

FOSSIL FOOTPRINTS

The Wonders of the World
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THE footmarks of an animal on soft mud or snow are objects people are quite familiar with, and they know how evanescent they are—here today, and gone tomorrow—a quality which the poet had in mind when he compared the perishable worldly record of men's deeds to "footprints on the sands of time." It would then be a wonderful thing if foot-prints could be found which have been preserved more thousands of years than such impressions usually last for hours: that have, indeed, been kept intact so long that the very kinds of animals which stamped them have died away and become extinct. And such is one of the wonders revealed by geological research, for footprints have been found which were made on the sands of seashores of ages ago, the impressions having, by a favourable combination of circumstances, been preserved for probably millions of years! The earliest discoveries of these long-hidden footprints caused perhaps the most astonishment. In this country they were first found at Storton quarries, a few miles from Liverpool, on the Cheshire side of the Mersey. In the year 1838, the quarrymen found some singular imprints on the whitish sandstone, which looked like the impressions of a thick, fat hand.

Fig. 1

There were the depressions caused by the four fingers, and also accompanying these, a remarkable mould of a thumb pointing inwards, just as one would suppose they would be left by a man planting the palms of his hands on a yielding surface as he crawled along. This was the idea the workmen had, for they took them to be the marks of "some one crawling away from the Deluge." There were two sizes of footprints laid bare, the lesser being of about half the length and width of the larger; and the geologists thought that they belonged to some four-footed creature up to then unknown, not a bone of it having been discovered. Similar footmarks had already been found at Hesseberg, in Saxony, on the surface of sandstone slabs. The larger

footmarks, which appeared to belong to the hind feet, were about eight inches long and five inches wide, and one impression was as much as twelve inches in length. There were also a smaller series of footprints here, of about half the size of the larger ones, which were at regular distances of about an inch and a half from them, and in front. The unknown animal which made them was provisionally named the cheirotherium, from its hand-like footmarks. The cheirotherium had evidently a wide distribution, as its footprints have since been found in numerous places in the Old and New Worlds. At Lymm, in Cheshire, they have been found with those of birds and the small, pointed impressions of crustacea; they have also been seen in the coal-measures of Greensburg, in West-moreland county, Pennsylvania, and in other places.

Fig. 2.,

Fig. 3.

Now, there can be not the slightest doubt as to the genuineness of these foot-prints on the sandstone. Every circumstance of their position and accompanying impressions of other kinds go to show that they were made when the rock was soft sand or mud, which was afterwards dried and hardened by processes the geologist has familiarised himself with as far as ascertained facts will permit. The Greensburg fossil footprints are even distorted slightly by the cracks made when the material on which they were impressed afterwards dried and shrank. The footprints were evidently made, too, on the shores of seas, and are often accompanied by the ripple-marks one often sees left on the sands when the sea has receded. A wonderful record sometimes also accompanies them of the showers which fell while these creatures were unconsciously leaving us the vestiges of their existence, for as each drop of rain fell it made a circular depression in the mud, the very shape of which is sufficient to tell the direction of the wind at the time! With these convincing proofs of the genuine nature of the footprints made by some unknown creature ages ago, just as certainly as the footmarks on the muddy street are made by the horse which has traversed it, geologists were not slow to speculate as to its form. The cheirotherium was evidently an air-breathing animal, for otherwise it could not have made the impressions, for a certain depth of water would have buoyed it up; it was also an animal with its fore feet considerably less than

