

Research Items

Geological Age of the Markleeberg Palæolithic Industry

THE distinctive palæolithic industry found in the gravels of Markleeberg on the right bank of the Pleisse, approximately 8 km. south of Leipzig, of which examples were first collected in 1895, and of which accounts have appeared on numerous occasions since 1911, has given rise to much controversy owing to an apparent contradiction between its position in the geological time-scale and its relation to the culture sequence of the French archæological classification. On typological grounds, the industry is regarded as a Mousterian which retains certain primitive characters in its technique and shows Acheulean influences. In a discussion of the geological evidence of the age of the deposits in which the industry appears M. R. Grahmann points out (*L'Anthropologie*, 45, 3-4) that difficulty arises, to a great extent, from the fact that the quaternary geology of the area is only very imperfectly known. Recent research has shown that there is evidence of three glaciations, corresponding to those of northern Germany, which may be termed Elster, Saale and Vistula. Applying this scheme to the Markleeberg deposits, the evidence is interpreted as indicating the moraine of the second glaciation, the Saale, as the source of the industry. Probabilities, however, point to the industry being older, while the diversity of facies it exhibits may well be due to the moraine having gathered up the debris of a number of sites of different ages. A suggested correlation of this scheme with that of the Alpine and north European glaciations equates the Markleeberg industry with the beginning of the Riss glaciation and makes it contemporary with the French Acheulean, thus indicating a difference in the course of development of stone age industries in central and eastern Europe and the west, while tending to support the view that the former were the earlier.

Agricultural Ceremonies in the Naga Hills

IN a communication dealing with the effect of ritual upon industries and arts in the Naga Hills, Mr. J. P. Mills (*Man*, 144, September) describes the agricultural ceremonies observed by the Nagas during the year, which have not previously been recorded. The village is a closely knit community which acts together in seeking the favour of the spirits for the crops of all. The essential act of worship is a day of rest, on which no one is allowed to work in the fields. In all, there are about seventy *kennü* days in the year; but they are so arranged as not to interfere with agricultural operations. Thus in those months when the people are busily engaged in clearing the ground, sowing the millet or preparing for the growing of the important rice crop, few *kennü* days are observed, except here and there for rest from the work in hand. The close of a time for a particular operation, such as, for example, of the season of pot-making in January, is marked by a day of rest. Private ceremonies, from the nature of the case, do not show the same consideration for agricultural operations, and the observance of the days of abstinence, such as are enjoined for sickness, a birth or death, make serious demands on time which may extend to as much as five days at a time. The agricultural year opens in January with three days of purification,

after which the clearing of new *jhums* and the sowing of millet begins. In March, when it is time to think of the rice, four days between March 10 and 15 are days of *kennü* and feasting preparatory to beginning the main work of the year. At various dates in the following months there are *kennüs* to avert bad luck or damage from various causes, such as hail, grubs, ants, etc. Jungle clearing is accompanied by a great deal of feasting and jollification. *Kennüs* take place on September 10 and 11 for the solemn eating of the first fruits, and on November 24-December 5 the whole village gives itself up to the great feast which marks the end of the year's work.

Cobalt and 'Coast Disease' of Sheep in Australia

AS is well known, minute amounts of certain elements, for example, copper, manganese, zinc, boron and others, are necessary for the normal nutrition of animals and plants, and evidence has been obtained that 'coast disease' of sheep in South Australia may be due to a deficiency of cobalt (Marston and Lines, *J. Council for Sci. and Indust. Res.*, Commonwealth of Australia, 8, No. 2, pp. 111-117). In this disease, sheep fed on certain pastures become lethargic and anæmic, waste and ultimately die. The soil in the area is deficient in certain elements, notably phosphorus, but additions of iron, manganese, arsenic, copper and phosphates failed to cure or prevent the disease. Other elements were also eliminated, and as cobalt had been found experimentally to increase the number of blood-corpuscles, it was decided to test the effect of this element. Two sheep which were almost *in extremis* with coast disease were therefore given 1 mgm. a day of cobalt in the form of cobaltous nitrate. The effect was almost immediate; within three days the animals improved in health, appetite and body weight, and in the condition of the blood, and within ten weeks had become almost normal again.

