

# THE SHENANDOAH LIMESTONE AND MARTINSBURG SHALE<sup>1</sup>

## INTRODUCTION

WHILE engaged in fieldwork on the Maryland Geological Survey, the writer has had an opportunity to examine to some extent the upper part of the Shenandoah limestone and the overlying Martinsburg shales.

*Shenandoah limestone.*—The name Shenandoah was proposed by Mr. Darton in 1892 for the limestones of the Shenandoah Valley and the formation was described in the vicinity of Staunton, Va., as consisting of “a great mass of impure magnesian limestones below, grading upwards through a series of cherty beds of no great thickness into several hundred feet of light-colored, heavily bedded purer limestones. The lower beds were not found to be fossiliferous. In the cherty beds only a few middle Ordovician gasteropods were found. . . . The upper member is sparingly fossiliferous at many localities with a middle to upper Ordovician fauna in which the forms *Orthis occidentalis*, *O. testudinaria*, *Leptæna alternata*, and *Chætetes lycoperdon* were predominant. *Pleurotomaria subconica*, *Conularia trentonensis*, *Platynotus trentonensis*, and several others were also noted.”<sup>2</sup>

Mr. Darton in his account of this formation in the Staunton folio described an upper member of the limestone from 200 to 350 feet in thickness which is said to be purer, more thickly bedded and generally of lighter color than the older part of the formation. It is also stated that in the upper division “fossils occur also in greater or less profusion throughout its course. The fauna is that of the Trenton limestones of New York.”<sup>3</sup>

Martinsburg is near the northwestern corner of the Harper's Ferry sheet which was mapped by Mr. Arthur Keith,<sup>4</sup> and the

<sup>1</sup> Published by permission of Dr. Wm. Bullock Clark, State Geologist of Maryland.

<sup>2</sup> Amer. Geol., Vol. X, p. 13.   <sup>3</sup> Geologic Atlas of the U. S., Folio 14, 1894, p. 2.

<sup>4</sup> Geologic Atlas of the U. S., Folio 10, 1894.

line between the Shenandoah limestone and the Martinsburg shale is clearly shown in the vicinity of that city, but the description of the formation gives no additional information regarding its age.

Professor Wm. B. Rogers considered that the Trenton, Utica and Hudson River formations were represented in the Potomac Valley at Williamsport and to the west; but he apparently regarded the greater part of the limestone as of Chazy, Levis and Calciferous age.<sup>1</sup>

*Martinsburg Shale.*—The name Martinsburg shale, like that of the Shenandoah limestone, was proposed by Mr. Darton from the exposures near Martinsburg, W. Va., “a region in which,” he states, “the formation is extensively and typically exposed.” It is stated that at the base there is “a thin series of alternating thin bedded limestones and slates” but for the most part the rocks of the formation “are slates and shales, mainly of dark color. . . . The beds are fossiliferous at many points; graptolites are found in the basal beds, notably in some light colored weathered shales in cuts of the Chesapeake and Ohio Railway, two miles east of Staunton and further east; along the Little North Mountain, and in the Warm Spring, Crab Bottom and other anticlinal valleys westward, remains of upper Ordovician brachiopoda are moderately abundant. The forms most frequently met with are *Leptæna sericea*, *L. alternata*, *Orthis testudinaria*, *O. pectinella*, and *Modiolopsis modiolaria*. The precise equivalency of the formation is not known, but judging from its general relations and fauna it probably comprises the Utica, Hudson River and possibly small amounts of adjacent formations of the New York series. It is the No. III of Rogers’ reports and has generally been called ‘Hudson River.’”<sup>2</sup>

Under the description of the formation in the Staunton Folio Mr. Darton states that “In the Jack Mountain exposures fossils are abundant, and the species are of Hudson age,” while “In the

<sup>1</sup> See Plate No. VII, Sec. No. I, in “A Reprint of Annual Reports and other papers of the Geology of the Virginias,” edited by Jed. Hotchkiss, 1884.

<sup>2</sup> Amer. Geol., Vol. X, pp. 13, 14.

beds east of Churchville and in the buff and red slates at the base of the formation in cuts two miles east of Staunton, Utica graptolites occur in considerable abundance."<sup>1</sup>

Mr. Keith, apparently, did not have a very clear conception of the lithological character of this formation for he states in his description that "It consists of black and gray calcareous and

