LEMAN'S N

The influence of worms on the soil of a country depends almost entirely on the amount of earth thrown up in their castings. The experiments and observations of Mr Darwin show that over the whole surface of the land this may be taken in our own country at an average of nearly one quarter of an inch per year. The observations quoted are so numerous that we must refer our readers to the work itself for them; but, as an example of the patient manner in which the author works, we may quote one experiment lasting twenty-nine years. In 1842 a layer of broken chalk was spread over old pasture land for the sake of observing at some future time the depth to which it would become buried. In 1871 a trench was dug across the field, and the line of white masses was everywhere 7 inches from the surface.

The mode in which large stones like the massy monoliths of Stonehenge become buried is fully explained by the author. Many persons may doubt the power of these lowly animals to produce such great results; but their enormous numbers and ceaseless activity must be borne in mind. The number of worms in an acre of land has been estimated at between 50,000 and 60,000, their weight being nearly 400lb.

By actual experiment—viz, collecting and weighing the castings—it is found that in some cases 881b. of earth are brought up on to the surface of every square yard during the year—an amount which reaches the high average of 18 tons per acre; and 10 tons may be taken as a very fair average.

For the part which worms have taken in the burial and consequent preservation of ancient buildings, such as the Roman villa recently disinterred at Brading, we must refer our readers to the work itself. The chapters on the denudation or levelling of the land, which is effected in part by the agency of worms, are particularly interesting; but we must pass on to the consideration of the concluding chapter, in which Mr Darwin summarises the result of the observations of himself and sons, carried out with so much method and regularity during a large number of years. In this he shows us the vast importance of worms to the agriculturist, and the important part they have played in producing the present condition of the surface of the earth.

No reader who has attentively gone through this most interesting volume can refuse to accept his final conclusions, in which he says:

> Worms prepare the ground in an excellent manner for the growth of fibrous rooted herbs, and for seedlings of all kinds. They periodically expose the mould to the air, and sift it so that no stones larger than the particles which they can swallow are left in it. They mingle the whole intimately together, like a gardener who prepares fine soil for his choicest plants. Finally, the soil is well fitted to retain moisture and to absorb all soluble substances, as well as for the process of nitrification. The bones of dead animals, the harder parts of insects, the shells of land and marine molluscs, leaves, twigs, &c., 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 the roots of plants. Worms likewise drag an infinite number of dead leaves and other parts of plants into their burrows, partly for the sake of plugging them up and partly as food. The leaves which are dragged into the burrows as food, after being torn into the finest shreds, partially digested, and saturated with the intestinal and urinary secretions, are commingled with much earth. This earth forms the dark-coloured, rich humus, which almost everywhere covers the surface of the land with a fairly well-defined layer or mantle.
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> When we behold a wide, level, 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 fact regularly ploughed, and still continues so 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.

THE FREE RELIGIOUS INDEX.

[August 11

QU'EST-CE QUE LE DARWINISME? Résumé d'une Conférence de Monsieur Leblois, 5 avril, 1881. Strasbourg; J. H. Ed. Heitz.

As early as the end of the last century, a few leading minds had begun to study the question of the origin of species. The French naturalist, Lamarck, and the German poet, Goethe, to cite but two names, solved the difficulty, both in the same way, by substituting for the theory of the creation of different species, independently one of the other, that of the descent of actual types from inferior forms, or, as we now say, that of the *evolution* of beings.

Here is what Lamarck says: "Systematic divisions, such as classes, orders, families, genera, and species, as well as their denominations, are a purely artificial work of man. Species are not all contemporaneous; they are descended from one another, and possess only a relative and temporary fixity. The diversity of the conditions of life has an influence on the organization, the general form, the organs of the animal, etc., which modifies them."

About the same time, Goethe wrote: "If one examines the plants and animals placed at the bottom of the scale of beings, they can scarcely be distinguished from each other. We may therefore say that beings, at first confounded in a common parentage, where it was almost impossible to separate them, have, little by little, become plants and animals, perfecting themselves in two opposite directions so that some have taken on the nature of firm, immovable trees, others, that of man, which represents the highest degree of mobility."

The authority of Cuvier has so extinguished Lamarck that that distinguished thinker is almost unknown. An heir to the ideas of Lamarck, Geoffroi Saint-Hilaire was violently attacked by Cuvier. The discussions occurred at the meetings of the Academy of Sciences the same year that the Revolution of 1830 broke out, and the last days of Goethe were brightened by the news of the support given by Geoffroi Saint-Hilaire to the theory of evolution. The very day that the German newspapers announced the Revolution of July, Goethe's friend Soret visited the poet, who was then eighty-one. "Well!" exclaimed the illustrious old man, "what do you think of this grand event? The volcano is in eruption; all is in flames; it is no longer a discussion in private." Supposing that he referred to the political event of the day, Soret said to him, "It is indeed a great event; but, with such a ministry, the expulsion of the royal family is a matter of course." "We do not understand each other," said Goethe, in reply; "I am not speaking of those people. My mind is on something very different. I am speaking of the bomb-shell which has just burst in the midst of the Academy,—the debate so important to science which has begun between Cuvier and Geoffroi Saint-Hilaire. We have in the latter a powerful ally who will not abandon us. I have noticed the interest with which the French scientific world is watching this discussion. The public has gotten hold of the question; it can no longer be kept secret, disposed of, and smothered with closed doors." Such was not the case, however, for some time thereafter. The theory of evolution had not yet been sufficiently founded in fact.

At the moment of Goethe's death (March 22, 1832), an English vessel, the *Beagle*, sailing in the Indian Ocean, had on board a young naturalist of twenty-three, who, during this voyage around the world, was collecting a quantity of facts which were destined to come to the support of the ideas of Lamarck. This young man was Charles Darwin. During this tour, Darwin, a perspicacious and conscientious observer, was struck with the numerous varieties, the changes in form and character, presented often by one species of animal or vegetable, according to the zone or the climate in which it lives. Returned to England, the young scientist was led to make a comparison between the natural facts which he had observed and the transformations which English gardeners and breeders produce artificially in plants and animals.

In these words, M. Louis Leblois, minister of the Church of the Temple-Neuf at Strasburg, traces briefly but clearly the historical growth of Darwinism, in the excellent little pamphlet whose title is placed at the head of this column. A few citations are added to show the spirit in which M. Leblois treats this question which has so sorely troubled the Church.

Speaking of the repugnance which the Orthodox always profess to the scientific explanation of the origin of man, M. Leblois says: "According to the second chapter of Genesis, man was formed from the 'dust of the earth,' and nobody that we know of has been shocked at this rather mean origin." Referring to the Biblical doctrine that Adam and Eve are the father and mother of the race, he says: "We need not dwell upon the fact that there exist white men, black men, red men, yellow men, etc.; that some have straight hair, others woolly hair, and that, if all descended in a direct line from Adam and Eve, it is difficult to imagine what colored skin and what kind of hair these first ancestors of the human race had." Commenting on the theory of Cuvier, who, in the words of Victor Hugo, may be said to have had "one eye on Genesis and the other on nature, endeavoring to please Orthodoxy by making fossils agree with Scripture and by flattering Moses with the mastodons," M. Leblois says: "It is contrary to good sense, which cannot accept a God performing the task of Penelope, by amusing himself with the production of one series of beings in order to destroy them and then proceed to the 'creation' of new ones. It is not less contradictory to the Bible than to the facts of geology itself." The author quotes with approval this witty sentence from Carl Vogt's scholarly *Lessons on Man*, "Our friends will doubtless admit, with one of their comrades, that it is better to be a perfect monkey than a degenerated Adam."

THEODORE STANTON.

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