

REMARKABLE PLANTS¹

II.—SOME CURIOUS ORCHIDS.

1. **GENERAL Structure of the Flower of Orchids.**—The exotic representatives of the natural order Orchideæ have long been favourite objects of cultivation in our hot-houses, from the beautiful and often bizarre form assumed by their curious flowers. Great as is the variety in the size, colour, and form of the flower in the different genera, it is, nevertheless, more than in most natural orders, constructed always on one plan in its main features. Before describing some of the more remarkable forms, it will be necessary to give a general description of this type, and to define the more important of the technical terms used by botanists in relation to it. Both in this account and in the description which follows of particular species, we are largely indebted to Mr. Darwin's most interesting work² on orchids, of which a new edition has just appeared; the illustrations are also reproduced, by the kindness of the publisher, from the same work.

In all orchids the number of sepals and petals (which together form the perianth) is three each, the former being almost always nearly or quite as brightly coloured as the latter. One of the petals—really the upper one, but, in consequence of the twisting of the ovary, apparently the lower one—is nearly always larger than the others, and is so situated as to form a convenient stage for insects to settle on. It is called the lower lip or *labellum* (Fig. 1, *l*), and often assumes the most singular and fantastic shapes. It secretes nectar or honey, which is often contained in a longer or shorter spur-shaped prolongation or nectary (*n*) at its back, but sometimes in the tissue itself, which is then commonly gnawed by insects. There is only one fertile stamen (rarely two), which is confluent with the stigma, and forms with it the *column*. The anther (*a*) consists of two cells, which are usually very distinct, and often so widely separated as to appear like two anthers. The pollen is not, in most orchids, in the form of a fine granular powder, but coherent into two club-shaped masses, the pollen-masses or *pollinia* (*p*), one contained in each anther-cell; these are prolonged below into a kind of stalk termed the *caudicle* (*c*). The ovary is inferior (beneath the calyx), often presenting the appearance of a stalk to the flower, and consists of three carpels closely united together into a single cavity. The single stigma (*s*) is sessile upon the ovary, and is confluent with the stamen (*gynandrous*). Its upper part is modified into an extraordinary organ called the *rostellum* (*r*), which, when mature, consists partly or entirely of viscid matter. In many species the pollinia are firmly attached to a portion of the exterior membrane of the stigma, which, when insects visit the flower, is removed, together with the pollinia. This removable portion of the rostellum is called the *viscid disc* (*d*), or by some authors the "gland" or "retinaculum"; when large, the portion to which the pollinia is attached is called the *pedicel* (often confounded with the caudicle). The part of the rostellum which is left after the removal of the disc and viscid matter is called the *fovea*, or sometimes the "pouch" or "bur-sicula." In the present paper we propose to give an account of a few orchids, interesting from the remarkable mode in which fertilisation by insects is effected.

2. *Coryanthes macrantha*.—The genus *Coryanthes* belongs to the tribe Vandææ, which includes many of the most magnificent extra-British orchids. The extraordinary mode of fertilisation is certified by Dr. Crüger, director of the Botanic Gardens at Trinidad. The accompanying figure (Fig. 2) represents the flower of *C. speciosa*, an allied species, but will serve to show the relative position of the parts. It is very large, and hangs

downwards. The lower portion of the labellum (*L*) is converted into a kind of bucket (*B*). Two short appendages (*H*), which arise from the narrowed base of the labellum, stand directly over this bucket, and secrete so much limpid and slightly sweet fluid that it drops into the bucket; the quantity secreted by a single flower is said to be about an ounce, but it does not appear to attract insects. When the bucket is full, this fluid overflows at a channel which forms a kind of spout (*P*), closely over-arched by the end of the column, which bears the stigma and pollinia in such a position that an insect, forcing its way out of the bucket through this passage, would first brush with its back against the stigma, and afterwards against the viscid discs of the pollinia, and thus remove them. In *C. macrantha* the labellum is,

