

Research Items.

The Spirit Cult in Hayti.—The spirit cult of Hayti, more popularly known as 'voodoo', is the subject of a communication by Dr. Elsie Clews Parsons in the *Journal de la Société des Américanistes de Paris*, N.S. t. 20. The spirit cult has hitherto been undescribed, owing to the attention given to one of its reputed features, namely, ritual cannibalism, the folklore of which is widespread among foreigners. If human sacrifices occur or have occurred, it is in connexion with the 'taureau criminel', the criminal bull, one of the *loi* or spirits, of which there are a large number, both Catholic and African. The cult makes no distinction between patron saint and West Coast fetish, and may be described as the theory and practice of possession by spirits. Every *loi* has his or her traits, an appetite for this or that offering; some like *tafta* (rum), others lean to a taste in dress or colour, a particular day of the week, a particular way of taking possession, and so forth. For example, *Loi Gédé* talks through his nose when he takes possession of anyone; he eats only cassaba, pepper and herring; he is a master of the cemetery. *Loi Exili* likes handkerchiefs and nice clothes; they must be red; in her food perfume must be put, and her favours are for men only, and nothing for girls; she is identified with a Catholic saint who carries a dagger in the hand. People who get *Loi Coulevé* (snake spirit) walk on their bellies. The snake is small in the day-time but at night it becomes so big as to weigh down the branches of trees. It visits houses, and people do not kill it. The *loi* may be cherished by anyone and may take possession of anyone, or it may have been inherited within the family so far back as the old people who were born in Guinea. Maintaining the shrine of the *loi* or making proper food offerings are important ways of holding their favour. The ceremonial cult of the spirit is observed in *Mangé loi* and *dansé loi*, spirit feasts and spirit dances, in which some, or at times all, participants are possessed. Secrecy attaches to them to a greater or less degree according to the disposition of the local constabulary.

Way-finding of Birds.—The factors concerned in the migration of birds appear to be manifold and not easily disentangled, but it is generally held that the impulse to migration is associated with the development of the sex organs. One of the most extraordinary facts of annual bird movements, conclusively proved by the method of ringing, is the return of spring migrants to the locality and even to the exact place in which they were born, and the question arises whether this orientation is connected in any way with the development of the sex glands. A problem, allied but not identical, has been tested by G. J. van Oordt and C. J. A. C. Bol (*Biolog. Centralbl.*, Bd. 49, 1929, p. 173). Carrier-pigeons possess an exceptionally strong 'bump of locality', and if this power is associated with the sex glands, the influence of castration should be apparent. The result was negative: the only conclusion to be drawn from the experiments was that the sex hormones had no influence whatever on the way-finding of carrier-pigeons. This result has, of course, no bearing upon the origin, the significance, or the purpose of bird orientation, but it must be regarded as a caution against premature acceptance of the suggestion that sex-hormones play a part in the direction impulse of wild migratory birds.

Aquatic Caterpillars.—H. S. Pruthi (*Records Indian Mus.*, vol. 30, pt. 3, 1928) describes the aquatic larva and pupa of *Aulacodes peribocalis*. He observed the caterpillars in the Nerbudda river in November-

December 1927 wherever the water was shallow and the current rapid. They spin their silky shelters, irregular in outline, in the crevices of rough stones. The shelter, which lodges only one caterpillar, is loosely attached to the substratum, leaving numerous openings by which water can enter or leave it, so that there is a free circulation of water round the caterpillar. The caterpillar does not appear normally to leave its shelter, and there seems to be no reason why it should, for there is always around it, within the shelter, an ample supply of fresh water laden with food materials—the larva probably feeds on minute pieces of alga. Its mouth-parts are like those of terrestrial caterpillars. Although the caterpillar is aquatic it cannot swim; if its shelter is torn away the caterpillar creeps towards the under sides of stones. The caterpillar is provided with eleven pairs of well-developed gills borne by the second and third thoracic and the nine abdominal segments, but it can live for four days after being taken out of the water. Spiracles are present, but their openings appear to be closed and the lumen of the tracheæ connecting them to the lateral tracheal trunks is more or less obliterated. When the larva is full grown, it makes under its shelter a tough and complex dome-shaped cocoon in which the pupal stage is passed. The central cavity of the cocoon communicates with the exterior by a very narrow crescent-shaped slit towards which the head of the pupa points. The moth emerges through this opening.

