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MR. DARWIN ON WORMS.

A new work by Mr. Darwin is certain to create a sensation, not only in the world of science, but also in what is usually called the general reading public. The reason for this popularity is obvious. Darwin is perhaps of all scientific writers the most interesting and readable to those persons who usually dread the mere mention of a book on learned subjects. Nobody knows better than he how to popularise a theory and to cast over it a certain veil of romance which renders it peculiarly fascinating, and this he does so skilfully that scientific truth is never perverted for merely artistic purposes. This latest work "The Formation of Vegetable Mould through the Action of Worms" contains information of the most deeply interesting character, which even the ordinary reader will find surprising, indeed almost incredible. The silent and mysterious agents, so usually despised, who perform day and night the office of Nature's ploughmen, are certainly marvellous illustrations of the old saying "God often uses the humblest tools to effect His greatest purposes." Worms have hitherto been treated, even by men of science, with contempt, and it is to Professor Darwin that they owe their elevation to their present somewhat novel "social position" in the animal world. They are, indeed, by no means such uninteresting or insignificant creatures as we are apt to believe them, and it seems are not without a certain kind of intelligence, which appears akin to reflection. Ever since 1837, when Mr. Darwin first read a paper upon their habits, they have been the objects of his constant attention and study. By night and by day has he watched them; sometimes spending hours in the dead of night contemplating their creeping movements, and this in his stockinged feet in order to avoid any undue vibration of the floor which might disturb them. That the result of such profound observation should be valuable is unquestionable, but even Professor Darwin's stanchest friends and his bitterest opponents must now confess that this remarkable book has surpassed expectation and is exhaustive. In short, it is a standard work of science, written with a succinctness and care which render it equally entertaining and instructive.

In his "Introduction," Mr. Darwin at once informs us that "the share which worms have taken in the formation of the layer of vegetable mould which covers the whole surface of the land in any moderately humid country" is the main object of his book. After describing this mould as being of a "generally blackish colour and a few inches in thickness," Mr. Darwin proceeds to explain how by the persistent action of the worm tribe this mould is constantly being turned over, triturated, and improved, thus in verity "all the vegetable mould throughout the country passes many times through the intestinal canals of worms, and that in consequence it would be actually more correct to say 'animal mould' rather then vegetable."

> Earth worms abound in England in many different stations. Their castings may be seen in extraordinary numbers on commons and chalk downs, so as almost to cover the whole surface, where the soil is poor and the grass short and thin. But they are almost or quite as numerous in some of the London parks, where the grass grows well, and the soil appears rich. Even in the same field, worms are much more frequent in some places than in others, without any difference in the nature of the soil. They abound in paved courtyards close to houses, and an instance is known in which they had burrowed through the floor of a very damp cellar. On the mountains of North Wales and on the Alps worms, as I have been informed, are in most places rare, and this may perhaps be due to the close proximity of the subjacent rocks, into which they cannot burrow during the winter so as to escape being frozen. Dr. M'Intosh, however, found them at a height of 1500 feet, on Schiehallion, in Scotland. They are numerous on mountains near Turin, at from 2000 to 3000 feet above the sea.

Earth-worms may be considered as terrestrial animals, though they are still in one sense semi-aquatic, like the other members of the great class of annelids. M. Perrier found that they could not even endure exposure in a dry room for a single night. On the other hand, Darwin tells us he has kept them alive for months under water. Worms are nocturnal in their habits, and can be seen after dark crawling about, but usually with their tails still inserted in their burrows. During the pairing season they come out of their holes even by day, and expose the greater part of their bodies for an hour or two in the early morning. The body of a large worm consists of from 100 to 200 almost cylindrical rings or segments, each furnished with minute bristles. The muscular system is well developed. The mouth is situated at the anterior end of the body, and is provided with a little projection, which is used for prehension. Worms breathe by their skins, as they do not possess any special respiratory organs. The two sexes are united in the same individual, but two individuals pair together.

