

## Research Items

### Arteries of Peking Man

PROF. FRANZ WEIDENREICH has made a study of the evidence afforded by endocranial casts of fossil hominids for the character of the meningeal artery, with special reference to its bearing on the phylogenetic problem (*Palæontologia Sinica*, No. 110, N.S.D. No. 3, 1938). It is known that the medial meningeal artery exhibits a rather great variability in recent man with respect to its ramifications. Two main groups are distinguished, of which the second, in which the trunk is divided at a low level into two branches, is the more primitive. In *Sinanthropus* the trunk is as a rule divided into two, or even three branches. There are numerous variations in detail; but the ramifications of all branches, which are rather abundant in recent man, are markedly poor. Little is known of the conditions of the medial meningeal artery in anthropoids or lower apes; but when the gibbon and the great apes are compared with *Sinanthropus* and recent man, it becomes evident that they bear a much closer resemblance to *Sinanthropus* than to recent man. The endocasts of Neanderthal man reveal that *Sinanthropus* is more primitive. Rhodesian man exhibits an instructive example of a mixture of primitive features and a far advanced character; while the peculiarities of the Neanderthal type, so far as known, confirm the conception that it is an intermediate form between *Sinanthropus* and recent man, as supported by the characters of teeth, brain and skeleton. The arterial pattern, in fact, comes close to the more primitive type of recent man. *Pithecanthropus* exhibits a typical hominid pattern similar to advanced *Sinanthropus*, but shows that the classification of *Pithecanthropus* as a gibbon by Dubois is untenable. The pattern of the Piltdown skull conforms in all respects to that of the more advanced type of recent man, while Swanscombe is also typical of recent man. It is evident that the ramifications of the artery in recent man are independent of both size of brain and racial character, but are peculiar to mankind at large.

### Boat Processions in Egypt

AMONG the customs of Ancient Egypt which have survived in attenuated form into modern times is that of the boat procession from Karnak to Luxor, in which the god Amun, accompanied by his divine companions Mut and Khons, journeyed up the Nile attended by the Pharaoh and his court. In the opinion of most Egyptologists, this great festival of Opet, of which there is a representation on the walls of the temple of Ramses III at Karnak, survives in shadowy form in the boat processions of Luxor and Qena, held annually on the birthday festival of the Muhammedan patron saint of the towns. The festival and the course of the procession have often been described; but Mr. James Hornell points out in *Man* of September 1938, that the boats which form part of the procession have not received special attention. The procession at Luxor takes place on the fourteenth day of the month Sha'bān, when the participants gather around the gaily-flagged boats in a square adjacent to the mosque of Sheykh el Miqashqash. The two boats are mounted on four-

wheeled lorries drawn by men and boys. Each boat is freshly painted, and fitted with a mast, on which is hoisted a blue-striped lateen-sail. Flags inscribed with texts are carried before and after the boats and float from the masts. In build these boats differ completely from the clumsily fashioned craft seen on the Nile. Their lines have a certain dainty elegance. They have clipper bows, long beak-like prows, and an open gallery frame built out beyond the transom stern. Instinctively we feel that in former years, when the festival had more importance than to-day, the boats used were really small replicas of Turkish galleys of the Middle Ages. The nearest related design to these Luxor craft is that typical of the galley-shaped sardine fishing boats now belonging to Malaga, a town held by the Moors until 1487.

### Nutritive Value of Pasteurized Milk

TWO sets of very similar, though not identical, experiments on the value of pasteurized, as compared with raw, milk for the nutrition of calves have been carried out at the National Institute for Research in Dairying (University of Reading) and the Rowett Research Institute, Bucksburn, Aberdeen, respectively, and the results are published in a joint report (Milk and Nutrition: New Experiments reported to the Milk Nutrition Committee. Part 3: The Effect of Commercial Pasteurization on the Nutritive Value of Milk as Determined by Experiments on Calves. Pp. 27. Shinfield, Reading: National Institute for Research in Dairying, 1938. 2s.). In both experiments calves were divided into two similar groups, one group being fed on commercial raw, and the other group on commercially pasteurized milk from the same bulk, with equal small supplements of other foods in the later stages of the experiment. In brief, it may be stated that there was very little difference at the end of the experiment in the weight, growth and general nutrition of the two groups.

