

In the neighbourhood of Aldwarke and Thrybergh extensive workings have proved that wash-outs have occurred at various horizons in the Middle and Lower Coal-measures, and the limits of certain of these have been accurately laid down on plans.

Denudation in the Barnsley Seam has been found over an area 1,700 yards in length from east to west, and in the Parkgate Seam (240 yards below) over an area 2,600 yards long from north to south. In neither case was the wash-out completely crossed, but its width cannot be less than 600 yards. The Swallow-Wood Seam, lying 60 yards below the Barnsley and above the Parkgate Seam, has been partly worked under the same area; but no signs of a wash-out have been found.

The opinion of the author is that the wash-outs occupy the sites of winding streams, meandering through the alluvial tracts in which the coal-seams were being formed.

CORRESPONDENCE.

FIVE THEORIES OF THE DEVON SCHISTS.

SIR,—Your reviewer has perhaps been unduly, and doubtless unintentionally, severe on the whole army of martyrs who have sacrificed themselves on the altar of the Devonshire schists during the past sixty-eight years. He hopes that mere hypothesis will soon give way to a more reasonable and probable interpretation of the facts. But, in truth, there has been but little hypothesis; though we undoubtedly have several elaborate theories, based on evidence much of which has seemed to eminent men worth consideration. We have had, for instance, the following distinct lines of argument:—

1. The schists are Upper Devonian, based on a certain interpretation of the anticline at Mudstone Bay, near Berry Head, and other stratigraphical facts.

2. The schists are Archæan, based on elaborate microscopical observations backed by great experience.

3. The schists are Devonian, based on a comparison of the slates, sandstones, and volcanic rocks between Scabbacombe Sands and Stoke Fleming with the schists between Hall Sands and the Prawle Point.

4. The Start schists are Lower Devonian, based on a comparison of the microscopical composition, character, and fineness of grain of the quartz-schists with those of the Lower Devonian thin-bedded sandstones.

5. The schists are older than Devonian, but not necessarily Archæan. The positive arguments in favour of this view I do not fully grasp.

Curiously enough, the authors of the Memoir, in their list of literature, have missed a most important paper, viz. "The Metamorphosis of the Rocks extending from Hope Cove to Start Bay," by W. Pengelly, F.R.S. (*Trans. Dev. Assoc.*, 1879). This paper is very important as a summary of the current opinions then held by geologists. The Upper Devonian age of the schists was treated as

an almost trustworthy working hypothesis from which to deduce the 'era of transformation.'

No doubt the earlier geologists misinterpreted the stratigraphy of South Devon, and therefore their theory broke down; but it was a very elaborately argued theory, and was by no means a hypothesis.

The Archæan doctrine of the schists is also a true theory, based on innumerable observations.

Mr. Somervail's view (No. 3) inferred the contemporaneity of the schists with the Scabbacombe—Stoke Fleming rocks; but the age of the schists will follow the age determined for the said rocks. There is nothing approaching a hypothesis in the argument.

No. 4, for which I am responsible, is based on a study of sediments, and is independent of both petrology and stratigraphy. It was at first based on a comparison of two specimens of thin-bedded sandstones with a specimen of a quartz-schist west of the Start. I first advanced it in a paper to the British Association in 1891; contending that the sandstone being Devonian the schist was Devonian too. This, however, committed me to it being also Lower Devonian.

In its then early stage this view was no more than a working hypothesis, advanced before the Survey attacked the schist district on its own account. It was a friendly challenge to my friends to upset me if they could. But, strange to say, they never succeeded in doing so, neither stratigraphically nor petrologically. My view has now attained the unexpected dignity of a theory, and has actually survived fifteen years' hostile criticism, and the accumulation of an immense mass of fresh information. However, it was never a mere hypothesis, as the facts, though few, were undoubted.

Until the publication of the Memoir there was one very weak spot in my armour. I had entirely failed to trace the albite granules of the schists into the Devonian rocks. Now that the quartz-felspar veins, abundant in both series, have been proved to be quartz-albite, that missing link is unexpectedly connected.

The view No. 5 was first advanced by Mr. Hudleston, F.R.S., in his address to the Devon Association, and has since been adopted by Mr. Lowe, F.G.S., and is apparently accepted by your reviewer. It is equally subversive of all the others, whether based on petrology, stratigraphy, or sediments. My contention that Nature will never exactly reproduce in the same spot Archæan conditions in Devonian times, is almost equally cogent against her reproducing Cambrian or Silurian conditions. As my argument is that the rocks in question (the quartz-schists) are Lower Devonian, and is not that these rocks are not Archæan, Cambrian, or Silurian, any of these latter alternatives is equally fatal to theory No. 4. Were I to be ousted from No. 4 I should return to my former allegiance to Professor Bonney. However, during the past fifteen years I have not been favoured with a scrap of evidence against my Devonian theory from the sediment point of view, and, so far as I can ascertain, there is no petrological or stratigraphical fact in hopeless conflict with it.

There is one point I may perhaps mention. Although the Torcross volcanic rocks are very inconsiderable, the Scabbacombe—Stoke

Fleming rocks are very important, both on shore and at sea. The islets of the Mewstone, Eastern Blackstone, and Western Blackstone are all volcanic. The Mewstone, with its southern mass of diabase abutting on its northern vertical slates, is as like the green 'schist' and mica-schist at the Start as a raw egg is to a boiled one; and I fully believe their relations are very similar thereto. A. R. HUNT.

CAVITIES IN CRYSTALLINE ROCKS.

SIR,—I notice in the February number of the GEOLOGICAL MAGAZINE a letter from Professor Bonney on the subject of atmospherically eroded rocks. In this connection it may be of interest to put on record the fact that hollowed rocks, apparently quite like those described by Mr. Tuckett, Professor Bonney, and the Rev. R. Baron, were met with under totally different atmospheric conditions in the Antarctic. The examples there also occur in granite. They are found at an altitude of about 4,000 feet in latitude $77^{\circ} 49' S.$, longitude $163^{\circ} E.$, in South Victoria Land, and at least two types may be distinguished.

A. In fairly normal granite. The rock is a very ordinary grey to pink granite with felspars usually about a quarter of an inch long; it appears to be quite fresh even on the surface, and has a marked superficial glaze on both convex and concave surfaces. The most striking cavity is on the south and weather side of a large block, and therefore faces away from the sun; it is about eighteen inches across

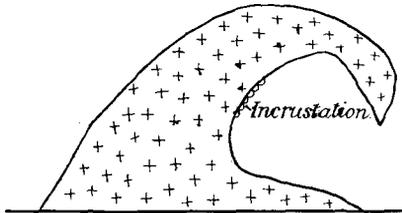


FIG. 1.—A large block of granite showing cavity on the south and weather side; 18 inches across at opening, diameter increasing to 2 feet inwards; depth of cavity more than a foot.

at the opening, and the diameter increases inwards to at least two feet. The depth of the cavity is a little more than a foot, and the back wall is partially covered with a hard mammillated or botryoidal crust, the surface of which is white and harsh to the touch. Pieces of this were brought home, and some of these Mr. Prior has kindly analysed for me: he says, "the incrustation consists mainly of carbonate of lime; there is a little silica left behind on solution in hydrochloric acid." The incrustation was lamellar, scarcely more than one-eighth of an inch thick on the average, but in the projecting botryoids, which are sometimes partially hollow, may be more. The incrustation was firmly fixed to the granite face, and it was impossible to make out whether the surface beneath it was or was not glazed.

B. In a very coarse granite with abundant large crystals of orthoclase. The hollowed blocks are rounded, but owing to the