

An Unusual Aspect of the Contact Between the Mooretown Sandstone and the Paoli Limestone

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The purpose of this paper is to describe an unusual aspect of the contact between the Mooretown sandstone and the underlying Paoli limestone observed by the writer in Crawford County, Indiana. The outcrop described below is located in a road cut along Indiana Highway 62, Section 33, T. 3 S., R. 2 E., about two miles northeast of the town of Leavenworth.

The Mooretown is the third member of the Chester series, Upper Mississippian, in Indiana, being preceeded by the above mentioned Paoli limestone and a thin, limy sandstone representing the Aux Vases sandstone of the Illinois section. However, at the locality described in this paper the Aux Vases is not present. The Paoli here rests upon a brecciated limestone bed which tops the Ste. Genevieve limestone.

The Mooretown formation in Southern Indiana is a sandstone, shale, or sandstone and shale, often containing one or two thin seams of coal. The sandstone is generally fine to medium grained, cross bedded, and iron stained, and varies from friable to well-cemented stone. Markings of the plant fossil *Stigmara* are frequently present and serve to characterize this sandstone formation. The thickness varies from 10 or 12 to 40 feet or more on the outcrop and generally averages 20 feet. It rests upon the Paoli in a more or less conformable manner, the contact usually being flat or slightly undulating.

At the locality described in this paper the Mooretown possesses most of the features usually found at other outcrops. The basal portion of the formation consists of a three foot bed of angular and medium grained, iron stained, well-cemented sandstone. Along the full length of the exposure in the road cut the plant fossil *Stigmara* occurs at the top of this bed. The remainder of the Mooretown is composed of ten feet of soft gray and tan shale. A thin smut streak was observed at the base of the shale section overlying the *Stigmara* zone at a position normally occupied by a thin coal bed. The boundary between the Mooretown and the subjacent Paoli, instead of being marked by the characteristic flat or moderately undulating surface, is represented here by a number of cylindrical depressions in the Paoli limestone that are filled with sands belonging to the Mooretown. Remnants of four sandstone columns that filled these depressions in the Paoli were observed by the writer (Fig. 1). At one other place on the face of the road cut sand and sandstone were cemented on the weathered limestone outcrop in sufficient quantity to strongly suggest the former presence of still another sandstone column. These sandstone columns, probably best described as natural casts, are ten to twenty-one inches in diameter and

penetrate the Paoli three to five and one-half feet or possibly more below the top of that formation. Like the sandstone bed above, the columns are composed of cemented, medium grained, iron stained sands.

Referring to figure 1, Column A is fourteen inches in diameter and three feet long. Only a portion of Column B remains, and that portion appears to be undergoing rapid disintegration. The lowest visible sandstone was five feet below the main body of the Mooretown; the actual base appears to be still lower. The remnant of this column was twenty-one inches in diameter. Column C (Figs. 1 and 2), the smallest of the group,

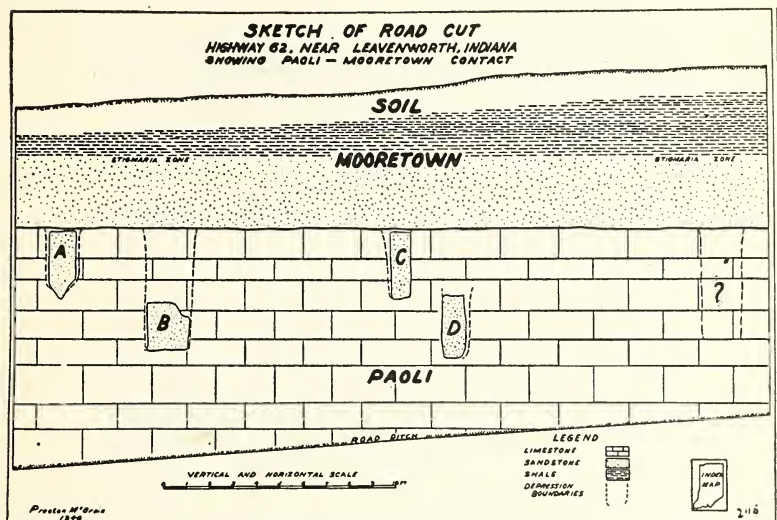


Fig. 1.

was but ten inches in diameter and projected three feet into the Paoli. Column D is also a remnant, its top portion having been removed by operations in making the road cut. This remnant is eleven to thirteen inches in diameter and it extends at least five and one-half feet into the Paoli. The actual base could not be determined. In general, structural features appear to be lacking in these columns. However, in Column C there were traces of lamination with the beds inclined toward the center of the depression.

To the writer's knowledge features such as the above have never been described in Indiana literature, and consequently their origin hasn't been discussed. Actually little is known about the upper surface of the Paoli limestone. As a rule the contact is seen only in quarries, road cuts, and vertical or nearly vertical cliffs. Consequently little more than a line is visible from which we must interpret the nature of the contact. Such is the case of the area in question.

Several questions arise as to the origin of the depressions in the Paoli limestone and the columnar shafts of sandstone filling them. Did

the solution developing the pits take place at, beneath, or above a former water table? Did the solution take place before or after the deposition of the Mooretown? Although the depressions are cylindrical for the most of their length they are funnel shaped at the top, and Column A is tapering at the base. These facts, together with the fact that the surface between the major depressions exhibits negligible relief, strongly suggests that their origin and orientation were governed by water whose movement was controlled by gravity, thus being formed by solution above the water table. The Paoli is a relatively pure limestone and would tend to be dissolved by carbon dioxide charged waters with little difficulty.

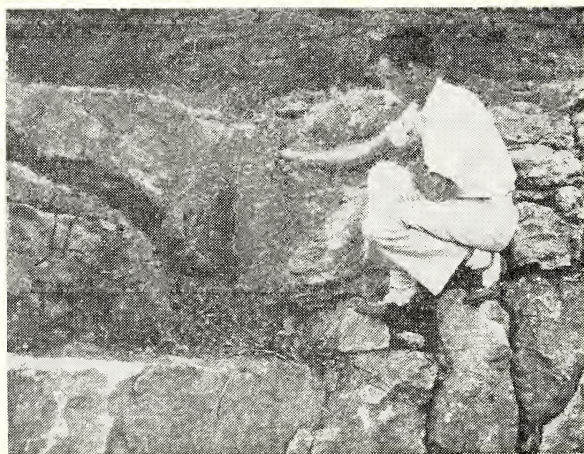


Fig. 2. View of the top of the Paoli limestone and one of the sandstone columns. Photo by P. D. Griffith.

The beds of the Mooretown appear to be flat lying or nearly flat lying, the only apparent inclination being the normal regional dip. There is no evidence of collapse or other disturbed features present in the unbedded Mooretown sandstone overlying the Paoli, such as would normally be present if the solution took place after the deposition of the sand. Also the *Stigmara* zone has maintained its position consistently over the full length of the outcrop. In view of the above observations, it is the opinion of the writer that the depressions which served as moulds for the sandstone columns were caused by the solution of the Paoli limestone before Mooretown time, and that the Mooretown sands were deposited on this erosion surface thus forming the rather peculiar unconformable relationship of the penetrating columns of Mooretown sandstone in the Paoli limestone.