

Research Items.

THE RELIGION OF MENTAWEI.—Mentawai Islands, lying west of Sumatra, owing to political conditions, have received more attention from Dutch and German than from English-speaking ethnologists. They were, however, visited in 1926 by Mr. Edwin M. Loeb, as a research scholar of the University of California, and he has now published an account of the religious organisation of the Pajeh group of islands in the *Publications in American Archaeology and Ethnology*, vol. 25, No. 2 of that University. He deals more especially with the *punen* system. The *punen* is the community religious festival (as distinct from the *lia* or family festival) which is attended by all members of the *uma*, the communal house. The festival is of long duration, sometimes lasting for years. It takes place at the building of a new communal house, the choice of a new priest, the making of a new field, the spilling of blood in the village, an epidemic, and so forth. The main ceremonial acts are the slaughter of pigs and chickens, the sacrifice of their livers and haruspication. The souls of the dead members of the *uma* are invoked to return, and imitative dances are held, and towards the end of the festival monkeys, deer, and sea turtle are hunted. All men sleep in the *uma* and sexual intercourse is taboo. The religious beliefs of the Mentawai Islands are animistic. They believe in nature spirits, souls, and ghosts; but the nature spirits, with a few exceptions, are not given names. They are the spirits in the sea, the jungle, and so forth. The exceptions are a god who causes earthquakes, the original meaning of his name being 'grandfather'. It is on account of this god that a human sacrifice used to be offered at the building of the *uma*. Other specially designated gods are two water spirits, the first being propitious if due sacrifices are offered and no ritual sin has been committed, and the second is evil. The soul cult is specially directed to the preservation of health and long life, while ghosts are the bringers of disease to whom prayer is offered for purposes of witchcraft, and to whom sacrifice is made only when they have entered a village bringing sickness, to induce them to go away.

THE REGENT'S PARK MEDUSA.—Prof. C. L. Boulenger and W. U. Flower (*Proc. Zool. Soc.*, Part 4, 1928) record observations on the freshwater medusa, *Craspedacusta (Limnocolodium) sowerbyi*, which reappeared in the *Victoria regia* tank in the Royal Botanic Society's Garden in Regent's Park in 1928 (see also NATURE, July 14, 1928, p. 58). The youngest specimens—about half a mm. in diameter—agree in structure with the description of American examples of the medusa of *Microhydra ryderi*. The latter is therefore merely the young stage of *C. sowerbyi*. The description given of *Microhydra germanica* shows that it corresponds with the young forms of *C. sowerbyi*, and the Chinese species *Limnocolodium kawaii* is also a synonym. The Japanese *C. iseanum* is clearly differentiated by the structure of its sense organs. The living *C. sowerbyi* passively sinks in the water, the velum hanging downwards from the umbrella margin and the tentacles floating upwards, the lip of the oral opening of the elongate manubrium being widely extended so as to catch organisms. In addition to this 'tow-net' method of feeding the medusa can feed on bottom-living forms, for the stomach has been recorded filled with *Arcella*. The authors consider that the increase in size of the mouth and the large manubrium of *Limnocolonida* show that this genus has become more perfectly adapted to the tow-net method

of feeding, but the radial canals are shortened and the sex-cells remain in the manubrial ectoderm, that is, in the primitive position in which they first appear in the young *Craspedacusta*.

THE MUSKRAT IN EUROPE.—In 1905 the American muskrat (*Fiber zibethicus*) was introduced into Bohemia on an estate near Prague, where it was hoped that it would breed and help to supply the demand for musquash fur which was then in fashion. The experiment succeeded better (or worse) than was expected, for the colony burst out of control and soon mid-Bohemia was overrun. About 1914, Bavaria and Saxony were invaded; in 1924 Silesia; and in 1928 the outposts were still spreading (Hj. Broch in *Naturen*, January 1929). The extent of the conquest may be judged by the fact that in 1921, 60,000 to 80,000 muskrat skins were sold in Berlin at prices which compared favourably with those obtained for American skins. Such an invasion could not but have its ill-effects. The muskrats, largely vegetarians, have attacked corn, potatoes, kohlrabi, turnips, and carrots. They have extended their carnivorous diet to frogs and fish, and the damage caused by their burrows to road and railway works has not been negligible. Strenuous measures have been adopted against the pest in the affected countries; in Bavaria special muskrat catchers have been appointed. The whole story is but another illustration of the danger of introducing animals in casual and unconsidered ways to new countries, and it strongly supports Dr. Broch's plea that there should be no relaxing of the law forbidding the importation of live muskrats into Norway.

