

Research Items

The Towednack Gold Hoard.—The affinities and dating of the hoard of gold objects found at Towednack, Cornwall, in December 1931 and May 1932 (see NATURE for Jan. 16, 1932, p. 90) are discussed in *Man* for August by Mr. Christopher Hawkes. Nine pieces were found, of which four are finished ornaments, two torcs, and a pair of bracelets. Two bracelets are unfinished and the remaining three pieces are bent rods or bars, evidently a goldsmith's raw material. No. 1 is a large torc, 45 inches in length, with enlarged terminals, circular in section, tapering inwards. The main portion is triangular in section and twisted from right to left. The whole is coiled double, and the terminals twisted for interlocking. No. 2 is a triple torc of a pattern hitherto unknown in prehistoric gold work, the body of the torc being formed of three strands of gold wire, each of triangular section and twisted like No. 1. The strands are welded together at the ends to form the terminals, which are bent back to interlock. It measures 4-4½ inches across. Nos. 3 and 4 are a pair of bracelets, quite plain, formed of rods circular in section, bent in an oval penannular form. They are excellently finished, smoothed, and polished. Nos. 5 and 6 are obviously unfinished, awaiting smoothing and polishing, but clearly intended to be quite plain like the previous pair. Of the rods, one is lozenge-shaped in section, the others irregular. There is no reason to think the gold is not of Wicklow origin. The two torcs obviously provide the firmest basis for chronology, and although the second is without parallel, its complexity of structure and fineness of workmanship point to an advanced stage in the development of torc manufacture. The simpler workmanship of No. 1 invites an abundance of comparative material, and an examination in detail of torc types suggests that it is a developed type, but earlier than the fully established Late Bronze Age types, for example, the Morvah hoard, and preceding the full establishment of the Late Bronze Age culture in Cornwall and Ireland. It belongs, then, to the period 1000-750 B.C., a period of transition, perhaps marking a renewal in the Irish-Cornish gold and tin trade.

Menominee Indian Music.—In a report on an investigation of the music and song of the Menominee Indians of Wisconsin (*Bull.* 102, Bureau of American Ethnology), Miss Frances Densmore records a close resemblance in ceremony and custom, as well as in the songs accompanying them, to the Chippewa. The medicine lodge of the Menominee is practically identical with the Grand Medicine Society of the Chippewa; and in the drum ceremony, which originated with the Sioux and is thought to contain elements of Christianity, the observances of the Menominee are closely akin to those of the Chippewa. On the other hand, in the use of war-bundles and hunting-bundles and in the morning star legend, they resemble the Winnebago. The songs recorded are mostly of a ritual character; but there are also love songs and lullabies. Some of the songs are those used in connexion with the ritual games, the bowl-and-disc game, the double-ball game, and lacrosse, which are played ceremonially for the benefit of a person who has dreamed a dream. The ceremonial character of the game is indicated by the fact that it is immaterial which side wins. Songs sung in connexion with adoption dances are recorded, as well as a number connected with treatment of the sick. Underwater and underground powers are frequently mentioned in connexion with the songs. Chief among the latter is the 'underground bear', a white bear larger than a grizzly, said to be an ancestor of the

Menominee tribe. It emerged from the ground as an Indian near the present site of Marinette, Wis., and was followed by more Indians. The chief of the 'underwater' powers is the 'underwater snake', usually referred to as the 'hairy snake', which lives in the water and personifies the powers of evil. If the body of anyone who has been drowned is found in an upright position, it is believed that he has been drawn down to his death by the underwater snake.

The Arthrodira.—Of recent years there has been a considerable accession to our knowledge of the Arthrodira. This group of Devonian fish-like animals has had a chequered career in regard to its zoological position. At first regarded as water beetles, these animals next became reptiles, and at length were recognised as fishes of some kind. Recently, Stensiö in an important paper on the head of *Macropetalichthys*, in which a very detailed account of the elasmobranch-like brain structure is given, came to the conclusion that the Arthrodira as a whole were true fishes and represented an early offshoot of the elasmobranch line. The most recent pronouncement on the subject is by Heintz (Anatol Heintz, "The Bashford Dean Memorial Volume", Article 4, 115-224. American Museum of Natural History, 1932). This investigator not only denies the elasmobranch relationship of the Arthrodira, but, while agreeing that *Macropetalichthys* is elasmobranch in affinity, also disputes its connexion with the Arthrodira. If this be the case, then the evidence of the elasmobranch affinity of the Arthrodira, based as it is chiefly on the structure of *Macropetalichthys*, falls to the ground. Heintz returns to an older view that the Arthrodira (together with the Antiarchi) form a separate group unconnected with any other group of fishes, and one which is perhaps not to be considered as formed of true fishes at all. They are ranked therefore as a class equivalent to the classes Agnatha (Cyclostomata) and the Pisces, and the name Placodermata, given by McCoy in 1840, is restored. The chief character on which this view is based appears to be the structure of the jaws, which is *sui generis* and unknown in any other form of animal.

