

Research Items.

Antiquities from Lambay, Co. Dublin.—Some forty objects found during the building of a sea-wall on the island of Lambay in 1927, and presenting some remarkable features, are described by Prof. R. A. S. Macalister in Vol. 38, Sect. C, 8-9 of the *Proceedings of the Royal Irish Academy*. They belong to two different periods, the earlier being relics of a settlement, the later of an interment. The earlier series includes axe-, adze-, and hatchet-heads of grit, lance-heads of flint, flakes of flint, rings of limestone, sharpening hones, and fragments of pottery. In the later series are the umbo of a shield in bronze, fragments of a circular object with ornament of repoussé moulding, showing characteristic La Tène curves, an armet with eight beads of bronze playing upon it, between each pair a flat disc of bronze, three ornaments from a sword scabbard, rings and fibulae of Roman provincial type, and a fibula of Rhenish provincial military type; in iron, the fragments of a sword, and a circular mirror of classical type; a ring in lignite, and a few fragments of leather. In both series certain special points are noted. The earlier series belongs to a neolithic or bronze age settlement, but the types are remarkably exotic. The adze-heads predominate in a way not common in Ireland, and they are made of unusual material. The javelin heads are definitely of an Iberian type, differing from the flat lozenge-shaped javelins which have been compared to Iberian types. The large quantity of flint is surprising and points to a constant supply, which it is suggested is new and unexpected evidence of early trade. The interment series is also remarkable in indicating a community at the end of the La Tène period which had established relations with Romanised provinces in an unprecedented way. The mirror and fibulae are new in Irish archaeology. One fibula was evidently copied from another in the series by a workman who, though highly skilled, did not understand the mechanism of his model. The pin in the copy is fixed to the catch so that the fibula could not be used as a brooch. The two series "open doors that give us new vistas in Irish history".

Evolution of the Human Skull.—Prof. William K. Gregory continues his studies of the evolution of the human head from fish to man in *Quart. Rev. Biology* (June 1929, p. 233). The present article deals with the *norma basalis*, and leads to a series of findings of general interest. Thus the bony tracts of the skull appear to be moulded around and with reference to other structures which are frequently represented by fossae in the dried skeleton. The form of a particular bone is partly determined by its position with reference to the midline of the skull, and to the axis and direction of locomotion, as well as by the stresses of gravitation and muscular contraction to which it is subjected. The increase or decrease of a bone affects neighbouring structures and tends to change the shape of the skull as a whole, but there appears to be some regulating mechanism, analogous to surface tension, which keeps the members of a functional series in line, particularly in the less differentiated stages. Occasionally it is found that over a long geological period a given element, such as the ectopterygoid, may be relieved of its functions and crowded out, illustrating change of function and the substitution of one part for another. But, although bones may be pushed apart or remoulded, they show a natural conservatism or inertia, so that many of them are retained throughout the whole series from fish to man, a conservatism more marked in the basal than in the lateral aspect.

California Sardine.—In *Contribution No. 69* from the California State Fisheries Laboratory, Francis N. Clark describes a study of the weight-length relationship of this sardine (*Sardina caerulea*). He uses a

mathematical 'factor' F , calculated from the formula $F = 1000W/Lx$, where W is the weight of a fish, and L its length; and x is the power to which L must be raised in order to express the relation between weight and length. From the data derived from material of four seasons, the value of x was found to be 3.15, but for the purpose in hand it was considered sufficiently accurate to assign the value 3.00 to x ; that is to say, to assume that the weight increases exactly as the cube of the length. Clark concludes that the weight-length factor F is a reliable index of condition and reflects the fat content of the sardine. The value of F fluctuates from month to month, and differs from season to season. A useful bibliography is appended which brings together more than eighty references from the somewhat scattered literature on the subject treated.

Chinese Crab Naturalised in Europe.—In 1912, for the first time, a Chinese crab, *Eriocheir sinensis*, was found in the Aller, a tributary of the Weser, in Germany. There is no definite knowledge of its mode of arrival, but presumably it was transported by shipping. Its spread since 1912 has been rapid, as Dr. W. Wolterstorff has discovered (*The Aquarium Review*, September 1929). Shortly afterwards, it was discovered in the lower Elbe, and in 1923 had reached Hamburg. In 1927 it was observed on the coast of the North Sea from Ems to Büsum, in the Havel near Brandenburg, and in the Elbe north of Magdeburg. Since then it has continued its rapid multiplication and dispersal, so that the author now knows at least thirty-five places on the middle Elbe and its tributaries where it has been found. It seems not yet to have penetrated to southern Germany, but a look-out should be kept in rivers bordering the southern North Sea for this oriental, which threatens to colonise a wide area in Europe.