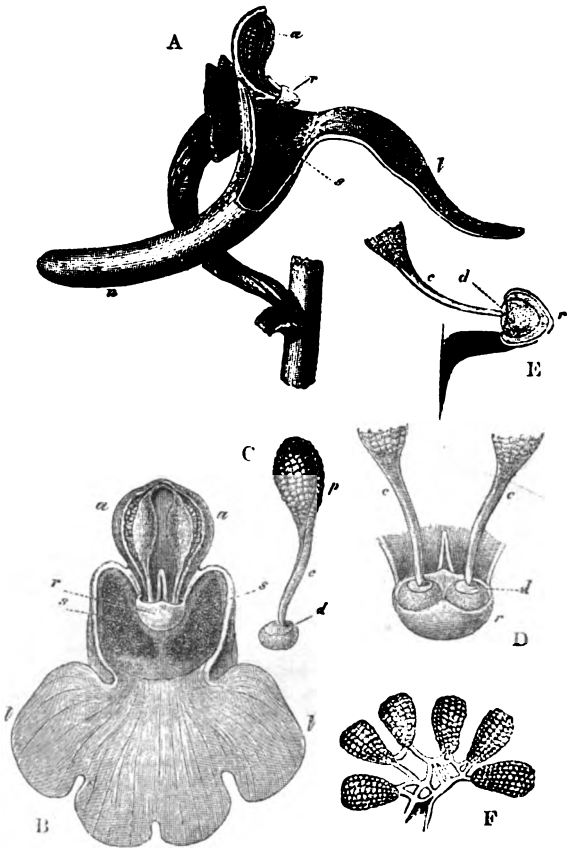


FIG. 1.—*Orchis mascula*. A, side view of flower, with greater part of perianth cut away; B, front view of flower; C, pollinium and viscid disc; D, caudicles with the viscid discs lying within the rostellum; E, section through rostellum; F, packets of pollen-grains; a, anther; r, rostellum; s, stigma; l, labellum; n, nectary; p, pollinium; c, caudicle of pollinium; d, viscid disc.

according to Dr. Crüger,¹ provided with crests, which are gnawed by bees, as is commonly the case with the labellum of the Vandææ. In this case the bees have been determined by Mr. F. Smith, of the British Museum, to belong to the genus *Euglossa*. Dr. Crüger states that these bees may be seen in great numbers disputing with each other for a place on the edge of the "hypochil" or basal part of the labellum. Partly by this contest, partly, perhaps, intoxicated by their food, they fall into the bucket, which is half full of the fluid already mentioned. They then crawl along in the water towards the anterior side of the bucket, where they arrive at the spout. But, in order to extricate itself through this opening, the bee has to use considerable exertion, as the mouth of the

¹ Continued from p. 299.
² "The Various Contrivances by which Orchids are Fertilised by Insects." By Charles Darwin, M.A., F.R.S., &c., Second Edition, revised, with Illustrations. (London: J. Murray, 1877.)

¹ *Journal of Linnean Society, Botany*, vol. viii., 1864, p. 130.

"epichil," or upper part of the labellum, fits closely to the column and is very stiff and elastic. The first bee which is immersed will have the pollinia glued to its back by their viscid disc. Having escaped through the passage with this appendage, the insect then returns nearly immediately to its feast, when it is generally precipitated a second time into the bucket, passes out through the same opening, and thus inserts the pollinia into the stigma as it forces its way out, thereby impregnating either the same or some other flowers. Dr. Crüger states that he has seen so many of the bees taking part in this operation that there is a continual procession of them through the passage. "There cannot be the least doubt," says Mr. Darwin, "that the fertilisation of the flower absolutely depends on insects crawling out through the passage formed by the extremity of the labellum and the over-

