

Research Items.

ORIENTATION OF CHURCHES.—In a lecture on "The Orientation of Churches," recently delivered to the members of the Sidmouth Literary Society, the Rev. John Griffith paid a whole-hearted tribute to the work of Sir Norman Lockyer in the study of stone circles from the astronomical point of view. His attention was first directed to the subject by an article by Sir Norman on "The Agricultural Divisions of the Year" in *NATURE*, in which it was pointed out that the orientations of stone circles grouped themselves around February, May, August, and November. This 'farmer's year' was based upon a division of the year with which he himself had been familiar from boyhood and, as he had at once pointed out to Sir Norman, coincided with the Celtic divisions of the year of tradition and folklore; while English fairs, as dated at the beginning of the last century, clustered around these four points. These facts indicate a continuous calendrical usage from the present day back to the stone age, over a period of 4000 years. Stimulated by this result of the application of astronomical methods to the study of ancient monuments, Mr. Griffith has devoted himself to investigating the orientation of the older churches of Great Britain and has obtained similar results. He finds that, allowing for a difference of five days in the calendar between the twelfth century, when most of those churches were built, and the present day, there appears to be evidence of dedication to a popular saint, who often differs from the official patron saint. In Wales the choice is generally limited to four saints, Mary, Michael, Peter, and John the Baptist, while everywhere the feast of St. James with St. Philip on Mayday is popular as occupying a seat which, since the dawn of traditional history, has been held by one pagan deity or another.

REST PERIODS IN NEW GUINEA.—In *Man* for March, Prof. C. G. Seligman describes the alternation of rest and work periods among the Sinaugolo of Rigo District, New Guinea. Among this people the *dubu* could be built and the great feast, the *tabu*, be celebrated only during the *kaba* period; while in the period known as *dauka*, intervening between two *tabu* feasts, the drum was not sounded or the customary small feasts held, while only those known as *dauka*, feasts accompanying payment for a wife, and death and mourning feasts, could take place, dancing being to the accompaniment of bamboo dancing sticks and not the drum. Food was not piled on the *dubu* but on temporary platforms. Otherwise life proceeded as usual, and the customary hunting, fishing, planting, and sexual taboos were observed. A *dauka* period recurred every second or third year. According to the explanation of a Sinaugolo headman, these periods were instituted to secure the proper observation of these ceremonies, and a relaxation from the toil of ordinary life represented by the *dauka* period. In the *tabu* feast itself all neighbouring and friendly villages take part, but it is given by one portion of a village or by a clan, though sometimes two clans united for the purpose. The preparations involved the collection of stores of food under a taboo. Food for the first ceremony, the *kidua*, is collected from neighbouring villages, this virtually constituting an invitation and acceptance of an invitation to the feast. This food was distributed to the visitors from neighbouring villages in the *kidua* ceremony. On the next day the pigs given at the *baiseno*, a dance preceding the *tabu* feast by about a month, were hung to the *dubu*. Then follows the giving away of the *tabu*, an essential feature of which was the boasting of the men with the object of

instigating visitors to undertake the next *tabu*. For the next two or three days feasting follows, in which the pigs given at the *baiseno* are killed and eaten.

EARLY CHINESE CARTOGRAPHY.—The oldest two maps of China known to exist were found some years ago at Hsianfu, the capital of the Shensi province, and were described by Prof. E. Chavannes in 1903. These maps formed the subject of a lecture by Prof. W. E. Soothill to the Royal Geographical Society on Mar. 14. They are engraved on stone, and preserved among other stone tablets. Chavannes dated the earlier of these maps 1043, but it is less easy to decide the date of the map from which much of it was copied. Prof. Soothill's conclusion is that the larger map is part of Chia Tan's map completed in A.D. 801, and that it may have been based on P'ei Hsiu's maps of the third century, not directly, but rather on copies elaborated by local cartographers. He believes that, with some change in names, it may be taken to represent China as it was known in the eighth century. The second map would appear to be more recent. It lacks the marginal notes of the other, and is covered by a grid of 100 li squares. Prof. Soothill thinks that it was drawn by an unknown cartographer some time during the three centuries preceding A.D. 1100, that is, after the time of Chia Tan. It suggests an endeavour to reconstruct P'ei Hsiu's lost map, using his net system, but it shows an advance in accuracy from Chia Tan's time.

