Mr. Darwin's *Origin of Species* * is no doubt one of the most remarkable books of the age; but it will be remembered that the author was hurried in its production, and rather than run the risk of its never being published through any inability to complete it, he launched it upon the world in an unfininished condition. He has since had time to put together a vast number of highly curious and interesting observations *On the Various Contrivances by which British and Foreign Orchids are Fertilized by Insects; and on the Good Effects of Intercrossing.* "In my volume on the *Origin of Species*," says Mr. Darwin, "I have given only general reasons for my belief that it is apparently a universal law of nature that organic beings require an occasional cross with another individual; or, which is almost the same thing, that no hermaphrodite fertilizes itself for a perpetuity of generations. Having been blamed for propounding this doctrine without giving ample facts, for which I had not in that work sufficient space, I wish to show that I have not spoken without having gone into details." The monograph he has just issued is crowded with striking illustrations in support of his well known views. For twenty years he has been a minute observer of the phenomena connected with the reproduction of a large class of Orchids, and he has collected sufficient data to make it all but certain that the fertilization of these flowers is accomplished by means of insects. Robert Brown was partially aware of the curious circumstance, but its confirmation has only been effected by a series of the most patient, ingenious, and laborious experiments. The structure of orchids is so peculiar, and the pollen, the fertilizing agent, is so firmly imbedded in the anther cells, that without some interposing agency the stigmatic surface would never be impregnated. It is abso-

* On the various contrivances by which British and Foreign Orchids are fertilized by Insects, and on the good effects of Intercrossing. By Charles Darwin, M.A. With Illustrations. London: Murray.

lutely necessary that the pollen be transferred, and the office is performed by insects. But to prove insects are necessary," says Mr. Darwin, "I covered up a plant of Orchis morio under a bell-glass, before any of its pollinia had been removed, leaving three adjoining plants uncovered. I looked at the latter every morning, and daily found some of the pollinia removed, till all were removed, with the exception of the pollinia in one flower low down on one spike, and with the exception of those in one or two flowers at the open of each spike, which were never removed. I then looked at the perfectly healthy plant under the bell glass, and it had, of course, all its pollinia in their cells. I tried an analagous experiment with specimens of O. mascula with equally the same result." It is strange that butterflies and moths, such useful agents in the transmission of pollen, are rarely detected in the act of visiting orchids. But there is other evidence to prove that they have rifled the flowers, for many specimens of sepidoptera have been caught with the precious pollen granules clinging to their heads and probosces. The proboscis of one mouth presented an "extraornary arborescent appearance," for along its length, in symmetrical order, were attached no less than eleven pairs of pollinia. All British orchids, except one, are reproduced by intercrossing. The exception is the bee ophrys, which is endowed with a special and perfectly efficient contrivance for self-fertilizations. The author, astonished at such a departure from the rule, looked at the state of the pollen masses in hundreds of flowers of this species, but he had no occasion to doubt the existence of the irregularity. There is another orchid, *cep hallanthera grandiflora*, which is capable of self-fertilization; but it also depends, in a great measure, upon the pollen which is brought to it by insects.

"I covered up a plant just before the flowers opened, and removed the thin net as soon as they had begun to wither. From long experience I am sure that this temporary covering could not have injured their fertility. The four covered flowers produced as fine seed-capsules as any on the surrounding plants. When ripe I gathered them, and likewise capsules from several surrounding plants, growing under similar conditions, and weighed the seeds in a chemical balance. The seed from the four capsules of the uncovered plants weighed 1.5 grain, from the covered plant the seed of an equal number of capsules weighed under one grain; but this does not give a fair idea of the relative difference of fertility, for I observed that a great number of the seeds from the covered plant were mere minute and shrivelled husks. Accordingly I mixed the seeds well together, and took four little lots from one heap and four little lots from the other heap, and, having soaked them in water, compared them under the compound microscope: out of forty seeds from the uncovered plants there were only four bad, whereas of forty seeds from the covered up plants there were at least twenty-seven bad; so that there were nearly seven times as many bad seeds in the covered up plants as in those left to the free access of insects."

The extract we have chosen will convey some idea of the nicety with which Mr. Darwin conducts his experiments. He cannot speak with certainty of the whole family of orchidaceous plants; but a vast number of specimens, indigenous and exotic, have received his careful attention. We are led to believe that the wonderful structure of the orchid is due to a long course of slow modification and to a succession of slight variations, and indeed many of the facts here brought to light for the first time, tend to confirm the daring, clever, but disputed opinions expressed in the *Origin of Species*. The botanist will feel both admiration and delight at the contents of this volume. The general reader need not turn away from it in dismay; for the technicalities are explained in such clear, brief, and simple terms, that with the aid of the diagrams they are easily to be mastered. We can endorse Mr. Darwin's promise, that if the reader "will have patience to make out the first case [Chapter I.] the succeeding cases will be easily intelligible."