ANIMAL HYPNOSIS.—J. ten Cate (*Biol. Zentrabl.*, Bd. 48, Heft 11) discusses the problem of animal hypnosis. Czermak (1856) found he could produce complete immobility in the newt by suddenly seizing with forceps a leg or the tail. Similar immobility after a sudden strong stimulus is met with in other animals, especially in insects, and is known even in a few mammals. But there are other cases in which the hypnotic condition is brought about by much weaker stimuli lasting for a longer period, for example, in consequence of holding the animal, by the suppression of the reactions of flight, defence and turning over, by transient pressure on definite parts of the body, by continuous gentle contact, etc. Hypnosis in these cases appears only under quite definite conditions and its origin is by no means so simple as has been assumed. The author describes experiments with the skate, the cockroach, the salamander, the rabbit, and the octopus, in which hypnosis was produced by the action of definite stimuli. He proceeds to refer to the condition of the musculature and to discuss the origin of hypnosis in animals. He concludes that in the vertebrate series the significance of the cerebrum for the realisation of the condition of hypnosis becomes the more important according to the higher grade of development of the central nervous system. Among the invertebrates the general rule appears to be that the higher the animal the more significant are its cerebral ganglia in regard to the origin of hypnosis.

CHROMOSOMES OF MAIZE.—A useful study of chromosome numbers in many different varieties of maize has been made by Randolph (*Memoir* 117, Cornell Univ. Agric. Expt. Station), who used the iron-acetocarmine method. All the different types of maize, including dent, flint, pop, and sugary, were examined,

including both meiotic and somatic chromosomes, and the chromosome counts in 338 plants were determined. In accordance with previous work, the typical diploid number was found to be 20 in all varieties. But plants with a higher number were found in two sugary and two starchy varieties, and in certain other cultures. In the exceptional cultures the numbers ranged from 21 to 28, but were constant in each individual, with rare exceptions. The chromosomes vary in length from about 2 microns to 4.5 microns, and the extra chromosomes were of the smaller size. Segmentation, fusion, duplication through non-disjunction, and hybridisation are discussed as methods by which the additional chromosomes may have arisen, but further studies are necessary before the exact method can be determined.

SOFT-WOOD IMPORTS INTO NEW ENGLAND.—Much has been read of the threatened famine in soft-wood coniferous timber supplies, and the matter is admittedly one deserving the closest attention. The intricacies of the question are very considerable, both in the Old and the New Worlds. A point bearing on this matter was discussed by Mr. Franklin W. Reed, of the National Lumber Manufacturers' Association, at the recent New England Forestry Conference (*Daily Science News Bulletin*, Science Service, Washington, D.C.). Mr. Reed stated that shipping lumber to New England, traditionally a forested region, seems like carrying coals to Newcastle; yet lumber is being shipped into the State and no tariff wall can keep out the invading lumber, for it is American lumber from the Pacific north-west. It comes into the New England market, partly because the digging of the Panama Canal has made intercoastal freight rates cheap, and partly because the Pacific lumbermen have been caught in an economic trap of overproduction and have to dispose of their product at abnormally low prices in order to maintain their establishments. "The present unfavourable condition, from the point of view of the New England producer, will end", said Mr. Reed, "when the excessive exploitation of the virgin stands of the Pacific coast is ended, either through agreement among the lumbermen or through exhaustion of the more easily accessible timber." Although New England may look with equanimity to such exhaustion, it would prove a serious matter for wider United States and world markets. In the meantime, however, New England timber owners and lumbermen are advised to consider the possibility of exporting hardwood products to the Pacific States via the Panama Canal. This section, it is pointed out, though possessing a surplus of soft-woods, has almost no hardwood resources and is now importing oak from Japan. It appears possible, therefore, that an exchange of New England birch, beech, and maple for Pacific Coast soft-woods might prove an economic possibility.

WATER-COOLED MERCURY VAPOUR LAMPS.—The Lummer and Straubel mercury vapour lamp, which furnishes a very bright light-source of small extent and proves most useful in spectroscopic work and as a subsidiary to devices for obtaining monochromatic light, has the disadvantage that it requires to be cooled in a current of water. In the *Rendiconti* of the Royal Lombardy Scientific and Literary Institute for 1928, Dr. Luigi Piatti, of the University of Pavia, describes a simple arrangement, which both prevents the lamp from coming into action unless the water is flowing and extinguishes it automatically if the water supply fails. Moreover, the arrangement is such that the electric circuit in which the lamp is inserted is kept well insulated from the cooling water.