A Possible Relict Fauna in Sydney Harbour.—Occasional records of molluscs from Sydney Harbour have suggested that attempts are being made by tropical forms to establish themselves there. Hedley suggested that the occurrences were seasonal, that when the Notonectian flooded the port they gained a footing, but perished when the stream swung off the shore. These odd records were met with some distrust, but Tom Iredale now finds that a large unrecognised molluscan fauna exists in the Harbour, and of this he has described several new genera and species (*Australian Zoologist*, vol. 5, March 1929). The material was obtained from the dredger *Triton*, but since a load weighs 1250 tons, only a cursory survey of the material could be made, although it was sufficient to indicate that many new forms are still to be discovered. Recently two valves of *Hippopus hippopus* were found, and this, with the other records, leads the author to the suggestion that the fauna in question may be a relict fauna, a reminder (or remainder) of the times when Sydney Harbour enjoyed a tropical climate. This supposition has often been confidently put forward as a result of geological studies, but the time required from such data has always referred to an age much earlier than the apparent age of the collection of molluscs which has just been discovered.

Diptera of Patagonia and Southern Chile.—During the present year the British Museum (Natural History) has inaugurated a monograph which is intended to give a complete review of what is known of the Diptera of the forested region of South America and of the Patagonian plateau. It is intended to issue this work in six parts, and the subject matter is largely based upon collections made during a joint expedition arranged by the Museum in conjunction with the

Bacteriological Institute of the National Department of Hygiene, Argentina. The two collectors engaged upon the trip were Mr. F. W. Edwards, of the British Museum, and Mr. R. C. Shannon, who represented the Bacteriological Institute. The first part of the series to be completed deals with the craneflies and is by Dr. C. P. Alexander, who finds that a considerable proportion of the genera and certain groups of species exhibit a marked resemblance to Australasian forms—a fact already appreciated in other groups of animals. Of Part 2, only two fascicules have yet appeared. In Fasc. 1, Mr. A. L. Tonnoir discusses the Psychodidae, and remarks that they form an aggregate which exhibits great affinity with the Psychodid fauna of New Zealand. He brings to light a new genus which he names *Nemoneura*, while all but one of the species of the family enumerated by him are new to science. In Fasc. 2, Mr. F. W. Edwards deals with the Blepharoceridae, and in the introductory part he discusses the affinities, morphology, and classification of that family. One interesting feature brought to notice is the presence or absence of mandibles in the females without the occurrence of species with these organs in an intermediate condition. The discovery of six new species of the most primitive known genus, *Edward-sina*, is also of interest, together with an illustrated account of the larva and pupa.

The Gulf Stream.—A useful paper by Mr. H. A. Marmer on the Gulf Stream and its problems appears in the *Geographical Review* for July. Mr. Marmer traces the history of our knowledge of the current and refers to many recent investigations in the problems of its origin, course, and effect. It has now been shown that the course of the Gulf Stream from the Straits of Florida to Cape Hatteras is nearer inshore than it was formerly thought to be. In places along this coast, it lies nearer to the 20-fathom than to the 100-fathom submarine contour. It has furthermore been found that the cool coastal waters along the eastern coasts of the United States, between the shore and the Gulf Stream, are not due to the Labrador current, which from Nova Scotia southward does not send south an inshore branch, at least as a regular flow throughout the year. Observations rather confirm the belief that the waters of the Labrador current, so far as they escape after contact with the Gulf Stream, turn eastward across the Atlantic. The cold inshore waters of the eastern coast of the United States are said to be due to land drainage, off-shore winds, and upwelling waters, and deflection by the earth's rotation of cold water from the Gulf of St. Lawrence.

Aerial Survey in Alaska.—Extensive experiments in aerial photographic surveys were made by the United States Geological Survey in south-eastern Alaska in the summer of 1926. The choice of area was decided both on account of the need of maps for forest, mining, and fishing interests, and by reason of the numerous waterways which provided easy access and landing-places for the aeroplanes. Three machines were employed, and in rather less than three months, during which there were many unfavourable days, an area of about 10,000 square miles was photographed. Prints were made from approximately seventeen thousand negatives. The aeroplanes flew to and fro, following lines as near as possible at right angles to the shore lines. A spacing of three and a half miles between adjoining lines was found to provide sufficient overlap in the pictures. The altitude of the aeroplanes was about 10,000 feet. An account of the work, with a specimen sheet of the map, is contained in *Bulletin* 797 E of the United States Geological Survey, by Messrs. R. H. Sargent and F. H. Moffit. The maps are preliminary sheets and of course without contours. They will serve as base maps for geo-

logical surveys that are planned for the region, but are subject to correction when more accurate horizontal control is obtained. But until this additional field work is undertaken, the aerial survey maps may be regarded as useful preliminary sheets.