### Under-water Movements of the Dipper

MANY observers have witnessed the fact that the dipper or water-ousel (*Cinclus cinclus*) can remain and move freely under water; but there has been much speculation as to how a bird, having a specific gravity less than that of water, can remain upon the bottom. It has been suggested that it grips with its toes, but it has been seen walking upon the sandy bed of a stream which afforded no possibility of holding. Dr. J. M. Dewar suggests that in moving water the bird makes its way against the current, at the same time depressing its head and neck, so that part of the force of the current has the effect of pressing it downwards (*British Birds*, 32, 103; 1938). In still water, the movement of the bird itself creates a current which has a similar effect. By a simple experiment with a block of wood, Dr. Dewar found that the speed of movement (by traction at a suitable angle) necessary to keep the block at the bottom of still water 10 inches deep was equivalent to a rate of only 0.5 mile per hour. More observations are required of the positions actually assumed by the dipper in its submerged movements under different conditions.

### Cattle Bot-flies in Norway

IN Norway, as in most European countries, the damage caused to cattle and hides by the presence of bot-flies, *Hypoderma bovis* and *H. lineatum*, was excessive up to about 1920. L. Reinhardt Natvig summarizes the position by stating that in 1922 the loss in England was £15 million, and for England (that is, Great Britain) and its colonies £30 million. Similar heavy losses are given for other countries. In many countries, however, the last twenty years has seen the institution of a vigorous campaign against these insect parasites, which, aided by the discovery of the value of derris in destroying the bots, has had strikingly successful results. Natvig illustrates the effect of the measures taken in Norway by means of two maps, the first showing the distribution and incidence of bots in cattle in South Norway in the years from about 1875 to 1920, and the second showing the same features in 1936 (*Naturen*, 62, 243; 1938). No evidence could be more convincing of the value of suitable preventive measures firmly and generally applied.

### Framework Grafting

AN interesting paper upon the regeneration of fruit trees by W. F. Walker, of Tasmania, has recently been published (*J. Roy. Hort. Soc.*, 63, Pt. 9; Sept. 1938). Many fruit trees in Tasmania ten years ago were not of the varieties most suited to modern needs. The orchards could, of course, be destroyed and replanted, but several unproductive years would have to be spent. The usual methods of re-grafting and budding were also tried, but most success was obtained with 'framework' grafting. The tree is headed back slightly, but only sufficient to retain the main framework of the branches. Scions are then inserted at intervals of about 8 in. all over the tree. They can be disposed so that they occupy space to the best advantage, whilst future pruning and yield are also under control. Closer spacing results in more fruit spurs, whereas more extended distribution gives greater vegetative growth. Several methods for the quick performance of the grafting operation are described in detail, and the method offers the fascinating possibility of changing the variety without the loss of more than one season's crop. Agricultural success is surely based upon such scientific versatility.

### Copper Deficiency in Cultivated Soils

RECLAMATION disease has been known in parts of Northern Europe for some time. It was first recognized as a disease and named by Elema, the name being derived from its frequent occurrence on sandy heaths and moorland soil recently reclaimed. These soils are rich in humus and strongly acid, but it is also found in peaty clay soils; in Denmark it has occurred in *Calluna* heath soils when brought into cultivation. In Holland the reclamation by draining of large areas of waste sandy heath and moorland has met with difficulties from this cause; earlier investigations showed that heavy dressings of urban refuse gave some measure of control; such refuse contains copper salts, and later work has shown that copper sulphate alone was most effective. Liming such soils increased the trouble, presumably lowering the availability of the copper and apparently also removing the small amount of available manganese. Now the observations of C. S. Piper and of D. S. Riceman and C. M. Donald have shown that the

'coastal sickness' attacking grazing sheep in certain coastal areas of South Australia, and the poor crops of cereal obtained from the same soils, similarly yield to treatment with copper salts. Dressings of 28 lb. of copper sulphate to the acre gave much improved yields of wheat, oats and barley, and a new feature is the fact that the original soil in these cases has a very high content of calcium carbonate and a pH between 8.5 and 9.0. The same dressing of copper did not effect much improvement on pastures on these soils, but there is evidence that higher dressings of copper or possibly treatments including other elements such as iron, will greatly improve the pasturage. The experimental work with the South Australian soils is described in Pamphlet No. 78 of the Council for Scientific and Industrial Research, Melbourne.

