

Research Items

Stone Circles in Tongareva.—In an account of the ethnology of Tongareva, commonly known as Penrhyn Island (Bull. 92, Bernice P. Bishop Museum, Honolulu), by Te Rangi Hiroa (Dr. P. H. Buck), reference is made to two roughly circular arrangements of limestone pillars. Nothing is known of their uses and no name is applied to them by the islanders. It has been stated that stone circles of a Stonehenge type are present in Tongareva—an erroneous interpretation of the word 'encircled' used by Lamont loosely in describing a marae which in reality was rectangular. The stones are not to be ascribed to an archaic civilisation; they are of the same type as those used in marae construction, and sun worship was unknown to the Tongarevans. The pillars, including the bilateral notched pillar of the Atutahi ellipse, are trimmed in the same way as the marae pillars. They must have been made by the ancestors of the present population. They are in fact extra-marae pillars set up near the marae for some subsidiary purpose which, it is suggested, were social gathering places on the way to or from the marae. Women and children were not allowed to enter the marae. The secular use of the circle may be borne out by the discovery of a partly worked shell fish-hook in one enclosure. The circle may have been used as the place in which was performed the dance and the wailing ceremony, an accessory performance outside the marae that required a clear space not far away. The circle probably arose from a desire to embellish the clear space where such dances were held. In function it would be subsidiary and complementary to the marae and not taboo.

Cherokee Medicine.—The late James Mooney left unfinished a study of a manuscript of Cherokee sacred formulæ and medicinal prescriptions, which has been completed, edited and checked in the field by Dr. Franz M. Olbrechts and is published as Bulletin 99 of the Bureau of American Ethnology. The Cherokee original has disappeared. While the Cherokee recognise that natural causes, such as the fall of a branch of a tree, may bring about an injury, they may still explain it as due to the machinations of an enemy, while disease in general is attributed to the action of spirits, anthropomorphic or zoomorphic, out of revenge for a slight. A rival spirit will then be called in to drive the attacking spirit away. Spirits cause disease not only of their own volition, but also by being invoked by witches or a man-killer. Such spirits are the sun, the moon, the river, which is the central object of an important cult, thunder (more of a disease expeller than a cause of disease), the two sons of thunder, known as the two Little Red Men, the Purple Man, the Blue Man, the Black Man, etc., and the Little People, who act in groups rather than individually. The animal spirits are prototypes of the common animals, but exceed them in their qualities. To these must be added human and animal ghosts. Dreams may also cause definite ailments. Cherokee medical art does not aim at curing disease or allaying pain, but at removing the cause, which it is the first duty of the medicine man to ascertain, in the first place by interrogating the patient as to whether he has infringed any taboos or has had any dreams. Great as is the number of spirits causing disease, the number of

those who drive it away is even greater. If a disease is thought to be caused by worms, worm-eating bird spirits will be called in. If the disease is of a very tenacious nature, the spirits of rats, beavers or weasels will be called in, because they also are tenacious and will gnaw and tear the disease-causing spirits.

Californian Shrimp Industry.—In the Fish Bulletin No. 38 of the Division of Fish and Game of California, Bureau of Commercial Fisheries, 1932, Mr. Paul Bonnot deals with the Californian shrimp industry in San Francisco Bay, both historically and statistically. Three shrimps make up the commercial catch, all species of *Crago*: *C. franciscorum*, *C. nigricauda* and *C. nigromaculata* in order of their abundance. These are all large animals measuring 2½–3 in. in length. Their life history is little known. Eggs may be found attached to the females throughout the year at various stages of development but there are no records of young shrimps being taken in the catches. Presumably they pass through the nets. Besides shrimps, *Pandalus danae*, *Spirontocaris cristata* and *Upogebia pugettensis* are occasionally taken and large numbers of *Euphausia pacifica*, with numerous fishes of many varieties. The Chinese shrimp net and the shrimp trawl are both used and appear to be equally efficacious as the amounts of the catches from each differ little. The shrimps are for the most part boiled and put into barrels to be sent away to the dried shrimp market in China. The catches have greatly increased in the last fifteen years, rising from 200,000 lb. in 1915 to 3,000,000 lb. in 1929. The largest numbers were in July to October. Sun-dried shrimps lose three-fifths of their weight in the process. The dried material yields one-third shrimp meats and two-thirds shrimp meal by weight.

