OKLAHOMA GEOLOGICAL SURVEY

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Occurrence of Radioactive Material in Sandstone Lenses of Southwestern Oklahoma

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OCCURRENCE OF RADIOACTIVE MATERIAL IN SANDSTONE LENSES OF SOUTHWESTERN OKLAHOMA

In the last few months sandstone lenses of Permian age containing radioactive bituminous material have been found in the southern part of Jefferson and Cotton Counties, Oklahoma. The lenses of radioactive sandstone occur locally beneath a cross-bedded bituminous gray sandstone.

The first discovery of radioactive bituminous sandstone was made by Mr. Westbeard of Randlett, Oklahoma, on the Clinton Byars farm in Cotton County near the SW¼ of sec. 30, T. 5 S., R. 12 W. The sandstone lens crops out approximately 100 feet below the top of a bluff along the north side of Red River. The sandstone lens lies beneath a cross-bedded bituminous gray sandstone. It has a maximum thickness of 15 feet near the center of the lens and is about 100 feet wide in the face of the bluff. The sandstone lens thins rapidly east and west into red Permian shales and appears to extend north and south. The sandstone ranges in color from light yellow through grayish-blue to pinkish red. The sandstone shows well developed lamination due to thin layers of radioactive bituminous material and to a greenish mineral similar in appearance to malachite. The sandstone zone containing the greatest amount of radioactive bituminous material is approximately 14 inches thick and is grayish-blue. This lens is nearly 10 feet long, tapering at each end to a thin lens 0.5 inches thick and pinching out east and west in the sandstone. Scattered through the central part of the sandstone lens and above and below the grayish-blue sandstone zone are numerous flat bodies of carbonized fossil wood 0.5 inches thick consisting of radioactive bituminous coal. This bituminous coal is cut by veinlets of a radioactive carbonate mineral and of a green copper mineral having a physical appearance similar to that of wavellite.

A second occurrence of sandstone containing radioactive minerals is on the farm of U. C. Miller in Jefferson County in the SW¼ of sec. 7, T. 5 S., R. 8 W. Here the sandstone occurs beneath a cross-bedded gray to black bituminous sandstone. The radioactive sandstone ranges from approximately 0.5 to 1.5 feet thick and is brownish-red on the weathered surface. In fresh exposures the rock is brownish-black to grayish-brown with a metallic appearance in localized spots within the rock. This sandstone occurs as a thin lens that can be traced from near U. C. Miller's house south to the bluff overlooking Red River, but thins rapidly northward and grades into shale.

These radioactive sandstone lenses are associated with a cross-bedded bituminous gray sandstone shown on the new Geologic Map of Oklahoma (Miser, 1954). The age of the sandstone is given by Miser as probably equal to that of the base of the Garber sandstone of northern Oklahoma.

This cross-bedded bituminous sandstone (Fig. I) crops out in southern and eastern Comanche County, dipping away from the south and east flanks of the Wichita Mountains. On the south flank of the Wichita Mountains the sandstone has a south dip of approximately 100 feet per mile.

Structural highs in eastern Tillman County, southern Cotton County, southern Jefferson County and east central Carter County cause this cross-bedded bituminous sandstone to occur exposed on or around the topographic highs on the structures as a cap rock and in numerous places along drainage channels.

The cross-bedded bituminous sandstone associated with radioactive sandstone lenses was mapped in Cotton County and in parts of eastern Tillman County as the upper part of the Auger conglomerate in the upper part of the Wichita formation (M. J. Munn, 1914). This conglomerate grades back and forth from a conglomerate to a cross-bedded bituminous dark gray sandstone and was described by Munn as follows:

> No single exposure is typical of this conglomerate lentil, because each bed is variable from place to place. However, the lentil as a whole does not change so much from one outcrop to another that it may not be recognized wherever exposures are good. Toward the east, in Rs. 12 and 11, the clay-limestone conglomerate bed becomes more sandy and loses its characteristic lumpy conglomeratic appearance. If the writer's correlations are correct the conglomerate bed becomes darker and harder toward the east, and in many places has the smooth-grained appearance of a calcareous, somewhat ferruginous sandstone and weathers out of the inclosed sandstone as irregular, slablike lenses or more or less round to flattish concretionary masses, some of which are several feet in length.

A description and measured section of the exposure in the bluff on the north side of Red River in sec. 30, T. 5 S., R. 12 W. was given by Munn as follows:

Beds exposed in "breaks" on north side of Red River in sec. 30, T. 5 S., R. 12 W.