High-Moor Vegetation of Eastern Prussia.—Dr. Reimers and Dr. Hueck have recently given an account of the high-moor vegetation of eastern Prussia (*Abhand. d. Math-naturw. Abt. d. Bayer Akad. d. Wiss.* Suppl.—Band 10 Abh. Munchen 1929, pp. 407-494, 12 plates, 2 maps, and 14 text figures). This is of an extensive rather than intensive character, based on the examination of a number of examples for which species lists are furnished and relative frequencies given. Most of the moorland communities described appear to conform in general terms with the zonal communities presented in the moorland of Ezeretis. Here open water occupied by *Nymphaea* and *Nuphar* is succeeded by a community in which the dominants are *Carex limosa*-*Scheuchzeria palustris* and *Oxycoccus vulgaris*. The last-named is also common in the next zone dominated by *Rhynchospora alba*. A drier community is characterised by *Andromeda polifolia*-*Drosera anglica* and *Sphagnum rubellum* (in contrast to *S. cuspidatum* in the preceding zones). The driest area is occupied by *Calluna* heath, which in its damper parts is associated with *Ledum palustre* and *Rubus chamaemorus*, whilst in its drier parts colonisation by *Pinus sylvestris* may take place. Low moor vegetation also occurs locally with *Menyanthes trifoliata*, *Ranunculus lingua*, *Peucedanum palustre*, *Comarum palustre*, *Aspidium thelypteris*, etc. A number of transition types are described; also several woodland communities, the status of which is not quite clear.

Inheritance of Resistance to Wilt Disease in Cotton.—An investigation of the resistance of Egyptian cotton to the wilt disease (*Fusarium vasinfectum*), and its inheritance, has been made by Dr. Tewfik Fahmy (*Bull. No. 95, Ministry of Agriculture, Egypt*). He classifies plants as susceptible, resistant, or immune according to whether they die as seedlings in infected soil, recover after developing mottled leaves, or show no symptoms. Some Egyptian varieties are completely susceptible, while others show a percentage of resistance and immunity. In crosses, immunity is dominant to susceptibility. The F_2 in one cross (Giza 7 × Sakha 3) gave 75 per cent immune, 15 per cent resistant, and 10 per cent susceptible. The immunes may segregate or breed true. The resistant plants in F_2 may give all three types or only immune and resistant. In a cross between susceptible and immune, there is an increase in the resistance of susceptible plants, as measured by the incubation period before the symptoms of the disease appear. Also, mother plants with a long incubation period have a higher percentage of immune progeny than those with a shorter incubation period, which are therefore less resistant. The correlation between susceptibility and length of fibre has also been studied.

Slime Moulds in Soil.—"The Distribution of Dictyostelium and other Slime Moulds in Soil" (K. B. Raper and Chas. Thom, *J. Wash. Acad. Sci.*, 5, 22, No. 4, pp. 92-96, 1932) describes the occurrence in soil of various members of the Acrasieae, a group of fungi closely related to the Myxomycetes, but which reproduce by means of amoebæ and have no flagellate stage. The organisms described belong to the genera *Dictyostelium* and *Polysphondylium*, and have hitherto been regarded as manure-inhabiting fungi. The present report shows that they are a normal part of the soil micro-flora, and clears up one of the puzzles as to the identity of the amoeboid forms found in soil. The use of suitable culture methods will probably show that many of the so-called amoebæ in soil are only stages in the life-histories of such fungi.

Geology of Uganda.—The Annual Report of the Geological Survey Department of Uganda for 1931 (Entebbe, 1932, pp. 20) records many features of geological interest. Mr. W. C. Simmons has discovered a true unconformable sedimentary junction between the Karagwe-Ankolean beds and the underlying basement complex. Dr. A. W. Groves has proved the existence in Uganda of a charnockite series closely paralleling that of India. As in India, some of the occurrences are associated with magmatic iron ores and graphitic schists. The chromium-bearing mica, fuchsite, has also been found in the charnockite areas. Dr. Groves records the effects of shearing movements on the crystalline rocks on both sides of Lake Albert. He finds that the degree of brecciation, granulitisation, and mylonitisation is related to the distance of each specimen from the nearest rift scarp, and reaches the conclusion that the disturbances bringing about the formation of the Albertine rift valley were responsible for these shearing effects. The observations thus support the compression hypothesis of rift-valley formation. They also imply the removal of a considerable overburden by denudation, corresponding to the accumulation of thick deposits in the Albertine depression. The tectonic activity which gave rise to the rift, and is probably still in progress, must therefore have begun long ago. It is announced that Mr. Combe has completed his memoir on the tinfields of Ankole. The finding of cobalt and nickel-copper ores on Ruwenzori is also recorded.