ESKIMO IN EAST GREENLAND.—In a lecture to the Royal Geographical Society on Mar. 21 on the Cambridge expedition which he led to East Greenland last summer, Mr. J. M. Wordie referred to the traces of former Eskimo habitation which occur on that coast. A search of the coast region between Sabine Island and Scoresby Sound revealed a number of tent rings, groups of winter huts, and a few graves. Clavering Island is rich in remains: some regions, on the other hand, showed no traces. The conclusion is that the Eskimo can never have been very numerous on the east coast, and Mr. Wordie believes that the evidence points to only one period of immigration during which the Eskimo arrived by the north of Greenland. This is a reversion to the earlier views of H. P. Steensby, who held that the Eskimo followed the musk-ox by that route. Recent examination of the north coast of Greenland by K. Rasmussen renders that route unlikely, not merely in the lack of Eskimo remains but in the absence of game or possible hunting grounds and the bad travelling conditions. Mr. Wordie visited the new Eskimo settlements formed by the Danish Government on Scoresby Sound, which are composed of Eskimo of pure stock from Angmagssalik, the one surviving Eskimo settlement from the original colonisation of that coast. If game resources last, the prospects of these new colonies are good, but it must be remembered that the disappearance of the majority of the east-coast Eskimo during the nineteenth century was probably due to the exhaustion of resources. The same might occur again.

FISHERY INVESTIGATIONS AT CULLERCOATS.—The results of the investigations carried out at the Dove Marine Laboratory, Cullercoats, during the year ending June 30, 1926, are given in Report 15 (N.S.), which has recently been issued by the Laboratory. Mr. Storror and Mrs. Cowan deal with their observations of the length, age, growth, and sexual condition of some 4600 herrings from commercial landings from the Shetlands, Firth of Forth, East Anglia, north-west and south of Ireland, Irish Sea, and Clyde. Mr. Gill, biochemist at the laboratory, gives a preliminary

description of some investigations regarding the characterisation of the flesh protein of the herring, the subject being attacked from the point of view of the amino-acids present. Mr. Gill also reports on his estimations of the quantity of dissolved oxygen in the waters of the River Tyne. The percentage in the tidal region follows very closely the amount of fresh water coming down the river, both being at a maximum in the winter and at a minimum in the summer. Heavy rains, however, even for a few days, can raise the oxygen content of the estuary from its low summer values to the high winter values. Mrs. Cowan describes the growth under aquarium conditions of the lump sucker (*Cyclopterus lumpus*) reared from the egg. Prof. Meek deals with some interesting replies to a letter circulated among fishermen and fishery officers requesting their opinions on the currents along the east coast of Great Britain.

VARIATION IN EARWIGS.—The bimodality of the curve for forceps-length in male earwigs (*Forficula*) has been well known since the original observations of Bateson and Brindley in 1892. Diakonov in 1925 published further evidence, from material collected in Russia, that the forceps are dimorphic and that the difference is probably not a genetic one but represents two independent positions of equilibrium for forceps development. He also showed various relationships between forceps-length and body-size, but the data were not fully analysed. Prof. J. S. Huxley (*Jour. of Genetics*, vol. 17, No. 3) has now published the original measurements and added a further analysis of this apparently unique type of dimorphism. He finds that plotting the logarithm of forceps-length against the logarithm of body-length gives a straight line, indicating that this organ has the same growth-mechanism as other organs showing heterogonic growth. With increasing body-size there is a tendency for the forceps to shift from short to long, the forceps of the largest animals always coming in the long group. In a colony under unfavourable conditions there was a decrease of mean body-size, but the means of forceps-length were scarcely affected. Nevertheless, the percentage of individuals in the population with short forceps was considerably increased. Similarly, more favourable conditions shift the forceps-length of some individuals during their development from the short to the long type. But there is still no evidence as to why there should be two positions of stability in forceps-length with a gap between them. This can probably only be determined by experiment.

MICRO-ORGANISMS IN TICKS.—Part I. of the 11th and 12th Reports of the Director (Sir Arnold Theiler) of Veterinary Education and Research of the Union of South Africa (Pretoria, Sept. 1926, 817 pp.) contains twenty-six papers ranging over the varied work of this active Department—serological investigations and other studies on blood and on inoculation, protozoology, helminthology, entomology, and studies on grasses and other plants. Attention may be directed to the account, by Dr. E. V. Cowdry, of a group of micro-organisms transmitted hereditarily in ticks and apparently unassociated with disease. These organisms are pleomorphic, bacterium-like, and intracellular, and they stain much less intensely with ordinary methods than most bacteria. They were found in fifteen different species of ticks, including representatives of the Argasidae as well as the Ixodidae. No evidence could be found of injury to the tissues of the ticks other than physical distention of the cells to accommodate large numbers of the organisms. They were found in every tick examined, not only from South Africa but also from Jamaica, Trinidad, Honolulu, and several parts of the United States; and as

they were present in the eggs of ten species and in the unfed larvæ of seven species, it was concluded that transmission was hereditary. The organisms in several respects resembled *Rickettsia*, but were of larger size. They also resembled the symbionts of certain lice and blood-feeding flies, but they never gave rise to definite organ-like structures comparable with the mycetomes, and they were restricted to the Malpighian tubes and the eggs, whereas the symbionts referred to are confined to the digestive tract.