Mollusca of Lake Geneva

AN interesting study of the ancient and modern molluscan fauna of Lake Geneva is made by M. Jules Favre ('Études sur la Partie Occidentale du Lac de Genève. 2. Histoire Malacologique du Lac de Genève'. *Mem. Soc. Phys. et d'Hist. Nat. Genève*, 41, Fasc. 3, 1935). Many species are discussed, but of special importance is the variability of *Valvata piscinalis*, which is very different at different depths. Two forms are found now living in the lake, the form *antiqua* having a thick and opaque shell, greyish yellow, pale, turriculated, with scarcely any umbilicus, which is distributed almost everywhere on the muddy bottom of the littoral and sub-littoral zone down to about 25 metres, then becoming scarce and disappearing at 40 metres, and the form *alpestris minor* having a whitish shell, diaphanous or almost hyaline with conspicuous transverse striations and large umbilicus, a much smaller form than *antiqua*. The form *alpestris minor* is now rare in the lake and localised in the vicinity of certain fields of Characeæ in the Bay of Belotte between 5.50 and 10 metres. It represents the primitive form occurring in the post-glacial sediment which has given rise to the common form *antiqua*, the latter being the best adapted to

littoral regions, thriving in the sub-littoral zone where it is not battered by the waves and tending in the littoral regions to be the typical form of *V. piscinalis*. The species established itself in the lake in Post-Glacial times very soon after the retreat of the glaciers, and was among the first of the molluscs to invade the sub-littoral region, rapidly undergoing important developments and varying greatly when large masses of Characeae filled a certain part of the area, these algae having a profound influence on the species. Then the original form varied in different ways according to its habitat, those on the muddy bottoms after much variation giving rise to the turreted *antiqua* with constricted umbilicus, now the commonest form to be found in the lake, those in the *Chara* beds being mainly planorbis-like flattened forms with large umbilicus. The form *alpestris minor* recalls the ancient population, and is only to be found in the fields of Characeae.

Australian Cowries

COWRIE shells, popular with amateur collectors because of the beauty of their texture and patterns, have been well illustrated in colour in well-known monographs by the earlier workers. The difficulty of observing the living inhabitant, on account of the readiness with which it withdraws into its shell, has for the first time been overcome on a large scale by the Australian naturalist, Melbourne Ward. He has observed and made paintings of twenty species which he kept alive in his aquarium, and the paintings have served to differentiate species which on shell-characters alone seemed to be indistinguishable. Coloured figures of the living animals and their shells, with adequate descriptions, have been published in a complete list of Australian cowries (Cypræoidea) by Tom Iredale (*Australian Zoologist*, 8, 96; 1935); and the animals are even more beautifully coloured than their shells.

Development of May-Flies

It has long been known that certain species of Ephemeroptera, or may-flies, pass through a very large number of nymphal instars. In this respect, they only find their parallel, in other insects, among the Plecoptera or stone-flies. An account of the post-embryonic development of several species of may-flies by Mr. F. P. Ide has recently appeared (*Canad. J. Res.*, 12, 433, April 1935). The life-histories of *Stenonema canadense* and of *Ephemera simulans* are described in detail, and those of nine other species less completely. In *S. canadense* the number of ecdyses was found to be between 40 and 45 and in *E. simulans* about 30. At each moult there is some increase in size, but the significance of moulting seems to be primarily for the purpose of changing morphological structure. Every change in external structure, even to the addition of a single seta, can only be accomplished through ecdysis. The determination of the instars is stated to be possible owing to the fact that each moult results in a change in the number of segments in the caudal filaments. The author comments upon the fact that many other insects grow to a much greater size than may-flies and yet only pass through four or five moults. He concludes that it is unlikely that so many moults could be concerned primarily with increase in size and that the reason seems to be in the need for the nymph to be constantly changing its structure in order to adjust itself to environmental changes.

