

Applied Entomology.

BULLETIN 805 of the United States Department of Agriculture deals with "Two Leafhoppers Injurious to Apple and Nursery Stock," and gives an account of the apple leafhopper and the rose leafhopper. Of the two species, the apple leafhopper causes the greater damage, and is most prevalent in the eastern States, attacking a large variety of plants, on which it chiefly injures the tender terminal leaves, causing them to turn brown. The rose leafhopper also attacks a large variety of plants, and is especially prevalent in the north-western States. Full accounts of the life-histories and descriptions of the insects in all stages are given, and sprays for controlling them recommended.

Farmers' Bulletin 650 of the United States Department of Agriculture deals with the San José scale, which attacks many species of trees, causing considerable damage to, and sometimes killing, fruit trees. During the summer the scale reproduces exceedingly rapidly, the life-cycle taking thirty-three to forty days, and, although it has a large number of parasites, they are insufficient to act as an effective check. The scale is distributed on nursery stock, etc., and the young are also probably spread by wind, other insects, and birds. The scale can be kept in check by thorough annual spraying when the plants are dormant, lime-sulphur wash being recommended for this purpose.

In Farmers' Bulletin 1061 an account is given of the Harlequin cabbage bug, which occurs in all but the northern States, and is a very bad pest of cabbages and allied plants. Removal of wild crucifers and remains of crops, trap-crops, and hand-picking are effective, and also contact insecticides, but co-operation between neighbouring growers is necessary to control this pest.

Farmers' Bulletin 1086 gives an account of "How Insects Affect the Rice Crop in the United States." The most important pest is the rice water-weevil, the larva of which feeds amongst the roots of the rice plant at the base of the stalk, causing considerable damage to the crop. The stink bug attacks the soft grains of the rice while they are forming. The fall Army worm or Southern grass worm occasionally becomes abundant and damages rice fields in the spring, but is easily destroyed by flooding the fields. The caterpillar of the rice-stalk borer feeds in the stalk and causes the head to die. These pests are controlled by thorough cultivation, by suitable flooding and draining of the fields, and by keeping the fields and banks clear of weeds.

In Farmers' Bulletin 1101 an account is given of "The Argentine Ant as a Household Pest." This ant occurs in scattered localities throughout the South. Owing to its encouraging aphids and scale insects, it causes considerable trouble to fruit-growers and others, while it causes much annoyance by swarming in houses. The ant has been distributed in foodstuffs, and is also carried by floods. Formulæ are given for tree-banding mixtures and for poisons for use in houses and in the open.

Farmers' Bulletin 1104 deals with the book louse or Psocids which frequently occur in houses and other buildings, and may occasionally increase in numbers to such an extent that it is necessary to take steps to destroy them, for which purpose fumigation with sulphur or hydrocyanic acid is recommended.

In the *Journal of Agricultural Research* (vol. xviii., No. 9, 1920) an account is given by J. M. Aldrich of "The European Frit Fly in North America." This pest occurs principally in the regions in which winter

wheat is grown, from the Great Lakes to the Ohio River and westward to the Missouri, but it is generally distributed over most of the country. A full description, with figures, is given of the life-history, and also a plate of the adult and puparium. As many as four broods were obtained in the summer, the first, from larvæ which had lived through the winter, in April. Eggs and larvæ are usually found on the young and tender shoots and also sometimes upon or within the glumes, wheat, barley, and various grasses being attacked. It is recommended that wheat should be sown late in the fall or early in the spring in order to escape the attack of this insect.

In the same journal (vol. xix., No. 1, 1920) an account of "The Banana Root Borer," which is a widely distributed pest of the banana, is given by G. F. Mozzette. The larvæ of this weevil, *Cosmopolites sordidus*, feed in the roots of the plant, and the damage done to young plants causes them soon to wither and die. Full descriptions of all stages and of the life-history are given in the paper, which is illustrated by four plates. Destruction of infested plants and trapping of adults by means of strips of banana-trunks placed on the ground are advised.

The European corn-borer has recently been introduced into the United States, being first discovered there in 1917, and has already spread over considerable areas in the North-east, and it seems likely to do more damage than any native species (State of Illinois, Department of Registration and Education, Division of Natural History Survey, Bulletin, vol. xiii., art. 10, "The European Corn Borer and some Similar Insects," by W. P. Flint and J. R. Malloch). The larva of this moth, *Pyrausta nubilalis*, Hubner, feeds on all parts of the plant above the ground, many species of plants being attacked, but corn appears to be preferred. An account is given of the life-history of this insect, which may have two broods in the year, the winter being spent as full-grown larvæ which hibernate in the stems of the food plant. This pest is probably chiefly spread in the stems of its plant-host, although, as the moth is a fairly strong flyer, it might also be disseminated in the latter stage. A number of native borers closely resemble the European corn-borer, and descriptions are given to enable it to be distinguished therefrom.

Bulletin, vol. xiii., No. 11, 1920, of the same series is concerned with "A Study of the Malarial Mosquitoes of Southern Illinois. 1. Operations of 1918 and 1919," by S. C. Chandler. An account is given of a survey of the mosquitoes of two districts of Southern Illinois in which malaria occurred frequently, in addition to less thorough work at other points. The breeding areas were examined, and larvæ were most plentiful in fairly clean, still water in which there was vegetation. Two of the species found are capable of transmitting malaria. To get rid of the mosquitoes drainage is the most effective measure. Clearing the edges of the ponds, etc., of vegetation is also suggested, as well as oiling the surface of the water, and the use of larvicides. Houses should be screened or fumigated.

