

Research Items

Problems of the New Stone Age

SOME problems in the changed outlook of the last twenty years on the introduction and spread of the neolithic civilization into Europe have been discussed by Mr. H. J. E. Peake (*Mem. and Proc. Manchester Lit. and Phil. Soc.*, 1936-7). By 1925 it had been shown that the neolithic culture had reached Switzerland from western Asia by way of the Ægean and Danube Valley early in the third millennium B.C. The problem remained whether it reached the west in the same way or had come by sea from the eastern Mediterranean. This question must be viewed from the wider standpoint, in time and space, of when man first began to cultivate grain and domesticate animals, and how such knowledge reached our islands. Cultivation of wheat apparently began in south Syria or northern Palestine. Early grain growers are, with certain exceptions, always possessed of domesticated animals, and the precise origins of agriculture are obscure. Its progress, however, can be traced from Asia, through the Ægean to Switzerland, via the Danube. West of the Rhine, however, is a rude pottery, which has been filiated with the leather bag, derived, it is now suggested, from animal *scrota*. This 'bag-ware' is found widely distributed in western Europe, appearing in Switzerland and Germany from the west, and having as its starting point Lusitania. Important elements in this Lusitanian culture are shown to derive from the eastern Mediterranean—the tombs and the pottery. The megalithic tomb is traced back to Tell Arpachiya and thus related to the Tell Halaf culture of the fourth or fifth millennium, while it descends to the stone cist of the early Bronze Age. The evidence of the pottery depends on a number of decorative and other details traced from the eastern Mediterranean and ultimately Tell Halaf, beginning not later than the end of the fourth millennium, and appearing in the Iberian peninsula about 2800 B.C. Cattle, which could scarcely have been brought from the Ægean, were probably acquired by contact with Danubian peasants of Switzerland. This culture passing through France reaches Britain by a land bridge from Artois, and appears as the early neolithic culture of Windmill Hill. The red "bag ware" found at Maiden Castle, on the other hand, may have reached Britain from Brittany.

South African Native Cattle

LITTLE has been attempted by Europeans in the way of improving the cattle of Africa by selection within native breeds, the practice being to intergrade with European breeds. H. H. Curzon and R. W. Thornton, realizing the potentialities of the native cattle, have laid a foundation for further investigations by outlining the cattle types of Africa and their approximate distribution (*Onderstepoort J. Vet. Sci. Anim. Ind.*, 7, 613; 1936). Probably all the breeds, except the Hamitic longhorn of Egypt, came originally from Asia, and all reached their destination through north-east Africa except the shorthorned zebu which was introduced along the east coast north of the Zambezi River. Three parent stocks are involved—Hamitic longhorn, brachyceros

and lateral-horned zebu; and from these three other types have been derived—short-horned zebu, sanga, and lyre-horned zebu. In West Africa there are possibly two other types derived from admixture of brachyceros and Hamitic longhorn in one case, and in the other from brachyceros and thoracic humped zebu. The paper is illustrated by perhaps the most complete set of photographs of African cattle breeds yet published.

Stomatopoda of the Bingham Oceanographic Collection

G. ROBERT LUNZ has reported on the Stomatopoda from various localities collected by the *Pawnee* and from coastal trawlings by members of the Bingham Oceanographic Laboratory (*Bull. Bingham Oceanographic Collection. Peabody Museum of Natural History, Yale University*, 5, Art. 5; Jan. 1937). There is also included valuable material collected on the west coast of Florida by Miss M. Storey of Stanford University and a few specimens from Tahiti obtained by Mr. Henry Sears. 157 specimens are recorded, referable to five genera and thirteen species. A new variety is described from Tahiti of *Gonodactylus chiragra*, a species well known throughout the tropical portions of the Pacific and Indian Oceans but not before recorded from Tahiti, also a new variety of *Chloridella rugosa*, and there is one new species, *Chloridella edentata*, described from a single specimen, its nearest relative being *C. mantoidea*.

Cytology of *Gagea spathacea*

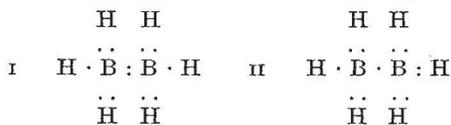
Gagea spathacea is a member of the Liliaceae occurring from southern Sweden through Denmark to Holland and Belgium. It apparently produces no seeds, its pollen is sterile and it reproduces vegetatively by numerous small bulbs. Dr. M. Westergård (*C. R. Lab. Carlsberg, Série Physiologique*, 21, No. 18), who has investigated its cytology, finds that while *G. lutea*, *G. minima* and *G. pratensis* undergo their pollen meiosis in Denmark in January, in *G. spathacea* this is delayed until April. *G. minima*, the most nearly related species, has $n=12$, while in *G. spathacea* $2n=circa\ 102$ and the chromosomes fail to pair in meiosis, with resulting micro-nuclei. This species is probably a hybrid; but it is not clear how its more than octoploid number of chromosomes has been reached. Its vegetative spread to Sweden must have occurred when the Baltic sea was a lake, unless it arose independently through crossing in the northern area. The embryo-sacs of *G. minima* and *G. lutea* ($n=36$) were examined, and stages were found indicating that the sac is of the type now known in *Lilium*, *Fritillaria* and *Tulipa*, that is, the four megaspore nuclei function, three passing to the chalazal end of the sac and one to the micropylar end. Here they all divide again, the chalazal spindles fusing so that two triploid nuclei result. One of the latter degenerates while the other divides. The mature sac thus contains an egg apparatus composed of three haploid nuclei and two triploid antipodal cells. In double fertilization a pentaploid endosperm arises from the fusion of a haploid and a triploid nucleus with the male nucleus.

