might be used to make the pieces fit—the result may look very well, but it will leave us no wiser as to the natural history of the rocks.

I may mention that the paper on some Alpine and Himalayan sections, which I had the honour to lay before the Geological Society two years ago,¹ bears upon the question here discussed: there is said to be a fissure along the base of the Alps, currently supposed to have swallowed up mountain ridges, and at sundry times to have given egress to the whole mass of the Alps; yet no one has given a circumstantial description of so wonderful a feature. If such a fissure can hide away and tell us nothing of such mighty performances, there will be, to my mind, a greater flaw in the geological record than any yet proved from palæontology.

III.—NOTE ON THE EXCAVATION OF THE VALLEYS IN DERBYSHIRE.

By H. C. SORBY, F.R.S., &c.

FOR a considerable time I have taken much interest in the question of the origin of the narrow and deep valleys in the Carboniferous Limestone district of Derbyshire, and have carefully recorded whatever seemed to explain their formation. So far I have never met with more striking facts than those to be seen in Deep Dale, about three miles in a direct line E.S.E. from Buxton. I estimate the depth of the valley at about 100 feet, and its width at from 100 to 200 yards. At a distance of about a mile from the Bakewell road there is a cavern, which is especially conspicuous on the east side. Its entrance is about 6 feet high, 20 feet broad, and 40 feet above the bottom of the valley. It extends nearly horizontally for about 30 yards, and then descends to a lower level, where I did not further examine it. On looking from the entrance to the opposite side of the dale I was surprised to see what appears to be a continuation of the same cavern. The entrance on that side is at about 80 feet above the valley, and is so much blocked up with detritus that one can only examine it for a space of 10 yards. Taking, however, all the facts into consideration, it appears to me that at a very remote period a subterranean stream flowed continuously along these two caverns, from west to east. There is abundance of suitable gather ground on the west side which even now has no well-marked surface drainage, and from which much of the water probably escapes by a subterranean course, ending in the large spring in the main valley, by the road-side below Kingsterndale. Of course the continuous passage of a stream through the two portions of the cavern could not possibly occur in the present state of Deep Dale—the water would have to run down one side of the valley, and up a steep incline on the other, and, therefore, I argue that at the time when the cavern was the bed of a subterranean stream, Deep Dale was only excavated to a slight extent. In the process of time, however, its depth was so increased that the cavern was cut in two; and a

¹ Read June 5th, 1867. Published in the Quart. Journ. Geol. Soc., London, 1868, Vol. xxiv., p. 34.

similar increase in the depth of the main valley of the Wye so altered the general drainage of the district, that water almost or entirely ceased to flow along the old channel. The point of chief interest is, therefore, this—that the facts lead us to believe that by far the greater part of such a valley as Deep Dale has been excavated since the surrounding country was dry land, probably chiefly by means of the same slow process of erosion as is now taking place, though the distribution of gravel brought from a distance indicates that this part of England has been again below the level of the sea at a comparatively recent period.

IV.—ADDITIONAL NOTES ON THE GROWTH OF SOIL.

By G. H. KINAHAN, M.R.I.A., etc.

IN the former notes¹ "On the growth of soil," I omitted to speak of the labours of the ants—these workers, although such pigmys in this country, and, therefore, compared with the earth-worms, less capable, individually, of work, are so numerous and energetic, that in the special places to which they resort, their yearly work is much more conspicuous than the annual worm-work; but the animals operate in different places, for while the earth-worm luxuriates in rich highly-cultivated land, the hill-building-ant loves a dry, sandy or peaty soil. In the spring the ants may be observed beginning their work, and from that time they carry on their operations all through the summer, to the late autumn, or early winter. On a moor they raise hillocks scattered promiscuously about over the ground, getting closer and closer together as the colonies increase. But where the ants are most useful is in places where crags and large stones are mixed up with patches of sandy peat. In such a locality they will always build on a rock, the foundation of their habitation being at its junction with the soil. These ants seldom raise their structures as high as the moorland ants, but they make up in extent for absence in height, and by this means the rocks are gradually covered with soil and vegetation; for, on account of the season of the year at which they build, the growth of the plants keeps pace with the formation of the ant-soil, and protects it in a great measure from "Meteoric abrasion."² During the winter, however, the shape of the ant-hills is somewhat modified, but the matted roots of the plants preserve the major part of the soil which will thus remain, forming an envelope for the rock.

As the annual work of one colony is rarely less than two square feet in superficial area, and sometimes exceeds a square yard, the yearly work done by a number of colonies must be very considerable. The ants that build in the sandy moors seem to frequent

¹ GEOLOGICAL MAG., June, 1869, page 260.

² When I proposed *chemico-fluvial denudation* as a better name than the vague term *sub-ærial denudation*, I had quite forgotten that Mr. Scrope some time since, called the same action *Meteoric abrasion*.—[*Geology and Extinct Volcanoes of Central France*.] This name is evidently so much superior to any since proposed, that I am surprised it has not been universally adopted.