XXXIV. PRELIMINARY REPORT ON THE SYCAMORE LIMESTONE.

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Part I. Introduction

Purpose

This report on the Sycamore limestone of Oklahoma is given as preliminary to a final report which will be offered as a part requirement for a masters degree in the School of Geology of the University of Oklahoma.

Very little work of a detailed nature has been done on this formation, consequently there are some problems concerning it which have been unsolved. First is a detailed lithologic description, second, is the placing of the formation in it's proper position in the columnar section, and third is the settlement of some structural problems. Dr. Gould* states, "The age of the Sycamore has been a matter of controversy and it is altogether possible that the last word on the subject has not been written.*** Following the preponderence of opinion, the Sycamore is here assigned to the basal part of the Mississippian and correlated with the Boone limestone".

Since the above quotation is the last that has been written, is readily seen that there is much to be done on the subject of the age and correlation of the Sycamore limestone.

Literature

The literature on the Sycamore limestone is very brief. Only five articles are found in the literature as much as a paragraph to the discussion of this formation, and of this five, only two writers have done anything which might be called detail work. The first writer, J. A. Taff* maps in part the limestone in the Arbuckle Mountain region, and describes its lithologic character to a limited extent. He did not find any fossils in the formation. The next report in which detail work on the formation was done appeared in 1924, by Geo. D. Morgan.* In this report Morgan describes and maps an entirely different phase of the formation which is possibly

*Gould, C. N., Index to the Stratigraphy of Oklahoma, Okla. Geol. Survey Bull. 35, p. 23, 1925.

*Morgan, Geo. D., Geology of the Stonewall Quadrangle, Oklahoma. Bureau of Geology, Bull. 2, pp. 48-50, 1924.

*Taff, J. A., U. S. Geol. Survey, Geologic Atlas, Tishomingo Folio, (No. 98) p. 5, 1903. U. S. Geol. Survey, Prof. Paper 31, pp. 14, 32-33, 48, 1904.

mentioned by Mr. Taff in his earlier report. Morgan also lists eleven species of fossils which he collected in the Stonewall Quadrangle.

The above constitutes all of the important articles which have heretofore been published on the Sycamore limestone.

Part II. Location

The outcrops of the Sycamore limestone are found in parts of Pontotoc, Murray, Carter, and Johnston counties. The principle areas are associated with the Arbuckle Mountain uplift, where the longest and most continuous outcrops flank the Arbuckle anticline. The formation is brought to the surface by faulting in the Criner Hill uplift; in T. 1 S., R. 3 E., in sections 22-23; in sec. 4, T. 4 S., R. 5 E; and sec. 34, T. 2 S., R. 3 E. In Pontotoc County the formation is found in two outcrops, the first occurring in the southern part of T. 3 N., R. 6 E., extending southeast into the northeastern part of T. 2 N., R. 6 E.; the second from the center of T. 1 N., R. 7 E., to the southeast corner of the township ending in the northeast corner of sec. 1, T. 1 S., R. 7 E. In Murray County the formation borders the Washita River on the north beginning in the extreme southeastern corner, extending northwest crossing the river in about sec. 28, T. 1 S., R. 2 E., and continuing on the south side of the river for several miles. Just southeast of Davis and northeast of Dougherty, there is a long sinuous outcrop beginning in sec. 2, T. 2 S., R. 3 E., extending northeast and ending in sec. 26, T. 1 S., R. 2 E. This outcrop is roughly the shape of a figure nine and occurs on the northwestern end of the Tishomingo anticline. North of this coutcrop is found the small up-faulted portion mentioned above. The formation enters Carter County in sec. 13, T. 3 S., R. 3 E., extending northeast to section 4 of the same township, where it is concealed by river sediment. It is again picked up in section 6, of the same township and it extends roughly westward through Tps. 2 & 3 S., and Rs. 2 E., 1 E., and 1 W., to the town of Woodford, where it again trends northwest and ends in sec. 12, T. 2 S., R. 2 W., where it is covered by Permian sediments. In Johnston County the formation runs southeast from sec. 18, T. 3 S., R. 4 E., across the township and leaves the County in the southeast corner section 36, and thence across sections 5 and 6 of T. 4 S., R. 5 E., ending just across the line of section 4, where it is terminated by a fault.

This long outcrop which is almost continuous for almost forty miles forms the southern limb of the Arbuckle anticline. It is not exposed on the northern limb of this anticline and it is thought the

long fault immediately north of the outcrop, in eastern Carter and Western Johnson counties has concealed the formation at this place. That this probable, is shown by the fact that small patches of the Sycamore are brought up and exposed on the surface by branching faults off this main fault in sec. 4, T. 4 S., R. 5 E., and in secs. 33 and 34, T. 2 S., R. 3 E.

Part III. Lithology

The Sycamore limestone has a number of characteristics by which it is easily recognized wherever it is encountered. It is a slate-blue limestone on fresh fracture, with a dense, even texture. It has a gritty appearance in contrast to the flinty appearance of other limestones which are more pure. It is exceedingly tough and sometimes breaks with a distinct conchoidal fracture. On weathering the bluish tinge changes to a characteristic light brownish-yellow hue, which is one of the very characteristic features of this limestone.