Distribution of Earthquake-Centres in the Philippines.—Father W. G. Repetti, *S.J.*, who recently

studied the distribution of Philippine earthquake-centres north of Manila during the years 1920-29 (see *NATURE*, 129, p. 367; 1932), has continued his work on those lying to the south of the capital. During the same ten years, there were in this region 102 earthquakes, the epicentres of which could be determined with accuracy by means of seismographic records. With one exception, all these epicentres were submarine. The most important zone is the ocean trough known as the Philippine Deep lying off the east coast of Mindanao. Epicentres are concentrated in two principal areas, one in lat. 6° 30' N., long. 126° 40' E., the other in about lat. 7° 45' N., long. 127° 10' E., both lying between 25 and 30 miles east of Mindanao.

Gas Burner Design.—The Bureau of Standards at Washington, in co-operation with the American Gas Association, has been engaged for some time determining the conditions which limit the efficient operation of gas burners of various types using gases of many different compositions, and the results so far obtained are embodied in a paper by Messrs. J. H. Eiseman, E. R. Weaver, and F. A. Smith in the June issue of the *Journal of Research*. In it the conditions which were indicated qualitatively in Circular No. 394 of the Bureau are specified quantitatively for a domestic burner of the 8-prong star type with 44 jets. For each rate of supply of gas measured in British thermal units per hour per jet, the percentage of the total air necessary for complete combustion which must be mixed with the gas before it arrives at the jet, and which on one hand will prevent a yellow tip and on the other neither produce a flash back nor a blow out, is shown by curves for jets of various diameters. The influences of the height above the jets of the utensil to be heated on the production of carbon monoxide and on the efficiency of the burner are also shown.

Crystalline Structures in Glasses.—Lord Rayleigh has published a set of photographs of various glasses, taken between polarising nicols, which show the presence of particles and threads, in size very approximately of the order of a millimetre, having crystalline structure not due to mechanical strain (*Proc. Roy. Soc.*, July). These had been previously found in fused quartz and a phosphate glass known as Corex, and were likened to the Lehmann structure in liquid crystals. They are not present in silica glasses which have not a large silica content, the limiting quantity being about 80 per cent, as in Pyrex. Silica is also not essential for their production, as they may appear in phosphate and borate glasses. When present, they naturally make the material incompletely isotropic, and their complete removal presents an interesting, if not indeed an intractable problem. The effect is possibly connected with the devitrification of glasses and the crystal structure found in them by means of X-rays.

Protein Monolayers.—Investigations of proteins as monomolecular films on liquids, a method previously attempted with indifferent success, has now been developed satisfactorily by E. K. Rideal and A. H. Hughes (*Proc. Roy. Soc.*, July). In the earlier work, the films formed were probably not homogeneous; in the present work, homogeneous films of known weight have been made by depositing a fragment of the protein from the tip of a delicate quartz fibre microbalance. These films were then examined by compressing them on the surface in a Langmuir film apparatus, as well as electrically and optically. Gliadin, with which most of the work was done, gave homogeneous films with a thickness so low as 3 Å., which changed on compression to a form having many of the properties of a gel, and quite possibly

the two-dimensional analogue of this state of aggregation. It is supposed that the basic polypeptide chains of the protein are stretched out flat on the surface in the most expanded state of the film, and that on compression and gelation the side chains to the main polypeptide chain are forced out of the surface.

The Heavy Hydrogen Isotope.—Of several recent papers on H^2 , one by E. W. Washburn and H. C. Urey (*Proc. U. S. Nat. Acad. Sci.*, July) is of outstanding importance in indicating a possible electrochemical method for separating it in quantity. In electrolysis, there will probably always be some difference between the electrode properties of different isotopes of the same element. Generally, this will be small, but with hydrogen it is apparently significant, and in the electrolysis of water the residual liquor should perhaps contain a marked excess of the heavy isotope. A long experiment to test this is in progress at the United States Bureau of Standards, but meanwhile some commercial residues have been examined, and show the expected enrichment qualitatively. Other chemical reactions might produce a similar change in the relative amounts of H^2 and H^1 , and the problem of their relative abundance in Nature is thus complicated by the history of the hydrogen-containing substances investigated. In the first July number of the *Physical Review*, the concentration of H^2 in 'ordinary' hydrogen is estimated to be about 1 in 30,000 by W. E. Bleakney, from mass-spectrum measurements, and the mass of H^2 is given as 2.01353 ± 0.000064 by K. T. Bainbridge; no

evidence for the presence of helium isotopes could be found by the former.

