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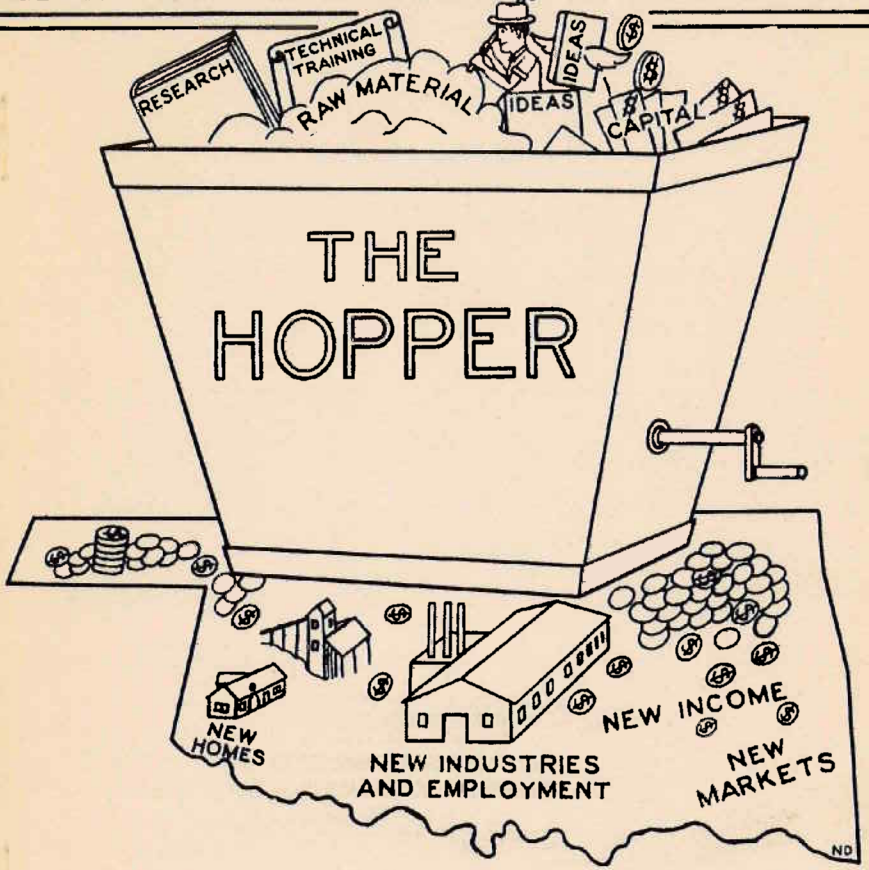

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GEOLOGY AND MINERAL RESOURCES OF

OKFUSKEE COUNTY, OKLAHOMA

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By Edward Richard Ries

ABSTRACT

Okfuskee County is in central eastern Oklahoma and covers an area of approximately 625 square miles. The consolidated bedrock that crops out is of Middle and Upper Pennsylvanian age, and consists principally of shales and sandstones, together with a few thin limestones and conglomerates. These are locally covered by surficial deposits of Quaternary age, including flood-plain deposits, higher terrace sands, residual high-level gravels, and eolian sand deposits. Volcanic ash is associated with the higher terrace sands.

Stratigraphy. The outcropping Pennsylvanian rocks are of the Des Moines, Missouri, and Virgil series, and have a composite thickness of about 3,865 feet. They are divided into 17 formations. which are further subdivided into 71 mapped units.

The oldest rocks exposed are in the upper part of the Des Moines series. They crop out in southeastern Okfuskee County and include, in ascending order, strata of the Senora formation, Calvin sandstone, Wetumka shale, Wewoka formation, and Holdenville shale. All are in the Marmaton group except the Senora, which is the highest formation in the Cabaniss group. A regional unconformity is present at the top of the Des Moines series, between the Holdenville shale and the overlying Seminole formation, but in Okfuskee

County there is no demonstrable truncation or overlap. That part of the Des Moines series exposed in the county has a composite thickness of about 1,580 feet.

