

MR. DARWIN'S ORCHIDS.*

THIS volume cannot, from its subject, hope to meet with anything like the wide acceptance of the *Origin of Species*. On the other hand, it will escape the active, and often angry, polemics which that work aroused. Mr. Darwin has chosen a subject of very considerable interest, and has treated it in a very masterly manner; but the nature of its details will somewhat circumscribe its publicity. Naturalists will study them with curiosity and with profit, but the general reader will, for the most part, fail to appreciate them. The mass of detail here accumulated round a single topic strikingly illustrates the inexhaustible nature of biological research, and the laborious patience with which Mr. Darwin lays his foundations. The net result is that some six thousand species of Orchids are absolutely dependent upon the agency of insects for their fertilization. That is to say, were these plants unvisited by insects, they would all rapidly disappear.

Everyone knows that in plants the fertilization is effected by the pollen of the anther (the familiar yellow powder which stains our fingers when we roughly handle the flower) reaching the ovules, or young seeds, through the pistil, or female organ. How this pollen reaches the ovule is interesting to the naturalist. Sometimes he sees it effected by very simple means. Sometimes the wind carries it from one plant to another. But in the vast majority of Orchids it is an insect which carries it. The pollen is so firmly embedded in the anther-cells that it cannot be shaken out by violence; and if the plant be carefully protected against the visit of an insect, it remains undisturbed—the seed is never fertilized; whereas, if no such precaution be taken, the insects will inevitably visit the plant for the sake of its nectar, and, while sucking up the nectar, will necessarily detach some of the pollen, which they will carry to the next flower, and there the fertilization will be effected. But how? By contrivances so wondrous and manifold, that, after reading Mr. Darwin's enumeration of them, we feel a certain awe steal over the mind, as in presence of a new revelation of the mysteriousness of creation.

Our limits, of course, will not allow us to follow Mr. Darwin's exposition. We shall confine ourselves to a single example. The anther consists of two cells longitudinally open in front—each cell containing its mass of pollen, called *pollinium*. If this pollinium be examined, when out of the anther-cell, it will be found to form a skittle-shaped packet of pollen-powder. Each grain of the powder has an elastic thread, and these threads form a sort of tail, *caudicle*, to the pollinium, which terminates in a minute piece of membrane, having a ball of viscid matter on its under side. When the insect inserts its proboscis into the flower in search of nectar, it strikes against one or both of the viscid balls at the base of the *pollinia*, and whatever touches these will cause them to adhere to it. Not only does the viscid base adhere to the insect's proboscis, but, owing to its composition, it "sets," like a cement, in a very few minutes; and thus, when the insect flies away, it carries attached to it one or more of the *pollinia*, firmly cemented, and standing erect like small horns. The firmness of the cement is necessary; for, if the *pollinia* were to fall sideways or backwards, they could never fertilize another plant. Yet, unless there were some other contrivance, even this would be ineffectual. For if we suppose the insect, bearing a *pollinium*, to alight upon another flower, it is clear that the *pollinium* must strike against precisely the same point of the new flower that it occupied in the old—namely, the anther-cell. But now mark! Though the viscid surface remains immovably fixed, the seemingly insignificant disc of membrane previously mentioned, which terminates the *caudicle*, is endowed with a surprising power of *contraction*, and this contraction causes the *pollinium* to sweep through about 90 degrees, always in one direction—namely, towards the apex of the proboscis. It does this, on an average, in thirty seconds, just the time to allow the insect to fly to another flower. Thus, when the insect alights upon the second flower, the *pollinium* is no longer upright, but inclined forward at an angle which will cause it to pass by the anther, and strike upon the stigma of the pistil. This stigma is also viscid, but not so viscid as, when touched, to pull the whole of the *pollinium* from the insect's head, though sufficiently so to break the elastic threads which bind the pollen grains together, and thus leave some of them on the stigma. Hence, a *pollinium* attached to an insect may be applied to several stigmas, and fertilize them.

One or two points still remain to be noticed. The balls of viscid matter, previously mentioned, are surrounded with fluid in the pouch, named *rostellum*, which contains them; and the importance of this fluid becomes evident when we reflect that the viscid material rapidly "sets" when exposed to the air. Mr. Darwin says he has pulled these balls out of their pouches and found them lose their power of adhesion in a few minutes. Again, those little contractile discs of membrane, which we have seen to be so indispensable for the fertilization of the flower, lie at the upper and back part of the surface of the *rostellum*, and are closely unfolded, and kept damp within the anther-cells. This also is important, since an exposure to the air of thirty seconds causes the contraction and movement of depression to take place; but so long as the disc is kept damp, the *pollinium* remains ready for action directly the insect removes it.

Again, the *rostellum*, after having been depressed, springs back to its former position. If this were not the case, and if an insect

failed to remove either of the *pollinia*, or only one of them, in the first case both, and in the second case one, of the viscid balls would be left exposed to the air; consequently, they would quickly lose all adhesiveness, and the *pollinia* would be useless. That insects do often only remove one of the *pollinia* at a time is well known. Mr. Darwin thinks it probable that this is generally the case—

For the lower and older flowers almost always have both *pollinia* removed, and the younger flowers close beneath the buds, which will have been seldom visited, have frequently only one *pollinium* removed. In a spike of *Orchis maculata* I found as many as ten flowers, chiefly on the upper ones, which had only one *pollinium* removed.

