

## CORRESPONDENCE.

## ARCHÆAN LIMESTONES ON THE FLANK OF THE MALVERN RANGE.

SIR,—The works which have been in progress for some weeks for the new reservoir of the Great Malvern Waterworks on the north-east flank of the Hereford Beacon have already brought to light a fact of no inconsiderable importance in its bearing upon the geology of this most interesting region. Briefly it may be described as follows:—The reservoir is to be formed by a huge dam to be constructed across the deep valley which runs down from the north-eastern flank of the Beacon, between the two most northerly of the four spurs or buttresses which most geological writers on the district have noticed abutting upon the Triassic plain of the Severn. It is in the deep wide trench which has been excavated for the foundations of this dam that the limestone is best exposed. The rock is a compact crystalline limestone, with a more or less distinct bedding, though much jointed in all directions, as if by incipient crushing, probably somewhat dolomitic, of a light-grey colour on fresh fractures, but in the more decomposed portions stained with oxides of the heavier metals; secondary crystals of calcite are often formed in quantity on the divisional planes of the rock.

Of the age of the rock (which so far appears to be absolutely unfossiliferous) there cannot be very much doubt. As the field-relations show that it cannot be younger than the complex of lavas and altered tuffs and volcanic muds of the hills between which the valley lies, a complex of rocks which two of the most capable judges on this question (Drs. Callaway and Hicks) refer to the Pebidian (later Archæan). My first visit to the spot was in company with Dr. Callaway, about a week ago; and the suggestion that the rock is one "archæan limestone of chemical origin" was made by him. On a second visit yesterday with my friend Mr. H. D. Acland, of Malvern, I was able to follow the exposition which the foreman of the works gave of its position in relation to what he called the "whin-rock." It strikes nearly north-west, and dips at an angle of about 80°. It alternates with the "whin-rock," which seems related to it as an "interbedded trap" (as if the two rocks were contemporaneous portions of the Pebidian series of this locality), or possibly, from the fact stated to us that the limestone is "softer and easier to work against the "whin" (as if the latter were intrusive), even somewhat older than the volcanic series. Macroscopic examination of some specimens seemed, however, to indicate contemporaneity by the apparent presence of pyroclastic materials in some portions of the limestone.

The presence of limestones (even massive limestones) in the later Archæans is known; and until quite recently it was generally assumed in this country that they illustrate those extreme views of "regional metamorphism" so much in vogue, the metamorphism having been so complete in such cases as to have obliterated all traces of organic remains. In 1888 I challenged that view, on the

ground of the much greater probability of a directly *mineral origin* of such limestones, as the necessary result of chemical reactions, which a common-sense application of known laws of thermal and general chemistry tells us must have taken place in the earlier (“pre-oceanic”) stage of the history of our earth. This was put plainly enough before the geological world in my “Metamorphism of Rocks” (Longmans, 1889), pages 6–16; and it is needless that I should do more now than refer the reader to that work, so far as concerns the theoretical bearings of the facts here narrated.

MALVERN.  
13th April, 1892.

A. IRVING.

REPLY TO PROF. J. F. BLAKE.

SIR,—There is only one point in Prof. Blake’s reply in your April Number that I intend to notice. Prof. Blake writes:—“General McMahon says he was considering capillary flow under heat and *pressure*, but in his paper he really only discusses the action of heat, and the present discussion on the effect of pressure is a new one.” This statement is really a very extraordinary one. In my paper in the *GEOLOGICAL MAGAZINE* (February, 1892, pp. 74, 75). I simply refer to statements regarding pressure made in my original paper (*Proc. Geol. Assoc.* vol. xi. pp. 431, 432). In this last paper I showed that pressure was a very important factor, and I gave very interesting statistics at pp. 438, 439 (then published for the first time) supplied to me by an eminent engineer showing that in the case stated, the actual measured pressure at 190 feet below the surface, was equal to the calculated pressure, and was no less than 80 lbs. on the square inch.

I do hope for the future success of “The Annals of British Geology,” that Prof. Blake will devote a little more attention to the mastery of the papers he attempts to boil down. Unless he does so, I am afraid that his geological *Bovril* will not prove a very stimulating or nourishing article.

20, NEVERN SQUARE,  
10th April, 1892.

C. A. McMAHON, Major-General.

CONE-IN-CONE STRUCTURE.

SIR,—If Mr. Young’s statement<sup>1</sup> is meant to be of universal application, it is certainly not borne out by observation. A radial arrangement of the cones about a large nodule is, I believe, not an uncommon thing. Good examples occur in the Lingula Flags of Borth near Portmadoc, which contain flattened nodules, extending along the bedding, sometimes several feet long. Each is surrounded by a layer of well-characterized “cone-in-cone,” and the apices of the cones are directed inwards towards the nodule, so that they point downward on the upper side, upward on the lower side, and horizontally on the edges of the nodule. I have noticed the same thing on a smaller scale in the shales of the Yorkshire Lias.

ST. JOHN’S COLL. CAMB.

ALFRED HARKER.

\*\* The Editor regrets that, through inadvertence, this letter has been delayed in publication.—EDIT. *GEOL. MAG.*

<sup>1</sup> See *GEOL. MAG.* for March last, p. 138.