

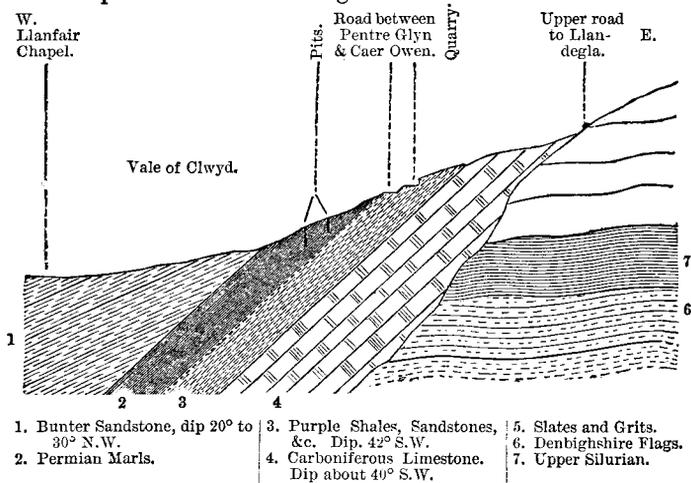
roofless cave (excepting where it is covered by a sea-worn arch), might lead to a better understanding of the origin of deposits in caves. Here no fresh water could ever have percolated to any extent, as the High Tor is surrounded by low ground.

On the footpath between Cromford and Bonsall, I have seen smoothed surfaces and markings on the limestone rock, which, if they are not glacial, are probably as much so as many phenomena which are attributed to icebergs, if not to sub-aërial glaciers. I believe the rock is called the *Bloody Stone*. D. MACKINTOSH.

PERMIAN STRATA IN THE VALE OF CLWYD.

To the Editor of the GEOLOGICAL MAGAZINE.

SIR,—I have recently observed on the eastern side of the head of the Vale of Clwyd, a small exposure of Permian strata, intervening between the Bunter Sandstone and the Mountain-limestone. The Permian is not marked on the map of the Geological Survey as existing anywhere in the Vale of Clwyd; and as its occurrence gives evidence of even still greater antiquity to an important erosion of the Mountain-limestone of North Wales than that mentioned by Professor Jukes in your last number, I send the accompanying sketch-section for publication in the Magazine.



SKETCH-SECTIONS NOT DRAWN TO SCALE.

On the Geological Survey Map, sheet 74, the Mountain-limestone near Llanfair Chapel, forming the eastern boundary of the vale, is represented about a third of a mile in width. It is, however, between Pentre Celyn and Caer Owen, much narrower; the whole of the space to the west of the road, and part of that to the east, consisting of an alternation of red marls, variegated shaly beds and purplish sandstones, and pebble beds, with some impure concretionary lime-

stone, dipping about 42° to the S.W., and resting with an apparent conformity on the denuded surface of the Mountain-limestone, which in this part of the vale has a similar dip. These beds were probably not visible at the time of the Survey, but are now exposed in quarries to the east and west of the road, and have recently been pierced by some pits sunk in search of hæmatite on its western or lower side. They are very distinct in mineral character from both the neighbouring Millstone-grit and the Bunter Sandstone of the vale, and are an exact counterpart of the Permian series of Shropshire.

The Bunter Sandstone is well exposed a mile to the north-west at Garth Gynan, where it dips north-west about 25° , and would appear to be unconformable to the beds at Pentre Celyn, but the junction is not visible.

Although the supposed Permian strata appear to rest conformably to the Mountain-limestone, the extreme thinness of the Limestone at this point, and the absence of the Millstone-grit, which is so largely developed close at hand, would indicate a great erosion of the Lower Carboniferous series before the deposition of the Permian. The Permian strata were here certainly deposited on nearly level Carboniferous Limestone; and if this were its original plane of deposition, the elevation, and probably the great dislocation, must have taken place between the Permian and the New Red period; also a second great erosion before the deposition of the New Red Sandstone. The Mountain-limestone, with its overlying Permian, must have been pitched up some 15° or 17° before the Bunter Sandstone was deposited against them, and then the whole further elevated to the extent of the present dip of the Bunter.

That a great denudation of the Lower Carboniferous series took place before the close of the Permian, is also evident from the large number of fragments of Mountain-limestone that occur in parts of the Permian breccia round the Abbersley Hills, and on the banks of the Avon, near Bristol.

From some facts I have recently observed in Flintshire and Denbighshire, I think the contour of the Mountain-limestone range of North Wales was not materially changed during the Glacial period; but that some further erosion did take place, is manifest from the abundant fragments of Mountain-limestone that occur in the Boulder-clay of the North Welsh coast. Ice-transported blocks of Mountain-limestone, weighing many hundredweights, and Mountain-limestone fossils also, frequently occur in the Drifts and Boulder-clay of the Severn Valley.—I am, &c.

GEORGE MAW.

To the Editor of the GEOLOGICAL MAGAZINE.

SIR,—Your Correspondent whose observations appear on page 236 of your Magazine for May falls into a serious error in supposing that the stratified and unfossiliferous clay, which appears upon the surface of the Lower Boulder-clay, at Heaton Mersey, near Manchester, belongs to the Upper Boulder-clay division. Yesterday I paid a visit to the locality, and, after comparing his notes with the sections that are now to be seen, it is evident that they are not