The Peritoneal Melanophores of Fishes.—The dermal chromatophores of fishes have been much studied but relatively little is known of the internal chromatophores present in the peritoneum, the pericardium, the walls of the larger blood vessels, the membranous coats of the central nervous system and elsewhere. In common cyprinoid fishes two kinds of peritoneal chromatophores are present, namely, melanophores and guanophores (or iridocytes) but there are no xanthophores. In the small Japanese species of minnow, *Acheilognathus intermedia*, selected for study by K. Yamamoto (*Mem. Coll. Sci.*, Kyoto Imp. Univ., Ser. B, vol. 7, No. 4, Art. 9, 1931) internal melanophores are plentiful; each is a minute stellate cell with numerous peripheral processes rich in dark brown or black pigment. It differs in shape from the dermal melanophore, for the latter has longer peripheral processes, and in distribution, for the peritoneal melanophores are more densely crowded so that they more readily join to form a continuous black screen. A single large peritoneal melanophore is surrounded by ten to thirty smaller ones all of which react together in expansion or in contraction. The dermal melanophore expands when the fish is kept in the dark and contracts when the fish is kept in the light; the peritoneal melanophore reacts in the opposite manner. Damage to the brain does not change the reaction of the peritoneal melanophore. In general the reaction time of this melanophore is slower than that of the dermal.

Hybrids of the Grass *Phalaris*.—Crosses have been made between *Phalaris arundinacea*, a grass of wide distribution in the northern hemisphere, and *Ph. tuberosa*, a Mediterranean species (T. J. Jenkin and B. L. Sethi, *J. Genetics*, vol. 26, No. 1). More seeds and a higher percentage of germination are obtained when *Ph. arundinacea* is the female parent. Both species are found to have $2n=28$ chromosomes, and hence are tetraploid, but in the hybrid meiosis 12 pairs of chromosomes are formed and 4 univalents. In both parent species there are 14 pairs of chromosomes in meiosis, but one or two bivalents may lag on the heterotypic spindle. The hybrids are functionally male-sterile, but a few good pollen grains are probably produced. They are vigorous and set seed freely in proximity to the parent species. Later generations showed considerable variability. On the basis of these results the theory of the hybrid origin of the Australian Toowoomba canary grass, which is also variable, is revived. It is suggested that this form, the status of which has been disputed, resulted from natural crosses in Australia between the introduced species, followed by back-crossing to *Ph. tuberosa*. It cannot be proved, however, that *Ph. arundinacea* was growing in Toowoomba at the time these crosses are supposed to have arisen.

Kimberlite in Tanganyika Territory.—The Shinyanga diamond fields have already been described by Dr. E. O. Teale in Short Paper No. 9 of the Geological Survey of Tanganyika Territory. Kimberlite occurrences have more recently been discovered on the Iramba Plateau, south-east of the former area, and these are now described in Short Paper No. 10, also by Dr. Teale. At Kisiriri the kimberlite occurs in sheet-like intrusions penetrating the granite along flat-lying joint planes; most of the sheets have chilled margins, the thickness ranging from thirty feet down to mere threads. At Kiomboi an irregular elliptical pipe occurs and other occurrences of kimberlite that probably lie over pipes are known in the Songeli and Mtawira districts. In some of these areas pitting and washing have been carried out, both on superficial gravels and on weathered kimberlite, but so far without encouragement except in the Songeli region, where two diamonds are reported from the river gravels. All the typical minerals such as ilmenite, garnet, olivine, diopside and zircon are found, and the Kiomboi pipe contains eclogite and numerous blocks of sandstone like that of the Upper Karroo. No outcrop of the latter is now present in the vicinity and the inclusions must have fallen in from a former capping of the formation.

