XVIII. PHOSPHATE ROCKS IN OKLAHOMA

A. C. Shead
From the Oklahoma Geological Survey.

Phosphatic material has been reported from time to time in various localities in Oklahoma. It has been said to occur in the Woodford shale, the Sycamore sandstone, near the towns of Dougherty, Berwyn and Ravia, on a contact of limestone and granite between East and West Timbered Hills and in Atoka county. However, in no instance, had a sample been exhibited or an analysis made of any such material until on August 13, 1921, Mr. A. C. Blair, a farmer on rural route 4, Hastings, Oklahoma, sent in some specimens to the writer for identification. No location was given and the situation of the deposit was unknown until the writer visited Mr. Blair in the summer of 1922, obtained the location from him and there collected about 150 pounds of sample and made some observations on the nature of the occurence.

Fortunately the geology of the region has been minutely worked out by Carroll H. Wegemann.* This author places the region in the Wichita beds of the Permian and gives the following section at the very place where the writer collected his sample, namely in the NE. cor. SE. ¼sec. 33, T. 4S., R. 9W.

Section of rocks exposed in the SE¼sec.33 T. 4S., R. 9W., by Carroll H. Wegemann.†

	Ft.	In.
Sandstone, yellow, altitude of base 966 feet	15	0
Shale, red	32	0
Sandstone, white		8
Shale, red, sandy	3	0
Sandstone, white	1	0
Shale, red	10	0
Shale, brown	1	0
Shale, gray, weathers light blue	7	0
Shale, red, sand	2	0
Sandstone, white	1	0
Shale, red, sandy	1	0
Sandstone, calcareous	3	0
Shale, green		4
Sandstone, dirty yellow, almost white containing many large round concretions	9	0
Conglomerate, concretionary, dark red and black, concretions up to ? inches in diameter; altitude, 899 ft.		10

*Wegemann, Carroll H., Anticliral Structure in parts of Cotton and Jefferson Counties, Oklahoma, U. S. Geol. Survey Bull. 602, 1915, p. 73.
†Idem.

Sandstone, blush white, shaly	3	0
Sandstone, bluish white, with red shale	2	0

Wegemann does not seem to have recognized the phosphatic nature of some of the nodules in this vicinity mistaking them, naturally enough, for limestone nodules of almost identical appearance in other portions of his area.

The phosphate occurs in the 32ft. shale bed in the above sec-

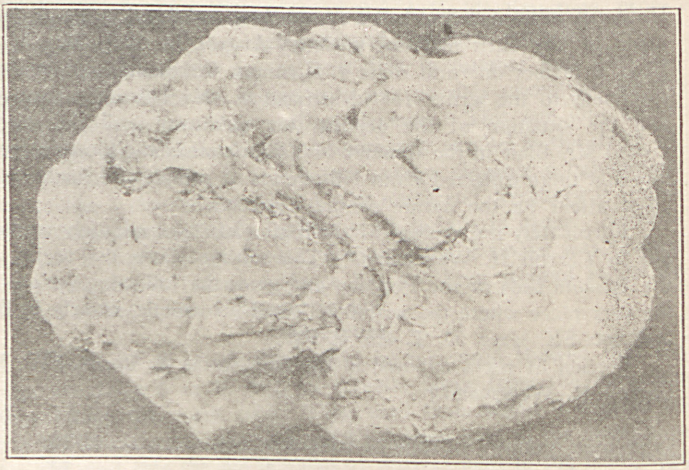

Fig. 2. Phosphate Nodule. Natural Size, NE. of SE¼ Sec. 33, T. 4 S., R. 0 W., Cotton Co., Oklahoma. 1 mi. north of extreme southwest corner of Cotton County. A. C. Shead.

tion which lies in the west facing bluff of the hill on which a Mr. Silkwoods' house now stands. The deposit is just west of the Cotton-Jefferson county line in Cotton county about a mile north of Red river and the extreme southeastern corner of Cotton county. It is one-half mile north of the main Burkburnett Texas to Waurika, Oklahoma road eight miles west of Waurika and two miles east of Wallings' or Wilson's store.

