## Research Items.

**Ancient Gold and Enamel Work from Cyprus.**—Mr. L. H. Dudley Buxton describes in *Man* for January a remarkably fine piece of ancient gold and enamel work, found, it is said, with two bronze tripods and a fragment of a large bronze vessel by a peasant while digging at Episkopi, the ancient Curium. Unquestionably the bronzes were of Mykenæan age, but it is uncertain what reliance can be placed on the story that all the objects were found together. The object is 17cm. in height and consists of a hollow cylinder of gold surmounted by a cloisonné sphere, on top of which stand two birds, almost certainly hawks. The cloisons on the sphere are formed by semi-circular bands in rows one above another. The colours are alternating rows of white, lilac, and green. The body feathers of the birds are similar but smaller scales; the wings and other large feathers are indicated by long parallel stripes. Mr. Buxton's descriptive note is followed by a discussion of the dating by Mr. S. Casson. In default of positive evidence the period must be established by technique, colour, design, and style. The object has no parallel. The method of representing and distinguishing the feathers is derived from the East and first appears on Hittite sculpture in a modified form on the Sindjirli sphinxes. It is not found in Egyptian goldwork; but it continues into Hellenic art, mostly in metal-work, and lasts into Byzantine times. The clue to the dating lies in the enamelled scales, which resemble very closely the incised coloured scales common on proto-Corinthian pottery. The application of enamel to cloisons in gold jewellery was not uncommon in the sixth, fifth, and fourth centuries B.C., but this example seems the earliest known. It can scarcely be later than the sixth century B.C. and probably belongs to the early part of that century. Prof. J. L. Myres adds a note in which he suggests the possibility of an earlier dating, pointing out the affinities of the treatment of the plumage and the wings, which exhibit features found in Phœnician, Hittite, and early Greek work. He recognises, however, that the earlier dating isolates the object as a piece of enamel technique. The object is figured in a coloured plate.

**Diorite Axes from Ireland.**—Two remarkable diorite axes from Rathlin Island, Co. Antrim, have been described by Dr. Marcel Baudouin and Mr. C. Blake Whelan (*Bull. Soc. Préhist. française*, 1931, No. 10). Their peculiar character, which is of particular interest to French archæologists, lies in the fact that they differ from the 'diorite axes' found in Brittany and Vendée and resemble the Campignian 'flaked axes' of flint. One of them shows no signs of polishing, and may be compared with specimens of the middle Campignian, or Estrellian, while the other is polished only at the base of the cutting edge, this bringing it into relation with the Jablinian, the period of the introduction of polishing. The method of manufacture—by striking off large flakes—differs entirely from that of the polished flint axe, in the preparation of which a large number of very small flakes was struck off. It is evident that, like the Campignian axes of France, the Irish were made without any intention of subsequent polishing, and the size of the flakes is responsible for the irregular character of the work in the partly polished axe. It is to be noted that the fine grained diorite of Brittany and Vendée, unlike that of Ireland, is not suitable for flaking, but was worked by pecking, as is shown by incomplete specimens. It is evident that the two axes here under consideration come from the same workshop. The method of working is identical, except that the one which is partly polished has a number of fine retouches along the edges. The resemblance to the 'haches plates' in flint of the Paris basin is marked. It is concluded (1) that there are diorite axes which were worked by flaking, a fact not yet admitted in France; (2) that there are diorite axes of Campignian facies which are partly polished, and that in a manner differing from that found in France; and (3) that this technique required a special kind of diorite.

**Migration of Birds at St. Kilda.**—The first-fruits of an interesting natural history expedition to St. Kilda carried out in the late summer of 1931, by T. H. Harrisson and a party of enthusiastic undergraduates, appear in a short account of the early autumn migration of that year (*Scot. Nat.*, p. 3, 1931). The visit lasted for three weeks, up to Aug. 13, and the observers had the advantage of seeing the arrival of the forefront of the autumn migration, which had passed on before Dr. Eagle Clarke landed on either of his prolonged visits. As a result, the composition of the migrant groups was somewhat different from that seen by Dr. Clarke. The largest movements were those of waders, but, on the whole, there was a scarcity of those species which breed in high Arctic latitudes and apparently follow the natives of lower altitudes in migratory succession. Few of the migrants seen stayed more than a few days on the island. The list includes twenty-two species.