FUNDAMENTAL CONSTANTS.—Prof. A. S. Eddington's theory of the relation between certain of the fundamental constants, to which several references have been made in NATURE this year, lends particular interest to two new numbers which have been published recently. H. Feder, working in the late Prof. Wagner's laboratory at Würzburg, who has re-measured Planck's constant h by a method based on the excitation of the continuous X-ray spectrum, now finds for it a value of $6.547 \pm 0.003 \times 10^{-27}$ erg. sec. H. D. Babcock, of the Mount Wilson Observatory, has revised a previous estimate of the specific charge of the electron (e/m) which he had made from the magnitude of the Zeeman effect for a number of spectral lines of known spectral types, and gives as its value $1.7606 \pm 0.0012 \times 10^7$ e.m.u./gm. In each case the changes called for in the older standard values are less than one part in a thousand, although it has to be remembered that the former method presupposes a knowledge of the actual charge on an electron (e), and the latter a knowledge of the velocity of light. The accounts of the two investigations are published in the *Annalen der Physik* (vol. i. No. 4), and in the January issue of the *Astrophysical Journal* respectively.

QUANTUM MECHANICS.—Dr. P. A. M. Dirac has reviewed some of the more recent developments of quantum theory very lucidly in the introductory paragraphs of a paper in the issue of the *Proceedings of the Royal Society* for April 6, on the properties of many-electron systems. Quantum mechanics is defined as "the general theory of all quantities that do not satisfy the commutative law of multiplication". Dr. Dirac considers that the general theory is now almost complete, apart from the question of the exact form in which relativity considerations have to be introduced. The latter, however, are only of importance where high-speed particles are concerned, and so the underlying physical laws necessary for the mathematical formulation of a large part of physics and the whole of chemistry may be regarded as completely known: the difficulty is only that insoluble equations are frequently encountered in the applications of these laws to specific systems. Dr. Dirac has given a sketch of the history of the spinning electron which brings out clearly the nature of the problem presented by the interaction of the orbital electrons of atoms and of molecules, and the way in which the impasse which this presented was removed by recognition of the fact that the electrons are actually indistinguishable one from another, and so can change places without our knowledge. This 'exchange' type of interaction leads also to satisfactory theories of homopolar valency and of ferromagnetism. Dr. Dirac's main object in this paper has been to take the ideas and results of group theory, which has been used extensively by German theoretical physicists, and to translate them into the more general and apparently simpler language of quantum mechanics, a transformation which appears to have the additional advantage that it often enables a simple physical meaning to be attached to an otherwise abstract theorem.

GRID CONTROL IN ARCS.—I. Langmuir and A. W. Hull have contributed a paper to the March number of the *Proceedings of the National Academy of Sciences* of the United States, from which it would appear that considerable developments in the use of enclosed arcs may be expected in the near future. The principle underlying the construction of the new tubes is the combination of grid control of the current from a hot cathode with conduction through an ionised gas, with the essential reservation that a

circuit can be made by raising the potential of the grid, but cannot be broken by again lowering it; a negative grid in a strongly ionised medium simply attracts to itself a thin sheath of positive ions, which act as a perfect electrostatic shield to the main body of the discharge. To stop a current flowing, the anode potential must be reduced to the neighbourhood of the ionising potential of the gas, and hence the grid does not affect the instantaneous value of the anode current, but only its average value. The action of the grid, once a discharge has been started, is in fact the same as that of the small exploring electrodes that are now used in the investigation of many types of gaseous discharges. More details of the arc tubes are being given by Dr. Hull in a series of articles in the *General Electric Review*. Perhaps the most remarkable feature of the first of these—in the April number—is the shape which is now being given to the electron-emitting surfaces of the cathodes. The bare filament type has been almost abandoned, and there has been substituted an elaborate structure of appropriately coated ribbons or vanes, in the design of which special care is taken to ensure that the emitting surface is efficiently insulated thermally. These tubes have already been made in metal, as well as in glass.

BREEZE AND CLINKER AGGREGATES.—Concretes made from furnace residues as aggregates often develop cracks within a short time of setting, and the causes of such failures have been investigated at the Building Research Station. The experimental methods employed and the results obtained are described in detail in *Technical Paper, No. 7*, by F. M. Lea (London: H.M. Stationery Office). Many breezes and clinkers contain combustible matter and even unburnt coal, and it is this material that is, in general, responsible for failure. The absorption of moisture and the oxidation of the coal cause swelling movements which may continue over a period of some days, and are particularly noticeable during the setting period and early life of the concrete. The presence of more than 40 per cent of combustible material in the breeze invariably results in a low-grade concrete, and the properties of the concrete improve as the combustible content decreases. Failure due to the presence of sulphur or its compounds appears to be rare, and up to 0.4 per cent of sulphur as sulphate and 0.75 per cent in other forms, is permissible. Other impurities do not appear to cause failure.

