

as to their temperature.

We never can tell you see how much use future generations may make of any little facts we may discover. Let us look a little closer to our subjects and see if some practical result has not already been produced by this close study of individual forms of plants. And even there I think I shall be able to show that a little has been done, and much more remains to be accomplished; it should also be borne in mind that this minute and painstaking study is of comparatively recent origin. In a paper on the two forms, or dimorphic condition in the species of *Primula*, published by Mr Charles Darwin, in the "Proceedings of the Linnæan Society," in 1862, we find some information to the purpose. He noticed, as most of us had, who had examined, however superficially, the Primroses of our hedge-banks and the Cowslips of our meadows, that there were two distinct forms of each—those having long and those having short styles. Among Polyanthus and Auriculas we knew these two forms as "pin-eyed" and "thumb-eyed" varieties. It was a pretty generally known fact that the two forms existed in nearly equal numbers in a state of nature; but this fact was the sum of our knowledge in that direction—we none of us knew or even suspected that this had a reason, that this had anything to do with the vital history of the plant we never even guessed until Mr Darwin placed it before us in unmistakable light. But now we can at once comprehend it, and at the same time we are led to observe the same thing in other and very different genera, and we are also prepared to make a practical use o

the fact. To reduce this interesting subject to the smallest possible compass, I may say that his discovery consisted in proving that "The short-styled plants, if insects be excluded and there be no artificial fertilisation, are quite sterile, whereas the long-styled produce a moderate quantity of seed. But when both forms are properly fertilised, the short-styled flowers (as with Cowslips, *Primula veris*) yield more seed than the long-styled." "In *Primula sinensis*, when protected from insects and not artificially fertilised, the case is somewhat but not materially different." I may explain what is meant by the term *properly* fertilised; our author discovered that if a short-styled plant were impregnated with its own pollen it produced a small quantity of seed, but that if the pollen of the long-styled form were employed, complete fertility was the result. The fact that to continue the existence of the species it was necessary that there should be a connection between the two distinct forms, and that this might the more readily be brought about, through the agency of insects, the shape of the flowers is precisely that best suited for the purpose. I confess that the more minutely I examine the structure and history of any plants the more I become conscious of the wondrous power and wisdom of the omnipotent creator.

Now we have got in this case a fact and the meaning of it—for no structural difference is without its meaning; and it also gives us a clue by which we may learn much of other genera—some species of *Linum*, *Oxalis*, *Cinchona*, *Knoxia*, and *Amsinckia*, not to mention others. But some of my readers may say, well, all this is interesting I dare say to the botanist, but what has the practical gardener to do with it; of what use is it to him to learn these facts? Well, I will endeavour to satisfy the most sceptical on this point. Sometimes I have visited a garden which I had long known, and have been obliged to say, "Why—your *Primulas* are not so good as they were last year, you haven't lost that capital strain you used to have, have you?" And the answer has been that they set but little (or sometimes no) seed, and by some accident that was lost, or did not come up well; or by some other means our friend was obliged to resort to the seedsman for a new supply. Had the seedsman been a member of one of the leading firms the chances are that no evil would have resulted from the change; but then, had the proper steps been taken our friend would not only have been independent, but have also had seed that he could have supplied the seedsman with. He should have selected a few short-styled forms, and fertilised the flowers with the pollen from the "pin-eyed" (long-styled) plants, and he would have had plenty of good seed, and retained the fine strain of *Primulas* without a doubt.

Take another instance from the genus *Linum*. Four years ago I had the greatest possible difficulty in obtaining a dozen or two of seeds of *Linum flavum*. Last year from plants in my

own garden I raised enough seed to supply the county; and simply by following the plan recommended for Chinese Primroses. Mr Darwin says of *Linum grandiflorum*, which is one of the very best annuals we have if properly grown—"In 1861 I had eleven plants growing in my garden, eight of which were long-styled, and only three short-styled. Two very fine long-styled plants grew in a bed a hundred yards off, and separated from the others by a screen of Evergreens. I marked twelve flowers, and put on their stigmas a little pollen from the short-styled plants. The pollen of the two forms is identical in appearance; the stigmas of the long-styled flowers were thickly covered with their own pollen, so thickly that I could not find one bare stigma; and it was late in the season, namely, September 15th. Altogether, to expect any result from this trial seemed almost childish. From my experiments on *Primula*, I had faith, and did not hesitate to make the trial, but certainly I did not anticipate the full result. The germens of these twelve flowers all swelled, and ultimately six fine capsules (the seed of which germinated this year 1862), and two poor capsules were produced; only four capsules shrank off. These two plants produced, before and after, and at the time of the trial, a vast number of flowers, but the germens of not even one swelled. All these flowers, though their stigmas were so densely covered with their own pollen, were absolutely barren." The short-styled form of this plant is, however, somewhat more fertile with its own pollen. It is highly probable that a comparatively few flowers are naturally fertilised by the pollen produced in the same individual flower. My own experiments lead me to believe this to be the case even in plants which at the first examination seem peculiarly fitted for self-fertilisation; but either from the pollen not ripening at the time when the stigma is ready to receive it (in some plants this takes place before, and in others after what we should call the right time), or from some other of many causes, this result is seldom brought about.

Here I might and perhaps ought to pass on to speak of the services which insects, particularly bees and moths render us, but the subject is far too interesting and too extensive to be taken up at the end of a chapter. It is a subject to which I have paid particular attention for the last three or four years; but the patient investigation, the great care required to make sure that one's observations are correct, is such that a whole lifetime might be spent in such work and yet the apparent results be but comparatively small. One has always to go through the same experiment three or four times and in as many different ways, in order to make sure that some little insect has not been playing him a practical joke. Sometimes one finds that the work of a season upon some particular species has been rendered *nil* by some inquisitive little bee or other insect; but then the experimenter only determines to repeat the trial next year with increased caution and a greater zest.