### World's Natural Resources

IN a paper on this subject by Mr. F. E. Lathe read at the June meeting of the American Association for the Advancement of Science in a series of communications on "Science and Society", an attempt is made to reach a quantitative estimate of the world's resources in food, power and minerals. The conclusions are that, with the continued applications of science, food supplies will suffice for a population of four times the present numbers, and that in power and most of the minerals of value to man there is little cause for anxiety. This is true, however, only when the world is considered as a single economic unit. For the large number of units, most of which are striving for economic self sufficiency, the outlook is very different. In order to illustrate the extreme mutual dependence of nations, Mr. Lathe has compiled a table showing the extent of national sufficiency of the seven great powers of the world in coal, iron, copper, lead, zinc, nickel, tin, asbestos and petroleum. Ascending numerical order shows decreasing sufficiency for national needs in each commodity. The table shows that only the British Empire, the United States and the U.S.S.R. are each self-sufficient in half or more than half these substances; but that no other power reaches that level in more than one commodity and several in no commodity. Thus he illustrates his theme that international trade is essential and self-sufficiency an economic fallacy.

### Antarctica and the Glacial Ages

THE Antarctic ice-sheet in Pleistocene times, which has recently been under discussion in the correspondence columns of NATURE (see Sept. 3, p. 438), enters into the argument of a consideration by Prof. F. E. Zeuner of the chronology of Pleistocene sea-levels (*Ann. and Mag. Nat. Hist.*, Ser. 11, 1; 1938), though the evidence taken into account concerns volume rather than extent. Prof. Zeuner compares actual conditions of sea-levels observed in the Mediterranean in the work of A. C. Blanc with those postulated on the basis of the 'glacial control' theory and the curves of solar radiation as calculated by M. Milankovitch in 1930, which have been found to reproduce correctly and in detail the fluctuations in the extension of the ice during the Pleistocene age. As a result of his comparison, Prof. Zeuner finds that the observable climatic phases and changes of sea-level in the Mediterranean agree completely with the fluctuations postulated on the basis of the curve of radiation. In the course of his computation, he

has occasion to observe that the Pleistocene sea-levels appear to be related to the glacial phases of the northern hemisphere only. This conclusion is based on his view that at no time did the increase in the volume of ice in the Antarctic, as compared with present conditions, ever exceed one third of the present volume. Taking W. B. Wright's figures of approximately twelve million cubic kilometres as the present volume, this would give in the most intense phase, that is, according to Milankovitch's figures of the solar radiation curve, the first phase of the last glaciation, Würm I, an approximate maximum volume of 16 million cubic kilometres, whereas R. A. Daly's calculation for the Scandinavian ice cap of the last glaciation is approximately five million cubic kilometres, the variation in the antarctic sheet being put at four to six million cubic kilometres at most, as against a deglaciation of the north American, European and Siberian ice-caps of 35 million cubic kilometres since the maximum.

#### Nickel Carbonyl

IN 1931 Pauling (*J. Amer. Chem. Soc.*, 53, 1367; 1931) showed that, on the theory of directed valency, nickel carbonyl ( $\text{Ni}(\text{CO})_4$ ) should have a tetrahedral structure. In 1934, the Raman spectrum appeared to indicate a square configuration. In the following year, electron diffraction studies pointed to the tetrahedral structure, but the observed nickel-carbon distances suggested that resonance occurred with some structure (probably the square configuration) having nickel-carbon double bonds. Recently Bailey and Gordon (*J. Chem. Phys.*, 6, 225; 1938) and Crawford and Cross (*ibid.*, 6, 525; 1938) have measured its infra-red spectrum and their results are in satisfactory agreement. In the later paper the data, obtained for liquid  $\text{Ni}(\text{CO})_4$  from  $1\mu$  to  $8\mu$  and for  $\text{Ni}(\text{CO})_4$  vapour from  $1\mu$  to  $23\mu$ , are analysed in conjunction with Raman spectral data, and indicate that the molecule has a tetrahedral structure, although the square configuration is not completely excluded. By the methods of group theory, normal co-ordinates, selection rules, and spectroscopic characteristics of both models have been derived, and the calculated values of fundamental frequencies, first overtones, and binary combination tones are compared with the observed results. Further, evaluation of the force constants show that that for carbon-oxygen stretching has a value intermediate between those for  $\text{C}=\text{O}$  and  $\text{C}\equiv\text{O}$  bonds. Interatomic distances, derived from force constants, agree with recorded values.

