SCIENCE.

The Movements and Habits of Climbing Plants. By Charles Darwin, M.A., F.R.S., &c. Second Edition, revised. (London: John Murray, 1875.)

THIS is an enlarged edition of the essay which first appeared in the ninth volume of the *Journal* of the Linnaean Society. Climbing-plants have already been the subject of interesting memoirs by Palm, Hugo von Mohl, and Dutrochet, and we have now a variety of most valuable observations made by Mr. Darwin upon more than a hundred widely-distinct species.

Mr. Darwin divides climbing-plants into four classes: those which twine spirally round a support, and are not aided by any other movement; those endowed with irritable organs, which, when they touch any object, clasp it; those which ascend merely by the aid of hooks; and, lastly, those which do so by means of rootlets. Neither of the two latter classes, however, exhibit any special movements, and the principal portion of Mr. Darwin's work is therefore devoted to plants belonging to the first two classes. These four principal modes of climbing are generally characteristic of distinct plants, though *Bignonia Tweediana* is a remarkable instance, inasmuch as it combines four different modes of climbing—namely, twining, leaf-climbing, tendril-climbing, and root-climbing. When plants climb by means of irritable organs, such organs may consist of modified leaves, branches, or, as in the case of the vine, of flower-peduncles: but these different classes sometimes graduate into one another. It is very interesting to observe that the homological nature of a tendril seems to make no difference in its mode of action. We should indeed, I think, be disposed to expect this from the interesting fact that climbing-plants are found among so many distinct orders of plants. Lindley divides phanerogamic plants into fifty-nine alliances, of which, without counting hook- or root-climbers, no less than thirty-five include true climbing-plants, to which a few cryptogamic forms must be added. The advantage to many plants of becoming climbers is very obvious, since they can in this manner reach the light, and expose a large surface of their leaves to its action and that of free air, with comparatively little expenditure of organised matter; and it is interesting to observe that, as Mr. Bates has pointed out, the tropical forests of America, which are so characterised by the abundance of arboreal mammals, also contain a large number of climbing-plants.

The power of climbing appears to depend upon the curious rotatory movements performed by the growing plants. Hofmeister has observed that the shoots and leaves of all plants, while young, move after being shaken, and Körner also has noticed that the flower-peduncles of a large number of plants, if shaken or gently rubbed, bend to one side. This rudimentary power of movement has, in Mr. Darwin's opinion, been specialised and perfected in the case of climbing-plants; and he thinks that leaf-climbers were, in the first instance, twiners, and subsequently became capable of grasping a support, which would be a great advantage to them. However this may be, it appears clear that the curious rotatory movements which are performed by the growing shoots of climbing-plants, and which are sometimes in the direction of the sun, but more often take the opposite course, are essential to the power of climbing.

Of these rotatory movements Mr. Darwin gives a most graphic account. For instance, speaking of an asclepiadaceous plant, belonging to the genus *Ceropegia*, he says:—

"I allowed the top to grow out almost horizontally to the length of 31 inches; this now consisted of three long internodes, terminated by two short ones. The whole revolved in a course opposed to the sun (the reverse of that of the Hop), at rates between 5 hrs. 15 min. and 6 hrs. 45 min. for each revolution. The extreme tip thus made a circle of above 5 feet (or 62 inches) in diameter, and 16 feet in circumference, travelling at the rate of 32 or 33 inches per hour. The weather being hot, the plant was allowed to stand on my study table; and it was an interesting spectacle to watch the long shoot sweeping this grand circle, night and day, in search of some object round which to twine."

In some cases, the plants really behaved almost as if they were alive:—

"Several times," says Mr. Darwin (p. 111), "I watched cases like the following: A tendril caught a thin stick by the hooks of one of its two extreme branches; though thus held by the tip, it still tried to revolve, bowing itself to all sides, and by this movement the other extreme branch soon caught the stick. The first branch then loosed itself, and, arranging its hooks, again caught hold. No other branches, as the tendril then stood, could possibly have touched the stick. But, before long, the upper part of the main stem began to contract into an open spire. It thus dragged the shoot which bore the tendril towards the stick; and as the tendril continually tried to revolve, a fourth branch was brought into contact. And, lastly, from the spiral contraction travelling down both the main stem and its branches, all of them, one after another, were ultimately brought into contact with the stick. They then wound themselves round it and round one another, until the whole tendril was tied together in an inextricable knot."

It is also curious that tendrils which would thrive and thicken if they met with a suitable support, die and drop off like a leaf in autumn if they fail to find such an object of attachment. The sensibility of some tendrils is very remarkable. In one case Mr. Darwin found that a loop of thin thread, only $\frac{1}{18}$ of a grain in weight, caused a temporary flexure. In another a touch with a pencil, so gentle as only just to move a tendril borne at the end of a long flexible shoot, was sufficient to cause it to become perceptibly curved in four or five minutes: but it is curious that tendrils which are drawn across one another do not catch, nor are they affected by drops of rain. Mr. Darwin found in several plants that a shower from a syringe, which instantly caused the leaves of a Mimosa to close, had no effect upon the tendrils of a passion-flower; whereas a loop of thread weighing $\frac{1}{33}$ of a grain, which caused the tendrils to become curved, had no effect upon the leaves of a Mimosa; a fact which curiously shows how the sensitiveness has become differentiated in different plants. In Mr. Darwin's opinion leaf-climbing plants were originally twiners, and tendril-bearers were originally leaf-

climbers; and certainly the disposition of the climbing species in the different natural orders lends a strong support to this view. Gradations of structure also are very interesting. Thus, among leaf-climbers, in the *Fumariaceae*, we have a most interesting gradation. The terminal leaflets of *Fumaria officinalis* are no smaller than the rest; in *Adlumia cyrrhosa* they are greatly reduced; in *Corydalis claviculata* they have become microscopical; and, finally, in *Dicentra* the tendrils have become perfectly characterised.

We have not space for more illustrations, but we trust that the facts above quoted will be sufficient to show the great importance of Mr. Darwin's work on Climbing Plants, and that its interest is by no means confined only to the student of Botany.

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