

SILURIAN ROCKS OF SOUTHERN ILLINOIS

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E. O. Ulrich gave the Bainbridge formation in Missouri its name in 1904, and at that time mentioned its occurrence in localities north and south of Thebes, Illinois.¹ The original application of the term apparently included strata of both the Alexandrian and Niagaran series in Missouri and Illinois. T. E. Savage in subsequent studies differentiated the two series and discussed the lithology and paleontology of the Alexandrian series.² Josiah Bridge and others, including Flint and Ball, have differentiated the Niagaran and Alexandrian series in southeastern Missouri.³

The writer has undertaken a restudy of the Niagaran strata in southeastern Missouri and in southern Illinois in order to delimit more exactly, if possible, the correlation of the Missouri and Illinois rocks with the Niagaran of western Tennessee. This correlation has been suggested previously by Ulrich, Foerste and others and it seems desirable to carry to some further extent the studies once initiated along this line.

In connection with this project some reconnaissance work has been done in Illinois, and this brief report presents the distribution of the Bainbridge formation in Alexander and Union Counties known to the writer. The following locations have been visited:

1. Outcrop in water of Orchard Creek, under bridge in SW $\frac{1}{4}$, NW $\frac{1}{4}$, sec. 21, T. 15 S., R. 3 W., nearly 1 $\frac{1}{4}$ miles south of Thebes.
2. Farmyard of Gerald Clutts, NE $\frac{1}{4}$, sec. 21, T. 15 S., R. 3 W.
3. In tributary to Orchard Creek, SW $\frac{1}{4}$, SE $\frac{1}{4}$, sec. 21, T. 15 S., R. 3 W.
4. Railroad cut near location 1, in the NW $\frac{1}{4}$, SW $\frac{1}{4}$, sec. 21, T. 15 S., R. 3 W.
5. Bed of Orchard Creek, SE $\frac{1}{4}$, SE $\frac{1}{4}$, sec. 21, T. 15 S., R. 3 W.

6. Cut along gravel road, south line of sec. 21, SW $\frac{1}{4}$, T. 15 S., R. 3 W.
7. Gully north of "Powder Mill Hollow," near center SE $\frac{1}{4}$, sec. 28, T. 15 S., R. 3 W., fork of tributaries near head of main gully.
8. In fault block, Railroad cut, SE $\frac{1}{4}$, SE $\frac{1}{4}$, sec. 28, T. 15 S., R. 3 W.
9. Fault zone, "Powder Mill Hollow," SE $\frac{1}{4}$, SE $\frac{1}{4}$, sec. 28, T. 15 S., R. 3 W.
10. On south fork of Salaman Creek, SW $\frac{1}{4}$ and SE $\frac{1}{4}$, sec. 2, T. 15 S., R. 3 W.
11. On north fork of Salaman Creek, NE $\frac{1}{4}$, SW $\frac{1}{4}$, sec. 2, T. 15 S., R. 3 W.
12. In farm yard of Nathaniel King, NW $\frac{1}{4}$, NE $\frac{1}{4}$, sec. 28, T. 13 S., R. 2 W., Union County, Illinois.

The lithology of the Bainbridge formation is well described by the term once used for its Tennessee counterparts, the "variegated beds." In places it is a pure, compact limestone, with a large admixture of reddish coloring material. Elsewhere, possibly in the same exposure, it is a very impure, argillaceous limestone, or a red or purple shale. A mottled aspect of the rock is its common aspect, with areas of grayish green in a red matrix, or, areas of red in a gray background. Extended streaks of grayish-green coloring follow along a joint for many yards in some stream beds or in vertical sections.

In its basal strata the rock is massive and resistant, and commonly quite dense in texture. Above the basal portion a shaly phase of the limestone, or a thinly banded shale may occur. About midway in the type section some massive beds occur and above these is a 10-foot horizon of dark *Cyrtograptus*-bearing shale. This shale is observed in the nearby outcrops but apparently is not of wide distribu-

¹ Personal communication, E. O. Ulrich, The Quarrying Industry of Missouri, Missouri Bureau of Mines, Vol. II, 2nd Series, pp. 110-111, 1904.