THE UTILISATION OF POLLEN BY THE HONEYBEE.—In a paper entitled "The Collection and Utilisation of Pollen by the Honeybee," published as Memoir 98 (June 1926) of the Cornell University Agricultural Experiment Station, Mr. Ralph L. Parker contributes observations of considerable interest. Pollen is known to be the chief source of protein in the food of bees, and a lack of it reacts deleteriously upon the developing brood. The adult bees use the nitrogenous material of pollen in the elaboration of the brood food that is fed to the larvæ for the first two days after eclosion from the egg. This predigested food is fed to the queen all through her larval life. The worker and drone larvæ, on the other hand, are fed afterwards with a mixture of honey and undigested pollen. Substitutes for pollen such as rye, oats, corn, pea-meal, etc., were not found to be beneficial. The feeding with such substitutes is a failure, since, although it may stimulate egg-laying by the queen and brood-care by the workers, larval development is not completed. Some of the simple sugars and proteins of pollen are available to the bee, but most of the other contents are not available. Proteolytic enzymes have been shown to be present in the bee's alimentary canal, but the actual proteins of pollen utilised by that insect have not, so far, been identified. Bee-keepers in regions which at times experience a shortage of pollen during the beginning of the season, are advised to preserve combs of pollen for use during such an eventuality, since no efficient substitutes can be recommended.

ORE DRESSING IN CANADA.—The Annual Report of Investigations in Ore Dressing and Metallurgy for 1925 by the Mines Branch of the Canadian Department of Mines has just been published and shows evidence of very active work. A number of complex ores, e.g. silver-lead-zinc, gold-copper, copper-lead-zinc, etc., have been investigated, and satisfactory methods for the treatment of the ores have in most cases been devised. A new process is outlined for the treatment of ilmenite, producing a titanium oxide concentrate capable of being used for the production of pigment and other purposes. Detailed reports upon the concentration by flotation of Canadian molybdenite and graphite ores are also included. It is evident that this section of the Department of Mines is doing excellent service in the development of the Canadian mining industry.

THE PALAGONITE FORMATION OF ICELAND.—The first of a series of papers describing a comprehensive study of the Icelandic eruptives (based on a collection made in 1924 by Dr. G. W. Tyrrell and Dr. M. A. Peacock) appears in the *Trans. Roy. Soc. Edin.*, vol. 55, Pt. 1, No. 3, 1926. It consists of a preface to the series, followed by an account of the basic tuffs by Dr. Peacock. These are either sideromelan-tuffs or palagonite-tuffs. The former consist of basalt glass which has been drastically chilled and fragmented owing to the sub-glacial extrusion of basalt magma. The palagonite-tuffs are the older sideromelan-tuffs which have been hydrated, usually by submersion beneath the sea or by hot springs. It is shown that palagonite is essentially the hydrogel of sideromelan, the hydration being accompanied by a partial loss of

lime and soda and an almost complete oxidation of iron. The palagonite due to submersion is an isotropic yellow gel, but in that due to the action of hot springs there is an obscurely birefringent fibrous structure. Both types are unstable and tend to crystallise with loss of part of the water into chlorites and zeolites. It is suggested that Fermor's proposal to use the term *palagonite* for chlorophæite and other late-magmatic hydrous residual materials in basaltic rocks should be discontinued, since the latter, though of somewhat similar composition to that of the Iceland palagonite, have originated by an entirely different process.

THE COMPOSITION OF METEORITES.—In the *Proc. Amer. Phil. Soc.*, vol. 65, No. 2, p. 119, G. P. Merrill summarises recent work on the chemical and mineral composition of meteorites. The chief point of interest is the result of a series of carefully conducted analyses of representative masses. Twenty-eight terrestrial elements have so far been detected, among those not found being antimony, arsenic, barium, strontium, fluorine, lithium, tin, lead, zinc, and gold. This is a particularly significant list, for it includes many of the common ore- and gangue-making elements that are associated with the continental rocks of the earth. The characteristic ore-making elements of norites and peridotites, such as copper, cobalt, nickel, and the platinum group, are all present, as would be expected. The minerals of meteorites are in many cases of a type that can be accounted for, provided that oxygen was relatively deficient in the medium from which they crystallised. It is pointed out that nothing akin to rocks of the granite family has been found in meteorites; and further, that meteorites have never been found in terrestrial beds of any geological horizon but the most recent. Merrill regards the possible meteoric origin of tektites as still unproved.