> Worms are destitute of eyes, and at first I thought that they were quite insensible to light, for those kept in confinement were repeatedly observed by the aid of a candle, and others out of doors by the aid of a lantern, yet they were rarely alarmed, although extremely timid animals. Other persons have found no difficulty in observing worms at night by the same means. I noticed that when worms were illuminated by a bull's-eye lantern having slides of dark red and blue glass, which intercepted so much light that they could be seen only with some difficulty, they were not at all affected by this amount of light, however long exposed to it. Sometimes a strong light appeared to distress them; but I doubt whether it really does, for on two occasions, after withdrawing slowly, they remained for a long time with their anterior extremities protruding a little from the mouths of their burrows, in which position they were ready for instant and complete withdrawal. The light was once concentrated on a worm lying beneath water in a saucer, and it instantly withdrew into its burrow.

As these animals are only affected by light when it falls directly on the head, and as they have no eyes, it is, Dr. Darwin thinks, evident that the light affects the cerebral ganglia through the skin. Worms are quite deaf. Still they are sensible to certain vibrations. For instance, when placed upon a piano they retreated immediately into their burrows when the note C was struck, and so on with other notes. The body of a worm is extremely sensitive to touch.

> There is little to be said on the head of mental qualities of worms. We have seen that they are timid. It may be doubted whether they suffer as much pain when injured as they express by their contortions. Judging by their eargerness for certain kinds of food, they must enjoy the pleasure of eating. According to Hoffmeister, they pass the winter either singly or rolled up with others into a ball at the bottom of their burrows.

Mr. Darwin appears to doubt that a worm has sufficient intelligence to find its way back to a burrow which it has once left. They have a fashion of lying near the mouths of their burrows for hours together, and, of course, readily fall victims to the blackbirds and other enemies.

> If worms are able to judge, either before drawing or after having drawn an object close to the mouths of their burrows, how best to drag it in, they must acquire some notion of its general shape. This they probably acquire by touching it in many places with their anterior extremity, which serves as a tactile organ. It may be well to remember how perfect the sense of touch becomes in a man when born blind and deaf, as are worms. If worms have the power of acquiring some notion, however rude, of the shape of an object and of their burrows, as seems to be the case, they deserve to be called intelligent; for they then act in nearly the same manner as would a man under like circumstances.

Having thus acquired some notion of the construction and attributes of worms, the reader is introduced to the last, and by far the most important, part of this singular book—the use of worms. They are the makers of mould and its greatest fertilisers. These silent creeping creatures, whilst we walk thoughtlessly over them, enjoying the beauties of the land, its greeness and its flowers, are labouring for our benefit. Nay, the very antiquary is greatly indebted to them for the preservation of monuments of remote antiquity. To give some idea of the industry and of the enormous amount of labour performed by these sightless creatures, Mr. Darwin tells us that—

> Coal cinders had been spread over a part of a field near Maer Hall, Staffordshire, in 1834; and when holes were dug to see the condition of things after a lapse of four years the cinders were found to form a line of black spots round the holes, at a depth of one inch beneath the surface, parallel to and above the white line of lime. Over another part of the field cinders had been placed only about half a year before, and these either lay on the surface or were entangled among the roots of the grasses; and I here saw the process, for worm castings had been heaped on several of the smaller fragments. After an interval of four and three-quarter years this field was re-examined, and now the two layers of lime and cinders were found almost everywhere at a greater depth than before by nearly one inch—we will say by three-quarters of an inch. Therefore moulds to an average thickness of the 22nd part of an inch had been annually brought up by the worms, and had been spread over the surface of this field. Coal cinders had been strewn over another field, at a date which could not be positively ascertained, so thickly that they formed (October, 1837) a layer one inch in thickness at a depth of about three inches from the surface. The layer was so continuous that the overlaying dark vegetable mould was connected with the sub-soil of red clay only by the roots of the grasses, and when these were broken the mould and the red clay fell apart. I will now give some cases of the action of worms on land differing widely from the dry sands or the swampy pastures just described. The chalk formation extends all round my house in Kent, and its surface, from having been exposed during an immense period to the dissolving action of rain water, is extremely irregular, being abruptly festooned and penetrated by many deep well-like cavities. During the dissolution of the chalk the insoluble matter, including a vast number of unrolled flints of all sizes, has been left on the surface, and forms a bed of stiff red clay full of flints, and generally from six to fourteen feet in thickness. Over the red clay, wherever the land has long remained as pasture, there is a layer a few inches in thickness of dark-coloured vegetable mould."

