

**Article XIII.**—OBSERVATIONS ON SOME “MUD FLOW”  
MARKINGS ON ROCKS FROM NEAR ALBANY, N. Y.,  
NOW IN THE AMERICAN MUSEUM OF NATURAL  
HISTORY, NEW YORK.

By R. P. WHITFIELD.

Among the various forms of mud marking, burrows of various animals, and peculiar plant remains, found on rock surfaces, which have excited the curiosity of various writers in their endeavor to explain their origin, there is one form which, so far as I am aware, has not yet been explained. This form is that usually referred to as representing ‘flowing mud’ and often closely simulates the flow of slag from an iron furnace, or the surface of lava flows.

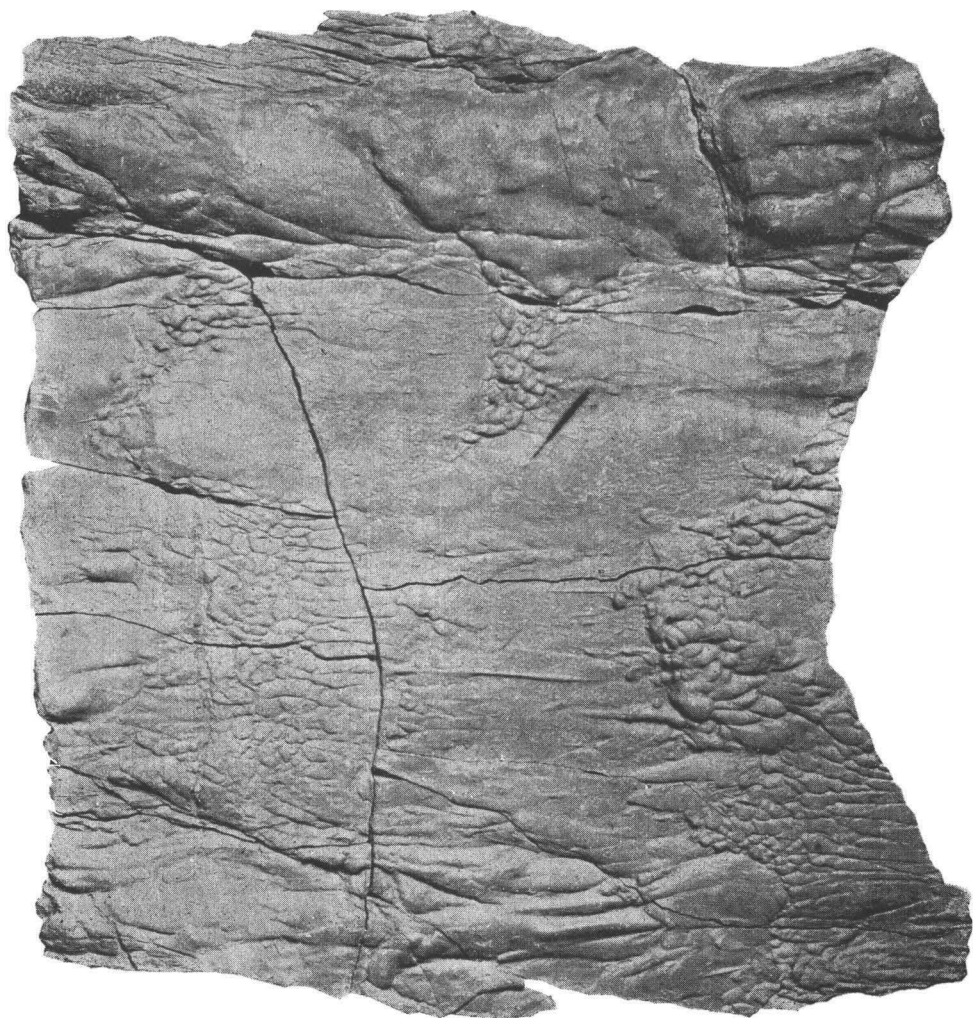
Prof. J. Hall read a paper before the Association of American Geologists in 1842, and subsequently repeated it in the Geol. 4th Dist. N. Y., 1843, p. 233, in which he mentions markings of this character from the Portage Group of New York. These, however, are on horizontally stratified rocks, entirely undisturbed and unaltered, consequently showing no reason for the mud composing them to flow.