Intertidal Ecology

THE study of the habits and distribution of the animals and plants inhabiting the intertidal region of the shore is one of considerable difficulty on account of the complexity of the environmental factors involved. Where many factors such as wave-exposure, emersion and immersion, insolation, etc., are concerned, it is desirable to study localities with as simple conditions as possible. Kitching (*Trans. Roy. Soc. Edin.*, 58, Pt. 2, No. 15, 1935), in describing a number of places on the Argyll coasts, has related the size and abundance of some of the most important species of animals and algae to wave-exposure, level and angle of slope of the rock. He also gives some data with regard to the hydrogen ion concentration, oxygen content and temperature in the various places. While some of the relationships are comparatively simple, such as the limiting wave-exposure which some algae can stand without being detached, or the inability of barnacles to survive within the 'sweep' of the larger brown algae, many of the relationships are very much less obvious, and collection of many more observations of this nature will be necessary for their elucidation.

A Rare Carnivorous Plant

DR. JOJI ASHIDA has given a very full account (*Mem. Coll. Sci., Kyoto Imp. Univ.*, B, 9, No. 3, Art. 5; 1934) of the opening and closing mechanism of the leaf blade of *Aldrovanda vesiculosa*, L., an animal-catching mechanism which has very seldom been studied, and never so thoroughly. Dr. Ashida was successful in growing this plant in culture throughout the year, the presence of dead leaves and stems of certain other aquatic plants proving to be the special requirement of this plant. The motile zone of the leaf blade lies at a distance of 0.15-0.25 mm. from the midrib and works apparently as the result of a loss of turgor of the inner epidermal cells on stimulation. The outer two layers, still turgid, then bend the two lobes so as to shut the leaf. After shutting, the surfaces are still compressed closer together, narrowing the cavity which encloses the animal victim. This is due to an increase of turgor and an active elongation of the outer epidermal cells; the water needed for the movement enters mainly through the outer surface. The subsequent expansion of the cavity within the closed leaf lamina and opening of the leaf is attributed to a transverse growth of the inner epidermis.

Distribution of Earthquakes in New Zealand

THE seismic record of New Zealand begins in 1848, and, from that time until the end of 1934, more than 6,000 earthquakes have been reported from various parts of the country. The distribution of these earthquakes, as regards both frequency and intensity, has recently been studied by Messrs. L. Bastings and R. C. Hayes (*Wellington Dom. Obs. Bull.*, No. 95; 1935). They divide the whole country into 19 areas roughly equal in size by lines of latitude and longitude. In the frequency map, the areas are shaded in tints depending on the percentage of the total number of New Zealand earthquakes felt within them. The highest percentage, 26.0, is reached in the district visited by the Murchison earthquake of 1929. A percentage only slightly less, 25.6, marks the western half of the central portion of the North Island, but this is due to the occurrence of more than a thousand

local shocks in and near Taupo in 1922. The district including Hawke's Bay has a percentage of only 9.0. The second map represents the maximum intensity of the earthquakes in the different areas, in six of which, at the north end of the South Island and the southern portion of the North Island, the tenth or highest degree of the Rossi-Forel scale was attained.

Theory of Elastic Solids in Practice

THE problems that arise when applying mathematical analysis to the stresses and strains in elastic solids only admit of exact solution in a few special cases. The demand for more accurate solutions has recently become urgent in the design of large electrical machines, as, owing to the improved methods of cooling now adopted, the permissible output has been greatly increased, and consequently the determination of the stresses and strains has become of primary importance. In the *Journal of the Institution of Electrical Engineers* of August, R. Poole discusses the various forces—magnetic, gravitational and mechanical—which act on the frames of large machines. It is pointed out that the effect of the magnetic pull on the frames is of great importance. He gives a method of analysis for calculating these effects which will be useful in practice, since it provides a means of showing the safe wear on the bearings of a machine and thus fixes the limits of mechanical design. As a check upon certain of the assumptions made in the mathematical treatment of the problem the author carried out photo-elastic tests upon model frames made of celluloid. The coloured photographs shown enable the distribution of the stresses and their approximate magnitudes to be seen at a glance. It is interesting to remember that these photo-elastic methods are based on the discovery made by Sir David Brewster that when a piece of glass is stressed and viewed in polarised light under certain conditions, brilliant colour effects are produced owing to the glass becoming double refracting. Prof. E. C. Coker has recently perfected an apparatus for this method of testing.