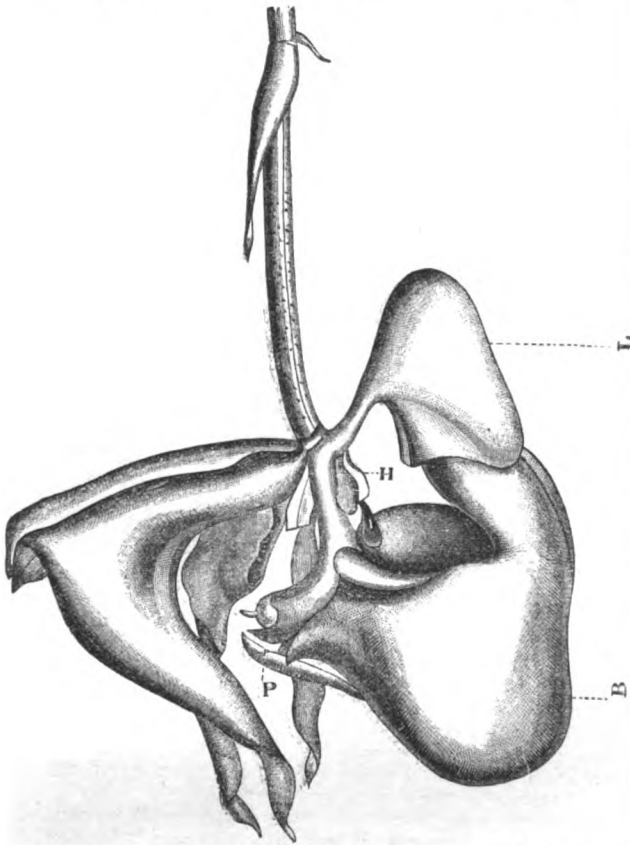


FIG. 2.—*Coryanthes speciosa* (after Lindley). L, labellum; B, bucket of labellum; H, fluid-secreting appendages; P, spout of bucket, over-arched by the end of the column bearing the anther and stigma.

arching column. If the large distal portion of the labellum or bucket had been dry the bees could easily have escaped by flying away. Therefore we must believe that the fluid is secreted by the appendages in such extraordinary quantity, and is collected in by the bucket, not as a palatable attraction for the bees, as these are known to gnaw the labellum, but for the sake of wetting their wings and thus compelling them to crawl out through the passage."

3. *Catasetum saccatum*.—The genus *Catasetum* belongs also to the sub-order Vandeeæ, and to a section of that order, the Catasetidæ, distinguished from all other orchids by several very remarkable peculiarities. In the first place it stands almost alone among all genera of orchids in having unisexual flowers; and so greatly do the male and female flowers—which are usually borne on different plants—differ from one another, that they were long

regarded as belonging to different species, or even genera; while, to complicate the matter still further, some kinds have a third hermaphrodite form differing greatly from either of the others. Thus *Catasetum tridentatum* (male), *Monachanthus viridis* (female), and *Myanthus barbatus* (hermaphrodite), are now known to be three forms of the same species. The second peculiarity of the male flowers of *Catasetum* is that they are provided with an extraordinary mechanical contrivance by means of which the pollinia are forcibly ejected on to the back of the insect, and thus carried to a female flower of the same species. There is no nectar in the male flower to attract insects; the ejection of the pollinia results from the accidental

