently disposed of by some other experiments which are described, generally similar to those performed at Berlin, but with a scintillation screen used instead of a Geiger electrical atom counter, and finally the Berlin experiments are themselves criticised on the grounds that the electrical counters used were not properly calibrated, and that occluded hydrogen was not removed from some of the materials employed. Drs. Kirsch and Pettersson take an entirely opposite view to Bothe and Fränz as to how the work of the latter is to be interpreted, and consider that it supports their own conclusions as to which nuclei can be disrupted, rather than those of Sir Ernest Rutherford and Dr. Chadwick. They do, however, concur with Bothe and Fränz in the opinion that electrical methods for registering individual atomic particles are likely to be of great value in this connexion, and it is stated that a report upon the applicability of these is to be published shortly.