Research Items

Pre-Crag Flint Implements

THE evidence bearing on the age of the implements of flint which since 1909 have been found in the Suffolk bone bed has been reviewed by Mr. J. Reid Moir in the light of the conclusions to be drawn from patination, from forms and flaking, and from condition (*J. Roy. Anthrop. Inst.*, 65, Pt. 2; 1935). It is argued that just as in a Pleistocene deposit implements can be sorted out according to their types and assigned to their appropriate age, so in a Pliocene deposit it is legitimate to treat them in a corresponding way. By observing the differences in patination and the reflaking of the pre-Crag flints, it is possible to divide them into five groups; and this classification is supported by an examination of form. Group 1, for example, is rich in implements of the Harrisonian eolithic type, made chiefly from primitive and coarsely shaped implements; but being made from primitive flake implements, they show an advance in technique on the true Harrisonian eolith, which was made from pieces of naturally broken tabular flint. In all the other groups, implements of this type are rare, showing that the production of artefacts of eolithic character ceased after the epoch in which implements of Group 1 were made. Of the rostro-carinates, the same proportion is present in Groups 1, 2, 3, but in 4 the proportion is much less, while in Group 5 none appears. In Group 2, where rostro-carinates occur in the same proportion as Group 1, the eolithic form, which is rare, is replaced by a whole series of racloirs, points, scrapers, choppers and other types. Group 5 is remarkable in being composed of 50 per cent racloirs and 50 per cent unclassifiable specimens. In the 363 specimens, only eight hand-axes are present, though the presence of one specimen in Group 1 shows that the knowledge how to make the hand-axe goes back a very long way. Taking the evidence as a whole, it is maintained that there are few who would deny that Group 1 is of very great antiquity but cannot represent the first attempt of man to shape flints; while Groups 2, 3 and possibly 5 are the most advanced. Group 4 seems to show a slight but very definite regression.

Fishes from the *Pawnee* Second Oceanographic Expedition

FOLLOWING his first and second reports (1928 *a* and *b*) in the same publication, Mr. C. M. Breder, jun., deals with the Heterosomata to Pediculati from Panama to Lower California (Scientific Results of the Second Oceanographic Expedition of the "Pawnee" 1926. *Bull. Bingham Oceanographic Coll.* Peabody Museum of Natural History, Yale University, 2, 1936). There is much interesting matter in this report, which includes many new species and observations. The new genus *Hubbsiella* is created to include *Menidia clara* Evermann and Jenkins, which differs from *Menidia* proper in several important characters, as has already been noticed by Jordan and Hubbs. Remarks on *Alectis hopkinsi* (Jordan and Starks) suggest that the Pacific representatives may lose their juvenile filaments of the dorsal fin normally by breakage, the stubs simply healing up and not regenerating. A useful key to the Eastern Pacific Hæmulidæ is given, containing twelve species belonging to nine genera.

Land and Freshwater Molluscs of Colorado

PROF. JUNIUS HENDERSON has enlarged greatly and corrected his original report of 1924 on this subject, and the present monograph, "Mollusca of Colorado, Utah, Montana, Idaho, and Wyoming—Supplement" (*Univ. Colorado Studies*, Vol. 23, No. 2, 1936), includes much new material. Careful work has been done upon Rocky Mountain molluscs during the past decade, resulting in a better understanding of many species and the addition of a number to the fauna, some of them new to science. In the comprehensive work now before us, we find a very large number of both land and freshwater forms listed and criticized, with valuable notes and, in some cases, figures and plates. All workers on mollusca in these districts will benefit by the publication of this most useful paper.

Animal Products

CHAPTERS vii and viii of the second part of the first volume of "Die Rohstoffe des Tierreichs" (Berlin: Gebrüder Borntraeger, 1935. 21.50 gold marks) deal with the hard substances produced by animals, ranging from fish scales, otoliths, tortoise shell and bird's claws to rhinoceros horns, antlers, bone and ivory. The second chapter treats of glue, gelatine and slime. Each product is considered historically, and its characteristics and treatment given. The data concerning its trade and the uses to which it is put are discussed. The full bibliography at the end of each chapter is subdivided into sections for each product. It is a most useful source of information.

Pathogenic Actinomyces

"THE Pathogenic Aerobic Organisms of the Actinomyces Group" is the title of a report by Dagny Erikson (Medical Research Council. Special Rep. Series, No. 203. London: H.M. Stationery Office. 1*s*. net). The study of fungi of medical importance has been hindered in the past by inadequate examination and description and by confused nomenclature. In this report, Miss Erikson has examined a number of strains of *Actinomyces* collected by Dr. A. G. Gibson from enlarged spleens in various clinical conditions, and a series of strains—variously labelled *Actinomyces*, *Streptothrix*, *Nocardia*, etc.—contained in the National Collection of Type Cultures, maintained by the Medical Research Council at the Lister Institute, London. The cultural, morphological and biochemical characters of twenty-five species are described, including fifteen that appear to be entirely new forms.