	Feet
Quaternary:	
1. Sand, loose brownish to reddish, coarse, massive; seems to be wind blown; capping bluff	15-30
Permian (Wichita formation):	
2. Sandstone, reddish, thin bedded, ripple marked; poorly exposed under the loose sand	4
3. Clay or shale, whitish, with some thin-bedded shaly sandstone	2

Permian (Wichita formation) — Continued.	Feet
4. Clay, red to grayish (mostly red), with some soft, reddish, thin, smooth, gray calcitic lime concretions; the slumping clay almost conceals a few thin beds of very soft clayey sandstone near the base	40
5. Sandstone and clay. Sandstone reddish, blocky to platy, cross-bedded and very irregular bedded. Changes to red clayey sandstone with light-colored streaks thence to red clay carrying many roundish clay-lime concretions having a very rough surface and a burnt brick-red color. The beds change from sandstone to clay and back to sandstone within short horizontal distances	15
6. Clay and sandstone; deep-red clay, interbedded with and changing locally to reddish and grayish clayey sandstone. The clay in many places contains smooth roundish gray clay-limestone concretions	10
7. Sandstone; top part soft, locally massive, yellowish to greenish in places, contains near middle large round to flattish black concretions single and twinned, some of which are more than a foot in diameter; bottom part thin and irregular bedded, weathers reddish with canary-yellow streaks. These sandstones and concretions change horizontally into red clay and shale and are extremely variable in occurrence	11
8. Sandstone, dark gray and yellowish at base with black specks; changing to dark and harder limy irregularly bedded sandstone in middle, which carries flattish irregularly bedded layers of a very hard, close-grained, reddish to dark rock, which seems to be composed of rather coarse subangular grains of quartz cemented with limestone. These lenses resist erosion better than the adjacent beds and remain on the surface as irregular slabs after the other portions have been disintegrated	9
9. Sandstone, grayish to light canary-yellow, rather massive	7
10. Sandstone, massive, soft canary-yellow to dark leaden gray, containing remains of fossil plants and small amounts of copper ore in lower 5 feet	12
11. Clay and shale, whitish to light gray, changing to deep purple blocky clay with lumps and streaks of copper ore and shale or clay pebbles	2

Permian (Wichita formation) — continued.	Feet
12. Shale, clayey, red and gray to green	10
13. Conglomerate, clay-limestone; soft, gray to reddish contains in places fragments of bones. This bed is in many places absent	2
14. Clay, deep red to purplish with one or more thin layers of soft impure whitish sandstone near base; clay contains in lower part considerable number of rather small gray, roundish calcitic clay-limestone concretions	8
15. Sandstone, 2-foot layer at top of soft whitish to gray sandstone which has the appearance of having become bleached and which in weathering forms cylindrical holes in upper surface (one-fourth to one-half inch in diameter) which trend in all directions in top layer. These holes appear to have been made by burrowing animals or worms in the ancient sand beach. Under this layer is a massive reddish irregular bedded impure sandstone having many thin dark streaks made up of small round black specks which are slightly more resistant to weathering and appear as ridges on face of cliff. Near base is a massive layer carrying many round black cannonball-like concretions, the largest a foot in diameter. Sandstone very irregular bedded with many cross-bedded zones and whitish layer at base	21
16. Clay, deep red, with thin purplish and ashen-colored layers, a few very thin layers of soft gray sandstone, and a layer of clay pebbles in gray calcareous clay at the bottom	20
17. Sandstone, reddish, at top, changing to grayish toward bottom, massive irregular bedded	10
18. Clay, principally deep red, with thin layers of sandstone and sandy shale, beds very poorly exposed with about 10 feet of greenish clay or shale at river level; about	50
	233

The cross-bedded bituminous sandstone (Bed No. 8) in the above description occurs approximately 100 feet below the top of the bluff and rests directly on 19 feet of sandstone (Beds 9 and 10) of which the lower 12 feet contains radioactive minerals.