Brooks's Law.—Robert Gurney (*Internat. Rev. d. ges. Hydrobiol.*, Bd. 21, 1928) has examined a number of growth stages of Copepoda with the view of testing the validity of 'Brooks's Law' propounded by Fowler (1909) as follows—"during early growth, each stage increases at each moult by a fixed percentage of its length which is approximately constant for the species and sex". Both Fowler, working on marine Ostracoda, and Sewell, on the Copepoda of the Bay of Bengal, found that in some cases there were two adult forms in each sex distinguished by size, and in one case the two forms of the adult male differed also in some structural features so much that they would have been admitted as distinct species if they had been taken separately. The author has investigated fresh-water plankton, in which as a rule only one species of Calanoid occurs, as being more favourable material than marine plankton containing a number of species. He gives details of growth factors in half a dozen species, and his general conclusion is that 'Brooks's Law' as stated by Fowler cannot be upheld but that the subject is worthy of more attention. Within rather wide limits there probably is a specific growth factor, but there is much individual variation, and the factor changes from moult to moult in most cases. The presence at the same time of large and small forms of the adult, according to the view of Fowler and Sewell an example of dimorphism within a single race, is capable of other explanations. The author finds it difficult to escape any other explanation than that there is a moult in a small proportion of the adults.

Control of the Codling Moth.—We learn from a recent *Daily Science News Bulletin* issued by Science Service, Washington, D.C., that an experiment is under way to attempt the control of the codling moth in the walnut groves of California by biological means. Advantage is being taken of the fecundity of a minute chalcid egg-parasite by adopting mass-rearing and liberation of the latter. The parasite

(*Trichogramma minutum*) is known to attack a great variety of insect eggs, and those of the grain moth have proved well suited for the experiment. It is stated that, in a building with a floor space of only 25 ft. × 36 ft., it is now possible to rear one million *Trichogramma* per day, the whole technique being a matter of skilful standardised routine. Packages containing 100,000 parasitised eggs of the grain moth occupy a very small space, and are easily sent by mail to growers troubled with codling moth. The parasites which emerge from these eggs are liberated in the walnut groves, and soon commence seeking out codling moth eggs, which are at hand in abundance. It is hoped that by materially raising the *Trichogramma* population in given districts, wholesale destruction of codling moth eggs will result, with a consequent reduction of the injuries wrought by this insect.

Light Periodicity and Plant Growth.—A further study of the importance of light duration as a factor in plant growth has been made by G. Reddington (*Trans. Roy. Soc. Edin.*, 56, 247-272; 1929), using throughout specified conditions of electric lighting. A large number of species of plants were examined and all, except beech seedlings, grew *initially* best in continuous light but *finally* best in 16 or 8 hours of light per day. The results are explained on the supposition that carbohydrate supply is primarily the limiting factor in growth, but that, where continuous light is used, water strain may, in the later stages, limit food and water supply to the growing points. Detailed observations are given in support of this argument.

Movements of Liquids and Gases in Trees.—The problem of the ascent of water in trees is being re-examined by D. T. MacDougall, J. B. Overton, and G. M. Smith, and they have recently reported (*Carnegie Instit. Wash.*, No. 397; 1929) data as to the movements of water and gases in various trees. They find great differences in the paths of movement of dye solutions injected or allowed to enter into woody stems. In some species these only move along the summer wood, in some only along the spring wood, and in others along the late autumn and early spring wood. In Monterey pine, however, the dye travels along the whole of each annual ring of wood. The evidence suggests that the non-conducting vessels are full of gas. Examination of the internal gas pressures shows them to be subject to considerable seasonal variations. Applying suction to the gas in the tree increases the tensions on adjacent water-filled manometers, but if gas pressures (of 4 atmospheres) are applied, they are registered by air manometers 2 m.-3 m. higher up the tree but not by water-filled manometers. It is therefore concluded that varying internal gas pressures have little effect on the cohesive water system.

Miocene Mollusca of Virginia and North Carolina.—Mr. W. C. Mansfield in a short paper (*Proc. U.S. Nat. Mus.*, vol. 74, art. 14) briefly outlines the different divisions of the Chesapeake group of the Miocene epoch in Virginia, and describes and illustrates on wonderfully clear plates, seven new species and five new sub-species of mollusca therefrom. We are promised further and more complete discussion of the whole in a forthcoming number of the George Washington University *Bulletin*.

