

*On the various Contrivances by which British and Foreign Orchids are Fertilized by Insects, &c.* By CHAS. DARWIN, M.A. (Illustrated.) Murray.

THE perusal of Mr. Darwin's book on "The various Contrivances by which British and Foreign Orchids are fertilized by Insects," might incline the reader to regard it as the result of nothing less than a life devoted exclusively to the subject. Yet of the great discussion concerning the "origin of species," the present work is, in fact, only a single chapter, the details of which have become inconveniently large to be incorporated with the rest of the argument.

The point which the author here seeks to establish is thus stated. "That nature abhors perpetual self-fertilization." "That marriage between near relations is in some way injurious—and that some unknown great good is derived from the union of individuals which have been kept distinct for many generations."

Self-fertilization is a rare event with the Orchids, and the description of the various contrivances by which the pollen of one plant is kept from contact with its own stigma and conveyed to that of another plant of the same species, occupies nearly the whole of the volume.

Orchids, it appears, are favourite plants with honey-loving insects. When the proboscis of a bee or a moth is inserted into the nectary of an orchid, it first comes in contact with a little capsule or pouch, the membrane of which at the slightest touch is ruptured, setting free a liquid and exposing the sticky ends of two club-shaped organs, to the further ends of which the pollen grains are attached. The sticky ends instantly adhere to the proboscis, which, when retracted, carries with it the pollen clubs fastened upon it in a somewhat erect position. Further down the throat of the nectary lies the stigma.

We have then to observe (first), the retired position of the anther chambers, of which there are two, containing the charged ends of the pollen clubs. (Second.) The prominent position of the viscid ends of the pollen-clubs in the throat of the nectary. (Third.) The manner in which the sticky ends of the pollen-clubs are kept moist, till wanted for use, by being immersed in a little pouch of liquid. (Fourth.) The extreme sensitiveness of the lips of this pouch, which open at the slightest touch imaginable. (Fifth.) The rapid setting of the viscid matter, which hardens into a dry cement in a very short time after the sticky ends of the pollen-clubs have touched the proboscis of an insect. (Sixth.) If the attached clubs remained erect, the proboscis at its next insertion into a flower would press the pollen grains into a position similar to that from which they had been taken, namely, into the anther chambers; but no sooner are the clubs fast than their pedicels uniformly begin to curl forward, bringing the pollenized ends of the clubs almost close to the proboscis in a more forward position, so that when the next flower is visited the proboscis pushes the pollenized tips of the clubs past the anther chambers and right upon the stigma of the flower.

In the genus *Catasetum* the flower has two slender horns, which when

touched by an insect convey the excitement of the touch to the anther chambers, which instantly discharge the adhesive pollen-clubs at the head of the intruder. Thus, and thus alone, at least three species of the genus *Catasetum* are fertilized.

Mr. Darwin has manifestly spared no labour in collecting facts illustrative of his subject. He gives a list of twenty-three species of *Lepidoptera* captured with the pollen-clubs of *O. pyramidalis* attached to their probosces. He has himself made observations on nearly all the British species of orchids, and upon a large number of exotic species, and he arrives at the conclusion that, "throughout the vast Orchidean order—including, according to Lindley, 433 genera, and probably about 6,000 species—the act of fertilization is almost invariably left to insects."

The chapter on the homologies of Orchids is one of the most interesting portions of the book.

At Torquay, Mr. Darwin watched a number of plants of *Spiranthes autumnalis*, and saw them visited by humble-bees. "The bees always alighted at the bottom of the spike, and, crawling spirally up it, sucked one flower after another." "I believe humble-bees generally act thus when visiting a dense spike of flowers, as it is most convenient for them; in the same manner as a woodpecker always climbs up a tree in search of insects." This seems a most insignificant observation; but see the result. In the early morning, when the bee starts on her rounds, let us suppose that she alighted on the summit of a spike, she would surely extract pollinia (pollen-clubs) from the uppermost and last opened flowers, but when visiting the next succeeding flower, of which the labellum in all probability would not as yet have moved from the column, for this is slowly and very gradually effected, the pollen masses would often be brushed off her proboscis and be wasted. But nature suffers no such waste. The bee goes first to the lowest flower, and crawling spirally up the spike, effects nothing on the first which she visits till she reaches the upper flowers, then she withdraws the pollinia; she soon flies to another plant, and alighting on the lowest and oldest flower, into which there will be a wide passage from the greater reflection of the labellum, the pollinia will strike the protuberant stigma. If the stigma of the lowest flower has already been fully fertilized, little or no pollen will be left on its dried surface; but on the next succeeding flower, of which the stigma is viscid, large sheets of pollen will be left. Then, as soon as the bee arrives near the summit of the spike, she will again withdraw fresh pollinia, will fly to the lower flowers on another plant, and fertilize them; and thus as she goes her rounds and adds to her store of honey, she will continually fertilize fresh flowers, and perpetuate the race of our autumnal *Spiranthes*, which will yield honey to future generations of bees.

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