Testing Green Karri Timber

UNDER the auspices of the Council for Scientific and Industrial Research of the Commonwealth of Australia, the Division of Forest Products is undertaking an extensive series of tests on the mechanical and physical properties of the timber of karri (*Eucalyptus diversicolor*). Several special tests have so far been carried out ("A Discussion of Special Tests on the Compressive Strength of Green Karri" by Ian Langlands, Division of Forest Products, Pamphlet No. 61—Tech. Paper, No. 19. Government Printer,

Melbourne, 1936). It is shown in this paper that green karri will withstand greater stresses perpendicular to the grain when the load is applied to the tangential face than when it is applied to the radial face. The modulus of elasticity of karri is also much higher when the load is applied to the tangential face. The influence of the width of the loading plate on the compressive strength perpendicular to the grain is considered in detail. The results are given of a series of tests on green karri which were carried out to check the applicability to this species of a rational formula suggested by the U.S. Forest Products Laboratory for northern hemisphere timber. The tests showed that the formula applies very closely when the stress at 1/10 in. deflection is considered; but if the stress at the limit of proportionality is taken as the criterion, the agreement is not so good because of unavoidable eccentricities in loading.

The Japanese Earthquake of February 21, 1936

THOUGH it did not attain more than semi-destructive intensity, the Kawati-Yamato earthquake of February at 10h. 8m. (1h. 8m. a.m., G.M.T.) ranks as the strongest felt in central Japan since the Tango earthquake of 1927. It is described in three short papers published in vol. 14 of the *Bulletin* of the Earthquake Research Institute. Messrs. N. Nasu and T. Hagiwara (pp. 285–289) study the early after-shocks, of which there were 77 during the first 24 hours. A network of five seismological stations was formed around the epicentre near Mt. Hutagami, from the records at which it was found that the focal depths of five after-shocks during the first fortnight were less than six miles. Mr. N. Miyabe (pp. 297–306) remarks that earth-sounds were heard at many places, but they seemed to come as a rule from the nearest mountain rather than from the epicentre. Lights were noticed with the earthquake by several persons, but it is not certain that they were connected with it. Mr. T. Saita (pp. 307–317) examines the relation between the amount of damage and geological structure. He states that, on hard ground, heavy buildings collapsed seriously, while, on soft ground, old and poorly built houses were much damaged.

A Piezoelectric Ultra-micrometer

THE ultra-micrometer is an instrument for the measurement of linear displacements smaller than those which can be measured by optical interferometry; these are limited by the wave-length of light. Whiddington in 1920, using two oscillating electrical circuits tuned so as to produce an audible beat tone, was able to extend the sensitivity of measurement to a value smaller than 10^{-8} cm. Later on, W. G. Cady and D. W. Dye used a piezo-electric quartz plate instead of a resonant electrical circuit. In *Science* of May 15, Prof. J. C. Hubbard describes how by using a quartz plate of 600 kilocycles resonant frequency, a frequency change of one sixtieth of a cycle may be detected. This corresponds to a frequency change of about three parts in one hundred million. To test the method, a micrometer condenser has been constructed so that each plate is attached to a separate support clamped to a heavy steel rod. Adjustments are provided for making the plates parallel and for making relatively large variations of plate distance by means of a micrometer screw. A variable condenser in parallel is provided so as to operate the micrometer condenser at any desired plate distance and thus secure a wide range of sensitivities. In the experiments which have hitherto been carried out, displacements of 10^{-9} cm. have been measured with an inaccuracy less than a few per cent, although no special precautions were taken against mechanical disturbances. It is hoped that by taking such precautions, displacements of 10^{-10} cm. may be measured. The attainment of a sensitivity of this order should open a new avenue of approach to many important and interesting problems in atomic and molecular physics.

Bakelized Bearings

AN extraordinary development in the kind of bearings used in machinery intended for heavy service is described in the *Metropolitan-Vickers Gazette* of July. The provision and maintenance of bearings in rolling mills is more difficult probably than in any other industry. The pressures are high, the conditions are usually dirty, and maintenance and replacements are difficult and expensive, both in cost of spares and in time lost while repairing or changing. For the heaviest service, white metal bearings have been found quite inadequate. Bronze bearings, usually called brass, are commonly used, but the wear is very rapid. Much thought has been given to this problem, and after many attempts an apparently most unlikely solution has proved the best. It has been found that a bearing material consisting of a fibrous substance like paper or cloth bonded with 'bakelite', a synthetic resin, is far better for this service than any metal. Also, no oil is used, but the bearing is fed continuously with a stream of water. The water has a dual function; in the first place it acts as a lubricant, and in addition it fulfils a more important function by keeping the bearing cool. Cooling is specially required in bearings of this kind, owing to the fact that the heat conductivity of the bakelized bearing material is very much smaller than that of metal. A stream of water is found the best means to carry away the heat generated by friction. A very large number of these bearings are already in service and give good results. The saving in power varies from 30 to 60 per cent, the life is increased about ten times, and there is a saving in the workers' time, as there is seldom need to adjust the rolls.

Relativistic Problem of Two Bodies

THE present verifications of the general theory of relativity deal only with gravitational fields due to a single body. For example, in the case of the advance of the perihelion of Mercury, the field is considered as due to the sun alone, an approximation which is legitimate owing to the smallness of the ratio of the mass of the planet to that of the sun. Prof. T. Levi-Civita (*L'Enseignement Mathématique*, **34**, 149; 1935. Paris: Gauthier-Villars), deals with the corresponding problems for two bodies of comparable mass. The equations of relative motion, to a certain degree of approximation, show that we may speak of a central force separable into a Newtonian attraction and an Einsteinian perturbation, which produces an advance of perihelion. This might have been expected, but it is strange to find that the centre of gravity oscillates slightly instead of being at rest or moving uniformly in a straight line. There seems no hope of testing this by observation, but the new formula for the advance of perihelion (slightly different from that applicable in the case of Mercury) may possibly be verified by observation of double stars.