The rock is in the form of heavy, dark red or maroon colored nodules, many of which show in some places a "turkey fat" or butter colored surface and in other portions metallic black fluted or slickensided areas that are probably highly manganiferous. As a rule, the surface is smooth and convoluted somewhat like the surface of a brain. Sometimes the convolutions are almost absent. The fragments of the nodules break sharply and smoothly with mostly plane surfaces and sharp edges and corners. They generally show pockets and veins of white or cream colored powdery ma-

terial and are found quite abundantly strewn over slopes.

The phospate rock is much like other smooth coprolite-like nodules of limestone found in the same region, with which they are very likely to be confused. The preponderant shapes of the nodules collected, were globular, ovoid or elliptically discoid though it is recognized that these forms probably result from chipping, weathering, and water rolling, of fragments of veins to be described later.

The material of which the nodules are made is extremely fine grained, in most cases so much so that the mineral particles can not be distinguished. However, the association and colors lead to the conclusion that the following minerals are present: limonite (yellow), hematite (red), finely divided quartz, aluminum silicates of the nature of kaolinite, pyrolusite and other oxides of manganese, and minerals that account for the calcium, phosphate and fluorine shown by the analysis to exist.

The chemical composition of the phosphate from an analysis made by the writer is as follows:

SiO_2	16.83 %
Al_2O_3	5.11 %
Fe_2O_3	3.23 %
MgO	Trace
CaO	39.76 %
Na_2O	0.43 %
K_2O	0.79 %
H_2O-	0.66 %
H_2Ox, Organic Matter	2.90 %
TiO_2	0.35 %
CO_2	3.07 %
P_2O_5	24.90 %
SO_3	Trace
F	4.31 %
MnO	0.176%
Total	102.516%
Less O equivalent to F	1.810%
Total (Corrected)	100.706%

From the analysis, it is evident that the material is of commercial grade since 50.00 per cent of B.P.L. (Bone, phosphate of lime) content constitutes a marketable rock and is so quoted in the reports.

While at this particular location the quantity of phosphate present is limited to a few tons of material, there are strong possibilities, since similar conditions prevail over a widespread area in the Wichita beds of the Permian both in this state and in Texas and since phosphatic rocks have been observed in the same formations of the latter state, that large commercial deposits may, on further search, be located in this territory. However, even if this be not realized, the location above mentioned will probably be extremely interesting as throwing light on the origin of phosphate rock deposits from a strictly scientific standpoint, as the following observations may disclose.

The phosphate has evidently come up in water solution and been

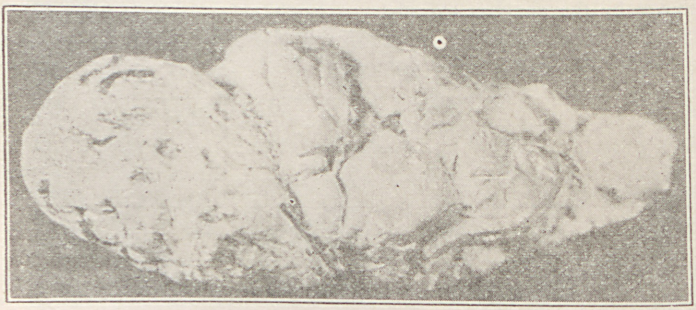

Fig. 3. Phosphate Nodule. NE of SE¼ Sec. 33 T. 4 S., R. 9 W. 1. mile N of extreme SE Corner of Cotton County, Oklahoma. Natural Size. A. C. Shead.

deposited along with its associated minerals, notably malachite, in cracks of the maroon colored joint clay, which acted as a mould for the phosphate. The fact that it exists in such a material where cracks must necessarily be transient owing to creep, wash, and flowage, argues a rapid deposition of the material and not a long continued geological process in its formation. These veins of mineral, originally continuous, crack transversely at frequent intervals into vertebrae or back bone like stringers, presumably under the influence of the creep of the containing clay along the slopes. Upon further movement of the enclosing clay the thin veins are broken up into blocks of a size dependent upon the interval of the previous jointing and lie scattered over the slope of the hill. Further movement causes fragments to chip off the thin edges and corners of the brittle material and the rounded nodular form to develop, that is characteristic of the form in which they are now found. All these

