

The Little Busy Worm.

Commenting on Mr. Darwin's recent work on earth worms and the part they play in preparing soil for the production of crops, the *New York World* says: This is an age of disillusion and rehabilitations in the animal kingdom as well as elsewhere, and after Sir John Lubbock has demonstrated that the sluggard who goes to the ant for instruction will select a teacher decidedly selfish, and on the whole rather stupid, comes Mr. Darwin, and in one of the most fascinating even of his books, demonstrates that the little busy bee is not nearly so busy and beneficent as the earthworm. The earthworm, which in the eyes of most men—it might even be said of most naturalists—appears as a mere blind, dumb, senseless and unpleasantly slimy annelid, comes forth under Mr. Darwin's patronage as a personage of intelligence and industry—the creator of our fertile, alluvial lands, the farmer's principal assistant, the planer-down of mountain sides and worker of vast geological changes, and one of the most useful allies of the numismatist and archaeologist.

The worm has no eyes, yet can distinguish light from darkness, and the fact that the front part of the body, containing the cerebral ganglia, is sensitive to light is of much lateral importance as bearing upon the evolutions of special organs of sight. When Mr. Darwin concentrated the rays of a candle upon the front part of the body, the worm "dashed like a rabbit into his burrow," but when the light was directed on other parts and the "head" left in shadow, it paid no attention. His "tame" worms paid no more attention to the piano or a metal whistle than the deaf adder described by Augustine as plugging one ear with its tail and laying the other in the dust, but when the pot in which they lived was placed in the piano and a cord was struck they "went below." They have some sense of smell, for though indifferent to perfumes or acetic acid they quickly discovered bits of cabbage and onion buried in the ground. They possess the sense of

ground. They possess the sense of taste, prefer green cabbage to red, and celery or horse-radish to either, and distinguish between the leaves of different trees, their daintiest meat being those of the wild cherry. But they are not exclusively vegetarian, being fond of fresh meat; on occasions they are cannibals, and they devour earth when they can get nothing better, living on the organic matter it contains. Anglers may find some consolation in the reflection that they swallow rose thorns and splinters of glass without seeming any the worse for it, and in Mr. Darwin's assurance that their wriggling when impaled on the hook is out of all proportion to their sufferings. They take no note of atmospheric waves or sounds, but hide during a frost. And it is sad to reflect that the earthworm, when pampered, degenerates, for those which Mr. Darwin kept, finding that frost and birds never troubled them, and that food was varied and abundant, became disgracefully negligent about constructing their burrow, and performed their work generally "in a slovenly manner." When they wish to exert themselves, worms display no little intelligence. Men could not act more rationally in handling heavy articles. Mr. Darwin tried countless experiments with familiar and unfamiliar objects, and the result was the same. They always drag fir-needles into their burrows by the base, drawing them in by the apex being impossible; but they make an exception in the case of the petioles of the ash tree, and carry the points foremost, as they serve for food. Furnished with strange leaves, they always found the easiest carrying-place, and tried with triangles of greased paper they hit on the easiest point sixty-two times in a hundred, "acting in nearly the same manner as would a man who had to close a cylindrical tube with different articles."

The methods of the worm's work and its result challenge attention. They eat animal and vegetable food, and swallow earth for the organic matter it contains, and their castings are composed of such earth as well as that voided for the excavation of their burrows. These castings, small serpentine coils of soft, fine clay, found at the mouths of their bur-

clay, found at the mouths of their burrows, form the layer of "vegetable mold" on which agriculture and most of our existent vegetation is wholly dependent. But for the worms these fine particles would never be sorted from the coarser, and all the surface of the earth would be composed of the same rough and strong material as the subsoil. In their gizzards they grind down the small stones into fine earth, and they generate the acids which in the humus are so effective in disintegrating the rock beneath, to say nothing of their work in bringing bottom particles to the surface, and so exposing the rock to action. Besides, as on slopes the soil they make is liable to be swept away, they are constantly renewing the process of denudation, and proving themselves geological agents of the first importance.

By experiments in measuring and weighing, Mr. Darwin came to the conclusion that the castings thrown up by earth-worms amount on the average to a uniform layer of mold on-fifth of an inch thick every year. In some parts of England ten tons of dry earth are brought to the surface annually on each acre of ground; in another case the castings were six and three-quarter pounds to the square yard, or fourteen and one-half tons to the acre. A field was covered with lime and left untouched for ten years, when the lime was found under three inches of "vegetable mold," and underlaid by a coarse, sandy soil. Another field, so thick with flints and stones that it was called "the stony field," was left for thirty years, when the worms had covered it with a turf so thick that the gallop of a horse over it was noiseless. A paved walk left to the worms was fairly covered with mold and carried underground, for the worm is an extensive engineer. He likes the shelter of a stone, and dips under it and throws up the castings at the side; presently the undermined stone sinks into the empty burrows, and the castings rise higher until it is covered. Thus it is that the worms are in a fair way to bury the immense fallen monoliths at Stonehenge, and thus it is that they have during the last sixteen hundred years buried the Roman ruins in England, as the towns of Silchester and Wroxter, and the vil-

of Silchester and Wroxter, and the villas of Chedworth and Brading, under from two to four feet of mold. Mosaic pavements are especially adapted to their work, and their services in preserving antique coins and weapons cannot be estimated. It may be added that M. Pasteur, in the course of his recent researches on splenic fever has convicted the worm of spreading the disease among cattle by conveying bacteria germs from dead carcasses to the surface of the ground near the vegetation cropped by living animals. But this can hardly weigh in the balance against the creature which has had so much to do with the development of the earth and but for which agriculture would be impossible,