

Research Items.

WATER-SUPPLY IN CENTRAL AUSTRALIA.—Recent investigations in the heart of Australia have given it a more promising aspect than it had of old. In *Discovery* for December, Mr. O. H. T. Rishbeth, in discussing the economic possibilities of Central Australia, points out that a considerable area, about 150,000 sq. miles, has an average elevation of some 2000 ft. and rises to 5000 ft. in the Macdonnell and Musgrove ranges. But even in this more elevated part of the far interior the rainfall seems to be less than 10 in. a year and very uncertain in its occurrence. The future of Central Australia depends on the possibility of securing a satisfactory water-supply. A great deal could be done by the conservation of surface waters by means of dams, etc., but subterranean water must be the chief source. Many quite shallow wells seem to run freely with good water, but these can scarcely be looked on as inexhaustible. Artesian wells are promising and the water, though highly mineralised, is valuable for pastoral purposes. When the water-supply is assured and railway communications established, Mr. Rishbeth thinks this region has a future as a pastoral area. The carrying capacity and suitability of different parts for various animals must be tested; rabbits and dingoes must be systematically attacked, and stock routes with permanent wells opened up. Gold, mica, and wolfram are also known to occur, but difficulties of transport as well as lack of water have delayed mining.

WATER IN THE KENT COALFIELD.—The Kent coalfield was revealed by a borehole near Dover in 1890; since then no fewer than forty boreholes, comprising upwards of 90,000 feet of boring, have extended our knowledge of its area and depth. At present the Coal Measures have been penetrated by shafts at only four points; at no place have they been proved at a less depth than 800 feet below ordnance datum, yet the only important natural difficulty in their exploitation is the presence of large quantities of water in the overlying rocks. In a paper recently submitted to the Institution of Civil Engineers on "Underground Waters in the Kent Coalfield and their Incidence in Mining Development," Mr. E. O. Forster Brown has brought together many interesting facts concerning the quantity, quality, and local pressure of the water met with at different horizons, and has made suggestions, based on the results of his observations, which should prove of value in the development of mining and underground water supply in Kent. In descending order the water-bearing strata overlying the Coal Measures are, the Eocene, Chalk, Lower Greensand, Hastings beds, and estuarine sands of the Great or Inferior Oolite. During the last nine or ten years, 2 to 2½ million gallons of water per day have been pumped from Tilmanstone and Snowdown pits from the water-bearing beds below the Chalk. This water is allowed to run off at the surface. The author points out that the main faulting and fissuring follow the direction of the major tectonic folds, and that the water in the Oolite sands is divided into independent blocks by post-Jurassic faulting; he indicates the importance of a knowledge of this faulting in mining development. The water in the Oolite sands and in the Carboniferous Limestone below the Coal Measures probably comes from the French side of the Channel where these rocks are exposed in the Boulonnais.

ANTS IN RELATION TO PLANTS.—Myrmecophytism is dominated by the feeding habits of ants and their offspring. Until these are fully understood, it is scarcely possible to grasp the true ecological signifi-

cance, and the origin of the extreme cases of apparent or true symbiosis, between certain ants and certain species of plants. In a recent and very readable publication ("Ants in their Diverse Relations to the Plant World," Bull. Amer. Mus. Nat. Hist. xiv., 1922, pp. 333-583: extracted from "Ants of the American Congo Expedition," pt. 4), J. Bequaert has brought together the varied and disconnected links of existing knowledge, and a perusal of this work only emphasises how necessary the close co-operation of entomologists and botanists is for the proper interpretation of many of the problems. The dispersal of seeds by ants is evidently an important factor in plant distribution. In Europe a great many grasses and herbaceous plants rely almost exclusively, or at least to a large extent, on certain species of ants for the successful dissemination of their seed. The cultivation of fungi by ants is one of the curiosities of biology, but we know that when the female of *Atta sexdens* starts a new colony, she carries in her infrabuccal pouch a pellet containing fungal hyphæ, with which to start fungus cultivation. She manures the mycelium until it attains a sufficiently luxurious growth to feed to the larvæ. The fungal parasites of ants, and the intracellular bacteria of these insects, also come in for discussion. A large part of the paper is devoted to a review of the myrmecophytes of Africa, and there is also included a bibliography of more than 1100 references dealing with ants in relation to plants.