Stress and Elasticity

AMONG the papers issued by the Institution of Mechanical Engineers for written discussion (to reach the secretary before October 31) are three which are of general interest to physicists. In one of these, Dr. W. A. Scoble, the reporter, presents the fifth and final report of the Wire Ropes Research Committee, which, besides dealing with further series of tests made on ropes of different construction subjected to various degrees of loading, bending, lubrication, etc., contains an appendix reviewing the work of the Committee. This brief statement authoritatively corrects several misconceptions, particularly regarding the true factor of safety, and provides a guide as to the best conditions under which to employ wire ropes. In "Stress Waves in the Tyres of Locomotives", Prof. E. G. Coker and Dr. M. Salvadori exhibit and explain a photo-elastic investigation of the stress wave travelling in a locomotive tyre. The effects of the rail, the chairs, the spokes and the balance weight are shown in a series of diagrams. Dr. David Robertson presents a paper, "Hysteretic Influences on the Whirling of Rotors", in which are summarised the known facts concerning elastic hysteresis. It is shown that this can produce whirling when the shaft is running above its critical speed, and that the action of clamping fits, couplings and

endwise friction may tend to produce similar effects. An approximate quantitative theory is evolved.

Steam Turbines

UNDER this title, the Association of Engineering and Shipbuilding Draughtsmen has issued a paper by C. S. Bradshaw (London: The Draughtsmen Publishing Co., Ltd.). The series of printed pamphlets, to which it is the latest addition, consists of papers written by practical men for the use of others engaged on similar work, and the present issue is in full keeping with this tradition. The author is concerned at each stage of his examination of the subject with making typical calculations for the guidance of his reader. After treating in detail the several principles involved in the utilisation of steam in an engine of this kind, he proceeds with the preparation of the provisional design for a 3,000 k.w. impulse turbine to the extent of determining the steam consumption, efficiency and details of nozzles and blades. The author also explains the advantages of extraction turbines as developed to meet the case where, in addition to power, a supply of low-pressure steam is required for heating or industrial purposes, showing that in a particular case a saving of nearly 25 per cent in fuel may be effected. As to future design, his view is that a primary turbine will operate in the range from 3,000 to 600 pounds per square inch, the steam then passing to the main turbines, an arrangement which he considers would raise the overall station efficiency from the present figure of 26 per cent to one of 35 per cent.

Furfural Yield of Uronic Acids

THE separation of hemicelluloses from other plant constituents is a matter of some difficulty, and no satisfactory criteria of purity or homogeneity exist. Plant gums, which are also polyuronide in nature, have similarly been found to be complex mixtures without any sharply defined differences of properties. It has, however, been customary to determine the relative amounts of the major constituent groups in such preparations. By determining the evolution of carbon dioxide on distillation with 12 per cent hydrochloric acid an accurate figure for the uronic acid content is obtainable. Furfural determinations similarly give an estimate of the pentose content. Because it is known that uronic acids also yield some furfural under the conditions of that determination, a correction has been applied by many workers, based on an assumption that the yield of furfural from a uronic acid is $\frac{1}{2}$. Norris and Resch at Birmingham have critically examined this point (F. W. Norris and C. E. Resch, *Biochem. J.*, **29**, No. 7, 1590; 1935) and find this assumption to be incorrect, the true value being considerably higher, and moreover influenced appreciably by the presence of other units such as hexoses. The significance of their observations will be realised when it is stated that the commonly accepted formula for pectin depends on a calculation employing the earlier erroneous factor. The conclusions of many other researches on the composition of hemicelluloses, mucilages and gums may have to be revised for the same reason. The effect of the use of the lower factor has been to cause the pentose content to be over-estimated and the hexose content under-estimated. This is more serious in the case of pectin and certain gums of high uronic content than in the plant hemicelluloses, the uronic content of which is much lower.