Room Comfort.—It is now nearly twenty years since Sir Leonard Hill introduced the cooling of a thermometer bulb at body temperature as an indicator of the comfort of a room. The smallness of the instrument has been found disadvantageous and a committee of the Medical Research Council and of the Department of Scientific and Industrial Research has adopted a comfort-measuring device which was described briefly by Mr. A. F. Dufton of the Building Research Station in the *Philosophical Magazine* for May 1930 and is now described in detail by him in Technical Paper No. 13 of the Building Research Board entitled, "The Equivalent Temperature of a Room and its Measurement". It consists of a cylindrical vessel of thin copper painted black, 56 cm. high and 19 cm. in diameter, the temperature of which

is maintained at 75° F. by a bi-metallic thermostat and a relay mercury switch which control the electric current through two electric lamps in the vessel, on a 200-volt circuit. A portion of the current flows through a coil which heats a thermometer, or a thermo-junction if a continuous galvanometer record is required. The indications of the instrument are thus proportional to the excess of 75° F. above a temperature for which the term 'equivalent temperature of the room' is proposed. The device is to be called a 'eupatheoscope'.

Polarity of Thunderclouds.—Experiments have been made in South Africa (E. C. Halliday, *Proc. Roy. Soc.*, October) to investigate the structure of thunderclouds by studying the changes in the atmospheric potential gradient accompanying different types of flash. The capillary electrometer invented by C. T. R. Wilson for such work was used, and an observer wrote notes on the flashes, at the same time marking the electrometer record. In some cases photographs of the flashes were taken. In 283 cloud-to-ground flashes, nearly all were accompanied by positive charges of the electric field. When the flashes took place within clouds, they usually produced negative field charges when distant and positive field charges when near. These results are consistent with Wilson's view that thunderclouds are charged positively above and negatively below. A number of simultaneous earth-cloud and within-cloud flashes were also observed.

Experiments with High-Speed Protons.—Chr. Gerthsen describes in *Die Naturwissenschaften* for September 30 an ingenious method for multiplying the energy of hydrogen positive ions. The ions are accelerated *in vacuo* and passed through a chamber filled with hydrogen where a process of exchange of charge takes place and fast neutral hydrogen atoms are produced. The neutral particles pass through a region of reversed potential into a second exchange chamber where fast positive ions are produced and these are accelerated by a potential derived from the same source as before. The arrangement tried gave proton currents of 10^{-8} amp. at velocities corresponding to 2×70 kilovolts, and the experiments of Cockcroft and Walton on lithium disintegration were repeated. The repeated application of the process is hindered only by intensity considerations, particularly as the probability of exchange of charge decreases with increasing particle velocity.

Sub-boundary Structures in Metals.—Deeply etched iron not infrequently shows within the crystals of ferrite a network the nature of which has been very obscure. Hitherto the general explanation has been that such sub-boundary structures were evidence of minute crystals the orientations of which varied very slightly. Similar effects have been noted in cast nickel and copper. In a paper to the Iron and Steel Institute (September, 1932), L. Northcott advances the view, which is supported by considerable experimental evidence, that oxygen in the metal is the cause. Iron which had not previously shown this structure did so when heated in contact with iron oxide, while a veined structure was removed by annealing in hydrogen within a certain range of temperature. The two other metals mentioned gave similar results.

Atomic Weights of Selenium and Tellurium.—The values obtained by Aston by the mass-spectrum method in the case of selenium and tellurium differ appreciably from those adopted in the International Tables of Atomic Weights. A revision of the chemical determinations has been carried out by Hönigschmid, who reports in *Die Naturwissenschaften* (1932, p. 659) that the analysis of silver selenide gives $\text{Se} = 78.962 \pm 0.002$, coinciding with Aston's result, whilst the analysis of TeBr_4 gives $\text{Te} = 127.587 \pm 0.019$, differing by 0.4 from Aston's value but agreeing with the International value and with a combination of Aston's results with the more recent mass-spectrum experiments of Bainbridge (*Phys. Rev.*, 1021, 1932), which disclosed some new lighter isotopes. A combination of the two spectra gave $\text{Te} = 127.58 \pm 0.15$, in correspondence with the chemical value.