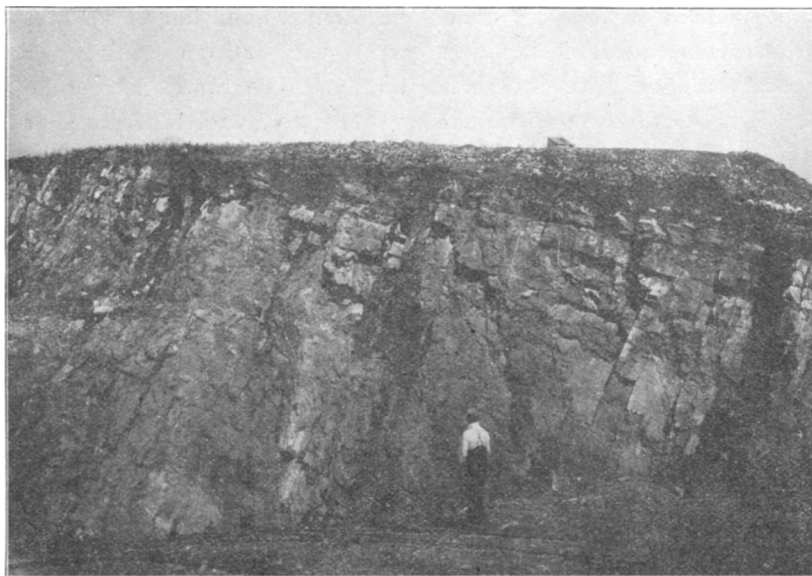


FIG. 1.—Parson's quarry in Shenandoah limestone, near Martinsburg, W. Va.

argillaceous shales of fine grain, and shows no variations within this area."<sup>2</sup> It will be seen in the following description that after the thin argillaceous shales in the lower part of the formation there are shales alternating with greenish micaceous sandstones. Again there is confusion in reference to the period to which the formation belongs for in the description it appears under the Cambrian,<sup>3</sup> and under the "columnar section"<sup>4</sup> and legend of the map as Silurian.

<sup>1</sup> Geologic Atlas of the U. S., Folio 14, p. 2.

<sup>2</sup> Geologic Atlas of the U. S., Folio 10, p. 3.    <sup>3</sup> *Ibid.*, p. 3.    <sup>4</sup> *Ibid.*, p. 5.

## DESCRIPTION OF SECTIONS

What follows in this paper in reference to the Shenandoah limestone relates more particularly to the upper part of that formation which was studied to some extent in the vicinity of Martinsburg, West Virginia, and Pinesburg, Maryland.

*Limestone and shale near Martinsburg.*—1. Along the Baltimore and Ohio Railroad immediately east of Martinsburg station are exposures of the upper part of the Shenandoah limestone. At the western end of the cut, just east of the railroad bridge over Tuscarora Creek, are dark blue, fairly massive limestones, some of which, however, on weathering split into quite thin, irregular layers (Fig. 1). These limestones are fossiliferous, two species of *Lingula*, together with some other forms having been noticed, and the rocks closely resemble many parts of the typical Trenton limestone of New York. In the eastern part of this cut, near the switchtender's station, there are thin layers of dark blue limestone which alternate with dark blue to black calcareous shales containing fragments of graptolites, and this part of the cut shows a transition from the massive limestones of the Upper Shenandoah to the lower shales of the Martinsburg formation. This part of the section is shown in Fig. 2.

3. To the east of the switch cut the rocks are covered for some distance; but about one half mile east of the station is Cemetery cut, where several hundred feet of quite thin, even, bluish, somewhat argillaceous shales are well shown. These may be seen in Fig. 3. In a rather hasty examination no fossils were found and the lithological character of these shales is rather more like that of the Hudson in New York than the Utica shale.

4. To the east of Cemetery cut is a covered space and then another railroad cut in shale follows. These shales which are mainly blue and arenaceous closely resemble lithologically the Hudson shales of the Mohawk Valley and Eastern New York, and alternating with them are thin layers of greenish, micaceous sandstone similar to those in the lower part of the Hudson in

numerous localities in New York. In the western part of the cut are some rather thin, blackish, argillaceous shales.

In the southern part of Martinsburg, operated by the Maryland Limestone Quarry Company, are extensive quarries in the massive Shenandoah limestone, large quantities of which are



FIG. 2.—Transition from Shenandoah limestone to Martinsburg shale in switch cut on B. & O. R. R. east of Martinsburg, W. Va. The men are standing opposite the upper part of the Shenandoah limestone and the Martinsburg shale is to the right.

shipped to the steel and other furnaces in the vicinity of Pittsburg. The limestone is mainly a light colored drab and this part is reported as the purest and best for flux. No fossils were found in the limited time given to the search and one of the quarrymen said he had never noticed any.

*Exposures near Pinesburg, Md.*—A number of the exposures in the vicinity of Pinesburg station on the Western Maryland

Railroad in the southern part of Maryland, about thirteen miles north of Martinsburg, proved more fossiliferous than those in the vicinity of Martinsburg.

1. The Pinesburg quarry is on the Western Maryland Railroad, a short distance west of the station. There is an exposure of about fifty feet, the southern and higher part of the quarry furnishing dimension stone which is dark blue to almost black in color with banded layers of blue and bluish-gray and contains fragments of trilobites, crinoid stems and some other fossils, while the northern and lower part is used mainly for ballast. The dip is 20° E. A view of this quarry is given in Fig. 4.

2. A short distance to the east of the quarry is an excavation in massive drab limestone, some of which before weathering is dark in color, but afterward it is all a light gray. Fossils are rare. Several specimens of *Leperditia*, a *Rhynchonella*, a fragment of a *Leptaena* similar to *alternata* and fragments of some other fossils were found.