But not only do worms bring an incredible quantity of earth to the surface by their action and their powers of forming what are popularly known as "worm castings," but they speedily bury things by covering them with the earth they throw up. It must always be remembered that the number of worm labourers in the earth is something incredible. Heusen declares that in a hectare of ordinary land there is usually about three hundred and fifty-six pounds of worms, or about 53·767 per acre, and in corn fields pretty nearly double the number. When this fact is taken into consideration it is easy to understand that the labour performed by such a population of workers is prodigious. So great, indeed, that when we reflect that a single worm throws up annually about twenty ounces of earth we may easily comprehend the vastly important part these despised creatures play in nature. Mr. Darwin is certain that archæologists owe an extraordinary debt of gratitude to worms for their careful labours towards the preservation of works of antiquity. The rapidity with which they can cover up an ancient pavement is astonishing, since in less than two years they have been known to conceal a tesselated pavement in a ruined abbey, and actually so thickly that grass and moss have begun to grow upon their earth castings. Worms, moreover, prepare the ground in an excellent manner for the growth of fibrous-rooted plants and for seedlings of all kinds. They periodically expose the mould to the air, and sift it so that no stones larger than those which they can swallow are left in it. They mingle the whole together like a gardener who prepares fine soil for his choicest plants. In this state it 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 molluscs, leaves, twigs, &c., are before long all buried beneath the accumulated castings of worms, and are then brought in a more or less decayed state within the reach of the roots of plants. Worms likewise drag an infinite number of dead leaves and other parts of plants into the burrows, partly for the sake of plugging them up, and partly for food.

The last passage in the book is so full of noble thought and so suggestive that its quotation will, perhaps, more aptly close this review than any further observations or tributes of praise.

> 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 through the bodies of worms. The plough is one of the most valuable of man's inventions and one of the most ancient, but long before he existed the land was in fact regularly ploughed by 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, namely corals, have done far more conspicuous work in having constructed innumerable reefs and islands in the great oceans, but these are almost confined to the tropical zone.

Mr. Darwin's last book is in every sense the equal of any one of its celebrated predecessors; charming in its style and fully evidencing profound learning, and full of evidence of the most patient and self-sacrificing observation. There is something touching in the picture drawn by the thoughtful mind of one of the most learned men of our age passing long hours in the dead of the night (in his stockinged feet, fearing lest the vibrations caused by his shoes might disturb these sensitive animals) watching the habits and mode of being of the lowly deaf, dumb, and blind worm. Henceforth, few of us who have read this extraordinary work will not turn aside, like St. Francis of Assisi of old, to avoid crushing even a humble worm.

It is certainly somewhat surprising that Dr. Darwin has not mentioned in his work the only known but mortal enemy of the worm, the slug, which sucks him up and destroys annually an astonishing number. The reviewer having recently placed several earth worms in a plate covered with earth and placed under a glass bell, was able to observe the astonishing dread which the large worms felt in the presence of a single slug, who, however, passed unnoticed by the younger ones. It would seem that the little animals had no innate dread of their enemy, and that the fear manifested by their elders was the result of experience. The fact remains that the large worms expressed such terror of the slug as to speedily abandon the earth on which that obnoxious animal was placed and hide themselves under another mound removed from the presence of their enemy, who, on being transferred thither, was greeted by an immediate exodus on the part of the old worms to fresh fields and pastures new and in a safer part of the plate. Not so the little ones, they did not hesitate to creep even over the slugs, who, however, taught them the lessons of experience by seizing upon them and speedily devouring them.

Ecclesiastical.