Mechanism of Flame Movement.—In the *Journal of the Chemical Society* for July, 1932, Coward and Hartwell, of the Safety in Mines Research Laboratories, describe experiments on the uniform movement of flame in mixtures of methane and air, with particular reference to the effect of the diameter of

the tube on the rate of propagation. They confirm the fact that the speed of flame increases with increase in tube diameter; in a tube of 100 cm. diameter, a 10 per cent methane — air mixture would be propagated at about 250 cm./sec., whereas in one of 2.5 cm. diameter at only about 65 cm./sec. For tubes between 10 cm. and 20 cm. in diameter, there appears to be an inflection in the curves representing the speed. The authors explain this by reference to the nodular appearance of the flame, which is due to convection in the flame front, and does not occur in tubes of small diameter. The enlargement of the flame surface increases the mass of the gas burnt in unit time, and the speed of flame increases accordingly. Even in the case of downward propagation of flame in wide tubes, these irregularities in the flame front are visible, and the authors plead that 'uniform movement' of flame may be regarded as an early phase of sensibly uniform speed usually observed in the propagation of flame (through a quiescent gaseous mixture) from the open end of a straight tube towards the closed end, but not as resulting from a particular mode of heat transference, representing the normal speed of propagation of flame by conduction of heat.

Astronomical Topics

The Leonid Meteors.—A Science Service Bulletin, by James Stokley, points out that even people who have no astronomical training can do useful work in observing the Leonid meteors. It will help to determine the time of maximum if they count the numbers seen during each hour of the night. If the meteors are too numerous for all to be counted, the count may be limited to a definite region of the sky, bounded by known stars, which should be noted in making a report; a region should be chosen that will remain in sight throughout the watch. An alternative study is that of the brightness of the meteors. The planets Jupiter and Mars, and the star Regulus will be suitable for comparison. Each observer should limit himself to some definite field of work. The most probable nights are those between November 15 and 16, and between November 16 and 17. The moon will prevent observation of faint meteors, but there should be many bright enough to be seen.

The observatories of Kodaikanal and Helwan have been asked to telegraph to the B.B.C. if they see a rich shower, so there is a possibility of receiving warning before the radiant point rises (a little before 11 P.M.). As the rich portion of the shower takes about four hours to be crossed by the earth, it is more or less an even chance that some portion of the rich shower may occur in the interval between 11 P.M. and sunrise. In 1866 the nodes of Tempel's comet and the meteors were practically identical ($231^\circ 26'$ comet, $231^\circ 28'$ meteors). The calculations of the B.A.A. Computing Section give $233^\circ 54'$ for the comet's node this year; if we assume the same for the meteors, the maximum would be about noon on November 16. The most hopeful time appears to be just before dawn on November 16. The sun rises at $7^{\text{h}} 19^{\text{m}}$ in London.

A Perplexing Variable Star.—The variability of the star R Scuti was discovered by Piggott in 1795, but the law of its variation defied analysis for more than a century. A special study of the star during

the period 1911–1931 has been carried on at the Observatory of the University of Michigan, first under Dr. R. H. Curtiss, and after his death by Mr. D. B. McLaughlin. The results are contained in *Publications of the Observatory*, vol. 9, Nos. 9 and 10. It may be described roughly as of the β Lyrae type, with two unequal minima, the average length of the double cycle being 143 days; on the average the B minima occur 62 days later than the A minima. The brightness at maximum is fairly constant at mag. 5 or slightly fainter; that at minimum is very irregular. Sometimes it does not fall below mag. 6, while early in 1925 it fell below mag. 8. The most curious feature is that sometimes the A minimum, sometimes the B minimum, is the deepest; there is a suggestion that these disturbances of sequence occur at intervals of nine cycles, or about 1300 days. The 143-day period is also subject to cyclic variations. The paper does not attempt to give any physical explanation of the star's curious behaviour.

Total Solar Eclipse Observations.—It was mentioned as a 'novel resource' in a paragraph in the columns of "Astronomical Topics" in NATURE of October 1 on the total solar eclipse of August 31, that some parties of observers had dashed by motor cars to places where the clouds were less dense. Dr. Elihu Thomson, director of the Thomson Research Laboratory, General Electric Company, Lynn, Mass., writes: "In observing the eclipse of June 6, 1918, in Colorado, U.S.A., I secured an automobile for the very purpose of following the blue sky, and after making two shifts, reached a high ridge under blue sky just three minutes before totality and had an excellent view in consequence. I believe this process was novel at the time and was referred to in the Harvard Observatory Annals. In the last eclipse, I, with friends accompanying me, repeated the same process and saw the total phase of the August 31st eclipse, which would otherwise have been missed."