The Rhineland Earthquake of 1929.—The results of an investigation of the records of the Rhineland earthquake of Dec. 13, 1928, have been published by B. Gutenberg (*Gerlands Beiträge f. Geophysik*, 23, p. 22; 1929). The focus was situated near Rödigen and the focal depth is thought to have been about 30 km. The longitudinal waves were propagated in the upper, intermediate, and lower layers, with velocities respectively $P_g = 5.6$, $P^* = 6.7$, and $P = 8.2$ km./sec. The values for P_g and P^* agree well with those found by Jeffreys for the Tauern and other Central European earthquakes, but the value for P is considerably higher than Jeffreys' value 7.7 or 7.8. Conrad has previously deduced $P = 8.12$, though he, too, found $P = 7.83$ for the Tauern earthquake. There appear, therefore, to be real differences between adjoining regions of the upper parts of the lower layer. The possibilities of further complications are suggested by R. Schwinner (*ibid.* p. 35), who infers from gravity measurements that there are sheets of heavy 'sima' rising up nearly to the surface through dislocations between the blocks of 'sial' corresponding to the Alps and the Bohemian massif.

Geology of Uganda.—The Annual Report of the Geological Survey of Uganda for 1928 (Entebbe, 1929) is a particularly interesting document. It contains a general description by A. D. Combe of the Bufumbiro volcanic area, notes on the leucite and other lavas of which were given by W. C. Simmons in the Annual Report for 1927. The discovery of large areas of moraines and fluvio-glacial deposits at the foot of Mt. Sabinyo is also recorded. Further information is given of the cassiterite deposits of Murisasando, and their association with quartz veins, pegmatites and muscovite-kaolin veins. There are already indications of several petrographic provinces in Uganda: leucite-lavas of Bufumbiro; augite-nepheline lavas of Elgon in the east; hypersthene-dolerite dykes; and granites of many types, including enstatite-granites in Karamoja and the better-known tin-bearing granites. At the Seismological Observatory records have now been made for a first complete year, and it has been possible to get time signals on a short-wave wireless set. Details of the shocks recorded are given. The Research Notes, which form a welcome feature of the report, deal with the geological history of the Great Lakes (E. J. Wayland); rock cisterns and prehistoric man (E. J. Wayland); augite crystals from the Belgian Congo portion of the Bufumbiro volcanic field (A. D. Combe and W. C. Simmons); and oscillations of lake level (W. C. Simmons). The officers of the Survey are to be congratulated on a successful and stimulating year's work.

The Hydrogen Molecule.—A recent paper by Prof. O. W. Richardson and Dr. P. M. Davidson, in the *Proceedings of the Royal Society* for August (vol. 125, p. 23) illustrates the very considerable extent to which the analysis of the complicated band spectrum of hydrogen has already proceeded. Many of the electronic energy levels for the molecule H_2 are now known, together with the associated vibrational and rotational changes in energy, and one of the important results obtained in the present paper is that the data for the energy functions of the more stable H_2 molecules obtained by two essentially different methods are sufficiently consistent to show that the analysis of the spectrum has progressed along sound lines. Other points considered are the potential energy of the molecules in the neighbourhood of

equilibrium positions of the two nuclei, the total energy of the molecules and the ways in which they dissociate, the kinetic energy of the electrons in the molecule, and the comparison of the states of the H_2 molecule and of the H_2^+ molecular ion. Attention is also directed to a mistake in the standard "Report on Molecular Spectra in Gases", and this is corrected in an appendix upon "The Mean Kinetic Energy of a System of Particles in Motion under their Mutual Forces, some of the Particles being held fixed and the others remaining in their neighbourhood".

Counting Ionising Particles.—Considerable attention is now being given to the improvement of electrical methods for detecting swift ionising particles. The old electrical methods, and one new one devised by Prof. Geiger, consisted essentially in the amplification of the ionisation due to a single particle by electrical fields within the ionising chamber. The majority of the new methods aim at making use of the initial ionisation without such magnification. One way in which this can be done is exemplified by the arrangement of Hoffmann and Pose (*Zeitschrift für Physik*, Band 56, p. 291), in which the ions are collected and registered in their original numbers by a very sensitive electrometer. This has several disadvantages, and a more promising line has been developed, largely in the Radium Institute at Vienna. The ions are again collected as a saturation current, but the potential changes brought about at the grid of a valve by their reception are amplified by other valve systems until they are large enough to be measured by less sensitive instruments. The circuits used differ somewhat from those which are most familiar in high frequency technique, since the input voltage is impulsive in this case, and numerous difficulties had to be overcome before the present arrangements were adopted. These do, however, appear now to be very satisfactory, and an investigation of natural H-particles has already been made with the new 'valve electrometer', by E. A. W. Schmidt and G. Stetter (*Zeitschrift für Physik*, Band 55, p. 467), which has revealed an interesting discrepancy between the numbers of particles recorded electrically and by the counting of scintillations, only about half the number found by the latter method being detectable by the former.