PREFERMENTS AND APPOINTMENTS.—The Rev. Selwyn Blackett, to the Curacy of Uxbridge Parish Church.—Rev. W. J. Baugh, to the Vicarage of Selcombe Regis.—Rev. Joseph Davies, to the Incumbency of St. Anne, Haughton.—Rev. Frank Barrow Gribbell, to the Vicarage of Christ Church, Erith.—Rev. James Samuel Hoare, to the Vicarage of Godstone, Surrey.—Rev. George Holloway, to the Rectory of Sutton, Norfolk.—Rev. H. Granger Southcomb, to the Rectory of Rose Ash.—Rev. H. E. Suckling, to the Rectory of North Wootton, Norfolk.—Rev. Alfred Freer Torry, to the Rectory of Murston.—Rev. Headly Willson, to the Curacy-in-Charge of St. Cosmus-in-the-Blean, Canterbury.

The new Dean of Wells (Dr. Plumptre) has published the sermon which he preached in his cathedral on Christmas-day on the subject of "The Ideal of Cathedral Life;" and an appendix to that discourse deals with the vexed question of vestments, which, however, he declares comes almost within the category of the "infinitely little," and styles the controversy a "melancholy and discreditable history." He holds with Tillotson that "charity is above rubrics;" and intimates that he does not intend to take advantage of the ruling in the Ridsdale case in favour of the use of the cope at Holy Communion in cathedrals, believing that the mind of the Church, as shown by the prescription of long unbroken usage, is more binding on the conscience than the letter of an obsolete rubric, confirmed though it may be by a recent interpretation.

The Archbishop of Canterbury has issued a circular-letter, directing the attention of the clergy and laity to a scheme for establishing more direct communication between the Anglican Church and the Episcopal Church in our colonies and in America. The project, which is being managed by a joint committee appointed by the S. P. G. and the Society for Promoting Christian Knowledge is—first, to supply the parochial clergy at home with the best information respecting fields for emigration; secondly, to publish simple handbooks for the use of emigrants; and, lastly, to make such arrangements as are possible for the reception of emigrants from the old country.

A GARROTING MACHINE.

The Berlin correspondent of the *Telegraph* writes:—A new system of garroting has been invented here by a most dangerous criminal of the name of Wilke, who, fortunately, is safe in the hands of the police. On Thursday last two men, conscience-stricken, presented themselves before the authorities, accusing themselves of having conspired with a locksmith (the man Wilke) to hire furnished rooms in different parts of the town for the purpose of extorting money in the following manner. One of them was to go to bed pretending to be ill, and send for a doctor. As soon as the physician arrived and bent over the bed, an iron collar of a special contrivance, hid beneath the counterpane, was to be applied to his neck until he had signed a bill of exchange; then he was to be strangled and thrown into a canal which was close at hand. Wilke had devoted much ingenuity to the construction of this instrument, which they described as something like a pair of tongs or pincers fixed on the end of a long iron tube, with a winch at the bottom, by means of which the tongs could be made to close as tight as one liked. The peculiar virtue of this nefarious invention was to consist in preventing the victim from crying for help by immediately depriving him of the power of utterance. To make matters still surer, Wilke had also constructed two steel traps for the victim's feet. The conspirators had begun by hiring a room at No. 59, Elisabeth-Ufer, where the Schiffahrts-Kanal has unusual width, and would facilitate the disposal of dead bodies. That very evening, the penitent accomplices declared, had been agreed upon for committing the first murder, and Dr. Lehrs, living close by on the Kaiser-Franz-Grenadier-Platz, was selected as the first victim.

As soon as this confession had been made policemen were sent to the house mentioned, where they were told that a man who pretended to be employed at the Government Office for Weights and Measures had, a few days ago, hired a room and paid a fortnight's rent in advance, but that he had not shown himself since; he had, however, sent a trunk into his room the day before. The directory having been referred to, and showing that no person of the name of Wilke was employed at the office in question, the constables proceeded to open the trunk, in which they found two man-traps, and all the component parts of the garroting machine. The trunk was carefully reclosed, and the landlady warned not to say a word about the visit. An agreement was then come to between the police and Wilke's two accomplices that the latter should at first assist their comrade in carrying out his diabolical plan, and only turn round upon him when the victim's life was in danger. Several constables were concealed in a neighbouring room, and at seven Wilke appeared, entered his bedroom with his confederates, went to bed, and sent for Dr. Lehrs. Instead of the latter a policeman came in disguise, and inquired after Wilke's health. The ruffian at once sprang up, and applied his pincers to the pseudo physician's neck. The latter, having managed to make Wilke understand that he had very little money about him, he was requested to fill up a cheque. On his refusal Wilke turned the winch, until the victim began to be afraid for his life, and began stamping on the ground. This was the signal for the accomplices to let the constable's hands loose, and for the police to enter and seize the criminal in the very act.

