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Literature.

THE POWER OF MOVEMENT IN PLANTS. By Charles Darwin, LL.D., F.R.S., Assisted by Francis Darwin. With Illustrations. London: John Murray.

One of the defects of the evolution theory has hitherto been the lack of any trace of something in plants corresponding with the brain and nervous system in animals. Mr Darwin endeavours in his new volume on the movement of plants to remove, in part at least, this difficulty. The chief object of the present work is to describe and connect together several large classes of movement common to almost all plants. The most widely prevalent of these is revolving nutation, or, as it is here termed, circumnutation, the nature of which is thus described :—

"If we observe a circumnutating stem, which happens at the time to be bent, we will say towards the north, it will be found gradually to bend more and more easterly, until it faces the east, and so onwards to the south, then to the west, and back again to the north. If the movement had been quite regular the apex would have described a circle, or, rather, as the stem is always growing upwards, a circular spiral. But it generally describes irregular elliptical or oval figures, for the apex, after pointing in any one direction, commonly moves back to the opposite side, not, however, returning along the same line. Afterwards other irregular ellipses or ovals are successively described, with their longer axes directed to different points of the compass. Whilst describing such figures the apex often travels in a zigzag line, or makes small subordinate loops or triangles. In the case of leaves the ellipses are generally narrow."

The primary cause of circumnutation is not, Mr Darwin tells us, as has been supposed, the increased growth of the side, which becomes for a time convex, but the increased turgescence of the cells, together with the extensibility of their walls. In the course of the volume it is shown that apparently every growing part of every plant is continually circumnutating. It is also shown that most of the movements of plants depend on modified circumnutation, and that those which have an independent origin are not so different as at first sight appears. A very elaborate treatment of the whole subject is thus summed up :—

"It is impossible not to be struck with the resemblance between the foregoing movements of plants and many of the actions performed unconsciously by the lower animals. With plants the astonishingly slight 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. The habit of moving at certain periods is inherited both by plants and animals, and several other points of similitude have been specified. But the most striking resemblance is the localisation 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."

We cannot but admire Mr Darwin's capacity for original research, his fine powers of minute observation, his patient toil in amassing particulars as exhibited in this volume; and we readily accept the results arrived at by so competent an investigator. But while we accept his scientific results, we are not satisfied with the accuracy of the conclusions which he draws from these. His strongest point seems to be that "there is always movement in progress, and its amplitude or direction, or both, have only to be modified for the good of the plant in relation with internal or external stimuli;" and that this, taken in conjunction with the resemblance between the movements of plants and animals, amounts to a presumption in favour of evolution. But it may be argued, on the other hand, that the progress to which he refers is strictly limited, and that the points of resemblance are insignificant when viewed in the light of the difference which exists between plants and animals. Although Mr Darwin only incidentally refers here [illegible] question shows the [illegible] And we think the author has been singularly unsuccessful in adducing anything which would point even to the possibility of such a theory as applied to plant life. We are confronted with the same initial difficulty, great and insurmountable, as in the case of animal life—the want of the semblance of progress. Mr Darwin and his followers, who ridicule the simple faith of the believer in the supernatural theory of the universe, show themselves to be the most credulous of mortals. It is the boast of science that it alone deals with certainties, yet the present volume is only one of many which prove that the highest scientific attainments may coexist with a theory of the universe which at the best is only a plausible guess.

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THE FORMATION OF VEGETABLE MOULD THROUGH THE ACTION OF WORMS.*

MR. DARWIN'S books are always interesting, not only from the controversy that has gathered round his name, but from the patient research and aggregation of minute facts which they are sure to display. These were never more strikingly exhibited than in the present volume. The facts are, even for Mr. Darwin, specially minute, relating to the habits of creatures usually left out of sight even by the keenest lovers of nature; and the time devoted to gathering them has been unusually long, the observations beginning in the year 1827, ten years after which date Mr. Darwin read a paper on the subject before the Geological Society of London. Moreover, the book is not marred by any of those risky, startling utterances which have thrown so much discredit on science, and have caused such heart-burnings in rival schools of thought. There is not a hint of evolution or development; the worm, whether he was created what he is, or whether he ceased to change after he had found suitable surroundings, has been a worm through long geological eras, and all that time he has been working for the good of man—"has taken a large share in the formation of the layer of vegetable mould which covers the whole surface of the land in every moderately humid country." This mould is so largely his work that it might better (Mr. Darwin thinks) be called animal than vegetable.

Surely, here is a clear instance of design. Our author says nothing directly about it; but no candid reader, no one whose mind is not unalterably made up the other way, can fail to see in the share which Mr. Darwin shows the worm has had in the economy of nature a striking instance of the adaptation of means to ends.

He begins by briefly but lucidly describing the creature to whom man owes so much; and in this, as in other parts of his book, he manages to write with thorough scientific accuracy, and yet with scarcely any scientific terms. This will increase the popularity of the book, and might well be imitated by writers who think it needful to enwrap their meaning in a net-work of long words and hard phrases.

Worms are found everywhere—in Iceland, in Kerguelen's Land, high up on the Himalayas, in the plains of Bengal. In England, they *seem* most numerous (to judge by their castings) in the poor soil of chalk-downs; but it is calculated that in garden-ground they are twice as numerous as elsewhere. Their habits are nocturnal—those that we meet wandering about by day are sick, generally affected by the parasitic larvæ of a fly. They have a gizzard (some species have several), in which, like fowls, they triturate, by the help of small stones, the earth that they swallow, and extract from it all the organic portion. This is the work which entitles them to the gratitude of man. For ages before he came upon the earth they have been manufacturing the fine mould on which the growth of plants depends, pulverising it over and over again, bringing it constantly up to the surface, transforming the very rocks (on all of which the acids it secretes have some effect) into serviceable soil. Worms breathe through their skin; and their intestines (on the principle of an intestine within an intestine) are so arranged that a very large absorbent surface is gained. They have an apology for a brain, viz., two cerebral ganglia near the anterior end of the body; and their brain power is sufficient to enable them to fix their attention. Thus, though eyeless, they are not insensible to light. A bright flash falling on them generally sends them to their holes at once—unless they are working or otherwise engaged, in which case they do not seem to notice the light. But Mr. Darwin, we shall see, credits them with greater powers than that of mere attention. Indeed, after reading his chapter about their intelligence, as shown by the knowing way in which they laid hold of his paper triangles, we can hardly help concluding that worms must rise in the scale; they have actually a sagacity and intelligence, as opposed to instinct, which the ant

* "The Formation of Vegetable Mould through the Action of Worms." With Observations on their Habits. By Charles Darwin, LL.D., F.R.S. With Illustrations. (Murray.)

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