

species of mosquito concerned, the result of the draining on the breeding-places, and generally a fuller account, but perhaps these will be found in another work to which the author refers, and here only the broad outline was intended.

The author in writing is inclined to use rather vague expressions, such as "a long series of blood examinations" (the number is not given), "proved up to the hilt" (sometimes a very dangerous expression, as one could easily show), "quinine in every shape and form" (dose not stated), "a high percentage" of the labourers harbours malaria parasites (figure not given), and his use of figures is not entirely satisfactory, *e.g.*, in the Panama chapters he quotes figures to show that there were eighty-three cases of hæmoglobinuric fever among Barbados natives, while there was only one

author is the "flights of mosquitoes" noted in the Canal zone.

These began about 6 p.m. and ceased before 9 p.m. "Hundreds of Anopheles could be seen passing by," and the flights attracted insectivorous birds to activity. The range of flight was about 6000 feet, originating in a marsh and terminating in an inhabited area, the object of the flight being apparently blood.

A most important fact that the author draws especial attention to is that in certain estates in British Guiana malaria has disappeared. Agriculture has in some way, for all practical purposes, abolished it. Anopheles do not breed in the water in land which is cultivated in British Guiana, but Culex do so in abundance. Now a knowledge of what exactly is implied in the term "agriculture"



Land raised by "hydraulic filling" on the east bank of the French canal at Gatun. The remains of the swamp trees are still to be seen. From "Rural Sanitation in the Tropics."

among natives of Costa Rica; but as no data are supplied as to the relative number of these two classes of labourers, one can draw no valid conclusion. On page 249 the admission rate in 1906 for malaria among a labour force of 26,705 was 821; in 1913 the rate for a force of 56,654 was 76. Now in order that these figures should be comparable it should have been shown that the percentage composition of the force as regards races was the same in 1913 as it was in 1906, but this is not done. One has little doubt that there has been this fall, but the figures *per se* do not completely prove it; if, for instance, the white population had been partly replaced by the relatively immune negro in the interval, this would vitiate the figures.

A very interesting phenomenon recorded by the

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here is of the first importance. We should imagine no more valuable data could be given than would be in an account of the difference between a malarial area and a non-malarial area in British Guiana. This book should be read by all officials who obstruct, or turn a deaf ear to, the claims of sanitation, though there are other necessities of life, as the author points out in his epilogue.

J. W. W. S.

THE POLLINATION OF FRUIT TREES.

INVESTIGATIONS carried out in this country, in America, and elsewhere have demonstrated the fact that many of our cultivated varieties of apple, pear, plum, &c., are self-sterile. They have shown, moreover, that whereas a variety

may be sterile when pollinated with its own pollen, it yields an abundant crop if pollinated with the pollen of certain other varieties. Hence it is of considerable economic importance to discover which varieties serve best for mutual cross-pollination.

Mr. Cecil H. Hooper has been engaged in the study of this subject for some years, and he published a short time ago a summary of the results of observations made by others and himself on the pollination of apples, pears, plums, and cherries.

The list of self-sterile apples is surprisingly large. It includes Lane's Prince Albert, Bismarck, Annie Elizabeth, Warner's King, Gladstone, Lady Sudeley, James Grieve, and Cox's Orange Pippin (rarely self-fertile).

It is to be observed, however, that, as indicated in the case of Cox's Orange Pippin, self-sterility is by no means absolute in all these varieties. This, although of no particular importance practically—for a poor setter no less than a completely self-sterile variety requires to be planted with a variety the pollen of which causes it to set fruit freely—is nevertheless significant from a scientific point of view. It means probably that some link in the chain of chemical changes pre-requisite for the germination of the pollen tube on the stigma and its growth in the style is missing, rather than an inability of the sexual nuclei to unite with one another. Thus it is known that the absence of a particular kind of sugar on the stigmatic surface may suffice for the suppression of the germination of a pollen tube. Hence it is most desirable that this problem of sterility of fruit trees should be studied more minutely than has been the case up to the present. The pioneer field work has been done fairly thoroughly; it is now time for the physiological botanist to intervene. He, unfortunately, is so sequestered in his laboratory that he rarely discovers even the existence of the stimulating problems which modern horticulture offers for elucidation.

The establishment of horticultural research stations at Merton, Wisby, and Long Ashton gives ground, however, for the hope that this attitude of aloofness is a thing of the past, and indeed it is these stations that are contributing most to our knowledge of the phenomena of self-sterility of fruit trees.

That the reproductive organs of fruit trees, like those of many other cultivated plants, are subject to grave disturbances is indicated by the fact that not a few apples are very shy of pollen bearing. Among varieties which exhibit this habit, Mr. Hooper mentions Newtown Wonder, King of the Pippins, Irish Peach, Baumann's Red Winter Reinette, Cox's Pomona and Broad-eyed Pippin.

Pears are apt even more than apples to be self-sterile, and such varieties as William's Bon Chrétien, Pitmaston Duchess, Doyenné du Comice, and others require to be planted in proximity with good "pollenisers." Progressive

fruit-growers are, of course, well aware of the stubborn fact of partial or complete self-sterility, and see to it that their orchards contain varieties which supplement each other's pollen requirements; but it is to be feared that many small growers are not so alive to these facts as they should be. However, so long as many of the small orchards of this country are so ill-cultivated as they are at present, self-sterility of varieties is of no great moment to the trees or owners, for the crops would inevitably be poor, in spite of the introduction of good pollenisers.

Of the insects visiting fruit trees and presumably engaged in transferring pollen to the stigmas of the flowers, Mr. Hooper gives an interesting list. In the case of apples observed during 1912 and 1913, the record was:—Hive bees, 72; bumble bees, 26; other wild bees, 2; other insects, 20. The insect visitors to the cherry were in somewhat similar proportions, but in the case of the plum the visits of bumble bees were to those of hive bees as 41 is to 29. How far the reduction in numbers of hive bees due to recent epidemics is likely to have an effect on the yield of apples is an open question.

FREDERICK KEEBLE.

PROF OCTAVE LIGNIER.

PALÆOBOTANY recently suffered a serious loss in the death of Graf zu Solms-Laubach and Prof. Zeiller. Another gap has been made in the ranks of the small body of botanists whose work is mainly concerned with extinct plants by the death, on March 19, of Prof. Octave Lignier, who occupied the chair of botany at Caen since its foundation in 1889. Prof. Lignier was born on February 25, 1855, at Pougy (Aube, Champagne). His earlier botanical studies were chiefly concerned with investigations undertaken to test the value of anatomical characters as a guide to the affinities of the Calycanthaceæ and other Dicotyledons. These researches led him to adopt certain views with regard to the important part played by the foliar vascular system (the "meriphyte") in the evolution of the conducting system of the stem. For his original ideas on this subject Lignier did not always receive his full share of credit. He also wrote on the anatomy and floral morphology of many other recent genera; but it is for his numerous additions to our knowledge of Mesozoic and Palæozoic plants that he is best known.¹ One of his most important contributions is the masterly account of *Bennettites Morièrei*, a Cycadean "flower," probably from the Gault.

Among other important contributions by Lignier reference may be made to his detailed description of several species of Jurassic and Cretaceous Coniferous and Cycadean stems and some Upper Cretaceous Angiospermous wood referred to the Hamamelidaceæ; his ingenious suggestions with regard to the relationships of

¹ "Notes on the Pollination of Orchards." By Cecil H. Hooper. *The Fruit, Flower and Vegetable Trades' Journal*, September, 1915.

¹ For a list of Lignier's papers, see "Titres et Travaux scientifiques de M. Octave Lignier." Laval, 1914.