the hind ones, and with the inner toes (thumbs and big toes) directed inwards. These were the few facts on which they based their speculations; there was not a bone nor a tooth of it found, and it is not surprising, therefore, to find some divergence of opinion as to what the cheirotherium was like. One had the idea that it was a kind of kangaroo, as such an animal would satisfy most of the required conditions, being an air-breather, having smaller fore feet than hind feet, and having the great toe (thumb) of the fore foot turned away from the others. Another supposed the tracks were made by a gigantic frog-like animal; while a third was disposed to believe they were left by a species of crocodile. The frog-form hypothesis was subsequently favoured by Professor Owen, who conjectured the cheirotherium was one and the same as the labyrinthodon, whose remains he had examined. The labyrinthodon was frog-like in general form, possessed teeth, was an air-breather, and had its fore feet smaller than its hind feet; and to these latter facts we have to add that it lived at the time when the footprints we speak of were made. It therefore, appears not improbable that the cheirotherium was the labyrinthodon; and is Professor Owen's idea of the creature as it crawled on the beach, and produced the hand-like impressions which so surprised the Cheshire quarrymen. Our third illustration represents the creature more perfectly, as it may be supposed to have existed amongst the surrounding scenery of its own geologic age. The teeth of the labyrinthodon, when examined in transverse section, present a very curious and tortuous pattern; whence the name given to the extinct animal. It was one of the extraordinary reptiles which once-lived in this land. The cheirotherium, or labyrinthodon, is not the only animal which has left its footprints behind it. Footprints of bipeds and quadrupeds have been found in great abundance at Turner's Falls, on the Connecticut River, Massachusetts, which have been identified as those of birds, lizards, tortoises, and frogs. The tracks have been found north and south of Turner's Falls for an extent of about eighty miles, but the Turner's Falls quarry is generally regarded as the great repository of these geological treasures, and they are now worked at extreme cost and labour for the specimens. Some of the slabs on which the footprints occur are valued at £100 to £200. The quarry has been visited by many distinguished authorities, including Sir Charles Lyell and Professor Huxley. Sir Charles Lyell was much struck with the general likeness of these

impressions to some of recent origin which he had seen on the shores of the Bay of Fundy. He had there minutely examined the pitted appearance produced by falling raindrops, the ripple-marks made by the wavelets, and the three-toed tracks left by a sand-piper; and here, in the Connecticut sandstone slabs, he saw the similar impressions made by the raindrops of hundreds of thousands of years ago; the ripple-marks produced by a vanished sea, and the clean-cut and finely-moulded imprints made by the feet of creatures which have been extinct for ages. The bird tracks are of singular interest; and some of them of such an extraordinary size that the bipeds which produced them must have had feet four times as large as the living ostrich, and the animal may have towered to a height of twenty-five to thirty feet!

Fig. 4.

In some of the lesser tracks there is great uniformity and singular delicacy of detail. If one follows a given track, each footmark is at a regular distance from the others, and what corresponds to the great toe is pointing inwards. The biped foot-prints are mostly of a three-toed character, and show the articulations wondrously well, although there are some where there is evidence of a fourth rudimentary toe directed backwards. Sometimes specimens have been obtained in which even the impression of the skin of the foot has been retained, and from the skin markings of one of these foot-prints Owen decided that it belonged to a bird of the ostrich kind, and not to a reptile. Such a conclusion is, however, received with some reservation when the geologist remembers that the iguanodon, although a reptile, had many ostrich characteristics, and some large three-toed footprints found in the Hastings beds near Cuckfield have been conjectured to be the impressions produced by an iguanodon's hind feet. Another fertile mine of footmarks of extinct animals has been found in the deposits of marl separated by masses of gypsum in the valley of Montmorency, in the neighbourhood of Paris. This marl, before hardening, is thought to have been the shore of a lake, and there are footprints on it of both bipeds and quadrupeds, including tortoises, crocodiles, iguanas, and geckos. There are also the impressions made by a huge wading bird of the size of the ostrich. It has been well remarked that these footprints give to us new and unexpected proofs that the animal life of what geologists term the Upper Eocene

period in Europe far surpassed in the number and variety of its kinds the largest estimate which had been previously formed of it. Indeed, they create the impression that our ideas of past life derived from the actual teeth and bones of animals which we have taken from their burial-grounds, the earth's strata, may be very incomplete, and that in the ages past there may have existed as many different life-forms, since become extinct, as there are on the earth now.