

DARWIN ON MOULD AND WORMS.*

NO man of science of our day understands better, or applies more thoroughly, than Darwin, the principle laid down by Lord Bacon, that "Man, as the minister and interpreter of nature, does and understands as much as his observations on the order of nature permit him, and neither knows nor is capable of more." To one who rightly apprehends this, the fundamental principle of modern scientific research, small things are great, so only that they illustrate the order of nature, are alike worthy of study. He may vary his survey over the depths of space, or into the structure of a microscopic creature; he may extend his view into the remote past and the distant future, or he may limit the range of his vision to phenomena taking place in a second or in a yet shorter time: but only in so far as his purpose is to determine the order of nature's works, is he the true minister and interpreter of nature. The modern student of science, following this principle, in its strong contrast with the philosophers of the Greek school, who, little disposed to persevere observations, evinced, as Humboldt has said, "inexhaustible fertility in giving the most varied interpretation of half-perceived facts;" and, as Bacon himself said, "Laid their whole stress upon intense meditation, and a continual exercise and perpetual agitation of the mind;" and so were led to frame systems on insufficient knowledge, and to explain false systems by false hypotheses. Doubtless, a philosopher of that school would have looked with contempt on a Darwin studying the movements of plants, the ways of bees, the breeds of pigeons, and analysing the play of features in joy or in sorrow, in anger or in pleasure. It would have seemed to him far worthier to culve from his moral conclusions ideas as to the true position of worms in the scale of being, than to devote years to the actual study of their ways and works. But by the humbler and more laborious method the student of science in our day manages to attain, or at least approach, the truth; the more brilliant philosopher of the older school eaded from his active mind multitudinous errors.

Darwin's latest treatise, on Vegetable Mould and Earthworms, affords perhaps the best illustration of his method of all the works that he has yet published. His "Origin of Species" and "Descent of Man" mark an epoch in science; but such a work as the present illustrates the way by which the new paths have been entered. It is true no one can read those epoch-making works without recognizing in every page the kind of work on which their author's mind has been engaged while establishing his theories, or the tone of modern scientific thought. But results have there to be touched on which, in a work like his "Monograph on the Cirripedia," "The Movements and Habits of Climbing Plants," and, above all, the present treatise, are exhibited in detail.

Fifty-four years ago Darwin announced the first results of his study of the formation of vegetable mould, in a paper read before the Geological Society of London. In the interval which has elapsed since then he has been accumulating the stores of knowledge about mould and mould-makers which are presented in the work now before us.

Perhaps the most remarkable results of Darwin's observations in the "stupendous work" accomplished by creatures so small and weak. It was objected against the views which he published in 1837, that worms could not possibly bury to

a depth of several inches fragments of cinders, burnt marl, &c., which had been strewn over the surface of meadow land. But now Darwin is able to speak confidently of their burial of the remains of Roman villas and pavements. He shows also how ancient encampments and tumuli have been gradually lowered by the agency of worms. Grass-covered slopes undergo perpetual denudation through their operations, the covering of grass remaining all the time intact, and even the inclination of the slope remaining unchanged. It may well seem incredible to the superficial reasoner, that creatures like worms,—small, weak, and soft-bodied,—should produce such results; nay, results far greater in the course of time, changing as they do the entire aspect of a country. It is this facility, as Darwin well remarks, "to sum up the effects of a continually recurring cause, which has often retarded the progress of science, as formerly in the case of geology, and more recently in that of the principle of evolution." When men like Sir John Herschel or Sir Charles Lyell have spoken of the effects of slowly-acting causes in modifying continents and seas, they have been ridiculed by the thoughtless, who cannot see how the downward rain, the slow movement of rivers, the play of waves on shore-lines, can produce such results. In like manner the biologist is ridiculed who, noting small changes in various races in short periods (or even in periods which to our conceptions seem long), points to the effect of such changes when multiplied during the lapse of those long periods of time of which the earth's crust tells us. But our author has shown how even creatures so tiny and weak as the coral animal have made large islands and long lines of sea-animaling reef, by constant labour; and now he shows how under our very feet the despised earthworm is changing the form and nature of the land we live on. When we learn that the rich dark mould in which vegetation thrives best, is made by worms, we see that not only the aspect of a country, but the condition of its inhabitants, and even its history, have been modified by their work. So that we may accept in its widest significance his remark that "It may be doubted whether there are many other animals which have played so important a part in the history of the world as have these lowly creatures."

The study of the habits of worms in this work is full of interest. As in nearly all the author's books, the language is clear and simple. It may be said indeed of this treatise, presenting the fruit of observations so long continued on a subject apparently so little promising, that great though its scientific value unquestionably is, it is better fitted than nine-tenths of our works of fiction to while away a weary hour. It merits, however, more than mere reading. It is a work not to be tasted merely, but to be chewed and digested.

We shall hereafter return to this work, to consider more at length some of the interesting results of Mr. Darwin's researches.

ARRANGEMENT OF ELECTRICITY.—The public hardly realises, as yet, a tenth part of the uses to which electricity can be readily and conveniently adapted; and exhibitions will furnish the best possible means of rendering them familiar with those uses, which, in many cases, are of an essentially domestic character. Electric bells, for example, although almost universal in large hotels, offices, and public buildings, make way but slowly in private houses, notwithstanding their many advantages. Telephones, in like manner, are far less numerous than they ought to be; and many forms of electrical arrangement quite common in the United States, are found to have great value in saving labour, are scarcely at all in use among ourselves. The electric light is not yet employed in many places for which it is eminently suitable; and its employment is still impeded by difficulties of detail which a larger demand would set aside.—Times.

* "The Formation of Vegetable Mould through the Action of Worms, with Observations on their Habits." By CHARLES DARWIN, LL.D., F.R.S. (London: John Murray, 1881.)