MR DARWIN ON WORMS.

A year ago Professor Darwin gave us the strange results of a long series of observations on the movements of plants, and now he has even stranger things to tell us as to the work of worms on our earth. His new work embodies the results of something like half a century's observations and experiments. Mr Darwin has given us reason to believe that probably nothing walks this earth 'with aimless feet', and that 'unintelligent' plants have something astoundingly analogous to a brain, and that their tiniest movements are all directed to a well-defined end. And now in the volume before us he has taught us to be cautious in calling anything common or unclean. If in his work on "The Descent of Man" he 'put down the mighty from their seats,' in that just published he has certainly 'exalted them of low degree.' 'It may be doubted,' Mr Darwin says, '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.' Indeed, Mr Darwin declares that these worms are among the greatest benefactors of humanity. They are nature's ploughmen; and had it not been for the work they have done through long ages, in many parts of the world, there would have been nothing for the plough to work upon. Mr Darwin gives us first of all a clear account of the structure of the worm, which is more elaborate and beautiful than it seems. It has no eyes and no ears, but has a digestive system of some little complexity, including something very like a gizzard. Everyone knows the difficulty of pulling a worm out of its hole; it will rather break than yield, and this is owing to a multitude of tiny bristles that fix themselves against the sides of the hole. Worms may have a sense of smell, and certainly have one of taste, as is proved over and over again by their preference for certain kinds of food. Where they can get them, their staple food seems to be leaves, though they are specially partial to onions. These leaves they drag down into their holes, not only for food, but to line the mouths of their holes with, probably for the sake of keeping their bodies from the cold earth. And in the methods followed by the worms in dragging leaves thus down through their holes, Mr Darwin discovers clear traces of intelligence, of a

thus down through their holes, Mr Darwin discovers clear traces of intelligence, of a faculty for adapting means to an end. The holes themselves exhibit workmanship of some elaboration, they are carefully lined often with a thin layer of fine, dark-coloured earth, which, when carefully smoothed, makes the holes fit easily, but perfectly, to the body of the worm. Often their holes are covered with a tiny heap of small stones, and sometimes they are plugged up by the stalks of leaves that have apparently been on purpose placed in proper position. But these and many other details as to the structure of worms and their habits are all preliminary to to the great purpose of the work, which is to show that what is generally called 'vegetable' mould is almost solely the work of these worms, and is, therefore, more animal than vegitable. They are constantly swallowing earth and tiny stones, and passing them through their bodies to the surface in a finely triturated and fertilised condition; in fact, they may be said to manure the earth inside their own bodies. By means of this process the entire earthy surface of a country is constantly in a state of change. The whole earth underneath our feet all over the world is swarming with worms; probably all over there are in every acre of land from 35,000 to 50,000 worms. Everyone is familiar with the casts of worms, which themselves look like worms of earth. With so many worms at work, then, it is not difficult to imagine what will be the effect of a constant accumulation of such casts. In some cases, if spread over the ground, they would measure, onefifth of an inch in depth per year, equal to 1 inch of earth brought up from below, passed through the bodies of worms, and deposited on the surface in five years. In one instance given by Mr Darwin 12 ozs. of castings were thrown up in a year on a square foot, or 6·75 lbs. on the square yard, equal to 14⅓ tons of so-called fertile "vegetable" mould over an acre in one year. The millions of leaves and other vegetable matter dragged by the persevering creatures underneath the soil, whether passed through their bodies or not, form a splendid natural manure. Not only so, but "the bones of dead animals, the harder parts of insects, the shells of land mollusca are before long all buried beneath the accumulated castings of worms, and are thus brought in a more or less decayed state within reach of

a more or less decayed state within reach of the roots of plants." The worm burrows generally do not go beyond a few inches beneath the surface, though not unfrequently they have been found at the depth of several feet, and thus, it is supposed, materially aid the drainage and allow the air to penetrate deeply into the ground. They are even a powerful factor in geology, performing a great part in the disintergration of rocks, not simply by direct action on the softer kinds, but by the indirect action of the acids which get mingled in their bodies with whatever they swallow, and which will have a slow, but ultimately powerful effect on even hard rocks. Not only the farmer, but the archæologist ought to be grateful to the worm for the work it has done, Mr Darwin shows that large stones, and even paved walks, when left undisturbed, have in the course of a few years been completely buried beneath the cast of worms. To this cause we owe the preservation of part of the floor of Beaulieu Abbey, and the recumbent huge stones of Stonehenge have sunk partly underground owing to similar action. Not only so, but Mr Darwin shows that there is the greatest probability that whole towns, like the old Roman towns of Silchester and Uriconium, owe their preservation for the inspection of modern archæologist to a large extent to the ceaseless work of generations of these lowly creatures, showing the stupendous effect of a continually recurring cause, even when it seems almost infinitesimally small. No one can rise from the study of Mr Darwin's new work, which is one of the most interesting he has written, without thenceforth feeling something like tenderness and respect for the hitherto loathed worm, even if he hesitates to credit it with all the stupendous feats which its advocate attributes to it. Mr Darwin has elevated the creature from a cumberer of the ground to the rank of a benefactor of our race, and has by his researches thrown another fresh flood of light upon the workings of nature.