Height of Mount Everest.—A note on this subject appears in the General Report of the Survey of India for 1927-28. The value of 29,002 ft. was computed in

1852 from observations taken in 1849-50. The last figure is retained, not on account of its probable accuracy, but in order to avoid the suggestion of an estimate in round figures. In 1907, Sir Sidney Burrard calculated the height to be 29,141 ft. Dr. de Graaff Hunter, applying improved refraction corrections to results from different observation stations, gets a height of 29,149 ft., which has a probable error of less than 5 ft. and a possible error of less than 15 ft. This, however, is more than the true geoidal height. When the correction is applied, Mount Everest has a probable height of 29,075 ft., with a possible correction of 25 ft. either way. It is impossible at present to give the height of Mount Everest with greater accuracy.

The Upper Atmosphere.—In the issue of the *Physikalische Zeitschrift* for Mar. 1, Prof. H. Benndorf, of the University of Graz, gives an account of the methods which have been used recently to obtain a more precise knowledge of the properties of the upper atmosphere. Altitudes of 20 km. to 30 km. have been attained by pilot balloons with registering instruments, but for greater altitudes the study of the propagation of sound waves through the atmosphere has given the most trustworthy data. Prof. Benndorf considers our present knowledge justifies the following statements. Traces of atmospheric gases can be detected at altitudes of 1000 kilometres, and at such altitudes motions of these gases must be rapidly damped down owing to their high kinematical viscosity. In the northern hemisphere there is a drift of the layers between 30 km. and 80 km. altitude to the east and above that to the west. In the 'troposphere' up to 12 kilometres convection currents keep the atmosphere well mixed and the temperature decreases with altitude until 220° absolute is reached. In the 'stratosphere' above, convection is less marked and the temperature remains constant at 220° up to 30 kilometres. Between 40 km. and 60 km. a layer at about 300° absolute—a tropical temperature—exists. For greater heights no statement can be made, nor is the composition there known, but there is no doubt that the gases there are ionised, that the negative ions are electrons, and that at altitudes of 80 km. to 100 km. there exists at least one conducting layer with free electrons numbering 10⁵ per c.c.

An Optical Law for Electrons.—The existence of still another analogy between electrons and waves has been indicated by E. Rupp in a recent issue (May 17) of *Die Naturwissenschaften*. When slow electrons impinge on a very thin sheet of metal, those which are not retarded are transmitted selectively, silver, for example, being very approximately two and a half times as opaque to electrons with an energy equivalent to 11 volts as it is to 16-volt electrons or 8-volt electrons. It is now found that the same selectivity is exhibited in reflection of electrons without loss of energy, silver again reflecting electrons particularly well when their energy is close to 11 electron-volts, and it would thus appear that the optical law connecting absorption and reflection is valid for electron waves. No relation has yet been traced between the wave-lengths of the electrons and the atomic constants of the metal foils, but it is suggested that absorption and reflection of the slow electrons are occasioned by the outer dispersion electrons of the metallic atoms.

Melting-point of Palladium.—A determination of the melting-point of palladium by Hoffman and Meissner in 1919 resulted in a value of 1556° C.,

which is 3° above the previously accepted temperature, and it is therefore interesting to note that a re-determination is described by Fairchild, Hoover, and Peters in the May issue of the *Journal of Research*, published by the U.S. Bureau of Standards. The method employed consisted in measuring the relative brightness of black bodies at the melting-points of gold and palladium, and calculating the upper temperature by means of Wien's law, which is equivalent to Planck's law for light and gives the spectral distribution of radiation from a black body. The melting-point of gold was taken as 1063°. The result obtained was 1553.6 ± 0.5 C., and when all possible sources of error are considered, the melting-point of pure palladium is probably 1553 ± 2 °.

Dielectric Constant of Desiccated Oxygen.—The change in the chemical activity of oxygen produced by prolonged drying is accompanied by an increase in the dielectric strength of the gas. Thus a greater potential is required to cause an electric spark to pass through the dry gas than through ordinary oxygen. An investigation to determine whether this change in properties involves a modification of the structure of the oxygen molecule with a consequent change in the specific inductive capacity, is described by Riley in the *Journal of the Chemical Society* for May. The method used was to compare the capacities of two similar condensers of the same dimensions, one containing carefully dried oxygen and phosphorus pentoxide, and the other oxygen passed over calcium chloride. By means of a thermionic valve apparatus the condensers were found to have the same capacity, and no change could be detected after ten months' exposure of the gas to phosphorus pentoxide. Hence, the chemical activity promoted by the presence of small traces of water does not appear to be connected with any change in molecular structure.