The Auger conglomerate extends eastward from Cotton County into Jefferson County where it was mapped by J. R. Bunn (1930) as the Ryan-Asphaltum

sandstone. The cross-bedded bituminous gray sandstone occurs in the upper part of the Asphaltum sandstone and the Ryan sandstone is composed almost entirely of this cross-bedded dark gray sandstone. Bunn describes the Asphaltum sandstone and the Ryan sandstone as follows:

ASPHALTUM SANDSTONE

The most important sand horizon from the standpoint of areal mapping is the Asphaltum sand. This sand zone is exposed in the vicinity of the town of Asphaltum and occurs through parts of Tps. 3 and 4 S., Rs. 4 and 5W. It marks the Healdton uplift showing up as a series of inliers along this major structural feature, with the overlying Claypool and Addington formations occurring progressively on either side. In every instance an exposure of this sand zone of any extent along this structural trend is indicative of local anticlinal structure. This sand zone is exposed over or around the Loco pool, the Healdton pool, the Hewitt pool, the other undeveloped anticlinal features along the Healdton uplift.

The Asphaltum consists of a series of gray buff, yellow, calcareous sandstones, generally massive, friable, and medium-grained, but locally laminated and thin-bedded. The thickness of this sand ranges from 20 to over 50 feet and consists of one or more members, separated by intervening shale beds. A nodular limestone stringer from two inches to one foot in thickness occurs uniformly 12 to 18 feet above the top of the sand throughout parts of Tps. 3 and 4 S., Rs. 4 and 5 W. In parts of Tps. 3 and 4 S., Rs. 4 and 5 W., this sandstone is saturated with asphalt, and several seeps of gas and heavy oil occur.

In the area just described this sandstone can be mapped in detail. Also observed local dips in individual beds are generally indicative of true structural dip.

RYAN SANDSTONE

A sandstone having the same general description and occurring in approximately the same stratigraphic position as the Asphaltum is typically exposed in the scarps immediately southeast and northwest of the town of Ryan. The sandstone here consists usually of one member, massive to thin-bedded, with a thickness of 17 to 28 feet.

The Ryan sandstone is exposed irregularly through parts of Tps. 6 and 7 S., R. 7 W. With very few gaps, it can be traced northwest through T. 5 S., R. 8 W., and parts of T. 4 S., Rs. 8 and 9 W. It appears to thicken in this direction, and in the bluffs bordering "Dead Man's Gulch" in T. 4 S., Rs. 8 and 9 W., at least three distinct members are present, forming a sand zone with a thickness in excess of 60 feet. The sandstone can be traced irregularly northeast from Ryan through parts of T. 5 S., Rs. 5, 6, and 7 W., the strike gradually swinging in a broad loop, circling the plunging northwest end of the

Nocona structural uplift. The sand is poorly exposed through this area, but can be followed by the cuesta-like topography, long dip slopes, sandstone float, and the sandy nature of the soil. It is characteristically exposed again through secs. 14, 15, 22, and 23, T. 6 S., R. 5 W., where the general normal northeast dip into the Ringling Basin can be clearly seen.

The Ryan sand can be correlated rather definitely with the Asphaltum sand previously described. It can be traced by well records across the Ringling Basin into the Asphaltum sand. Its general lithologic similarity and the stratigraphic repetition on either side of the Ringling Basin practically assure this correlation.

The Ryan sand makes a fair marker for general detail mapping. It is exposed only over areas structurally high, marking the northwest extremity of the Nocona high, and various anticlinal folds along the Waurika arch.

This cross-bedded bituminous sandstone in western Cotton and Comanche Counties and in eastern Tillman County becomes a thin conglomerate bed. In eastern Cotton County and southwestern Jefferson County the sandstone is well developed cross-bedded fine-grained dark bituminous sandstone with a calcite cement. North and east of T. 5 S., R. 9 W. in Jefferson County, the sandstone loses much of its bituminous material and is at many places poorly cemented. The rock becomes a light gray to white iron-stained cross-bedded sandstone with only a trace of bituminous material.

The bituminous gray sandstone occurs at the base of a series of sedimentary beds of Garber age and marks the contact between the rocks of Garber and Wellington age (see geologic map, Plate I). This contact as shown on the geologic map is somewhat generalized in a few areas, but for the most part it is accurate in areas where prospecting can best be done for other possible radioactive sandstone lenses. These beds extend south across Red River into Texas and should be examined there for possible occurrence of radioactive sandstone lenses.

This report is issued in order to call attention to the association of the radioactive material with a marker bed. The map shows the occurrence of that bed and thus indicates the line of outcrop along which more lenses of rock bearing radioactive minerals might be found. It is possible that the radioactive minerals are concentrated at places along an unconformity between the rocks of Wellington age and those of Garber age. The residual material in the basal part of the Garber is the expected site of concentration.

