

their own pollen, and they would not produce fruit; but when they were pollinated with another variety of pear they would produce excellent fruit. We will be very glad if people are stimulated to think out along this line and work out these problems.

MR. GROFF: I am sure it is very kind of the Secretary to refer to my work, but there is really nothing for me to add. I would like to say, in reference to the queries that have been put, that they show how limitless is the field for study and observation in natural things, and how great is the opportunity of any of the members who are here to have it said of them, as has been said of the late Mr. Fuller, "He learned from the open book of Nature, and the universities learned from him." (Applause.)

Mr. RACE: I would like to ask Prof. Fowler or Mr. Groff if any hybridizer has actually seen the bee conveying the pollen—that is, if they have ever seen the bee or other insect loaded with pollen and conveying it from one flower to another? I notice from a German writer that that theory has been very severely attacked. This writer says that the only service they perform is by the use of their wings as a fan to distribute pollen in times of calm, when the wind is not doing that service, and that they have never yet been seen loaded with pollen. The same writer says it cannot possibly be, without a current of wind, distributed a very great distance by those insects.

Prof. FOWLER: I think there are a good many thousands of observations recorded. For instance, Baldwin, in his work on cross-fertilization, expressly tells us that he examined the bees themselves, that is, caught the different insects, examined them, and found the pollen of certain flowers on them. (Hear, hear). He has seen those insects going from one flower to another, and has written down a good deal about it; and Baldwin was an exceedingly careful observer—very few men have been more careful. Of course, he might be mistaken sometimes in conclusions. There is another book, by Mueller, on cross-fertilization, where he gives lists of the insects that he has seen, and the plants on which he has seen them, and the plants on which they arrive carrying the pollen. It is a large volume, filled with observations that he has devoted a number of years of his life to. There is a little popular book—which is not quite so reliable, however—namely, Grant Allen, on the "Colors of Flowers," showing the value of the colors to secure fertilization by means of insects. Then every work on botany, if it is of any size, has a few chapters devoted to fertilization. Both Baldwin and Mueller refer to a large number of others for special observations. There is a little book called "Spraying of Plants," published by McMillan & Co., in New York, that gives the names of the insects that affect the plants, and the plants that are fertilized, and goes on with all kinds of spraying that have ever been used in the world from the old Persian times down to the present. I think those works show conclusively—at least, I have perfect faith in those writers that have devoted years of attention to the subject—that they have seen the bees going from one plant to another; and a special point is that if a bee sets out to visit any kind of flowers, he sticks to that special species the whole day. Bees have been watched by the hour going from one plant to the other, but he always goes to a plant of the same kind as the one that he has set to. In that way he fertilizes every plant as he goes along. If he went from one plant to a different one, of course his labor would be all in vain so far as fertilization is concerned. (Applause).

Mr. GROFF: From my limited observation the theory I have formed is that the bee carries the pollen, but that the pollen is mixed on the stamen and not on the stigma, and what we call natural fertilization takes place by the contact of the pollen and the stigma. It is not transferred to the stigma by the bee.

Mr. RACE: Of course I was not heterodox myself, only I wanted to see what these professors had to say on that question; I saw that it had been attacked.

Prof. SHORT: When visiting a few years ago at my brother-in-law's fruit farm at Winona I happened to be there at the time when the grapes were in blossom, and he remarked that quite a number of valuable grapes often did not mature well in the bunches. I asked him to show me those—I think several varieties of Moore's Early and Worden and several varieties of the Rogers, and so on, were pointed out. On examination I found that the stamens on those particular varieties were extremely small, slight and

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