**Herring Behaviour.**—In the *Journal du Conseil Permanent International pour l'Exploration de la Mer*, vol. 6, No. 2; 1931, Mr. Michael Graham makes an original contribution to the study of the problems of herring behaviour. By collecting ideas from fishermen and observing at sea with the drifters, the author attempted to find out how and why the herring get into the nets. It is generally agreed that the entanglement of the fish in the net is due to some sudden concerted movement on the part of the shoals, known by the fishermen as a 'swim'. Mr. Graham collected observations on the time, area, and directions of these swims. So far as information can show, the swims appear to be limited in area and to have a definite direction; that there are certain hours when the swims predominate seems certain. It is suggested that normally the herring can see the net, but that a shoal is subject to crowd psychology and will act concertedly under the influence of such factors as panic, sexual excitement, and migratory impulse; under such conditions the fish would be unable to avoid the net. The author records a number of fishermen's beliefs and discusses them in the light of his hypothesis. It is to be hoped that this very interesting work on the habits of the herring will be followed up.

**Storage and Transport of Fruit.**—The Empire Marketing Board has recently published two reports on the deterioriation of fruit during transit by sea. "Australian and New Zealand Fruit Shipments" (E.M.B. No. 46, H.M. Stationery Office, 1*s*. net, pp. 64, Nov. 1931) is a report by the Economic Section of the Board of a five years' survey covering investigations in the Dominions and at the docks of Great Britain. Inquiry was directed along four main channels—over-ripeness, fungal rotting, internal breakdown, and bitter-pit. The first two causes of deterioration are aggravated by too high a temperature in the ship's hold. Two types of internal breakdown are described, one associated with low temperature and the other with late harvesting. Bitter-pit has been shown to be more extensive in early than in late picked apples, and more severe in fruit from trees bearing a light crop. The report emphasises the need for a uniform temperature during shipment, not too high to over-ripen or cause fungal

rotting, nor too low to cause deep scald or internal breakdown. The need for quicker handling of fruit consignments after arrival at British docks is also suggested. The other report is entitled "Transport and Storage of Bananas with special reference to Chilling", and is by Dr. C. W. Wardlaw and Dr. L. P. McGuire (E.M.B. No. 45, H.M. Stationery Office, 1*s*. net, pp. 37, Nov. 1931). It deals chiefly with main stalk rot of bananas (*Thielaviopsis paradoxa*), finger stalk rot (*Glœosporium musarum*), and fruit rot (*Botriodiplodia theobromæ*), and shows how these diseases can be overcome by rapid chilling of the cargo to 53° F. This temperature is low enough to curtail fungal activity and high enough to allow adequate ripening. Pre-storage and nutritional factors also influence the fungal rotting.

**Ensilage.**—Ensilage has now become an important part of agricultural practice in the British Isles, and an up-to-date account of the subject is to be found in Bulletin No. 37, issued by the Ministry of Agriculture as a revised edition of their Miscellaneous Publication, No. 53 (London: H.M. Stationery Office, price 1*s*.), by A. Amos and H. E. Woodman. Although the making of silage from succulent green fodders is recorded in 1843, the first attempts to introduce the art into Great Britain were but temporarily successful, and it was not until 1910 that any consistent advance in its production was made. The operation is not difficult, the crops are easy to grow, require less labour than roots, and can conveniently be cut between hay and corn harvests. In addition, silage has a high feeding value and will keep for a long period without deterioration. Several distinct forms of silage can be obtained according to the conditions under which it is produced; the quality can also largely be controlled. Although most herbaceous plants are satisfactory for conversion into silage, certain points should be observed in making a selection of the most suitable crop. The three chief methods of silage making are by means of tower silos, clamps, and stacks. Full details, including any necessary precautions, are supplied for each method. The chemistry of silage and the changes that occur in the plant while it is in the silo are also fully discussed, and a comparison of the results of feeding experiments with silage, the fresh green crop, and other commonly used food-stuffs shows that it can be used with advantage for many classes of stock.