RESEARCHES ON ORTHOPTERA AND DERMAPTERA.—Part 3 of the "Faune de France" has recently come to hand and is devoted to a description of the Orthoptera and Dermaptera of that country. M. Chopard, the author of this fascicule, is a well-known authority on these insects. In a compass of a little more than 200 pages he has provided a useful and profusely illustrated systematic handbook on the rich fauna inhabiting France. Mr. Morgan Hebard (Occasional Papers of the Bernice Pauahi Bishop Museum, vol. vii., pp. 305-376, pls. xxvi.-xxvii.) revises the species of the same orders of insects inhabiting Hawaii. It appears that the Gryllidæ are the richest in species of any family and number 30 kinds, of which 24 are probably native and 6 "adventive." There are no Phasmidæ, no native species of Acrididæ, and of 16 species of Blattidæ only 2 are native. Of the Dermaptera there are 12 species, one half of which are native. In the Annals of the Transvaal Museum (vol. 9, 1922, pp. 1-99, 4 plates), Mr. J. A. G. Rehn describes the Dermaptera and Blattidæ of the Transvaal and Natal. In the first-mentioned group only 9 species are recorded and none are new: among the Blattidæ there are 73 species of which 24 are new. In the *Bulletin of Entomological Research*, vol. xiii., part 2, 1922, Mr. B. P. Uvarov contributes a study of the grasshoppers of the genus *Hieroglyphus* and their nearest allies. They are well known in India as pests of rice and sugar-cane, but hitherto only one species, *H. banian*, has been considered noxious. It appears, however, that several species are probably injurious, and this article is written with the view of aiding in their discrimination and recognition.

SOME INDIAN LEECHES.—In his notes on some leeches in the Indian Museum (Rec. Ind. Mus., xxii. pp. 689-727, December 1921) T. Kaburaki deals with twenty-seven species and makes three new genera. In the single example of Foraminobdella, a new genus of the Herpobdellidæ, found in a stream in the Nilgiri District, Madras, the digestive tract opens to the exterior not only at the mouth and anus but also

by a pore in the mid-dorsal line of the fourteenth somite. The gut of *Trematobdella*, as described by Blanchard, also opens by a pore in the mid-dorsal line, and in Horst's *Nepheleis dubia* there are two slender passages from the gut to the ventral surface where they open to the exterior.

PHILIPPINE CATTLE ROUND-WORM.—B. Schwartz records (*Philippine Journ. Sci.* xx. No. 6, 1922) observations on the life-history of *Ascaris vitolorum*, a parasite of cattle and of water-buffaloes in the Philippine Islands. The eggs develop rapidly—but if exposed to the heat of the tropical sun are quickly destroyed—and contain larvæ after about twelve days. Such eggs hatch in the intestine and the larvæ migrate *via* the liver and lungs back to the alimentary canal, as in the common round-worm of man, *Ascaris lumbricoides*, but appear to have a greater tendency than in the latter species to linger in the liver.

DISTRIBUTION OF OLIGOCHÆTA IN THE ANTARCTIC.—Two further parts of vol. vi. of the Australian Antarctic Expedition are contributed by Prof. W. B. Benham—Part 4 on the Oligochæta of Macquarie Island and Part 5 on the Unarmed Gephyrea. In the former four oligochætes are recorded—two species of *Marionina*, one *Lumbricillus*, and one *Microscolex* (*Notiodrilus*). In connexion with this last, Prof. Benham discusses the views that have been advanced to account for the present distribution of Oligochæta on the sub-Antarctic islands and concludes that this cannot be accounted for by polyphyly, floating rafts, carriage by birds, or by drifting seaweeds, and he is led back to the view, first put forward by Beddard in 1891, that the various islands and southern lands were once connected by land bridges. He believes that the former occurrence of chains of islands would suffice to explain the distribution of oligochætes, for the cocoons of these worms might then have been distributed on the feet of birds, and the pelagic larvæ of some of the littoral animals might have been able to survive for the short time necessary to pass across the intervening seas. He puts the origin of the Oligochæta "somewhere in the early Mesozoic epoch."