#### Lighting in Mines

THE Mines Department has been co-operating with the manufacturers of safety lamps and lamp bulbs and with other associations with the object of assisting the industry. The Secretary for Mines has published a circular (M.D. No. 115) giving an account of the directions in which progress is being made. A most important development is in connexion with lamp bulbs. It is found that the argon now commonly used for lamp bulbs can be replaced advantageously by krypton. Recent investigations show that a higher lighting efficiency is obtained without any reduction in the life of the bulb or any increase in its current consumption. The tests made at the Mines Department Testing Station on krypton-filled bulbs show increases of 20-30 per cent in lighting efficiency as compared with argon-filled bulbs of the

same rating and life. The arrangements already in use for testing the performance of 'approved' bulbs will be applied to krypton-filled bulbs, and collieries can therefore rely on the maintenance of the improved results obtained in the tests. The use of these bulbs, which are slightly smaller in diameter than ordinary bulbs, does not entail any alteration in the construction of the lamps or batteries, but as krypton is more expensive the bulbs are  $2\frac{1}{2}d.$  dearer. The Secretary of Mines considers that owing to the high efficiency of the lamps the cost will be less for a given illumination. When the British Standards Institution undertook to specify the requirements for miners' lamp bulbs, it was necessary to fix the life of the lamp. This was fixed at 600 hours, but it was found in practice that the actual working life was longer than this. The B.S.I. has now reduced the laboratory test of 600 hours to 500 hours as this greatly improves the efficiency. Attention is also directed to a new type of mercury vapour bulb for lamps fixed in position which works at the low pressure of 100 volts and gives high efficiency and a long life.

#### Measurement of Powdered Materials

THE methods at present available for measuring the fineness of powdered materials used in engineering and industrial processes are described in detail in a paper submitted to the Institution of Mechanical Engineers by Dr. Harold Heywood, senior research officer of the British Coal Utilization Research Association. In it, definitions of particle size and shape are discussed and examples are given by means of typical size-distribution curves for granular and powdered materials such as moulding loam, pulverized coal, Portland cement, and mine atmospheric dusts. For the size grading of comparatively coarse powders the method of sieving or screening is used, and the author explains and elucidates the theory of sieving and the relationship between particle size and sieve aperture. Differences in materials due to density, particle shape, stickiness, hygroscopicity, etc., have made it impossible to devise a general sieving specification and, as the process cannot, in general, be carried to completion, the usual practice is to specify an end-point either by limiting the time of sieving or by continuing the operation until the weight passing the sieve in a given time is a stated percentage of the original sample or of the residue on the sieve. The first is an easy test to apply, and, in the case of a particular material not likely to vary much in fineness, provides a useful test. The last is more sound fundamentally but is difficult to apply. In the grading of particles of sub-sieve size, the processes used involve motion in a fluid. Dr. Heywood discusses the motion of such particles and gives a method by which their falling velocity can be calculated when the fluid flow around them is turbulent. He describes several processes which are employed in this form of analysis and explains their respective merits and advantages, including in his survey elutriation by means of air or water, sedimentation, hydrometry and the obscuring of a beam of light by dilute suspensions. Reference is also made to a device developed at the Fuel Research Station for comparing the fineness of viscous suspensions such as coal-oil mixtures for boiler firing, and consisting of a test-tube containing the mixture and pivoted slightly above its centre of gravity. This is made to oscillate, and the changing time of oscillation as the powder sinks provides the means of determining the rate of settling.