The Department of Agriculture, Ceylon, Bulletin No. 46, by N. K. Jardine, gives an account of "Field Experiments with Anti-Tortrix Fluids." The experiments showed a greater yield from the treated plots than from the control, and the quality of the tea was not lowered. In treating a substance intended for human consumption, such as tea, the use of poisons is not possible, and as contact poisons are useless against the tea tortrix, owing to its rolling itself up

in a leaf, it was necessary to find some other substance which would serve the purpose, and lead chromate was found to be very suitable. The formulæ used are given and also the cost of each and of the spraying. Samples from the control and sprayed

plots were tested by tea-brokers, and their reports are given, the tea treated with the sprays, especially that containing resin and sodium carbonate, in addition to lead chromate, being generally preferred. Rain was found to have little effect, provided the spray had dried.

Food and its Preservation.¹

THE work done under the direction of the Food Investigation Board of the Department of Scientific and Industrial Research during the year 1919, although its primary object may be said to have been of a practical nature and mainly devoted to the various means of preserving animal and vegetable food, serves well to show how such an object requires previous investigation of many fundamental and purely scientific problems. On account of the strictures that have been made as to the support of pure science by the Department in question, we may take note that it is pointed out in the report before us that "the application to industry of many of the researches is not immediate, and often not obvious." Such results will be especially referred to in the course of this article, but it is not intended thereby to minimise the value of the practical work of the Board.

With regard to the freezing of meat and fish, a valuable series of researches was undertaken on the phenomena occurring in the freezing and thawing of systems containing colloids and electrolytes, with especial reference to the separation of the constituents of such systems and to the diffusion of salts through their solid phases. Our knowledge of the properties of these systems has been greatly enlarged by this work, and a general report on it is now being prepared. Attention may be particularly directed to the fact that by sufficiently rapid cooling to a temperature which corresponds to the eutectic of a saline solution the separation of frozen water as a visible phase is avoided. Thus, on thawing, the system returns to its original state and the irreversible separation of the colloidal material does not take place, as happens on slow freezing at a temperature only a few degrees below the freezing point of the system.

The conditions of growth of bacteria and moulds were naturally subjects of immediate interest. It is well known that bacteria growing in a particular medium, after a period of multiplication, gradually die off. This is shown by Dr. Graham-Smith, in the report, to be due, not to accumulation of toxic products of their own activity, but to the exhaustion of some specific food material. Bacteria of another species are able to grow in a medium which has previously been exhausted by a different species so

far as its own growth is concerned. An interesting fact brought out by researches on the "black-spot" mould (shown to be a species of *Cladospodium*) is that it will grow at a temperature of -5° C. It is clear that the protoplasm in the cells does not freeze, although the expressed juices of plants usually freeze between -2° and -3° C. No doubt capillary forces are responsible for the lowering of the freezing point in the narrow cells.

The question of the discoloration of fruit led to an investigation on the nature of the enzymes responsible for oxidation in plants. An important fact in relation to the general theory of the mechanism of oxidation was brought out in an examination of linseed oil. It was found that the oil oxidises slowly in air without the presence of any kind of catalyst, although in the oxidation system of the cell there is evidence of the presence of a catalyst accelerating autoxidation. In connection with enzymes the work on pectin production may be mentioned.

Of more strictly chemical interest is the discovery that glycerol can be replaced in fats by mannitol, such fats being similar to the corresponding glycerol esters and behaving in the same way as foods. Other work giving an insight into the chemistry of the production of glycerol itself was also undertaken. Of practical importance for workers with the products of degradation of proteins is the method devised by Mr. Foreman for estimating the simpler products of bacterial decomposition. A curious fact is that the equilibrium position reached in the autolysis of beef is not the same as that in the case of mutton, suggesting that the presence of more than one phase in the heterogeneous system of the cell must be taken into consideration.

The work of the Engineering Committee of the Board, as would be expected, has been mainly industrial, but the systematic investigation of the heat-flow through various materials and the loss of heat by convection from plane surfaces may be referred to here as of general scientific interest.

We may note, finally, that the Board has obtained a grant to build and equip a research station at Cambridge for biochemical and biophysical investigations at low temperatures.

W. M. B.

The Older Palæolithic Age in Egypt.

PROF. C. G. SELIGMAN, at a meeting of the Royal Anthropological Institute on January 11, read an important paper on "The Older Palæolithic Age in Egypt," embodying the results of an attempt made in 1914 to secure definite stratigraphical evidence of the antiquity of implements which, if found in Europe, would be classed as Chellean, Acheulean, or Mousterian. The sites visited were Abydos, Thebes, Tel-el-Amarna, Meir, and Wady Sheikh, and a short trip was made to the Fayum. Some areas, however, may be described as flintless;

flints of Palæolithic type were very common in the neighbourhood of Thebes and Abydos, but were scarce near Meir and Tel-el-Amarna, and did not include either Chellean or Acheulean types. Wady Sheikh showed no definite Palæolithic types, but specimens of early historic date were valuable for the light they threw on the patination of high desert specimens.

The implements found included hand-axes (Chellean type), hand-axes with borer point (not found in Europe), and finely worked ovates (Acheulean type). The points, side scrapers, borers, hollow scrapers, and tanged points (spear- or arrow-heads) Prof. Seligman grouped together as Mousterian, not because

¹ Department of Scientific and Industrial Research. Report of the Food Investigation Board for the Year 1919. Pp. 36. (London: H.M. Stationery Office.) Price 6d. net.