² Savage, T. E., Pre-Devonian of Southern Illinois, Bull. Ill. Geol. Surv., 16, p. 336, 1910.

³ Flint, R. F., and Ball, J. R., Revision of the Silurian in Southeastern Missouri, Jour. Geol., Vol. XXXIV, pp. 248-256, 1926.

tion. Above the shale an impure earthy limestone and shale occurs, commonly green in color. And, at the top, are a few strata of well-bedded red or purple limestone.

The green limestone and shales are exposed in several outcrops in southern Illinois and seem to be more widely distributed there than in southeastern Missouri. The green limestones are apparently intergradational with the overlying Bailey and a sharp contact between the two formations has not been observed in this locality.

Distribution and Extent.—The scattered outcrops of the Bainbridge range from the south half of section 28 in T. 15 S., R. 3 W. to the north part of section 28 in T. 13 S., R. 2 W., a distance of about 13 miles. A distance of about 8 miles separates the one exposure thus far known in Union County from the ones in Alexander County, southeast of Gale. A further somewhat unique occurrence of the formation is known to be in the bed of the Mississippi River. Dredging operations in December of 1938 were bringing the Bainbridge in massive blocks from the bed of the River. The stone is used in a wing dam on the Missouri side. The place of the dredging operations is approximately in the center of section 28, T. 15 S., R. 3 W., assuming that that section were projected into the river bed. This midstream occurrence evidently is incorporated in some of the fault blocks of the region.

The author is indebted to L. E. Workman of the Illinois State Geological Survey for information concerning the subsurface extent of the Bainbridge formation in the state. He writes that the shaly, fine-grained red Bainbridge limestone is found as far north in Illinois as the northern part of Bond and Lawrence Counties and through the center of Effingham County. This extends the formation northerly for about 100 miles from the Alexander-Union County line, and northeasterly for about 150 miles. Workman states further that north of these limits, as in Clark County, traces of the reddish rock appear in the samples, but that there

is no appreciable thickness. This report points to the reddish Bainbridge as far north on the east side of the state as the gray dolomites in the vicinity of Grafton are on the west side.

The Bainbridge occurs in association with the Alexandrian Brassfield or Sexton Creek formation in half the number of outcrops cited in this discussion. The Brassfield occurs in isolated, boulder-like masses along creek beds and near fault traces. Weathering and erosion have attacked the Brassfield very effectively and it is not as extensive in this part of Alexander County as is the Bainbridge. In the Union County vicinity, the Brassfield apparently is of considerable thickness in the slopes west of the Bainbridge occurrence.

The average thickness of the formation, which in Missouri is about 130 feet, is not shown in the Alexander County outcrops. A section of only 9 feet is seen at low water in Orchard Creek.⁴ This outcrop evidently is near the top of the formation. Greater thicknesses are displayed in "Powder Mill Hollow," where the rock is disturbed by faulting, and in the gully north of the "Hollow." A possible thickness of about 50 feet may be estimated in "Powder Mill Hollow", based on plane table readings and with no allowance for dips. About the same thickness seems evident in the gully north of the "Hollow" and in this gully the waterfall descent of the stream bares a cliff of something more than 15 feet in height. About 3 miles northeast of these occurrences the Bainbridge, exposed at the stream level of Salaman Creek, rises for apparently 40 feet or more into the slopes of the valley wall. Probably it is of considerable thickness also in Union County but is concealed by undergrowth.

The Bainbridge is among the calcareous rocks which have been tested for rock wool possibilities by local interests. A number of citizens of Thebes are interested in its commercial possibilities, and the author in his inquiries has received much help from Mr. E. L. Holliday, Mr. J. E. Rimer, and Mr. Clutts, of Thebes, Illinois.

⁴Ball, J. R. Type section of Bainbridge formation of southeastern Missouri, Bull. A. A. P. G., vol. 23, p. 598, 1939.