Colour and Mineral Content of Honey.—Analyses of several specimens of American honey by Schuette and Remy (*J. Amer. Chem. Soc.*, July), in which special attention was given to the presence of manganese and copper, on which emphasis has been laid by students of nutrition, have given interesting results. The analyses of twenty-two specimens of honey, of which eighteen were taken directly from the comb, showed that the mineral content of the dark-coloured varieties was higher than that of the light-coloured. The manganese and copper contents were also higher in the darker-coloured honey. The average percentage of ash in the light honeys was 0.06, that in the dark honeys 0.17. The light honeys contained an average of 0.29 mgm. copper and 0.30 mgm. manganese, the corresponding values for the dark honeys being 0.56 mgm. and 4.09 mgm. The maximum figures were 0.70 mgm. copper and 0.44 mgm. manganese for light honeys, and 1.04 mgm. copper and 9.53 mgm. manganese for dark honeys. The characteristics and flavour of honey are probably influenced to a marked degree by nectar and pollen. They, in turn, may well vary in composition and quality according as the plant which produced them is affected by such growth factors as the meteorological conditions prevailing in its habitat and the nature and fertility of the soil. It is suggested that a dark honey should have a higher nutritive value than a light one, although colour and quality often bear an inverse relationship to each other in the lay mind.

Astronomical Topics

The Corona without an Eclipse.—*L'Astronomie* for June contains an article by M. B. Lyot, giving further particulars about his results obtained at the Pic du Midi. He states that the brightness of the inner corona is about equal to that of the planet Mars, which is readily visible in daylight; but observation of the corona is rendered more difficult by the great brightness of the sky near the sun; this is, however, greatly diminished at a height of 10,000 feet, especially when cloud and dust are absent; a further difficulty, due to diffused light in the telescope, is diminished by keeping the lenses quite free from dust, and by placing diaphragms in the tube, slightly larger than the solar image, to shut off sunlight. In order to distinguish instrumental defects from genuine solar markings, the coronagraph was rotated slightly between exposures; instrumental markings remain in the same place on the plate, but solar ones follow the solar image. Using a red screen, it was possible to view prominences directly, without a spectroscope; a Wratten screen, transmitting light between wave-lengths 6500 and 6600, permitted photographs to be taken of coronal jets, rising to a height of 7' above the sun's limb.

M. Lyot gives measures of the wave-lengths of the green and red lines in the coronal spectrum; the plates were measured at Meudon by M. H. Grenat, who found for the green line 5302.83 on the east of the sun and 5302.87 on the west; the difference is in the right direction for rotation, but no stress is laid on this. The line in the red, which was traced to a height of 6' above the limb, gave wave-length 6374.75, but with a probable error of 0.15. Unsuccessful attempts were made to photograph other lines at 4232, 4086, and 3986, which had been obtained from eclipse photographs.

M. Lyot notes, in conclusion, that sunspot activity was decidedly low when these results were obtained; he hopes for better results near maximum. He makes

the observation that much longer exposures can be given than during eclipse.

Sunspots and Comet Activity.—De Morgan in his "Budget of Paradoxes" describes as a joke a correspondence between Pons and von Zach, in which the latter humorously explained Pons's failure to find comets during a certain period by noting that sunspots had also been absent then; Pons took this seriously and made a successful search for a comet after the return of large sunspots. De Morgan adds, "It would mend the story exceedingly if some day a real relation should be established between comets and solar Spots". Something like this suggestion has now actually come to pass. *Popular Astronomy* for May contains an abstract of a paper by Messrs. Hulbert and Maris, which brings forward many striking instances in which unusual solar activity has synchronised with remarkable phenomena in comets visible at the time. It is not the first time that the suggestion has been made. It was noted that the activity of Morehouse's comet in September 1908 came at a time of spot activity; the greatest magnetic storm of the year occurred on Sept. 11; many people thought then that the two events were connected. Indeed, since all cometary activity is now ascribed, directly or indirectly, to solar action, it is quite to be expected that the action of the sun on comets should depend on its state of activity.

Hulbert and Maris note that there were magnetic storms in the autumn of 1835, when Halley's comet exhibited striking changes, and again that a great storm occurred on Dec. 3, 1846, a few days before Biela's comet split in two. Of course, the solar activity does not bring comets, but it may well increase the brightness of those that happen to be there, and so increase the chance of discovery. It thus appears that the jest of von Zach may be taken in earnest.