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ARKOSE OF THE NORTHERN ARBUCKLE AREA.

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ARKOSE OF THE NORTHERN ARBUCKLE MOUNTAIN AREA.

Extending along the northern flank of the Arbuckle Mountains is an arkosic series which bears an important time relation to the orogenic movements of that region.

These deposits have been chiefly studied, and are typically developed, in the western part of Pontotoc County, and it is therefore suggested that they be known as the Pontotoc series, but by no means is it to be inferred that their outcrop is limited to the confines of the county indicated. The lower contact of the formation has been traced along an irregular line from the vicinity of Sulphur northeastward through Dolberg, to the west of Ada, across Canadian River to the west of Tyrola, to the east of Konawa and to the northern limit of the Stonewall quadrangle through the eastern side of sec. 16, T. 6N., R. 6E. Beyond this point the contact has not been carefully followed, but the formation is known to continue in the same general direction for a number of miles. From Sulphur the contact turns westward along a line about parallel with the Arbuckle Mountains and has been traced in that direction as far as the Atchison, Topeka, and Santa Fe Railway.

As noted later, the upper contact of the series is more difficult of definition than the lower, but the fact that the two are separated by a large areal extent of the formation is evidenced by the presence of arkosic strata at the following rather widely scattered localities: Wynnewood, Hart, Vanoss, Bebee, a point one mile south of Stratford, Maxwell, and just east of Konawa.

The strata comprising the series consist of coarse sandstones, shales, and impure, argillaceous or arenaceous limestones. The sandstones are made up almost entirely of quartz and feldspar, although some fragments of limestone are always present,

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The writer is now engaged in making a geological survey of the Stonewall quadrangle, the results of which will be published in a bulletin of the Oklahoma Geological Survey. The present preliminary article is published by the permission of the Empire Gas and Fuel Company.

and locally, limestone pebbles predominate to such an extent that almost pure limestone conglomerates are the result. The shales and limestones of the series always carry quartz and feldspar, although in varying degree. The feldspar is sometimes so abundant as to form a large percentage of the total.

The source of most of the material comprising the beds was the Arbuckle Mountains. Proximity of the series to the mountain mass and the close similarity between the feldspars in the arkose and those in the igneous rocks of the mountains constitute sufficient evidence to justify this conclusion. In addition, the presence in the series of fragments and pebbles of limestone which by their contained fossils may be identified as belonging to limestones outcropping in the Arbuckles would apparently leave no room for doubt.

The grains of quartz and feldspar are quite distinct and well separated and are of large size. Even in outcrops remote from the mountains it is not unusual to find great numbers of almost perfectly preserved orthoclase crystals averaging more than a quarter of an inch in length. Such evidence is taken to indicate that periods of torrential distribution of these materials alternated with long quiescent periods during which the contributing igneous mass weathered and crumbled in situ. Whether the coarse fragments and crystals, and their distribution are entirely the result of variation in rainfall which caused periodic removal of weathered igneous material, or whether they indicate recurring uplifts are questions difficult of proof, but the general evidence leads to the conclusion that both these processes contributed.

The thickness of the Pontotoc series is not accurately known, but is thought to be between 1,000 and 1,500 feet. In a general way the formation may be divided into three parts. The lowest of these comprises alternating strata of sandstones, conglomerates, and shales, each carrying a large percentage of feldspar, which for the most part is pink orthoclase, but which locally consists of more basic varieties. The middle portion also carries sandstones, but the shales are thicker and more numerous, and in addition a total thickness of about 100 feet of impure limestones is present. The quantity of feldspar in this portion is about the same as it is in the lower part. In the upper division shales predominate. Limestones are almost entirely absent and although there are a few local occurrences of grits and conglomerates, the sandstones become thinner and more fine-grained with a consequent decrease in the size of the feldspar particles.

The base of the series as defined in this paper is easily distinguishable. For an example of the sharpness of this lower contact the reader is referred to the bluff on the west side of Sandy Creek about 300 feet west of the southeast corner of sec. 9, T. 3N., R. 5E. To reach this bluff from Ada, the nearest

railroad point, one travels southwestward over the upturned edges of northwestward-dipping sandstones, shales, and conglomerates, none of which contain megascopic feldspar,* but on crossing Sandy Creek and climbing the bluff in question a sandstone is suddenly encountered which contains such a quantity of pink orthoclase as to give it almost the appearance of a true granite. From this point westward for a number of miles it is difficult to find even a small piece of rock which does not contain an appreciable amount of feldspar.

Although clearly marked by feldspar the base of the formation is not defined by any traceable or distinctive stratum. The sandstones throughout the entire series are given to rapid and complete gradation into shales or impure limestones, and these in turn intergrade so often and so completely that an individual bed is rarely to be found which can be followed for more than a few miles. In addition to this variability caused by intergradation, mapping of individual beds over large areas is made practically impossible by the presence of numerous, small unconformities within the series.

