SOME GEOLOGICAL PROBLEMS OF NORTHEASTERN OKLAHOMA

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Northeastern Oklahoma is an area which holds many unsolved problems in geology. It is perhaps unique that a region so near to the heart of the oil industry should receive so little attention from the geologists of the area. It is true that the petroleum possibilities of this area are not great but there is still opportunity for small fields to be discovered and produced. It is the purpose of this article to point out some of the more important geological problems of northeastern Oklahoma and their relation to the petroleum industry.

The most important problems of the area are concerned with stratigraphy. The various lithic units found in the area are tabulated below.

		Southern Oklahoma (Muskogee-Porum Area)	Northeastern Oklahoma (Vinita-Wagoner Area)
Pennsylvanian Period	Des Moines Series	Taft ss Shale Inola ls Shale Crekola ss Shale Bluejacket ss Shale	Taft ss Shale Inola ls Shale Crekola ss Shale Bluejacket ss Shale
	Boggy Fm.		
	Savanna Fm.	Spiro ss Shale Sam Creek ls Shale Spaniard ls Shale Keota ss Shale Tamaha ss	Spiro ss Shale Sam Creek ls Shale Spaniard ls Shale Keota ss Shale Warner ss
	McAlester Fm.	Shale Cameron ss Shale Lequire ss Shale Warner ss	
	Atoka Series	McCurtain sh Hartshorne ss Shale Blackjack School ss Shale Webbers Falls ss Shale Dirty Creek ss Shale Georges Fork ss Shale Pope Chapel ss Shale Coody Creek ss	Shale Blackjack School ss Shale Webbers Falls ss Shale Dirty Creek ss Shale Georges Fork ss Shale Pope Chapel ss Shale Coody Creek ss
	Atoka Fm.		
	Morrow Series		Mississippian

There has been much controversy in the past years among the leading geologists of the Mid-Continent region as to the correct age of certain lithic units found in the area. It is commonly accepted that the Atoka formation of southern Oklahoma extends into northeastern Oklahoma. It is also accepted that the Atoka formation thins greatly to the northeast. Just how far the formation extends and how much it thins is the point of controversy. In the vicinity of T6N R18E the Atoka formation is approximately 5,000 feet in thickness. It consists primarily of sandstones and shales. As the Atoka extends to the north it becomes thinner and in the vicinity of T10N R18E it is only 1,250 feet thick. The convergence of the Atoka formation continues to the north and at Muskogee, Oklahoma (T15N R18E) it is only 950 feet thick. Recent work by Renfro (1947) indicates that the Atoka series disappears entirely in the vicinity of Choteau, Oklahoma (T20N R18E). Renfro's work also indicates that the various sandstones of the Atoka formation pinch out against the Morrow limestone to the north. This of course means that a series of stratigraphic traps are present throughout this area. It is quite possible that some of the older wells of the area may have been producing from traps of this sort without knowledge of their existence.

The basis of the above information concerning the thinning out of the Atoka formation has been solely field indications and lithology. In order to strengthen and test this data two new problems are now being investigated. The first is to correlate accurately the Spaniard limestone over the critical area between T13N and T24N along R18E by means of microfossils. There is a limestone unit in the vicinity of T21N which has been called Atoka in age by some workers. It is their contention that this limestone is a portion of Atoka which is not thinned out but which is carried on into northeastern Oklahoma. Preliminary data indicates that this unit is Spaniard in age and not Atoka. If this correlation can be definitely proven then the contention that the Atoka does not occur north of T20N in the area is greatly strengthened.

The second problem is to investigate the heavy mineral content of the Warner sandstone. This unit has been traced by surface methods from Kansas into southern Oklahoma. The Kansan equivalent is the Little Cabin sandstone. The Warner is the first lithic unit which extends completely from southern Oklahoma to Kansas over this area. It is also the basal member of the McAlester-Savanna group. If the Warner sandstone can be correlated by means of its heavy mineral suite then the Warner equivalents to the south can definitely be established. It is possible that all or part of the Hartshorne sandstone of southern Oklahoma is a Warner equivalent. However preliminary data collected in this problem indicates that the Hartshorne is not a Warner equivalent but that it pinches out and thus should be part of the Atoka formation. It is indicated that the Warner extends directly into southern Oklahoma overlapping the Hartshorne sandstone in the vicinity of Muskogee, Oklahoma (T15N R8E).

Another prominent stratigraphic problem of northeastern Oklahoma is concerned with the Morrow formation. The Morrow is not found to the north of Choteau, Oklahoma (T20N R18E). In Sec. 8 T20N R19E the Warner is found to lie directly upon Mississippian shales. The field indications are that the vicinity of Choteau and Vinita were emergent during Atoka and Hartshorne time. The Morrow was probably truncated by erosion during this emergence. At the beginning of Warner time the area was submerged and the Warner sandstone deposited by a transgressing sea. Therefore it is thought that the Hartshorne should be included in the Atoka formation. It is also thought that the Atoka might well be raised to series rank as it represents a period of time before the sea was high enough to submerge this area. It is interesting to note that R. C. Moore of the Kansas Geological Survey in a recent article has also suggested this change.

The structure of northeastern Oklahoma is far from simple. The area is crossed by numerous faults of various kinds. As yet the area has not been studied in detail but work of this nature is now being done in part by students

of the University of Tulsa. Field data collected last summer indicates that the Seneca fault zone passes to the west of Scaly Bark Mountain (T20N R18E). In Section 1 T19N R17E there are several small faults which are well exposed. Most of the faults of this area trend northeast-southwest. A recent survey of the Bull Creek anticline located in Section 27-T19N R17E indicates a greater closure than previously thought. The closure is in the vicinity of 50 feet. It is interesting to note that the town of Wagoner is located on the center of a dome with approximately 50 feet of closure. It is not likely that this structure will ever produce due to the extreme difficulty of leasing and drilling within a townsite. The expected production would be small, probably 10 or 15 barrels per day with a rapid decline curve. There are undoubtedly petroleum traps formed in the area by having reservoir rocks cut by faulting. Most of the faults have a relatively short displacement but quite sufficient to produce structural traps. It is quite probable that some few small fields of this type can be developed in this area with further investigation.

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