ON THE ELEVATION OF MOUNTAIN CHAINS.

SIR,—In reply to the slight notice with which Mr. Scrope has honoured my speculation on volcanic action,[1] I can assure him that nothing was further from my intention than to claim as original what I had learnt from him. It was merely for the sake of brevity that I omitted a reference, which I thought every one could supply. When my paper was read, I used the words, "With respect to the raising of *ejectamenta* in a fissure, it is clearly proved by Scrope, in his work on volcanos, that the force to which it is due is the expansion of aqueous vapour when relieved from pressure." I regret that I did not transfer the sentence in full to your pages.

It will, however, be perceived that although I am indebted to Mr. Scrope for my ideas of the *nature* of a volcanic eruption, my speculation as to its *cause* differs from his theory.

He attributes the elevation of mountains and the trains of volcanoes which often accompany them, to local changes of temperature. "The results of such a local change of temperature would seem to be, first, the dilatation—whether or not amounting to fusion—and, consequent, upward pressure and bodily rise of the expanding matter beneath the centre or medial line of the area affected, but without producing its outward extravasation there; and, secondly, and at the same time, the upward rush and (sooner or later, probably) the external eruption of portions of this heated and fluidified matter through fissures formed towards the margin of the elevated area, and ranging in parallel lines on one or both sides of its central axis of maximum upthrust."[2] It appears, then, that the motive power, in Mr. Scrope's opinion, is the pressure from below of matter expanded by an accession of heat.

I, on the other hand, conceive the elevation of the mountains to be owing to the contraction of the general mass of the earth within its already cooled crust, and suspect a diminution of pressure beneath mountain ranges on account of their being partly supported by their lateral abutments. I conceive the diminution of pressure so caused to induce liquefaction of the subjacent plutonic mass; so that eruption takes place through vents prepared for it—not by the upward pressure of increasingly heated matter, as supposed by Mr. Scrope; but by the crumpling of the crust through lateral pressure caused by a general cooling of the globe. To my mind the difference between these views amounts almost to an interchange of cause and effect.

HARLTON, *near Cambridge.* O. FISHER.

FISHER.—DENUDATIONS OF NORFOLK.

SIR,—Under this heading your number for December contains a paper by the Rev. O. Fisher. The opening sentence is—"Upon the land-surface a certain amount of the fine material is being carried into the rivers, and by them deposited at the heads of the Broads, or where such do not exist, in the sea. This denudation by *pluvial action* is undoubtedly greater where the land is under the plough than it would be otherwise." The wildest subaerialist will require nothing

[1] GEOL. MAG. Vol. V., p. 493. [2] Scrope's Volcanos, 1862, p. 273.