FUNGAL DISEASES OF RICE.—In the annual report of the Department of Agriculture of the Uganda Protectorate special attention is directed to local fungal diseases of rice. Early failures in the rice crop used to be attributed to unsuitable environmental conditions, but it is noteworthy that the symptoms of "blast" disease resemble the effect of drought and poor soil. This well-known disease, caused by *Piricularia oryzae*, is reported for the first time in Africa. The disease appears to be widespread, not one of the plots examined being completely free. Both leaves and stems are affected, and when the latter are attacked at both nodes and internodes the plants may break down and the whole plot collapse entirely in bad cases. The ears are sometimes normal, but if attacked the grains are empty or only half filled. At no time has any diseased condition of the roots been observed. "Blast" appears to be the only major disease of rice in Uganda, but in one instance *Gibberella saubinetii*, a fungus with a bad record, has occurred. The supposed conidial stage of this fungus, a species of *Fusarium*, has not been proved to be connected with the *Gibberella*, and it is not pathogenic to wheat, rice or maize, on all of which it was found in the country.

PRAIRIE VEGETATION IN ILLINOIS.—A paper by Homer C. Sampson under this title, published as Article 16, in vol. 13 of the Natural History Survey

of the State of Illinois, illustrates how American ecologists are attempting to record their main natural vegetation features before these are too much modified by man's activities. Sampson recognises the great importance of climate in determining the "centre of distribution" of the great prairie formation, which coincides roughly in its distribution with the area where the ratio of rainfall to evaporation lies between 60 and 80 per cent. As the prairie is met with farther from its natural centre of distribution, its stability becomes increasingly less so that it disappears before various edaphic and biotic influences. Sampson describes the origin of the prairie from the swamps and drier upland regions left at the close of the last glacial period. On these two soil types two different series of plant associations have followed, hydrophyte and xerophyte respectively in character, but both have ended in the prairie zone in the same association, dominated by *Andropogon furcatus*, the tall blue stem grass. Very striking must have been the appearance of the wide-rolling plains, clothed with this grass growing to a height of 10-12 feet, so that the earlier settlers could follow the movements of their cattle only by climbing to elevated ground and noting the agitation in the vast plains of grass. The author is to be congratulated on one unusual feature which terminates a memoir which is throughout admirably clear and concise. This is the bold attempt made to summarise the chief features of prairie vegetation in non-technical language so that the general public may learn the results of the study of one of the great natural assets of the state. This public should be interested in the author's statements as to the relative want of success that attends efforts to bring natural forest under cultivation as compared with the results of cultivation of prairie land which is normally richer in humus and less leached of its inorganic constituents.

WEATHER IN THE WEST INDIES.—Monthly and annual reports of the West Indies and Caribbean Weather Service have reached us for 1921 and a large part of 1922. The publication is carried out by Mr. Oliver L. Fassig, meteorologist in charge, at San Juan, Porto Rico, the service being in co-operation with the governments of the islands of the West Indies and of the adjacent coasts of Central and South America, under the controlling influence of the U.S. Weather Bureau. Daily rainfall returns are given from about 350 stations throughout the year 1921, and from more than 400 stations in the early months of 1922. In the latter year monthly mean and extreme temperatures are added. For each month the mean rainfall for the entire section is given based upon the reports from all stations observing, and usually a comparison is made with the normal. In 1921 the mean precipitation for the entire area was lightest during the month of April with a mean of 2.11 in. and a mean frequency of 8 days; the month of heaviest rainfall was October with 7.57 in. which fell on 16 days. The mean annual fall for the entire area was 54.32 in., and the mean number of days with rain was 144. In Jamaica the annual extremes at different stations ranged from 26 in. to 199 in., and in Trinidad from 60 in. to 156 in., the annual totals differing greatly, due to the varying topography. Observations are recorded of evaporation, water temperature, and earthquakes. The occurrence and movements of tropical storms are stated, warning of each storm being given by the U.S. Weather Bureau. Considerable development of the reports is evident, and the value of the data will in this way be further enhanced.