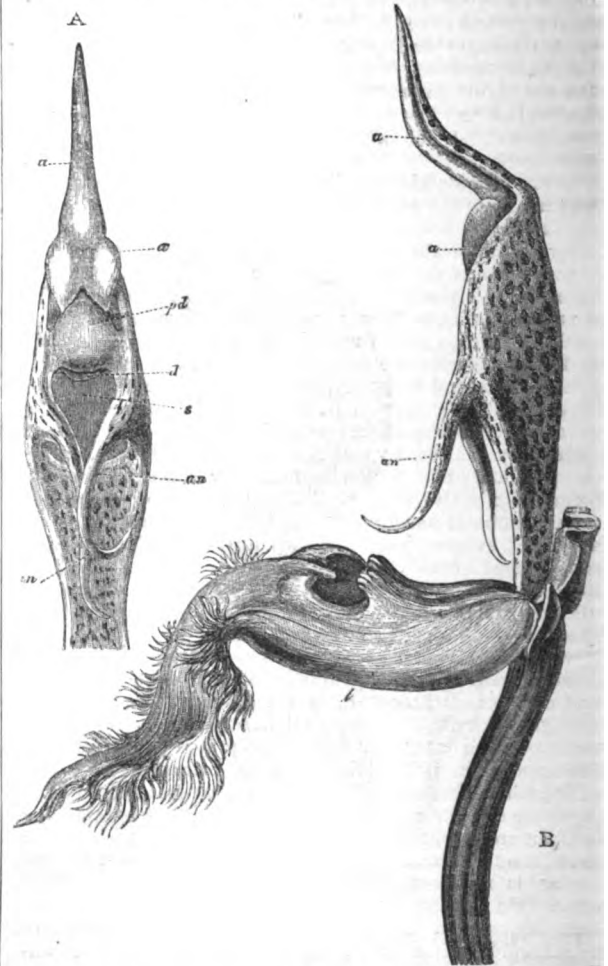


FIG. 3.—*Catasetum saccatum*. A, front view of column; B, side view of flower, with all the perianth except the labellum removed; a, anther; an, antennæ; d, viscid disc; l, labellum; pd, pedicel of pollinium; s, stigmatic chamber.

touching, by the wing of a passing insect or of one seated on the labellum for the purpose of gnawing it, of two long horns or antennæ, which occur in no other genus, and are placed in such a position that when touched by the insect the pollinia are projected on to its body, to which they adhere by their blunt and excessively adhesive point. The insect then flies away to a female plant, and while standing in the same position as before on the flower, the pollen-bearing end of the pollinia is inserted into the stigmatic cavity, and a mass of pollen left on its viscid disc. Mr. Darwin has examined five species of *Catasetum*, and finds that this is the only possible way in which they can be fertilised.

In the accompanying Fig. 3 (A being a front, B a side

view of a flower, from which all the perianth except the labellum has been removed), *a* represents the anther containing the pollinia, and prolonged above into a long point, *an* the antennæ, which are rigid, curved, hollow horns tapering to a point; but the two differ from one another in this respect, that the apex of the left-hand one bends upwards, while the right-hand one hangs down, and is apparently almost always paralysed and functionless; *l* is the labellum; *d* the disc of the pollinium, which is remarkably large and viscid; *pd* the pedicel of the pollinium; *s* the stigmatic chamber, which is of course functionless in the male flower. The action of the parts is thus described by Mr. Darwin:—When the left-hand antenna is touched, the edges of the upper membrane of the disc, which are continuously united with the surrounding surface, instantly rupture, and the disc is set free. The highly elastic pedicel then instantly flirts the heavy disc out of the stigmatic chamber with such force that the whole pollinium is ejected, bringing away with it the two balls of pollen, and tearing the loosely-attached spike-like anther from the top of the column. The pollinium is always ejected with its viscid disc foremost, and with such force that it is thrown to a distance of two or

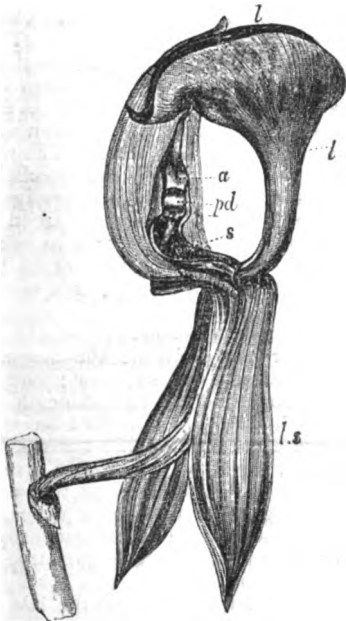


FIG. 4.—*Mormodes ignea*. Lateral view of flower with one of the sepals and one of the petals removed. *a*, anther; *pd*, pedicel of pollinium; *s*, stigma; *l*, labellum; *ls*, lateral sepal.

three feet. On one occasion Mr. Darwin touched the antenna of an allied species, *C. callosum*, while holding the flower at about a yard's distance from the window, when the pollinium hit the glass, and stuck by its adhesive disc to the smooth vertical surface. A series of experiments showed that even violent concussion of any other part of the flower except the antenna produced no effect whatever in disturbing the pollinia.