On the surface of the semi-metamorphic rocks at Kenwood, near Albany, N. Y., and in close connection with the Utica Slate Graptolite bed of that locality, where the disturbance has been very great, so that the layers are curved, distorted, and much broken up, there occur many very beautiful examples of these ‘flowing mud’ forms, varying from fine sculpturings to rounded ridges of ten or more inches in width.

The three figures here given represent three of the best examples seen from this locality, reduced to about one-eighth their natural size; the smaller one being more imitative in its character than the two larger ones.

The rocks at this locality are much disturbed and distorted, folded and plicated to crushing, often to the degree of comminution, and are composed of mud shales alternating with arenaceous limestone layers known as ‘bluestone,’ and extensively used as a rough building stone.

The areas covered by these markings are seldom of great extent, nor are they confined to the "thinning out edges" of



No. 1.  $\frac{1}{2}$  nat. size.

layers, as intimated by Prof. Hall to be the case in the Portage Group; but are common to many of the harder layers, irrespective of thickness or position, other than that the marked surface

is invariably bedded against a layer of fine mud shale which is compactly imbedded into all the depressions of the sculpturing.

This sculpturing of the surface is confined to the hard layers, and appears to be invariably on the *under* side of the layer ; and



No. 2.  $\frac{1}{8}$  nat. size.

to be a mould of a sculpturing produced by some sort of action on the surface of the soft muddy layer below it, which has been filled by the deposit of sandy material producing the harder stone.

By studying the occurrence of these markings, during frequent visits to the locality, I am convinced that they are on the *under sur-*

*face*<sup>1</sup> of the layer. This view I find is confirmed by Prof. Hall, in speaking of those of the Western New York Portage.

That these features are not uncommon on rock surface may be inferred from numerous mentions that have been made of them. J. P. Lesley,<sup>2</sup> refers to them as common on the Portage and Chemung rocks of Pennsylvania at several localities. Dr. D. D. Owen in the Geology of Wisconsin, Iowa, and Minnesota figures a similar form as coming from the red sandstones on the north-west shore of Lake Superior.<sup>3</sup>



No. 3.  $\frac{1}{4}$  nat. size.

None of the authors appears to give any very reasonable explanation of the formation of these peculiar features, but all refer to them as "flowing mud," and Prof. Hall likens them to the surface produced on "flowing cinders from an iron furnace," which they certainly closely resemble.

<sup>1</sup> Trans. Assoc. of Am. Geologists and Naturalists, 1840-1842, pp. 422 *et seq.*

<sup>2</sup> 2d Geol. Surv. Penn. Dictionary of Fossils (P. 4), Vol. I, p. 424.

<sup>3</sup> Atlas, Tab. rD, fig. 1.

Some years ago a form very similar to the smaller of the three specimens here figured, but very much smaller in dimensions, from the Pipe Stone beds of Pipe Stone Co., Minn., was described as a trilobite, under the name *Paradoxides barberi*, and many imitative forms could be found if one's imagination were exercised sufficiently. But there is no evidence of any organic structure connected with any that have come under my observation. Their close resemblance to flowing lava, or to the surface of flowing slag from a blast-furnace, is so perfect, that the most casual observer is struck with it at once. But still this does not appear to be a rational explanation, for if, as is apparent, they are on the under side of the hard layers, the mould into which these low reliefs were cast was in the soft mud forming the shale, and must have been a depression. The hard rock substance contains no internal evidence of these embossed figures; neither does the soft shale present, in its lamination, any evidence of separating in the form of the figures, but on the contrary flakes parallel to the line of bedding, *i. e.*, the stratification of the mass. Consequently no clew to the mode of formation is afforded from the objects themselves, and from the surroundings and conditions, the theory of flowing or moving mud does not seem tenable; for if, as seems to be the case, the embossed surface is the under side of the hard rock a flow would not produce this result. They may be due to the lateral compression to which the layers have been subjected, causing a wrinkling of the surface. But here there is more than a wrinkling and a distinct flow feature produced which is difficult to explain by any theory of pressure.