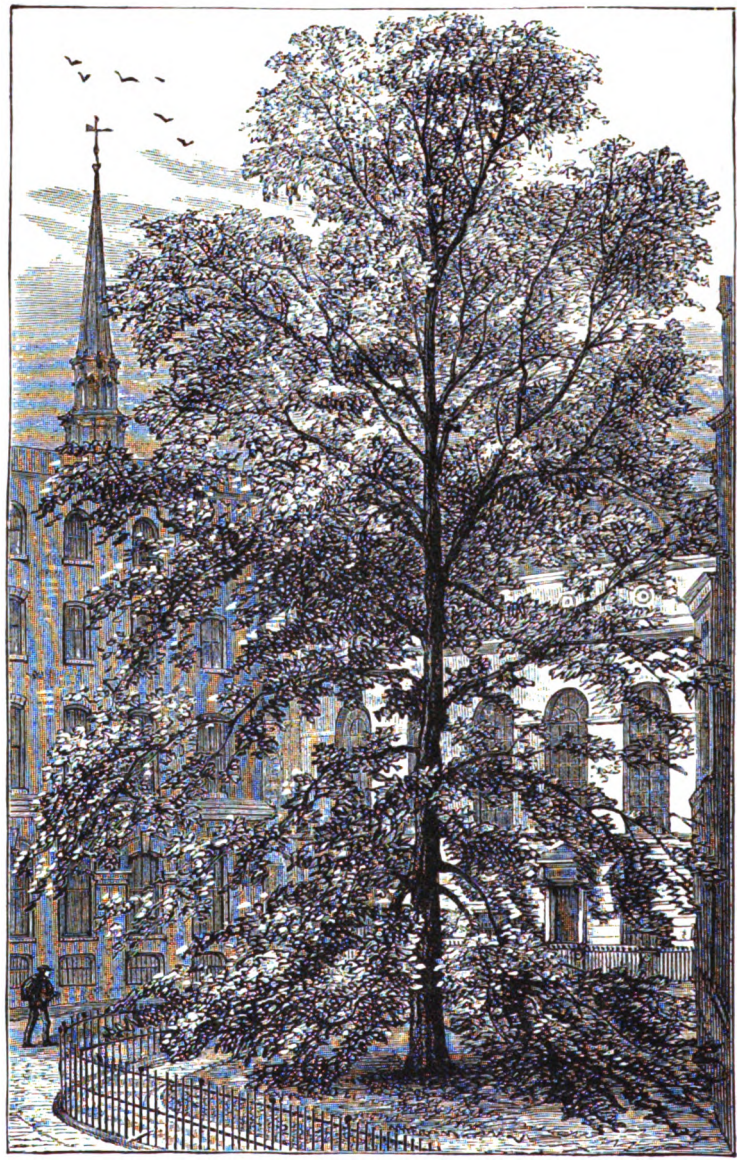
BOOKS.

THE FORMATION OF VEGETABLE MOULD.*

In this book Mr. Darwin gives another proof of his wonderful faculty of observation, and of his marvellous power of bringing together facts which most persons would fail to see had any connection with one another, and arranging them before his readers in a manner that must convince them of the correctness of his conclusions. Hitherto very few persons have had even the slightest idea of the very important part which earth-worms play in the economy of Nature; they have generally been looked upon as creatures, the object of whose existence, beyond affording food for blackbirds and thrushes, is very doubtful, and whose presence otherwise in gardens is decidedly objectionable. Anyone who may read this account of Mr. Darwin's most instructive observations on these animals (and every agriculturist and horticulturist should do so) will be surprised to learn the prominent part which these despised creatures take in the formation of so-called vegetable mould, in the preservation of antiquities, and positively in altering the form of the surface of the earth; these facts are all the more surprising when we consider how comparatively low in the scale of animal life the earth-worms are, and how destitute they are of the organs and sense with which the higher animals are furnished.