**Ganometric Method of Measuring Geological Time.**—Prof. H. Fairfield Osborn, with the assistance of Mr. E. H. Colbert, has published in the *Proceedings of the American Philosophical Society*, vol. 70, No. 2, 1931, a preliminary notice of a method of measuring time in its geological aspect. This method, which is termed the 'ganometric', has been arrived at from a close examination and comparison of the enamel folds in the posterior molar teeth of the many genera and species of elephants. It has been found that the total length of enamel, when measured along the folds, shows a definite increase in course of time. The rate of increase seems to vary in different phylogenetic lines, being rapid in some and slow in others. More detailed investigation into this interesting suggestion is in progress, and, if the thesis can be proved true, it will form a very useful test of the age of deposits and in addition will be most useful in helping to date such human remains and artefacts that may be found, as they sometimes are, in the same levels as proboscidian remains.

**A New Canadian Uraninite.**—In 1930 uraninite was discovered in pegmatite on the Huron claim, Winnipeg River area, south-east Manitoba. Selected material has now been analysed by H. V. Ellsworth, and the results appear in the *American Mineralogist* for December 1931 with a general account in which J. S. DeLury collaborates. The figures for age calculation are as follows:

| | | |
|---|---|---|
| U | 53·50 | 55·01 |
| Th | 12·46 | 12·25 |
| Pb | 15·44 | 15·50 |
| $\frac{\text{Pb}}{\text{U} + 0{\cdot}38\ \text{Th}}$ | 0·265 | 0·260 |

The very high lead-ratio makes this the oldest uraninite yet discovered, and in view of this surprising result, it is of importance to notice that the authors add, "There is not the least suspicion that galena or any other foreign minerals were present". The ratio is approached only by that of the Ingersoll, South Dakota, uraninite (0·225) analysed by C. W. Davis. The Manitoba uraninite occurs in pegmatites that cut the Rice Lake series, which is lithologically similar to the Keewatin-Coutchiching rocks of Ontario. If the age indication of the lead-ratio is accepted, the pegmatites must be very much older than those cutting the Grenville series in Ontario and Quebec, for which the corresponding ratios lie between 0·15 and 0·16.

**Measurements on Isotopes.**—A number of new measurements on isotopes with the mass-spectrograph have been described by Dr. F. W. Aston (*Proc. Roy. Soc.*, Jan.), which provide, as usual, a useful check upon the chemical values of the atomic weights. Caesium, for which the accepted chemical value is 132·81, has been found to have the distinctly higher atomic weight $132{\cdot}92 \pm 0{\cdot}02$. For strontium the positive ion value is $87{\cdot}64 \pm 0{\cdot}06$, in excellent agreement with the chemical value 87·63. For rubidium and thallium the chemical and electrical values are also in good agreement, although for the latter element Hönigschmid's number 204·39 is preferred to Briscoe's more recent 204·34. Barium ($137{\cdot}43 \pm 0{\cdot}08$) also agrees reasonably well with the chemical determination, but for scandium Dr. Aston's value is $44{\cdot}96 \pm 0{\cdot}05$, which is lower than the chemical value, 45·1, suggesting that the latter needs revision. For the remaining element studied, lithium, Dr. Aston gives a value $6{\cdot}928 \pm 0{\cdot}008$, in good agreement with some other recent physical determinations, but not in accord with the results of band spectrum analysis.