Perhaps even more remarkable, if we can assign degrees of comparison where all is so wonderful, is the process traceable in the *Catasetum* :—

A brief inspection of the flower shows that here, as with other Orchids, some mechanical aid is requisite to remove the pollen-masses from their receptacles, and to carry them to the stigmatic surface. We shall, moreover, presently see that the three following species of *Catasetum* are male plants; hence it is certain that their pollen-masses must be transported to female plants, in order that seed may be produced. The *pollinium* is furnished with a viscid disc, in this genus of huge size; but the disc, instead of being placed, as in other Orchids, in a position likely to touch and adhere to an insect visiting the flower, is turned inwards and lies close to the upper and back surface of a chamber, which must be called the stigmatic chamber, though functionless as a stigma. There is nothing in this chamber to attract insects; and even if they did enter it, it is hardly possible that the disc should adhere to them, for its viscid surface lies in contact with the roof of the chamber.

How then does Nature act? She has endowed these plants with, what must be called for want of a better term, sensitiveness, and with the remarkable power of forcibly ejecting their *pollinia* to a distance. Hence, when certain definite points of the flower are touched by an insect, the *pollinia* are shot out like an arrow which is not barbed, but has a blunt and excessively adhesive point. The insect, disturbed by so sharp a blow, or after having eaten its fill, flies sooner or later to a female plant, and whilst standing in the same position as it did when struck, the pollen-bearing end of the arrow is inserted into the stigmatic cavity, and a mass of pollen is left on its viscid surface. Thus, and thus alone, at least three species of the genus *Catasetum* are fertilized.

In many Orchids, as in *Listera*, *Spiranthes*, *Orchis*, we have seen that the surface of the rostellum is so far sensitive, that, when touched or when exposed to the vapour of chloroform, it ruptures in certain defined lines. So it is in the tribe of the *Catasetidae*, but with this remarkable difference, that in *Catasetum* the rostellum is prolonged into two curved tapering horns, or, as I shall call them, antennae, which stand over the labellum where insects alight, and the excitement of a touch is conveyed along these antennae to the membrane which has to be ruptured; and when this is effected, the disc of the *pollinium* is suddenly set free. We have also seen that in several *Vandee* the pedicels of the *pollinia* are fastened down flat, but are elastic and tend to spring up, so that, as soon as they are freed, they suddenly curl upwards, apparently for the purpose of detaching the pollen-masses from their anther-cells. In the genus *Catasetum*, on the other hand, the pedicels are fastened down in a curved position; and when freed by the rupture of the attached edges of the disc, they straighten themselves with such force, that not only do they drag the balls of pollen and anther-cells from their places of attachment, but the whole *pollinium* is jerked forward, over and beyond the tips of the so-called antennae, to the distance of two or three feet. Thus, as throughout nature, pre-existing structures and capacities are utilized for new purposes.

Having detailed the various contrivances by which fertilization is effected in the various genera and species—six thousand in all—Mr. Darwin adds a valuable chapter on the Homologies of Orchids; but this is too technical for the general reader. The only remark we have to make is on the unhesitating teleology with which Mr. Darwin asserts that the Orchid secretes nectar in order to attract insects. Surely it is enough for the philosopher to note that the nectar is secreted, and the insect attracted, without perilously undertaking to assert that the nectar is secreted specially for that purpose, when the secretion may have many and more important parts to play.

MIEL ET FIEL.*

OF this little volume, faith in Christianity is the soul—morality, which ought to be the perfume of poetry, is religiously respected. As to the philosophical spirit which governs its contents, it soars in too high a region to be influenced by the petty details of social prejudices, or to take any account of the vulgar distinctions of rank. It is free, impartial, universal—honouring what is good, rebuking what is bad." &c. &c. &c. We are glad to be able, on the authority of the author, to impart this valuable information to the public. To say the truth, if we had unfortunately been left to ourselves, we should have discovered nothing of the kind in the book. We turned over its pages with some curiosity, because, when a writer publishes among foreigners, and for foreigners, poems in his own tongue, he owes it to his country (and ought, accordingly, to take more than ordinary precautions) that they should be really good of their kind. The readers to whom he appeals are less likely to be indulgent than those whom he might meet with at home, for the simple reason that the knowledge which they possess of his language is drawn, as a rule, from the more eminent authors, and that their standard, therefore, is naturally a high one. We have probably a hundred known writers of verses, below our recognised poets, who would generally be admitted to possess a certain degree of talent. One man has a power of simple pathos; another writes, at times, on a particular class of subjects, with spirit and energy; and a third displays some grace and delicacy of

* On Various Contrivances by which British and Foreign Orchids are fertilized by Insects. By Charles Darwin, M.A., F.R.S. London: Murray, 1862.

* *Miel et Fiel: Mélanges Poétiques*. Par Adrien Saintour, Auteur d'un Volume de "Fables en Vers;" d'un Volume de "Fables Morales en Prose (Français-Anglais), à l'Usage des Jeunes Étudiants," etc. London: Dulau & Co. 1862.