Worms, as is well known, have no limbs, and eyes and ears are also wanting; it appears, however, that they are not insensible to light, and are probably able to distinguish night from day; they have no organs of hearing, and are perfectly deaf; their sense of smell seems very limited, and as an acute sense of smell would be of no use to them, it seems confined to the odours of substances which may be of service to them as food. They have the sense of touch, however, strongly developed, and are keenly alive to a current of air and to any vibrations in the soil. Mr. Darwin placed pots of earth containing worms on a piano, and at night when the worms were on the surface of the earth if even such a high note as G above the line in the treble clef was struck, the vibrations caused the worms to disappear instantly, though they had taken no notice of the sound of the piano when not in contact with it. They are probably not insensible to variations in temperature. The mouth of a worm is a small aperture devoid of jaws or teeth, but is provided with a small, projecting lip, with which it can lay hold of its food, &c. Their food consists of leaves, which they drag into their holes, and any nutritious matter which may be contained in the earth they swallow; they make their burrows, which are sometimes between 5 ft. and 6 ft. deep, partly by pushing away the earth on all sides, and partly by swallowing it, passing it through their bodies and depositing it on the surface; the worm-casts found on lawns, &c., are the result of this action. Von Hensen estimates that 53,767 worms exist in an acre of garden ground, and Mr. Darwin assumes that half that number (26,883) per acre may be found in ordinary Grass and arable land, and by his figures shows that each worm annually ejects 20 oz. or 1¼ lb. weight of earth.



Plane Tree in Stationers' Hall Court.

The quantity of earth annually brought to the surface in this manner by worms is truly marvellous. Mr. Darwin estimates that on land which is suitable for worms to inhabit "a weight of 10 tons of dry earth annually passes through their bodies, and is deposited on the surface of each acre of land, so that the whole superficial bed of vegetable mould passes through their bodies in the course of a very few years." The observations on which this estimate is based are fully detailed, and will be read with great interest. It appears that worms often leave their burrows and form fresh ones; the old holes collapse, and the surface of the ground gradually sinks, but is also being constantly raised by fresh castings, consequently any substance lying on the surface gradually sinks and is covered by the soil thrown up by the worms. In this way chalk and cinders which were known to have been spread over the surface of pasture land at a certain time have been found many years afterwards some inches below the surface. A field near Mr. Darwin's house at Down, in Kent, "was left to become pasture land; it was so thickly covered with large and small flints, that it was always called by my sons the stony field, and when they ran down the slope the stones clattered together. After 30 years a horse could gallop over the compact turf and not strike a single stone with his shoes." In the same way the remains of ancient buildings no doubt sink and become covered with soil.

Mr. Darwin fully recognises the part dust may play in lowering or raising the surface of the ground, but he does not allude to the considerable additions which pasture fields receive from the dead leaves, &c., of the herbage, as well as the droppings of animals, which are considerable in fields where cattle and sheep are pastured, and which must materially assist in the formation of mould. Worms are also shown to be active agents in levelling the earth; their casts when first thrown up are very viscid, and naturally flow somewhat downward on land which is not level; again, worm-casts when dry easily roll, and if disturbed by the wind or otherwise will on uneven ground be sure to roll downwards to some extent. Of this levelling process abundant proofs are given. Mr. Darwin concludes this most interesting and instructive book with the following remarks: "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 though 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 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 these lowly-organised creatures. Some other animals, however, still more lowly organised, have done far more conspicuous work in having constructed innumerable

* "The Formation of Vegetable Mould through the Action of Worms." By Chas. Darwin, LL.D., F.R.S. John Murray: Albemarle Street.

reefs and islands in the great oceans; but these are almost confined to the tropical zones." The moral, so to speak, to be learnt by horticulturists from this book is to encourage earth-worms as much as possible (except, of course, among plants in pots). Every one who has the opportunity should read this book; and having done so, they cannot fail to regard earth-worms with much interest and even respect. But, as before pointed out, enough has not been allowed for the great part the decay of vegetation itself plays in the formation of mould. We have clear proof everywhere of the leading importance of this—in wood, marsh, and other situations where the annual growth is not removed.