The writer is grateful to Mr. J. M. Bullard, member of the Oklahoma House of Representatives, for calling his attention to the occurrences and for spending a day in the field in order to show him the localities.

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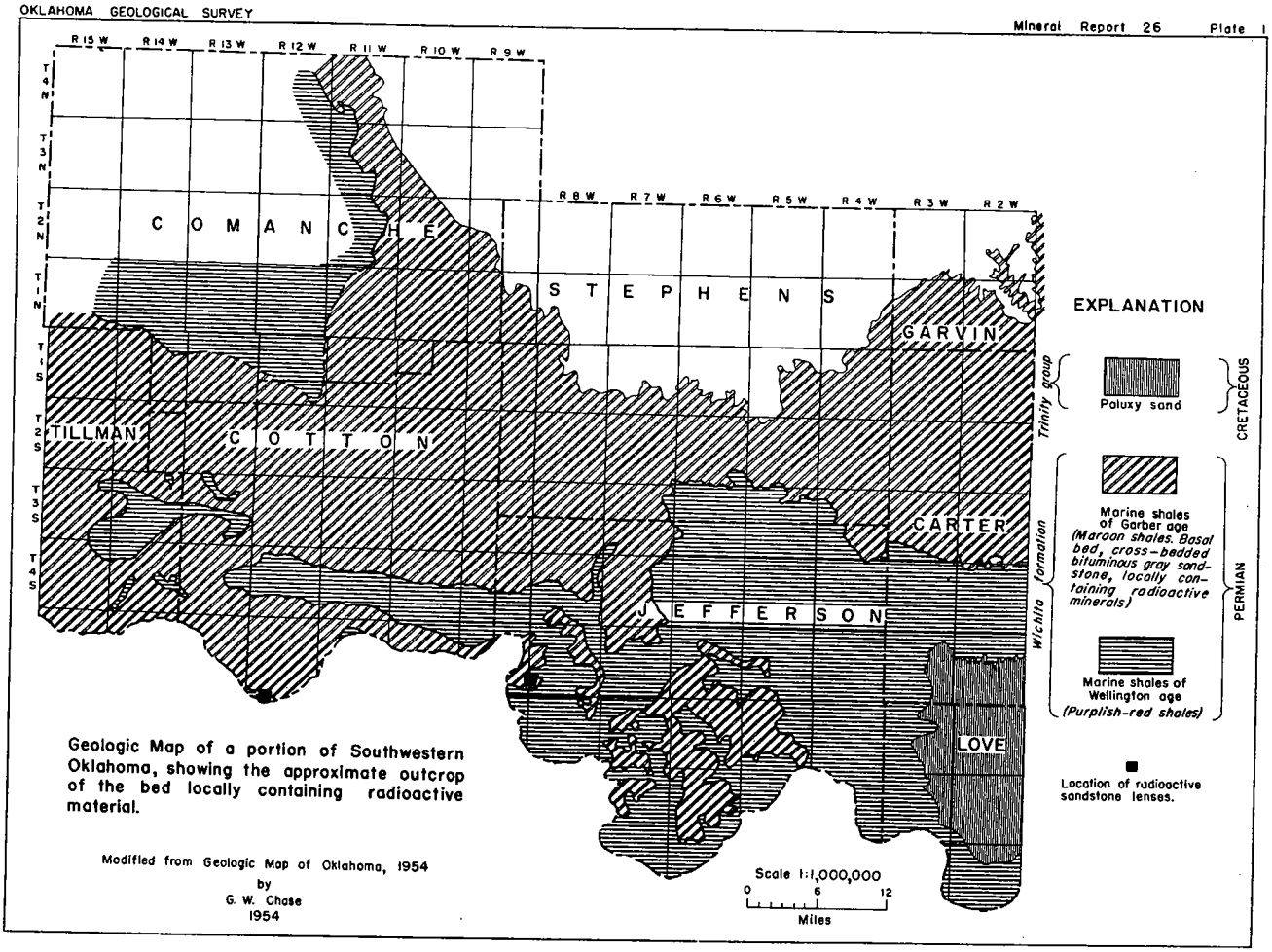

Geologic Map of a portion of Southwestern Oklahoma, showing the approximate outcrop of the bed locally containing radioactive material.

Modified from Geologic Map of Oklahoma, 1954
by
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