**Ammonium Phosphomolybdate.**—Although the yellow precipitate formed from molybdic and orthophosphoric acids in presence of nitric acid is known to have the composition $(NH_4)_3PO_4$, $12MoO_3$, $2HNO_3$, $H_2O$, it is usually supposed to be formed only when ammonium molybdate is present in large excess, and hence that the method cannot be used for the determination of molybdenum. Special conditions in great number have been published in connexion with the use of the method in the determination of phosphoric acid. Kitajima, in the *Scientific Papers of the Institute of Physical and Chemical Research, Tokyo*, No. 330 (October 1931), shows that molybdenum can, in fact, be determined by this method, and he has worked out the conditions for the determination of phosphoric acid.

**Chlorination of Benzene and Toluene.**—It is generally known that in the chlorination of toluene at higher temperatures substitution occurs mainly in the side chain, whilst in the presence of halogen carriers in the cold the nucleus is substituted. Mason, Smale, Thompson, and T. S. Wheeler have described (*J. Chem. Soc.*, Dec. 1931) experiments on the chlorination of toluene and benzene in the vapour phase, the main object being to determine to what extent chlorine enters the nucleus of toluene at high temperatures in the absence of specific chlorine carriers, and to determine whether, as regards the kinetics of side-chain chlorination, this hydrocarbon can be regarded as a substituted methane, the chlorination of the latter

hydrocarbon having been investigated by Mason and Wheeler, whose results were published in the September issue of the same journal. The results show that in the absence of specific carriers chlorine enters the side chain, and also, with the same conditions of short periods of heating, the kinetic formulæ developed by Martin and Fuchs in 1931 apply to toluene considered as a substituted methane. In the case of benzene, the main object was to investigate, with particular reference to the formation of monochlorobenzene, the extent to which substitution occurs at high temperatures, in the absence of specific chlorine carriers. It is shown that direct chlorination to chlorobenzenes takes place in the vapour phase above 400°, mono- and di-chlorobenzenes being the chief products. The rate of reaction is not so great as in the case of toluene. The results, in the case mentioned, are in good agreement with the kinetic formula for a two-stage reaction. The rate of reaction is increased by addition of iodine, a chlorine carrier, and other liquid-phase catalysts. With ferric chloride the proportion of dichlorobenzene formed is increased and a little trichlorobenzene is also formed.

**Bushings for Outdoor Transformers.**—The increasing use of outdoor substations for the transmission of electrical power has made it necessary to adapt transformers for use in unprotected positions out-of-doors. The transformers are usually connected to overhead transmission lines, the junction between transformer winding and overhead line being at the terminals, where the winding is brought out from the oil tank surrounding the transformer. These terminals are called outdoor bushings, and on their design a great amount of scientific and mathematical research has been expended. In a paper read to the Institution of Electrical Engineers on Dec. 3, Mr. W. J. John gave a careful résumé of the work that has been done previously and deduced some useful conclusions. The main requirements of a bushing are that it must withstand all the electric stresses due to its connexion with the overhead system, insulate the conductors when rain is falling on the transformer, and be absolutely water-tight so that moisture cannot get into the insulating oil. Before the engineer accepts bushings, they have to pass certain standard tests; but the severity of these tests should not be unduly high. They have to be tested under artificial rain conditions, the water used having a standard resistivity usually of 10,000 ohms per cm. cube. The shape of the bushings is of importance, so that the electric stresses which govern flash-over and puncture may be computed. It is of special importance to prevent the brush discharges, usually called the corona. Mr. John gave laws for corona and puncture-voltage, and also for the permissible voltage gradients. He showed that for any given flash-over distance under wet conditions, the corresponding dry flash-over distance can be fixed within narrow limits; experiment shows that the law connecting the two is linear.

## Astronomical Topics.

**Astronomical Phenomena for February.**—Venus is becoming increasingly conspicuous as an evening star; the planet is drawing away from the sun, and going farther to the north of it; its stellar magnitude is $-3\cdot5$, three-quarters of the disc being illuminated. Venus will be near the moon on the evening of Feb. 9, and about a degree north-west of Uranus on the evening of Feb. 26.

