BOOKS RECEIVED.

THE POWER OF MOVEMENT IN PLANTS. BY CHARLES DARWIN, LLD., F. R. S., assisted by FRANCIS DARWIN. D. Appleton & Co., Bond street, New York. 1881.

The announcement of a new work from Dr. Darwin brings joy to the heart of every naturalist, and the present volume will be much cherished by botanists, because it introduces a line of research which is comparatively unworked and one which promises interesting results to those who have time and patience to continue it.

The object of Dr. Darwin in writing this book was to describe and connect together several large classes of movements common to almost all plants, which is chiefly noticed in climbing plants, the tips of which revolve, bending successively to all points of the compass. This movement is called by Darwin *circumnutation*, and a plant is said to *circumnutate*.

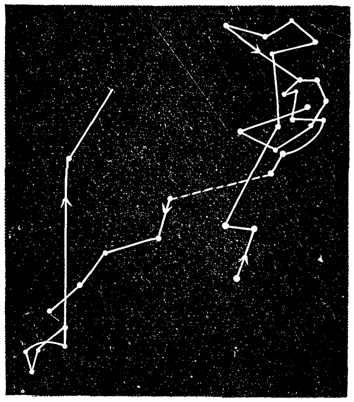
In the course of the present volume it is shown that all growing parts of every plant are continually circumnutating, though often on a small scale. Even the stems of seedlings before they have broken through the ground, as well as their buried radicles, circumnutate, as far as the surrounding earth will permit. In this universally present movement we have the groundwork or basis for all the varied movements which are essential to the requirements of plant life.

Thus the great sweeps made by the stems of twining plants, and by the tendrils of other climbers, result from a mere increase in the amplitude of the ordinary movement of circumnutation. The position which young leaves and other organs ultimately assume is acquired by the circumnutation movement being increased in one direction. The leaves of various plants are said to sleep at night, and it is shown that their blades then assume a vertical position through modified circumnutation in order to protect their upper surfaces from being chilled through radiation. The movements of various organs to or from the light are all modified forms of circumnutation, as are the equally prevalent movements of stems, &c., toward the zenith, and of roots toward the centre of the earth. The method of observation employed by Darwin is thus explained:

" Plants growing in pots were protected wholly from the light, or had light admitted from above, or on one side as the case might require, and were covered above by a large horizontal sheet of glass, and with another vertical sheet on one side. A glass filament, not thicker than a horsehair, and from a quarter to three-quarters of an inch in length, was affixed to the part to be observed by means of shellac dissolved in alcohol. The solution was allowed to evaporate until it became sufficiently thick to set in two or three seconds, and it never injured the tissues, or even the tips of tender radicles. To the end of the glass filament an exceedingly minute bead of black sealing wax was cemented, below or behind which a bit of card with a black dot was fixed to a stick driven into the ground. The weight of the filament was so slight that even small leaves were not perceptibly pressed down. The bead and dot on the card were viewed through the horizontal or vertical glass plate (according to the position of the object), and when one exactly covered the other, a dot was made on the glass plate with a sharply-pointed stick dipped in thick Indian ink. Other dots were made at short intervals of time, and these were afterward joined by straight lines. The figures thus traced were therefore angular, but if dots had been made every one or two minutes, the lines would have been more curvilinear, as occurred when radicles were allowed to trace their own courses on smoked glass plates. To make the dots accurately was the sole difficulty, and required some practice. Nor could this be done perfectly when the movement was much magnified, say 30 times and upward, yet even in this case the general course may be trusted."

To make this clear we give a diagram of one of the most simple of Darwin's experiments, and the following further explanation:

"*Brassica oleracea*" (cruciferæ.)—Radicle. A seed with the radicle projecting .05 inch was fastened with shellac to a little plate of zinc, so that the radicle stood up vertically; and a fine glass filament was then fixed near its base, that is, close to the seed coats. The seed was surrounded with little bits of wet sponge, and the movement of the bead at the end of the filament was traced (see figure) during sixty hours. In this time the radicle increased in length from .05 to .11 inch.



Brassica oleracea, circumnutation of radicle traced on horizontal glass from 9 A. M., January 31, to 9 P. M., February 2. Movement of bead at end of filament magnified about forty times.

We trust that those who would take up this subject will consult this work, as the amount of detail there given is most essential to a thorough comprehension of this study, but in case any of our readers are unable to do so, the explanation we have given may suffice.

The chapters on the sleep of plants are most interesting and instructive, and many discoveries relating to this phenomenon are presented.

There are also certain movements in plants which are not due to circumnutation, such as when a leaf of the Mimosa is touched it suddenly assumes the position as when asleep, but this movement occurs from a different cause to that which produces the sleep of plants. The sleep movement of plants is due to modified circumnutation; this would not happen from a touch.

Space will not permit us to further describe this important branch of the subject, but we hope on a future occasion to again refer to it, and offer some illustrations of the most striking instances. But as Mr. Darwin observes, it is impossible not to be struck with the resemblance between the sleep movements of plants and many of the actions performed unconsciously by the lower animals. With plants an extraordinarily small stimulus suffices; and even with allied plants one may be highly sensitive to the slightest continued pressure, and another highly sensitive to a slight momentary touch. But the most striking resemblance is the localization of their sensitiveness and the transmission of an influence from the excited part to another which consequently moves. Yet plants do not of course possess nerves or a central nervous system; and we may infer that with animals such structures serve only for the more perfect transmission of impressions, and for the more complete intercommunication of the several parts.

INFLUENCE OF THE VENTILATION OF MUST UPON ALCOHOLIC FERMENTATION.—E. Rotondi considers that ventilation mechanically promotes the decomposition of the sugar, and acts also chemically, because the albumenoid bodies are transformed into more diffusible matters, and because oxygen by increasing the quantity of ferment indirectly intensifies the fermentation.