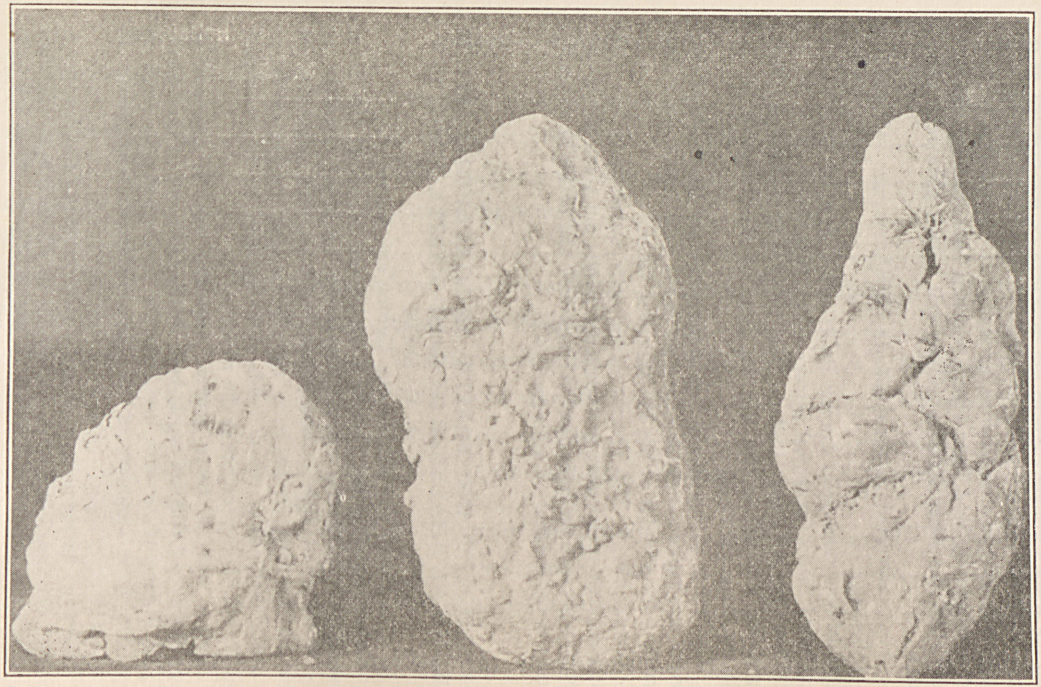

Fig 4. Phosphate Nodule NE. of SE¼ Sec. 33 T. 4 S., R. 9 W. 1 mile N. of Extreme SE. Corner of Cotton County, Oklahoma. Natural Size. A. C. Shead.

different phases can be seen plainly at the place mentioned. Inasmuch as the seams in the clay are not wide, the veins of mineral are thin and hence are generally extended in two dimensions, the jointing being distant compared with the thickness of the original vein. If the interstitial clay should be washed away these flat nodules would settle in plates or laminae, according to the position of their centers of gravity, and form layers which if subsequently cemented would show the characteristics of the well known plate rock phosphates.

Those interested in phosphate in Oklahoma, are referred to the following:

Oklahoma Geological Survey Bulletin, No. 3, p. 60.

United States Geological Survey Folio, No. 122.

University of Texas Bulletin, No. 1814, p. 64; which mentions phosphatic material in the Wichita beds of the Permian in the adjacent state of Texas.

The writer is continuing the investigation of these interesting nodules and hopes to be able to present in the near future some data regarding the nodules of the Permian Red Beds.

Summarizing: The present paper calls attention to the fact that phosphate rock exists in Oklahoma, points out a locality where it occurs, presents an analysis of the material, and offers an explanation as to the method of its formation.

XIX. NOTES ON BARITE IN OKLAHOMA WITH CHEMICAL ANALYSES OF SAND BARITE ROSETTES

A. C. Shead

From the Oklahoma Geological Survey.

Notwithstanding the fact that barite and especially the form known as "sand barite rosettes," has long attracted attention as one of the most widely disseminated of Oklahoma minerals, yet little definite progress has been made in working out the extent of its areal distribution, the methods of its genesis, or the geological significance of its presence in the rocks.

Before any of these general questions can be answered a great amount of detailed work, both in the field and in the laboratory, will have to be done and it is the purpose of this paper to present a short summary of the accomplishment recorded up to the present time.

The only statement regarding the areal extent of the deposits is a verbal one, attributed to C. N. Gould in which it was said that the barite occurs in an outcrop of red sandstone about ten mile