Jupiter is in opposition on Feb. 7; satellite II. will be in transit from 1.15 to 4.7 A.M. on this day, and will partially cover its own shadow; reference should be made to the British Astronomical Association Handbook for mutual eclipses and occultations of the satellites; the seasons for these only occur once in six years, so opportunities should not be missed.

Neptune is in opposition on Feb. 26; it is then $1\frac{1}{4}°$ east of the fourth magnitude star $\rho$ Leonis, which will make the planet easy to pick up in small telescopes.

Occultations of stars by the moon occur at 9.11 P.M. on Feb. 11, at 7.35 P.M. on Feb. 16, and at 6.19 P.M. on Feb. 18; the stars are rather faint. February is a good month to look for the zodiacal light, since the ecliptic then makes its greatest slope to the horizon in the evening sky. This applies only to those who are far from the glare of artificial lights. The most convenient minima of Algol occur at 11 P.M. on Feb. 16 and at 8 P.M. on Feb. 19.

The well-known variable star Mira Ceti is due to reach its maximum early in April; but it will then be too near the sun for observation. It should, however, be visible to the naked eye after the middle of February, and it is of interest to follow the increase of its light, which is fairly rapid. Its position relatively to $\alpha$ and $\gamma$ Ceti and to $\alpha$ Piscium should be learnt from a map. A binocular is a help.

**A New Faint Comet, 1931 *e*.**—This comet was found by Herr K. Reinmuth on Dec. 31 in the course of the regular work on minor planets that is carried on at Königstuhl, Heidelberg. It was of magnitude 15; its motion did not differ greatly from that of a minor planet, but both he and Dr. M. Wolf decided that it was a comet after inspecting its images on four different plates; its aspect was decidedly nebulous, its diameter being estimated as 36″. The following positions are from *Rechen-Instituts* Circulars 530 and 533; they are referred to the equinox of 1925:

| | | | |
|---|---|---|---|
| Dec. 31 | $19^h\ 29{\cdot}9^m$ U.T. | R.A. $3^h\ 49{\cdot}6^m$ | N. Decl. 37° 26′ |
| Jan. 10 | 18 58·4 | 3 45·1 | 37 22 |
| 12 | 21 41·0 | 3 44·7 | 37 21 |

No orbit is yet to hand, but the above figures suggest that the comet was stationary in R.A. about Jan. 16, in which case it would be near the discovery position at the end of January.

The comet was within a few degrees of 1931 *d* (Neujmin 1), but identity is not possible, the orbit of Neujmin being well known; moreover, it had sunk to magnitude 17 in December, and showed no sign of nebulosity at this apparition.

**Nova Pictoris.**—A series of observations has been published (*Mon. Not. Roy. Ast. Soc.*, Nov.) of the components of this star made with the $26\frac{1}{2}$-inch refractor at the Union Observatory, Johannesburg, by W. H. van den Bos and W. S. Finsen; they also include some made at Lembang, Java, by Dr. J. Voute. An interesting point is the outward movement of the components *B*, *C* from the principal star *A*. The measured distances early in 1928, 1929, 1930, and 1931 were for *B*: 0·35″, 0·55″, 0·84″ and 0·95″; for *C* they were 0·38″, 0·60″, 0·80″, and 0·98″. The faint component *D* remained nearly constant at 0·27″; it was not visible in 1931. The nebulous and unsymmetrical character of the central nucleus *A* added to the difficulty of the measures; *B* and *C* faded more rapidly than *A*; in 1929 they were fainter than *A* by 1·6 and 2·1 mag., in 1931 by 2·6 and 3·6 mag. The paper compares Nova Pictoris with Eta Argus; it is recalled that Dr. Innes detected two near companions of Eta Argus in 1914 and 1915; also the disc of the principal star appears nebulous in the $26\frac{1}{2}$-inch. The light-curve of Eta Argus resembles that of a nova, differing only in the slowness of the changes; Nova Pictoris has also been slower than the average nova, but much more rapid than Eta Argus.