RECORD: Anon. 1881. The plough of the animal world. *The Spectator* (22 October), pp. 1334-6.

REVISION HISTORY: Transcribed by Christine Chua and edited by John van Wyhe. 1.2020. RN1.

NOTE: See http://darwin-online.org.uk/converted/pdf/1881_Worms_F1357.pdf

[page] 1334

THE PLOUGH OF THE ANIMAL WORLD.

MR. DARWIN has written another of those wonderful books in which he works out the cumulative effect of an apparently very minute cause when multiplied by an immense multiplier,—first, in number, and then in duration,—and shows us that so accumulated, it is of enormous, instead of very minute, significance. The cause whose effect on our planet he takes for his subjects is the work of the Earth-worm,—a totally blind

* The Formation of Vegetable Mould through the Action of Worms, with Observations on their Habits. By Charles Darwin. London: John Murray.

[page] 1335

creature, with very poor senses of any kind; and the results which it produces on the distribution of the soil on the surface of the globe, he proves to be immense. Mr. Darwin believes, on evidence which seems very satisfactory to his readers, that each English earth-worm probably passes, on an average, about twenty ounces of matter through its body in the course of a year; but then it brings that quantity of matter to the surface of the earth, and there deposits it, and brings it up in a form very different from that in which that matter existed before it passed into the worm. In the first place, the earth is finely triturated in the gizzard of the creature, and triturated with the fibrous parts of the leaves on which it feeds, and with which it lines its burrows, so that the mould which results is what we know as vegetable mould, a totally different substance for the purposes of the farmer and the gardener from the substance on which the worm first begins to act. Mr. Darwin, however, shall tell us in his own words what he has proved the result of the earth-worm's work to be:—

"Worms have played a more important part in the history of the world than most persons would at first suppose. In almost all humid countries they are extraordinarily numerous, and for their size possess great muscular power. In many parts of England a weight of more than ten tons (10,516 kilogrammes) of dry earth annually passes through their bodies, and is brought to the surface, on each acre of land; so that the whole superficial bed of vegetable mould passes through their bodies, in the course of every few years. From the collapsing of the old barrows the mould is in constant though slow movement, and the particles composing it are thus rubbed together. By these means fresh surfaces are continually exposed to the action of the carbonic acid in the soil, and of the humus- acids which appear to be still more

efficient in the decomposition of rocks. The generation of the humps-acids is probably hastened during the digestion of the many half-decayed leaves which worms consume. Thus the particles of earth forming the superficial mould are subjected to conditions eminently favourable for their decomposition and disintegration. Moreover, the particles of the softer rocks suffer some amount of mechanical trituration in the muscular gizzards of worms, in which small stones serve as mill-stones When we behold a wide, turf-covered expanse, we should remember that its smoothness, on which so much of its beauty depends, is mainly due to all the inequalities having been slowly levelled by worms. It is a marvellous reflection that the whole of the superficial mould over any such expanse has passed, and will again pass, every few years through the bodies of worms. The plough is one of the most ancient and most valuable of man's inventions; but long before he existed the land was, in feet, regularly ploughed, and still continues to be thus ploughed, by earth-worms. 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-organised creatures."

When we consider that a single earth-worm is not supposed to pass more than twenty ounces of earth through its body in the year, such a total result as this seems almost incredible. But then we must remember that from at least 20,000 to 30,000 of these creatures are believed to be at work on every acre of British earth suit- able for their activity, and that in Great Britain there are 32,000,000 millions of such acres. If ten tons of earth pass through these creatures on every one of such acres in the year, 320,000,000 of tons of earth are brought to the surface by them in Great Britain alone, in a single year; and when this large weight of soil is multiplied by the number of years during which their agency has certainly been at work,—Mr. Darwin thinks a million years not at all an extravagant estimate,—the effect that they have produced in making the vegetable mould of the world can hardly be exaggerated.

For ages before man appeared on the earth, the soil in which his food was to be produced was being ploughed by millions of infinitesimal ploughs, which not only crumbled the soil into much finer particles than our ploughs can crumble it but also essentially altered its chemical constitution, so as to make it infinitely better adapted for raising those richer products which higher organisations need.

We call attention to the subject, however, not, of course, because we can add anything whatever to the evidence adduced by Mr. Darwin, or to the physical inferences which he has so acutely deduced from that evidence, but because he has said nothing concerning what seems to us one of the most important of the aspects of the case,—the bearing of this discovery of his on what is ordinarily called the argument adduced to prove conscious Design in Nature. Hitherto, the tendency of Mr. Darwin's writings has been declared by the great school of Continental Atheism to be all in favour of their materialistic view of Nature. It has been shown, they think, that what was mis- taken for anticipatory purpose by our older naturalists, was no- thing but the selective tendency, necessarily resulting from the great conflict for existence, to favour such variations in organisation as help the individual to live,

and to extinguish such variations in organisation as render the individual less fit for the great mêlée. It has often been pointed out that, though this criticism would have some weight as regards all those variations which benefit the individual even in their initial and immature state, it has no weight as regards those variations in organisation which do not benefit the individual at all until they are complete. The sensitiveness of a nerve, for instance, is supposed to be the rudimentary stage of a new perception; but though a new perception of the outside world, so soon as it is really complete, would constitute an immense advantage to the creature possessing it, a new sensitiveness which carried no new perception of external things, might well constitute one of the greatest conceivable disadvantages in the conflict for existence.