3. On the railroad, between the quarry and the station, is a small cut through thin bedded, dark blue, compact limestones and some shaly layers. Fossils are common in some of these layers and on one a large number of poorly preserved and crushed specimens of *Asaphus platycephalus* Stokes were found. The complete list of species found in this cut is as follows:

1. *Asaphus platycephalus* Stokes.
2. *Monticulipora* (*Prasopora*) *lycoperdon* (Say).
3. *Calymene callicephala* Green (?).
4. *Lingula rectilateralis* Emm. (?).
5. *Plectambonites sericea* (Sowb.).
6. *Orthis* (*Dalmanella*) *testudinaria* Dal.
7. *Rhynchotrema inaequivalue* (Castelnau) (?)

The rock has been quite badly crushed, but in lithological appearance it closely resembles the Trenton limestone in New York. This limestone ledge is near the top of the Shenandoah formation, for the Martinsburg shales occur only a short distance to the east by the side of the road at the Pinesburg station



and to the east of "Slate Ridge." The weathered shale is a gray to an olive-grayish color and is very argillaceous. It is to be noted that the lower shales of the Martinsburg are argillaceous and calcareous, while the arenaceous ones finally alternating with

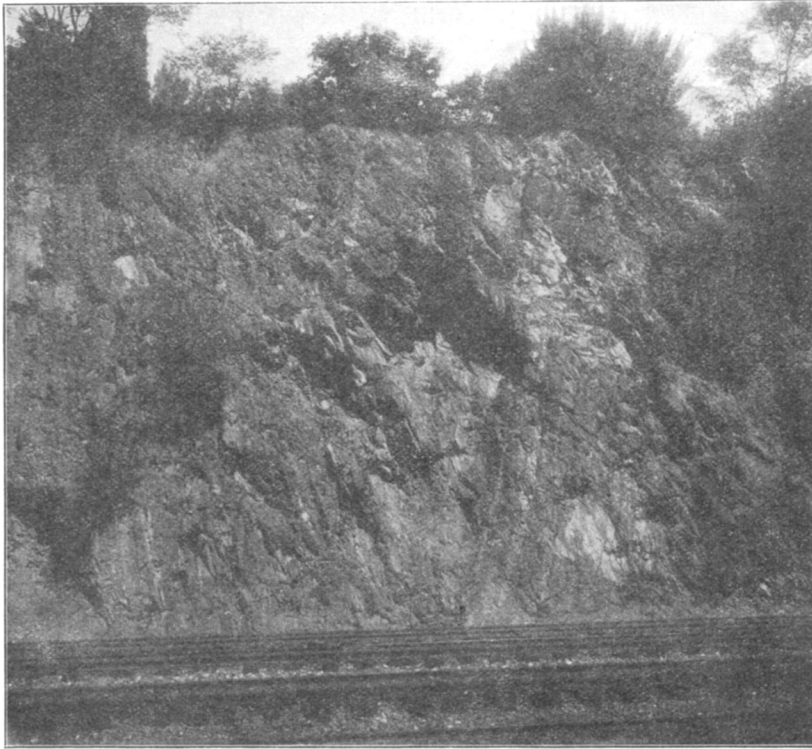


FIG. 3.—Martinsburg (Utica) shale in Cemetery cut, on B. & O. R. R., one half mile east of Martinsburg, W. Va.

sandstones, occur higher in the formation. This part of the formation, composed mainly of thin bedded, micaceous, somewhat buff-colored sandstones, alternating with some olive argillaceous and arenaceous shales, may be seen by the side of the highway west of Williamsport, Md., and in the western part of the town.

## CONCLUSIONS

The fauna found in the railroad cut at Pinesburg is composed of species which are of common occurrence in the Trenton limestone of New York, and the lithological appearance of the rock is that of typical thin-bedded exposures of that limestone. There seems no question but that the upper part of the Shenandoah



FIG. 4.—Shenandoah limestone in the Pinesburg quarry west of Pinesburg, Md.

limestone is correctly correlated with the Trenton limestone. The lower part of the Shenandoah limestone contains Cambrian fossils; but the line of division between the Cambrian and Lower Silurian, which apparently is not indicated by any physical break, has not yet been determined in the Great Valley. It is hoped that future work in Maryland or West Virginia may give us more definite information concerning the composition and limits of this great limestone formation. The bluish to black calcareous and very argillaceous shales which succeed the Shenandoah limestone and form the lower part of the Martinsburg



shales closely resemble the Utica shale, and represent that formation.

In that lithological change from the argillo-calcareous shale, the arenaceous deposits of the succeeding portion of the Martinsburg formation agree with the transition from the Utica to the Hudson shales of New York. This arenaceous part of the Martinsburg shale the writer would correlate with the Hudson shales of New York as exposed in the lower Mohawk Valley and the Helderberg region. In the revised list proposed by Clarke and Schuchert for the New York series,<sup>1</sup> Lorraine beds is probably the name of the formation with which these shales should be correlated. It is to be noted, however, that the deposits which have been called the Hudson formation in the Mohawk and Helderberg region do not contain many of the species, or resemble closely in lithological appearance the rocks in the vicinity of Lorraine, New York.

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<sup>1</sup> Science, N. S., Vol. X, 1899, p. 876.