4. *Mormodes ignea*.—The genus *Mormodes* belongs also to the small family Catasetidæ; the pollinia are again violently ejected, as in *Catasetum*; but the mode in which this is effected is somewhat different, and very curious. The appearance presented by the flower is represented in Fig. 4. The base of the column is bent backwards, at right angles to the ovary, then resumes an upright position, and is finally again bent near the summit. It is also twisted so that the anther, rostellum, and the upper part of the stigma face one side of the flower, to the right or left, according to the position of the flower in the spike. In the drawing, *a* represents the

anther, which is elongated and triangular, but does not extend to the apex of the column. A group of spiral vessels runs up the column as far as the summit of the anther; they are then reflexed, and run some way down the anther-case. The point of reflexion forms a short thin hinge, by which the top of the anther-case is articulated to the column beneath its bent surface; and this hinge appears to be the sensitive portion of the structure, conveying any stimulus from a touch to the disc of the pollinia, and causing the ejection of the latter. *pd* is the pedicel of the pollinium, covering the rostellum; *st*, the stigmatic surface, which extends down to the base of the column, and is hollowed out into a deep cavity at its upper end; *l* is the very remarkable labellum, narrowed at the base into a nearly cylindrical foot-stalk, and its sides so much reflexed as almost to meet at the back, forming a folded crest at the summit of the flower. Near the summit it has a slight cavity, into which the summit of the column fits, fixing it in its place. The whole labellum is compared by Mr. Darwin to a cocked hat supported by a foot-stalk, and placed on the head of the column. *ls* are the two lower sepals, which hang down like wings; the upper sepal and one of the lateral petals have been cut off. By a number of experiments Mr. Darwin found that the minute hinge in the anther-case already described is the only portion of the flower that is sensitive to touch. When an insect lights on the folded crest of the labellum, the only convenient landing-place, he will lean over the front of the column in order to gnaw or suck the bases of the petals, which are filled with a sweet fluid. In so doing, he will disturb the summit of the column which fits into the cavity of the labellum; this will press on the hinge in the anther-case; the stimulus will then be conveyed to the pollinium-disc, and the pollinium will be violently ejected. Owing to the peculiar structure of the parts, guided by the hinge, which now serves a second function, the direction in which the pollinium flies is necessarily vertically upwards. If no object is in the way, it is projected perpendicularly up in the air, an inch or two above and close in front of the terminal part of the labellum, and would then alight on the folded crest of the labellum immediately above the column. But if the insect which has caused the disturbance remains in the same position, the pollinium will necessarily alight on his head, and will thus be carried off to fertilise another flower. The pollinium has, however, still the anther-cap attached to it; this drops off, as the pedicel dries on exposure to the air and gradually straightens itself from the almost hoop-shaped form which it bore when ejected; and when this has been done, the pollen-masses attached to the head of the insect are precisely in a position to strike against the stigmatic surface of the next flower visited.

Other instances, almost as extraordinary, could be cited of the special contrivances met with in species belonging to this order, to insure cross-fertilisation rather than self-fertilisation of the flowers. A. W. B.

THE MOVEMENT OF THE SOIL-CAP

AMID all their general tameness the Falkland Islands boast one natural phenomenon which is certainly exceptional, and at the same time very effective.

In the East Island most of the valleys are occupied by pale-grey glistening masses, from a few hundred yards to a mile or so in width, which look at a distance much like glaciers descending apparently from the adjacent ridges, and gradually increasing in volume, fed by tributary streams, until they reach the sea. Examined a little more closely, these are found to be vast accumulations of blocks of quartzite, irregular in form, but having a tendency to a rude diamond shape, from two to eight or ten or twenty feet long, and perhaps half as much in width, and of a thickness corresponding with that of the quartzite bands