PEAR BLIGHT IN CALIFORNIA.

THE discussion of California pear blight given in Mr. Webber's report of the proceedings of the Botanical Society of Washington,* induces me to offer some additional notes on this subject.

Although supposed cases of pear blight have been reported in California for many years, an examination of the affected orchards has always resulted, until recently, in throwing doubt upon the presence of that disease within the State. In the spring of 1899, however, there occurred a typical outbreak of blight in southern California, the malady assuming the normal epidemic form of spring development, spreading over several counties in a short time. This was the first case of the kind to come to my knowledge, although the orchards of the State had been under continual observation for upward of ten years previously.

As early as the spring of 1900 the disease developed seriously near Hanford and at other points in the southern half of the San Joaquin valley, while at present it has spread to a large percentage of the leading pear-growing districts of southern California and of the San Joaquin and Sacramento valleys. There are still special districts within the State which are wholly or nearly free from its ravages—as the Santa Clara valley and other coast regions.

The destructive development of pear blight in the hot interior valleys of California should at once dissipate the somewhat popular theory that bacterial and many other diseases of the East will not thrive under the semi-tropic and more arid conditions of portions of the Pacific coast. The facts are quite to the contrary. In California there is not alone a spring and summer, but likewise a fall and winter epidemic of pear blight, and the latter form of the disease is by far the more destructive manifestation of the two. The writer has given the name of 'winter blight' to the fall and winter type of the disease, and by careful inoculation experiments, conducted with pure cultures, has demonstrated the cause of winter blight to be identical with that of spring blight in the East.*

The leading characters distinguishing winter blight are: First, it rarely if ever attacks a tree at points higher than a man's head, always affecting the trunk or base of the main limbs, hence the larger and more vital portions of the tree; second, the infection takes place about the time the crop is gathered or shortly after; third, it continues in a most active and destructive state during the months of November, December and January; and, fourth, it may prevail in an orchard showing little or no signs of the spring form of the disease. The experience of growers supported by observation in the orchards shows that winter blight infections usually occur in short spurs developed upon the base of the main limbs or on the trunk of the trees. In California it is not uncommon for these spurs to develop clusters of flowers in the late fall, when the moisture rises in the soil or after the fall rains begin. The belated flowers rarely occur at points higher than a man's head, and they therefore serve as points of infection for the basal limbs and trunk of the trees. As the spurs are short the time required for the bacillus to pass from the flower to the parenchymatic tissues of the cortex of limb or trunk is brief, and the girdling of the trunk or main limbs is often a matter of a comparatively brief time. As the winter temperature of many California valleys is sufficiently warm to permit the blight bacillus to grow during November, December and January, and as the organism is so located in cases of winter blight that the affected parts cannot be removed by pruning without removing the more essential portions of the tree, the winter development of this disease has frequently resulted in more serious injury and greater losses of trees than the spring form of the malady in the East. In the latter form of the disease the twigs and smaller limbs are the leading points of infection, and a careful and early removal of the infected parts is commonly accomplished without serious injury to the trees.

In winter blight, as in spring blight, the

* SCIENCE, N. S., Vol. XV., pp. 989–991.

* See *California Fruit Grower*, May 4, 1901, Vol. XXVI., No. 675, p. 4.

growing tips of purely vegetative shoots occasionally serve as points of infection. Mr. Waite has said that 'it is only in the blossom blight that the honey bee is concerned,'* but Professor A. J. Cook has thrown a light upon this subject which suggests a need for further investigation. Professor Cook states that the bee men claim that the inoculation of pear flowers by means of bees 'cannot be the exclusive method of spreading this disease, as it often attacks and plays fearful havoc with nursery stock and young trees that have never blossomed at all.' To this Professor Cook replies that "It is well known that buds secrete a sort of glue for their protection in winter or spring. This attracts bees and other insects. The bees secure the main part of their bee glue or propolis from such resin-coated buds"; stating also that "it seems quite likely in such visits the bacteria are taken from diseased buds [or other sources of infection] and conveyed to healthy plants."† I would add to these views of Professor Cook that infection through growing buds of walnut branches is also of very common occurrence in the walnut bacteriosis caused by *Pseudomonas juglandis*.

This distribution of *Bacillus amylovorous* (Burrill) De Toni, through the agency of bees and other insects has been carefully demonstrated by Waite. The relation existing between the number of bee visits and the virulence of an epidemic of blight has, however, received less attention. Relative to this phase of the subject the writer has made several field observations having a direct bearing. A few miles north of Hanford, California, a large colony of bees was located within one fourth mile of two of the most valuable pear orchards of that region. These orchards were practically destroyed by blight before those more distant had become seriously affected. A second case of like nature was observed near Fowler and a third at Banning, California. The contrast between the number of infections in orchards near large colonies of bees and those more distant was very striking in both cases noted in the San Joaquin valley. The field conditions presented convincing evidence that near proximity of large colonies of bees to pear orchards greatly increases the danger to, and hastens the time of destruction of the latter.

Newton B. Pierce.
Pacific Coast Laboratory,
Santa Ana, Cal.

* Paper read before the National Bee Keepers' Convention, Pan-American Exposition—printed in *California Cultivator*, Vol. XVIII., No. 25, pp. 390–391.

† *California Cultivator*, Vol. XVII., No. 6, pp. 83–84.

THE ARC OF QUITO.

At a meeting of the Société de Géographie in Paris, France, on May 2, 1902, a communication was made to the Society by M. R. Bourgeois, Commandant du Service Géographique de l'Armée, Chef de la Mission française de l'Equateur, giving an account of the recent operations of the French Officers in remeasurement of the old arc of Peru now called the arc of the meridian of Quito.

An account of the reconnaissance for the extension and remeasurement of this arc can be found in Science for November 2, 1900.

The following is taken from *La Géographie*, the bulletin of the Société de Geographie for May 15, 1902.

As has been stated the reconnaissance was made in 1899. The time to complete the work was estimated at four years and in 1900, 500,000 francs (about $100,000) was appropriated for the field expenses.

The mission, composed of five officers, a military surgeon and seventeen non-commissioned officers and privates started to Equador in 1901 and began the work immediately after their arrival in June.

The first year's work has been completed, and M. Bourgeois has returned to France to report the progress made, leaving the Mission to continue the work under the direction of Captain Maurain.

The Mission reached Guayaquil June 1 with geodetic and astronomical instruments, camp outfit, baggage, etc., weighing 20,000 kilos (about 40,000 lbs.). This immense outfit was transported with difficulty to the scene of operations, and during 1901 the work was