Magnetostriction

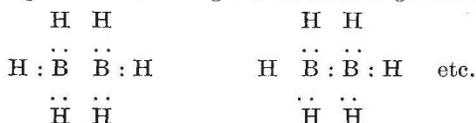
THE June issue of the *Science Reports* of the University of Sendai, Japan, contains two reports of the Research Institute of Iron, Steel and other Metals by Dr. Y. Masiyama, which deal with his recent work on magnetostriction of iron, nickel, cobalt, single crystals of iron and binary alloys of the three metals. The specimens were ovoids placed in the centre of a magnetizing coil, the field of which could be varied from 0 to 400 gauss. The changes of length of each ovoid were determined by fixing it between two quartz tubes coaxial with it, one of which projected out of the coil and ended in a small brass block. To compensate for temperature changes of length of the ovoid, a brass bar of suitable length was placed within the coil parallel to the axis of the ovoid and between two similar quartz tubes. Between the brass blocks a thin spindle carrying a mirror was placed in such a way that differential changes of length of ovoid and brass rod produced a rolling of the spindle and rotation of the mirror. The changes of length observed are generally less than 30 millionths at the maximum field, and are shown by curves in terms of the field and of the magnetization. They are independent of the sign of the field and at low fields are different for increasing and decreasing fields. For cobalt and nickel and alloys of the two the length decreases; for iron and alloys containing iron the length decreases at first, then increases as the field is increased. Each material tested showed hysteresis in its magnetostriction, and the effect will have an important bearing on the theory of magnetization.

Structure of Diborane

AN outstanding difficulty for the valency theory is the molecule B_2H_6 , and the non-existence of the molecule BH_3 , since boron is a trivalent element in numerous other compounds. Some light is thrown on the problem by determinations of the interatomic distances by S. H. Bauer (*J. Amer. Chem. Soc.*, **59**, 1696; 1937), by means of the electron diffraction method. The values for the B—B (1.86 Å.) and B—H (1.27 Å.) distances are considerably larger than the single-bond separations expected from other diatomic hydrides. This is interpreted as meaning that the bonds in the molecule have to some extent a character weaker than single bonds. This would be expected for the B—H bonds on the basis of structure I:



which gives each B—H two thirds single-bond and one third one-electron-bond character. A slight extension considering resonance to structures such as II would further account for the increased B—B distance. The distances are also compatible with a structure representing resonance among the seven arrangements:



giving each bond 6/7 single-bond and 1/7 no-bond character. Theoretical arguments support the view that the molecule resonates among all the above structures, the B—B and B—H bonds having single-bond, one-electron-bond and no-bond characters.

Shortening of the B—B distance below the single-bond value is not observed; this is regarded as eliminating all structures such as Wiberg's, which attribute some double-bond character to the B—B link. The stability of B_2H_6 relative to BH_3 is explained as due to the resonance energy made available by the full use of the four orbitals of boron.

High Intensity Light Sources

AN article by Dr. J. A. V. Fairbrother in the *Electrical Review* of August 6 discusses the light source required to project a beam within a fairly small angle. Practical considerations permit only a small source, as otherwise a large paraboloidal reflector would be required. The lower limit to the size of the light source is fixed by its brightness (intrinsic brilliancy) and the quantity of light obtainable from it. The intrinsic brilliancy is measured by the candle power divided by the projected area of the source on a plane perpendicular to the direction of view. It is convenient to measure it in candles per square millimetre. For bodies which emit full radiation the intrinsic brilliancy increases rapidly as the temperature approaches the melting point. As carbon and tungsten have the highest melting points, the carbon arc and the hot tungsten filament are the two high-intensity light sources usually employed for projection purposes. But owing to the fact that much of the spectral emission from a hot surface is not in the visible region, it is an inefficient converter of heat into light. One of the earliest light sources was the Welsbach mantle, which made use of the selected radiation from cerium and thorium. At the present time the most promising of all is the selected light emission from gases and vapours the molecules of which are excited by the passage of an electric current. By exciting mercury vapour in a quartz envelope at a high pressure, a light source is attained which has a higher efficiency and greater intrinsic brilliancy than over-run tungsten. The author has obtained with a carbon arc a maximum brilliancy of 330 candles per sq. mm. which is about eighteen times the average intrinsic brilliancy of the 5-kw. tungsten filament spot lamp. Mercury vapour quartz lamps are now being made the length of the arc of which is only about 10 mm. and which when the temperature is kept low by cooling water in contact with the outer wall of the envelope can take an input of 700 watts. This lamp approaches the carbon arc in intrinsic brilliancy and is more than twice as efficient.

Sunspot Photography with a Small Visual Refractor

THIS is the title of a paper by Mr. Cecil Maby (*J. Brit. Astro. Assoc.*, **47**, 9, July 1937), in which the author gives the results of his experiments with different filters and photographic plates. He made use of his telescope and its Huygenian eyepiece as projection lenses, and those who are interested in the photography of sunspots will find much useful information in this paper on the employment of visual refractors for this purpose. The paper should be studied by amateur astronomers, who will find a full description of the equipment, which is both efficient and inexpensive.

ERRATUM. The paper referred to under the heading "Petrofabric Study of Moine Schists" in *NATURE* of September 4 (p. 429) was by Dr. F. C. Phillips, Department of Mineralogy and Petrology, Cambridge, and not by F. C. Cole as stated.