It separates into small rectangular blocks as a result of pointing. This jointing occurs in two sets; the major set sunning parallel to the bedding, and which separates the foramtion into thin layers which are about six inches, more or less, in thickness. The second set of joints run almost at right angles to the first, forming the blocks mentioned above. In places there are found distinct layers of shale. At the exposure south of Crusher, in the railroad cut and continuing west for several miles, there is a distinctive parting of a bluish-black shale which is about fifteen feet thick in the cut, widening out westward until in places there is a small valley formed as a result of this shale parting which is probably 200 feet wide in some places. This shale parting occurs almost in the center of the formation which is approximately 160 feet thick where exposed at the railroad. Farther west toward Woodford in northeastern Carter County, this shale parting is absent, so it seems as if this shale is a lenticular mass occurring within the formation. Just north of Woodford there are a number of horizons in the Sycamore where the formation is apparently a very shaly lime. However the shale is not a distinct member, as in the occurrence farther east, but is included with the layers of the hard, bluish limestone which is characteristic of the other exposures. In other words, the limestone itself has graded into a rock that seems to be a limy shale.

In the Stonewall Quadrangle the formation does not reach nearly the thickness found in other exposures. In this area it has never been observed to have a thickness of more than five feet, with a probable average of about two feet. In comparing this thickness

with other exposures it would be suspected that the lithologic character of this outcrop would be entirely different; but the formation here is still a hard, tough, slate-blue limestone, weathering to the characteristic bright yellow hue.

Microscopic

Approximately fifty thin sections of the limestone will be made from the various sections which have been measured. (About twenty have already been made.) A hasty study of these slides shows one remarkable fact; that the limestone is made up of about 40 per cent quartz; this occurring as small subangular grains, averaging about 10 millimeters in diameter. There is also an appreciable amount of iron stain in all of the slides. Calcite in some sections is well crystalized. As yet no heavy mineral determinations have been made, but from a chemical analysis it is evident that magnetite and possibly anatase or rutile may also be present. If other heavy minerals are present, they will be brought out by following the usual methods of heavy mineral determination, which will be done in the near future.

Chemical Analysis

A. C. Shead* has made two analyses of Sycamore limestone from samples obtained at the exposure in the railroad cut south of Crusher. These analyses are only approximate, since the alkalies are not determined.

*Shead, A. C., Physical and Chemical Analysis of Oklahoma Mineral Raw Material, to be issued as bulletin of the University of Oklahoma.

APPROXIMATE CHEMICAL OF THE SYCAMORE LIMESTONE

By A. C. Shead[1]

	114	115
SiO_2	40.85	39.03
Al_2O_3	3.48	3.49
Fe_2O_3	0.43	0.19
FeO	0.74	1.01
MgO	1.02	1.15
CaO	28.09	28.92
H_2O	0.23	0.25
TiO_2	0.266	0.266
CO_2	23.89	24.40
MnO	0.01	0.01
	99.006	98.716

No. 114

65 feet thick above shale parting, 1½ miles south of Crusher, south of railroad bridge over Washita River, in N. W. ¼, sec. 6, T. 3 S., R. 3 E., in Carter County, Alkalies not determined.

No. 115

Same as 114, except the limestone is 56 feet thick and lies below the shale parting. Alkalies not determined.

MINERAL CONTENT CALUCLATED FROM CHEMICAL ANALYSIS

Quartz	36.76	34.93
Kaolin	7.57	7.59
Calcite	47.42	48.55
Dolomite	6.01	6.78
Hematite and Magnetite	1.17	1.20
Anatase (?)	0.266	0.266
	99.196	99.316

From the above mineral content, it is evident that the Sycamore limestone is a distinctly sandy lime with an appreciable amount of shaly material.

[1]Shead, A. C., Physcial and Chemical Analyses of Oklahoma Mineral Raw Material, to be issued as a bulletin of the University of Oklahoma.

Part IV. Fauna

Morgan, as already stated, has collected a number of species from the Sycamore limestone in the Stonewall Quadrangle.* These species were identified by Professor Shuchert, who states that although guide forms are lacking, he is satisfied that the fauna is Kinderhook in age, which presents a condition which is difficult of explanation, when a fauna of the adjacent portions of Caney and Woodford formations are considered. However, Morgan places the Sycamore together with the upper portion of the Woodford and the lower portion of the Caney, as partially equivalent to the Moorefield shale, the Batesville sandstone, and the Fayetteville shale of Arkansas. The writer has collected a number of species at the foot of Vine's Dome (Scott's Dome), a number of which have been identified. All of them (eight forms) are found in the Caney shale, six in the Mooreville shale and two in the Fayetteville sandstone. There are a number of species yet to be identified and the writer hopes to obtain a number of others so that some distinctive guide forms may be found by which the age and correlation of the Sycamore limestone can be definitely established.

*Op. cit. p. 50.