COAL CARBONISATION.—On Feb. 8, 1927, Dr. C. H. Lander, Director of the Fuel Research Board, read a paper before the Institution of Petroleum Technologists on "The Production of Oil from Coal." The history and work of the Fuel Research Department, which set out to study this problem in particular, was surveyed. The most interesting part was a disclosure of recent experience with vertical retorts of cast iron. Coal has been carbonised at 625° continuously in this retort setting, from March to December 1926, when it was let down for inspection. These retorts, which are again in use, are stated to have been easy to operate, and the coke product has given satisfaction to consumers. Yields of tar reaching 18 gal./ton were obtained, and it is believed that the retorts approach technical success. More experience of protracted working is necessary before commercial success can be assessed.

IRREGULAR EMISSION OF X-RAYS.—Any experimental work with X-rays in which unusual discontinuities are recorded is now of particular interest, in view of its possible bearing on the *J*-phenomena which are being investigated by Prof. Barkla and his school. It has already been shown that in certain circumstances the relation between the intensity of a number of characteristic rays and the voltage on the bulb changes abruptly at about 4.5 times the minimum potential required for the excitation of each. D. Nasledow and P. Scharawsky, working in the X-ray Institute at Kiew, now report similar changes when a Müller tube of the hot filament type is run at constant voltage and with a variable current (*Zeit. für Phys.*, 41, p. 155, 1927). The *K α* and *K β* lines from a copper target were separated by reflection from calcite, and their intensities were measured by an ionisation method. When less than 4 milliampères were passing through the bulb, the intensity of either

line was closely proportional to the current; for greater currents the rate of increase was linear, but less rapid than before. A break still took place at 4 milliamp., when the exciting peak voltage was raised from 30 kilovolts to 45 kilovolts. No explanation is offered of these results—which the authors propose to extend—but the apparatus appears to be described in sufficient detail to permit of comparison with the experience of other workers in this field.

FORMS OF SULPHUR TRIOXIDE.—The *Gazzetta Chimica Italiana* for Jan. 1927 contains a series of memoirs by G. Oddo and A. Casalino on the different forms of sulphur trioxide, which were studied some years ago by Oddo. The vapour density of the liquid form at 25° is only slightly above the value for SO_3 , although slight association may be present. The amorphous and fibrous solid varieties gave molecular weights about 83.77 as a mean. The solutions of the trioxide in phosphoryl chloride were found to give solid solutions in all proportions, and the results of the depression of freezing-point were therefore irregular and unsuitable for the determination of the molecular weight. In anhydrous sulphuric acid the molecular weight of the liquid form was 80, of the fibrous form 88. The papers contain a detailed description of the preparation of the different forms of sulphur trioxide and of the transformation of one form into another.

MAGNETIC OBSERVATIONS IN AUSTRALIA.—Magnetic observatories in the southern hemisphere are so few that it is an event of some importance when a new one is instituted. For many years, only one magnetic observatory was in operation in Australia, at Melbourne, and even this was of limited service to magnetic science owing to the non-publication of its observations. Gradually this observatory became disturbed by electric tramways, and in 1919 a new observatory, 34 miles away, was built. The magnetograph house is above ground, and consists of a chamber within a chamber, the walls being well lagged to reduce temperature changes. No attempt is made to control the temperature of the inner room by artificial heating. There is no resident observer, the records being changed by a local resident, who also registers a time-break at the beginning and end of each record. The records are posted weekly to Melbourne for development and computation; an observatory official visits the station monthly to make absolute observations for base-line values, and to execute any necessary adjustments. The magnetographs are of the Eschenhagen type; the absolute instruments include a Kew magnetometer and a Schultz earth inductor. During 1924, which appears to be the first year for which hourly observations are published, the vertical force instrument gave considerable trouble, there being large changes in scale value and base line; the horizontal force magnetograph had a nearly constant scale value. The results are given in an (undated) publication, "Melbourne Observatory: Hourly values of the magnetic elements at Toolangi in 1924." It is very satisfactory that the Director, Dr. J. M. Baldwin, has been able both to institute this new observatory and also to obtain publication of hourly values of the elements, a course which places the observations so fully at the disposal of investigators of terrestrial magnetism. It is to be hoped that in time the Government of Victoria may provide the funds necessary for a resident observer, without which it is impossible to maintain a magnetic observatory with full efficiency. The only other magnetic observatory in Australia is the one recently instituted by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington; it is situated near Perth, Western Australia.