Thus arrested, the scoundrel has since confessed that he intended procuring himself a sum of money, of which he was in great need, by garroting, but denies having had any intention of taking his victim's life. He pretends that he purposed to abscond with his accomplices after committing the deed and cashing the cheque, leaving the doctor to the chance of being released from his iron collar in course of time. Wilke turns out to be 28 years old, a native of Kustria, and possessing a wife and children, who live separated from him. Some philanthropic fanatics are already making out that he is out of his mind; but it appears that he has been for two years constructing his garroting instrument, and that ever since Dec. 3 he has been bent on executing his plan. According to one version, he is said to have mentioned the matter to his accomplices ten days ago, and that they immediately acquainted the police with the plan. The latter would not believe in the possibility of any such heinous wickedness, until the materials were found in the trunk. Of course, from a certain point of view, every person committing a crime can be said to be out of his mind. But if modern sentimentalism succeeds in saving wretches like Guiteau and Wilke from the punishment of death by classing them among lunatics, we shall see all sensible men in Europe uniting, like the San Francisco Vigilance Committee, or like the Heilige Vehme of Westphalia, to form secret associations for the purpose of lynching criminals. The instrument is described as being cleverly constructed after a principle derived from a mediæval instrument of torture contained in the Markische Museum. It is reported that Dr. Langerhans, member of the Prussian Parliament, was elected to be the second victim, and a member of the Reichstag as the third. The latest report says that Wilke watched his accomplice going across the square to Dr. Lehrs' house, and that the crime was not attempted in the evening, but during broad daylight.

Much interest was evinced on Thursday in the resumption of the inquest held upon the body of Emma Cummins, formerly a barmaid of the Criterion, and whose suicide under very painful circumstances was reported a fortnight ago. The inquiry had been adjourned to permit of the attendance of Lieutenant Ponsonby, and in his evidence on Monday he said that, after living with her for a few days, he had left her, as they did not get on well together. The jury in their verdict conveyed the strongest expression of censure upon the conduct of Lieutenant Ponsonby.

THE DUNECHT OUTRAGE.—A rumour circulated on Saturday to the effect that the police had found an important clue to the recovery of the body of the late Earl of Crawford is now confirmed. There is reason to believe that the authorities could at any moment lay their hands upon parties who are implicated in the crime of despoiling the tomb at Dunecht, but such arrests are not deemed advisable, as they would not lead to the recovery of the body or to the detection of the master thieves. That the body was not hidden in the vicinity of Dunecht, as at first surmised, but conveyed to a distance, is absolutely certain. Once outside, it was, doubtless, placed in a vehicle and conveyed to a distance. The most important of the police discoveries is the tracking of the conveyance. It was a two-horse brake, and was seen in the vicinity of Dunecht shortly after midnight in May, being driven rapidly in the direction of Banchory, where it seems to have crossed the Dee, as about 2 o'clock the same morning it passed the mill of Hirn, in the parish of Strachan, Kincardineshire. A dance party at the miller's residence had just broken up when the brake drove past, and, although the post-boy in charge of it applied the whip, there was sufficient light to enable the miller's guests to see both the vehicle and its occupants. It contained three men, and it was remarked that besides there was an object suspiciously like a human body. The vehicle was then on the road which passes over the side of the Cairnamont, a spur of the Grampians that leads into Forfarshire. Its course has been tracked to Fordoun, where there is a station on the Caledonian Railway from Aberdeen to the south, and it is said to have been identified as belonging to an inn-keeper in a quiet village a few miles from Fordoun Station. The seat of the police investigations is for the present removed to London, whither probably the body was taken, and where it is alleged to have been placed on board an Italian yacht. Certain mysterious advertisements are appearing at present in the Aberdeen newspapers purporting to be communications between parties implicated in the outrage, but some of these are believed by the police to be valueless or calculated to mislead the authorities.