A METHOD OF PRODUCING SOUND STEEL INGOTS.—In a paper read before the Iron and Steel Institute on May 3, Sir Charles Parsons and H. M. Duncan described an experiment carried out on a large scale to produce steel ingots of exceptional soundness. The mould used consists of a strong steel casing lined with specially shaped firebricks and is closed by a cover similarly constructed and a bottom chill of steel or cast iron of large dimensions. Through the cover are openings for the pouring of the steel, the escape of gases, and for the insertion of oil burners to keep the surface of the steel hot. In this way the metal is constrained to solidify from the bottom upwards, and not, as in the ordinary ingot, from the sides inwards. The ingots produced, weighing as much as 20½ tons, are, as would be expected, very free from axial unsoundness and fairly free from segregation. The height of the ingot is small compared with its diameter. For purposes of handling in forging, a stalk must be cast on to the ingot after it has just set. The mechanical tests given by such an ingot are distinctly better than those from a normal ingot of similar weight, particularly as regards specimens cut transversely. In the typical

ingot discussed, with a height of 45 in. and a diameter of 70 in., the typical V segregates of the normal ingot are absent, or shown only in a series of basin-shaped white markings on the sulphur print. In this ingot the oil burners had been concentrated on the centre of the top surface, but since then better results have been obtained by arranging the burners around the sides of the mould.

AREA-COMPUTING SCALE.—A useful device for computing the approximate area of plane figures of irregular shape is issued by Messrs. G. Cussons, Ltd., Technical Works, Manchester. It consists of a celluloid rectangle with graduated radial markings designed to give the required area in square inches to two decimal places. As a substitute for Simpson's and other computing rules it should prove very serviceable in certain circumstances, since it needs only to be laid on the paper. Special scale markings have been included to ensure full accuracy in limiting cases where this might otherwise be lost. The instrument is stoutly made but transparent, whilst the markings are distinct and the figures clearly legible. Explicit instructions for use, and easily grasped, are given in a circular accompanying the area-computing scale, and a number of illustrations are included. The theory of the instrument has been given by Mr. R. W. K. Edwards in the *Proceedings of the Royal Society*, vol. 73, and elsewhere.

EFFECT OF NITROGEN PEROXIDE ON COMBUSTION.—In vol. 73 of the *Proceedings of the Manchester Literary and Philosophical Society* (1928–29), Prof. H. B. Dixon and W. F. Higgins record further observations of the ignition temperatures of gases determined by their 'concentric tube' method whereby the influence of surfaces is practically eliminated. The abnormal behaviour of ether vapour was confirmed, and a discovery of interest was the remarkable accelerative effect of small quantities of nitrogen peroxide on combustion, as shown by a considerable depression of the ignition temperatures of ether and hydrogen in air. One part of nitrogen peroxide in 12,000 of air caused a depression of 30° in the value for ether in air; 1 part of nitrogen peroxide in 200 of air brought the ignition temperature of hydrogen down to 455°. These observations may be correlated with the recent observation of H. W. Thompson and C. N. Hinshelwood that nitrogen peroxide in suitable small proportions accelerate the union of hydrogen and oxygen at temperatures just below ignition. They emphasise also the rôle of peroxides in accelerating combustion reactions of several types.

ILLUMINATION IN BUILDINGS.—Article No. 18 of volume 19 of the *Scientific Proceedings of the Royal Dublin Society* deals with the measurements of the ratios of the illumination at various points within buildings to the illumination from the sky at points outside, made by Drs. W. R. G. Atkins and H. H. Poole. The measurements were made by means of photoelectric cells and galvanometer deflections, so that they involve no visual comparisons of brightness. They are expressed in terms of the 'daylight factor,' that is, the ratio of the illumination of a small horizontal surface inside a room and outside where it receives light from the whole sky, but no direct sunlight. The daylight factor in a well-lighted dwelling room is about 1 per cent, and close to a window may be 7 per cent. In an ancient church it sank to 0.2 as the mean value for about thirty different points, at some of which it was only 0.03. The authors point out that with such low factors it is not worth while to fit glass transparent to ultra-violet light in windows which do not receive direct sunlight.