Magnetic Storms and Radio Signals.—A recent *Daily Science News Bulletin*, issued by Science Service, Washington, D.C., reports that at a meeting of the American Geophysical Union on April 23, Miss I. J. Wymore announced that the Radio Laboratory Department of the Bureau of Standards has discovered an interesting relation connecting magnetic storms and radio signals. When the radio signals from European stations are weaker than usual and the signals from nearer stations in America are louder, then magnetic storms may be expected. After a magnetic storm much stronger signals are received from distant stations. The conclusions were deduced from the records obtained by experiments made with the long waves used for high power trans-oceanic transmission. Several days before the maximum of the terrestrial magnetic disturbance the signals were weak when received at Washington. The trans-oceanic signals, however, received at Washington from Tuckerton, New Brunswick, N.J., and Rocky Point, L.I., were decidedly stronger at periods varying from two to four days before the magnetic disturbance.

Composition of Gum Arabic.—There are a number of substances, such as pectins, plant gums, hemicelluloses and mucilages, which appear to be formed by the influence of enzymes upon cellulose and may be termed acid polysaccharides. Comparatively little is known concerning the structure of these substances, and an account of an investigation of the composition of gum arabic in the May issue of the *Journal of the American Chemical Society* is therefore of considerable interest. The plant gums are usually the calcium, magnesium, and potassium salts of very complex organic acids, and arabic acid, obtained from gum arabic by hydrolysis, appears to be an aldobionic acid

of formula $(C_{12}O_{20}H_{12})_n$. Among the products of further hydrolysis, rhamnose, *d*-galactose, *l*-arabinose, and *d*-glucuronic acid have been identified.

Synthesis of Chaulmoogric Acid from Hydnocarpic Acid.—Chaulmoogric and hydnocarpic acids are constituents of chaulmoogra oil, and are of great importance on account of their extensive use in leprosy therapy. Some years ago Power concluded that chaulmoogric acid is a homologue of hydnocarpic acid, and this has recently been confirmed by Stanley and Adams. They have synthesised chaulmoogric acid from hydnocarpic acid by successive conversion of the latter into the ethyl ester, the alcohol, bromide, and through hydnocarpylmalonic acid to hydnocarpylacetic acid. The latter showed no depression of the melting-point (68°) when mixed with pure natural chaulmoogric acid and had a rotation of $+61.9$ °. The amides prepared from the synthetic and natural products also had identical melting-points. This work is described in the *Journal of the American Chemical Society* for May, which also contains a paper by Hinegardner and Johnson on the preparation of chaulmoogrylresorcinol and some of its derivatives. The bactericidal properties of these compounds are being examined in the hope that they may be free from certain objectionable effects produced by prolonged use of chaulmoogric acids.

Long Period Forecasting.—A reprint has been received of a paper by E. T. Quayle on "Long Range Rainfall Forecasting from Tropical (Darwin) Air Pressures", which appeared originally last year in the *Proceedings of the Royal Society of Victoria*. The economic importance of this subject for a country with a rainfall so capricious as that of Australia is evident, and the results obtained are such as to suggest that the accuracy of forecasts of the early spring rainfall of Northern Victoria, based purely on Darwin pressure for the two winter months of June and July, renders these of genuine value. The relationship is a negative one, low tropical pressure being followed more than eight times out of ten by rainfall above the average, and it seems highly significant that the connexion is actually closer than that between synchronous pressure and rainfall for two-month periods. The relationship diminishes quickly when earlier or later periods are considered; thus between Darwin pressure for June and July and the rainfall of ten representative stations in Northern Victoria in August and September, the correlation coefficient is -0.79 ± 0.04 , while between May and June pressure and July and August rainfall the coefficient is only -0.65 ± 0.06 . For July-August pressure and September-October rainfall the coefficient is even smaller, namely -0.52 ± 0.07 . This detracts less from the value of the results than would be the case were the spring rainfall not of such particular importance in cereal production, and for the growth of the pasture. The relationship, it may be noted, is of the simple linear kind which justifies the use of the ordinary regression equation in the calculation of rainfalls for individual seasons, and offers some prospect of good results in the anticipation of the dreaded droughts. Presumably the clue to this relationship is to be found in the southward migration of the tropical low-pressure belt with the approach of the Australian summer, and it seems to imply a greater continuity in any abnormal feature of this belt than might have been expected. This aspect of the matter, interesting as it is from the theoretical side and from the possibility it holds out of unravelling the physical processes at work in the production of abnormal seasons, the author unfortunately does not follow up.