Standard Cells.—The August number of the *Journal of the American Chemical Society* contains two papers by Prof. G. A. Hulett and W. S. Niederhauser dealing with polarisation and hysteresis in standard cells. Although previous work had indicated that such cells were subject to considerable polarisation, even at relatively low currents, the analysis of the effect between the two electrodes had not been adequately studied. The first paper deals with the polarisation of the individual limbs of the saturated, unsaturated, and acid cadmium cells and of the zinc cell at very low currents. The effects of charging and discharging the cells were studied. The results show that most of the polarisation occurs in the mercury limbs; that the effect of charging is more severe at the mercury electrode; whilst that of discharging is more severe at the amalgam electrode; and that a recovery effect, present only in the mercury limb of the cell, appears when the polarisation occurs at the higher currents and tends to decrease the polarisation of the cell. No noticeable change in the resistance of the cell accompanies polarisation. A large number of important experimental results is accompanied by a discussion. In the second paper the adjustment of the individual limbs of standard cells to temperature changes is considered. New cells show high values of hysteresis, which decrease during the first month or so and are probably due to overheating in the course of construction. A method of avoiding this trouble and of setting up

cells which give normal values within a few hours of construction is described.

The Night Sky.—The June issue of the *Journal de Physique* contains an account of an extensive series of observations upon the spectrum, colour and polarisation of the light from the night sky, by J. Dufay, of the Observatory of Lyons. The work has been done almost entirely with calibrated photographic plates, and is essentially quantitative. M. Dufay has studied both the green auroral line and the continuous spectrum, and finds that the former carries about one quarter of the total radiant energy between 5000 Å. and 6000 Å.; after allowing for the auroral line, the residual light has a distribution of energy which is more nearly like that of sunlight than that of the blue sky, although it is relatively stronger in the longest and the shortest visible wave-lengths. M. Dufay finds that the light from the night sky is definitely polarised, with the privileged plane passing through the sun, but that the extent of the polarisation—about three per cent—is decidedly less than that of the zodiacal light. He concludes that the light comes partly from feeble stars and the permanent aurora, and partly from atmospheric diffusion and zodiacal light, but that these factors do not account for more than about one-half of the total radiation, the origin of the remainder of which has still to be found.

Ignition of Firedamp.—Although a number of fire-damp explosions have been attributed to frictional sparks or heating caused by picks or working machinery, experience and earlier research work have shown that it is very difficult indeed to cause ignition by such means. In a paper (No. 54, H.M. Stationery Office, price 6d.) issued by the Safety in Mines Research Board, Mr. M. J. Burgess and Prof. R. V. Wheeler have described further experiments carried out with sparks produced by the abrasion of steel by revolving wheels and also with an ordinary chain coal-cutting machine working against a built-up mass of rock in explosive atmospheres. The results show that, with certain kinds of rock, firedamp could readily be ignited, although it is not certain whether ignition was caused by the sparks emitted or by the heating of the rock surfaces caused by the impact of the coal-cutter picks. These results are obviously of importance in connexion with the use of such machines in mines where firedamp occurs and the paper is a valuable contribution to the literature of safety in mines.

Low-Expansion Nickel Steels.—For clock pendulums, standard tapes for geodetic surveys, standards of length, scientific instruments where variations in size due to changes of temperature are to be minimised, and for other purposes, a 36 per cent nickel-iron alloy is in general use and most of the credit for the development of the iron-nickel alloys is given to Guillaume and his co-workers. The alloys, however, have been the subject of extensive researches, and in *Engineering* for Sept. 27, Mr. T. F. Russell discusses two theories of this alloy and gives results from experiments carried out in the Research Laboratories of the English Steel Corporation, Limited, Sheffield. The theories are due to Benedicks and Honda, but having considered their respective views, Mr. Russell says he is convinced "that in order to explain the variations in expansibility, magnetic induction, hardness, etc., which may be brought about in this alloy by suitable treatment, much more profound theories, probably based on interatomic relations, will have to be propounded". Results are also given of an investigation of the alloy known as 'nilex', made with the view of correlating the coefficient of expansion, Brinell hardness and magnetic induction, the article being accompanied with curves and a description of the apparatus used in the research.