Since these difficulties have precluded the possibility of mapping any one stratum as the base of the formation the writer has resorted to the use of feldspar fragments in the same manner that distinctive or index fossils are used in the identification of strata. That is the base of the Pontotoc series has been considered as being represented by a line drawn through those points at which, (on going upward through that portion of the stratigraphic column of the Stonewall quadrangle which lies above the Holdenville shale) megascopic feldspar is first encountered. The top of the formation is less definitely marked than the base and up to the present has received less study than has been given to the lower contact, but it has been observed that as one ascends through the series the quantity of feldspar in the rocks gradually diminishes and finally disappears. The general line along which this total disappearance takes place has been considered as the top of the series.

In defining the base of this formation as being represented by the first arkosic series occuring above the Holdenville shale it is probable that an entirely unnecessary precaution is taken. A thin conglomeratic sandstone, however, carrying some igneous pebbles has been found in the southwestern part of the Allen oil field. This stratum occurs near the base of the Wewoka formation which underlies the Holdenville shale and it is desired to prevent any possible confusion. Between the Pontotoc series

* The writer has not made a microscopic examination of these rocks below the Pontotoc series, but no feldspar has been revealed by the use of an ordinary hand lens.

and the sandstone just mentioned there are more than 1,000 feet of strata, and in none of these has there been found a single piece of arkosic material.

In view of the conclusions which are drawn in this paper it is desired to make a tabular comparison of the igneous material found in these two formations.

PONTOTOC SERIES	CONGLOMERATIC SANDSTONE OCCURRING IN THE WEWOKA FORMATION SOUTH OF ALLEN
1. Components entirely separated.	1. Components interlocked. (Complex pebbles)
2. Fragments and crystals angular.	2. Fragments rounded and well water-worn.
3. Grain coarse.	3. Grain (of pebbles) fine to microscopic.

From the foregoing it will be seen that the materials are entirely dissimilar and it is therefore concluded that the sources of the two types were dissimilar.

The restricted range and small areal extent of the pebbles found in the Allen exposure indicate one, or a combination of the following possibilities:

1. The condition of deposition was quite temporary; or
2. The source of the material was small and quickly exhausted.

The well rounded character of the pebbles might be taken to indicate that through the operation of some temporary current they had been brought in from a remote locality. On the other hand, the texture is that of near-surface igneous types and it may be that the particles were derived from dike or sill rocks which were exposed in the adjacent Arbuckles at, or near the time of the deposition of the basal beds of the Wewoka formation.

In the foregoing discussion an attempt has been made to show that during the time intervening between the deposition of the pebble bearing sandstone of the Allen area and the initial beds of the Pontotoc series no large igneous mass was exposed in the territory adjacent to the area under consideration.

AGE OF THE PONTOTOC SERIES.

It was only after a long search that a sufficient number and variety of fossils were found to establish the age of the formation.

Early in the course of the work a few poorly preserved gastropods were collected from an impure limestone and sent to Dr. J. W. Beede for identification, but he reported that they all belonged to the genus *Bulimorpha* and were insufficiently distinctive to establish the age of the beds as anything closer than Carboniferous.

Later a shale was found, just north of the town of Center, from which a plant collection was taken and sent to Dr. David White for identification. Dr. White reported the following forms: *'Neuropteris ovata,* the large form of upper Pennsylsylvanian age; *Pecopteris arborescens* and *Pecopteris hemi teliоides;* fragments of *Cordaites,* and probably *C. communis;* indeterminable fragments of *Calamites* indeterminable stem fragments possibly belonging to a fern; a few small fragments of a large species of *Pecopteris* comparable to *P. ("Callipteridium") Dawsonianum,* or one of the closely related species from the Conemaugh and Dunkard of the Appalachian trough; and a fern fructification, probably a new species, if not a new genus', and stated that in his opinion the shale was late Pennsylvanian in age.

Still later a very fossiliferous limestone was found along the south bluff of Canadian River, about three miles north of the town of Bebee, and from this a marine fauna was taken which seems to corroborate the opinion of Dr. White. All of these fossil-bearing beds were found in the middle or upper part of the series.

Having thus determined the presence of an arkosic series in the western part of the Stonewall quadrangle and having shown that the underlying formations, although often conglomeratic, contain no observable feldspar, it would appear that a sort of stratigraphic "bench mark" has been established to which reference may be made with some degree of assurance and which should be of great service in the solution of the problems of the Arbuckle Mountain region.

After six months work in the Stonewall quadrangle, it is the mature opinion of the writer that the base of the Pontotoc series is the time equivalent of the period at which the Arbuckle Mountains were worn down to their igneous core.