Mr. Mackintosh does not seem fully to appreciate the fact that these valleys have been filled with ice, and that it has not merely filled them, but passed over the fells which divide them.

What Mr. Mackintosh will endeavour to prove from the observations he has recorded, I cannot venture to predict, and so will wait patiently for the *dénouement*.

FRANK RUTLEY,
Geological Survey of England and Wales.

ON A COLUMNAR CLAY-BED IN TIDESWELL DALE, AND ON SO-CALLED PHOLAS-BORINGS IN MILLERS DALE.

SIR,—Allow me to express my general concurrence in the views put forth by Mr. Edward Wilson, in your last number, as to the nature of the altered Clay-bed in Tideswell Dale. I only awaited a full report of the Rev. J. M. Mello's paper, as read to the Geological Society, before publicly expressing my belief in the volcanic nature of the beds in question. I have, on two occasions during the last summer, examined very carefully the Tideswell marble-quarry, and certainly a more instructive section could not be desired. Mr. Wilson's description of it leaves little to be said. We have at the lower part of the quarry, a coral reef converted into a bed of hard massive Limestone marble; upon that a thin layer of ash; then a deposit of red clay, varying in the open section from a thickness of about five feet at one end of the quarry, to from twelve to fifteen feet at the other; and upon this, with a *well-defined line of demarcation*, lies the Toadstone, which is probably twenty feet in thickness at the middle of the quarry, but which is much wasted by denudation in other parts. One inference only seems to me inevitable, viz.: that we have before us in the quarry a complete record of an eruption, during which lapillæ were first thrown down; then an outflow of ferruginous mud took place; and, finally, a bed of lava was ejected, which must, in this place at least, have flowed with so steady and majestic a movement that it rolled over the mud without displacing it; hence the nearly horizontal line of division is clear and well defined to a remarkable degree.

One singular and striking fact seems to have escaped the notice of Mr. Wilson. At the north-west end of the quarry, where the Clay-bed is the thinnest, the hexagonal columns are from three to four inches in diameter, and they extend from the upper to the lower boundary of the bed; whilst at the other end of the quarry, where the Clay-bed has a threefold thickness, the columns are only about one inch across, and they die away in the amorphous clay of the lower part of the stratum. Important deductions might be made from this fact as to the persistency of the heat of the superincumbent Lava-bed at the time of its deposit.

I consider that the Tideswell quarry settles for ever the question as to whether or not this bed of Toadstone, at least, was or was not intrusive in its origin. No one looking at the section can fail, I think, to come to the conclusion that the Toadstone-bed was a sub-

aerial or submarine deposit of prior age to the higher Limestones in the series, which elsewhere rest upon this bed.

I may mention that I possess some exceedingly beautiful specimens of miniature basaltic-like columns in common brick-clay, that were picked up by a friend in a field where clay had been burnt for agricultural purposes. These resemble very closely the columnar clay in the Tideswell quarry.

In reference to another subject, I may remark that in going to and from the quarry in question, I passed, on each occasion, through that part of Millers Dale where the Rev. T. G. Bonney (see GEOLOGICAL MAGAZINE, Vol. VII., p. 267) says he found apparent burrowings in Limestone. I sought carefully for these hollowed Limestones, but found none; and I am driven to the belief that Mr. Bonney, in his hurried visit, mistook a bed of Toad-stone—a trap-bed much lower in the series than the one above mentioned and which runs along the valley at the road-level for a great distance—for Limestone, and that the vesicular cavities which abound therein were mistaken for the borings of animals. This error could of course only have arisen from a very hasty examination of the locality.

BURTON-ON-TRENT, 14 *Nov.*, 1870. EDWIN BROWN, F.G.S.

BURIED SEA-CLIFFS *v.* FAULTS.

SIR,—In your number for April, at page 192, is a paragraph headed "Buried Sea-cliffs *versus* Faults." This met a reply by Mr. H. B. Woodward in the Magazine for May, with whose remarks I fully concur. I wish to add, that in the year 1846, at the Meeting of the British Association at Southampton, I showed a section of the railway between Bristol and Taunton. At four places the sections were enlarged, one of which represented, on the scale of 40 feet to the inch, the Uphill cutting. An abstract of my communication appears at page 59 of "Reports of Sections," vol. for 1846, and in it occurs the following paragraph:—"At the Uphill section, not only are violent dislocations of the Red Marls and Lias produced, so that the Lias-beds dip at an angle of 70° or more towards the plane of intersection between the Lias and the Limestone, which plane itself dips in the same direction, but in addition, the igneous rock appears in full force; and it clearly bears relation, not only to the fault which brings into juxtaposition the Limestone and Lias, but to an extensive fault in the Limestone itself, by which the whole series of beds on one side differs from that on the other."

My principal object in writing this is to state that these sections were deposited in the Jermyn Street Museum, and may be seen on application. An examination of the Uphill cutting will satisfy any person that it cannot be adduced in evidence of the theory of "Buried Sea-cliffs *versus* Faults." WILLIAM SANDERS.

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