This consideration, however, has not forced itself strongly upon the minds of materialistic Atheists, probably because we know too little of the history of the initial stages of those organs which; in their mature stage, are of the greatest advantage to the animal world, to bring its drift impressively before the imagination. In the case, however, of the subject of Mr. Darwin's present study, it appears perfectly clear that the benefit conferred on the world at large by the work of the earth-worm is almost in inverse pro- portion to the benefit conferred upon the individual by that work. In other words, the more earth passes through the worm in proportion to the nourishment which it receives, the more benefit is conferred on the world at large, the more ploughing is done by the earth-worm for the bene- fit of other creatures, and the more is the soil chemically improved by its agency. Yet, of course, the less work the worm has to do for its own adequate nourishment, the better would be its chance of obtaining that nourishment, and of multiplying its species. We gather, indeed, from. what Mr. Darwin says, that part of the essential structure of earth- worms—the gizzards, in which the earth is powdered, by being crushed up with the little stones swallowed for this purpose— is provided solely for the execution of this extra work, and is not to be found at all in other varieties of the species which live in mud or water, and feed exclusively on dead or living vegetable, matter, without taking the trouble to grind down an enormous proportion of unnutritious soil, for the sake of the very minute fragments of organic matter which it may happen to contain.

The function of earth-worms in their ordinary state appears to be closely analogous to that of the miners who grind quartz for the sake of the grains of gold which they find scattered through it, but with this difference, that the miners do not know how to find the grains of gold in equally large supplies in any other way; while the earth-worms, but for the instinct which compels them, at certain parts of the year, to swallow so large a quantity of earth, would find a much richer supply of the nourishment most suitable to them on the surface of the ground; without passing so much that, to them, is pure waste through the mill, for the sake of so minute a proportion of food. It seems perfectly clear, then, that the instinct of the earth-worm, has its, end, mainly, not in the good of the individual which door that work, but in the good of other and more highly organised beings, who did not even begin to exist on the earth for ages upon ages after the earth-worm had been preparing the surface of the

planet for their appearance. These creatures pierce and grind down and bring to the surface the particles of the earth, not for their own good mainly,—for they could obtain that good equally well, at far less expense of labour, if, like the mud and water worms, they fed on vegetable matter only,—but for the ultimate good of Man. The earth-worms are the ploughs by which the surface of the globe was being prepared to yield Man harvests long before either we or our harvests had been even conceived, except in the mind of that Eternal Wisdom to which the future is present, and the present contains the augury of the future. No one, we think, can read Mr. Darwin's remarkable book without being convinced that the Earth-worm works less for itself than for the future of the globe it inhabits, and would have been quickly superseded in the conflict for existence by some other creature whose organisation is more economically adapted to secure solely its own nourishment and multiplication, had not the plan of the Universe included a deliberate preparation for slowly approaching, but still distant, ages as well as for the immediate future. Mr. Darwin, at least, clearly regards the borings of the earth-worm as finding their explanation in the course of millions of years, rather than in the immediate advantage of the creature which undertakes these beneficent feats of disinterested skill. He indicates clearly that so far as regards the good of the creature itself,

the work of the earth-worm, so far from being economical, so far from conforming to the rule of attaining the maximum of good at the minimum of cost to itself,—which is the rule which qualifies for selection under the high pressure of conflict for existence,—presents a case of an immense waste of labour, although that waste of labour turns out, when interpreted by the light of other creatures' organisations and experience, to be a remarkable economy of force. Still, the moment any economy is admitted to be an economy only to one who can foresee the future, the materialistic view of the Universe is given up. What made the Continental atheists welcome Mr. Darwin's doctrine of selection by conflict for existence, with so much delight, was this, that it appeared to furnish an explanation of terrestrial progress, without implying or imputing any foresight or anticipation of the future in the creative forces of the present. What these materialistic fanatics will say to Mr. Darwin's present treatise, we do not yet know. But we fancy they will find it nearly impossible to explain the organisation of these minute but marvellous ploughshares of Nature, which not only plough, but enrich the soil they cleave, without admitting that their most important functions seem to be directly adapted much less to any advantage which they themselves extract from the exercise of those functions, than to the advantage of creatures which did not exist upon the Earth till ages upon ages after they had been preparing its surface for the heir of these dis- interested and most fruitful labours.