Rocks of the overlying Missouri series crop out in the central part of the county, where they have a composite thickness of about 1,270 feet. These strata are placed in the Skiatook group below, consisting of the Seminole formation, Checkerboard limestone, Coffeyville formation, Hogshooter formation, Nellie Bly formation, and the Dewey formation; and the Ochelata group above, consisting of the Chanute, Tallant and Barnsdall formations. Rocks of the Missouri series are mostly thick grayish- to brownish-green shales, thin sandstones, and thin limestones, all of which are cypically marine. Limestones of the Checkerboard and Hogshooter formations disappear southward, in the central part of the county, by grading into shale. A minor unconformity is present at the base of the Barnsdall formation.

The youngest bedrocks exposed are in the Virgil series of Upper Pennsylvanian age. The mapped units in ascending order are Vamoosa formation, "Pawhuska" formation, and the Ada and Vanoss formations, undifferentiated. These formations crop out in the western part of the county and have a total thickness of about 880 feet. The strata consist of red to reddish-brown shales, sandstones, chert conglomerates, and dolomitic limestone, mostly deposited in a deltaic environment.

The Vamoosa contains at its base a chert conglomerate about 50 feet thick which is here named the Boley conglomerate member of the Vamoosa formation. At the base of the Boley conglomerate

is the most prominent unconformity in Okfuskee County. Below it, all the Tallant formation and the upper part of the Barnsdall formation are strike-overlapped, the magnitude of overlap increasing southward toward the Arbuckle Mountains. By making the base of the Boley conglomerate the base of the Vamoosa formation, the writer restricts the definition of Vamoosa as originally given by Morgan.

Fossils. Most of the shales and many limestones of the Des Moines and Missouri series in Okfuskee County are fossiliferous. Although many fossils are long-ranging, "Marginifera" muricatina, Mesolobus mesolobus, Delocrinus granulosus, and a few other species were found to be diagnostic of the Des Moines series, whereas Chonetinella and Triticites irregularis were found to be diagnostic of the Missouri series. Fossils from the Virgil rocks are scarce and are undiagnostic. Faunal evidence indicates paucity of life in post-Dewey time.

Subsurface geology. The outcropping formations of the areal geologic map were traced into subsurface through the use of the electric logs of wells drilled for oil and gas. Generally the sandstones of the surface change into shales westward in subsurface, and this change is accompanied by westward thinning. The following important correlations are made with subsurface units as used by petroleum geologists in Okfuskee County; (a) subsurface Checkerboard limestone is equivalent to a sandy limestone in the Seminole formation; (b) subsurface Oswego is equivalent to a calcareous sandstone in the middle of the Wetumka formation; (c) subsurface Prue sand is equivalent to the upper Calvin sandstone; (d) subsurface Verdigris limestone is equivalent to limestones in

the middle shale of the Calvin formation; and (e) subsurface Skinner sand is equivalent to the lower sandstone of the Calvin formation.

Structural geology. The regional structure of Okfuskee County is a gently dipping homocline in which the strata generally strike N. to N. 28 E. and dip westward 0.5 to 1 degree. The homocline is locally modified by anticlinal folds, noses, and faults, some of which have served as traps for petroleum and natural gas.

Surface faults of the county are typically en echelon, occurring in belts that trend northeastward roughly parallel to the strike of the Pennsylvanian formations. Within these belts the faults are arranged in subparallel, overlapping alignment, mostly striking N. 17 W. to N. 45 W. and commonly making an angle of about 45° with the direction of the belt in which they lie. All of these faults appear to be normal. Displacement on the en echelon faults is generally less than 40 feet at the surface, and decreases downward, as few of the faults can be detected in deeper subsurface work.

Drainage. Detailed drainage study in Okfuskee County showed that the drainage area of Deep Fork Canadian River is much larger than the drainage area of North Canadian River. At places, Deep Fork drainage encroaches within 2 miles of North Canadian River. At the same longitude, in R. 8 E., North Canadian River flows at an elevation of 800 feet, whereas Deep Fork flows at an elevation of 700 feet. This study indicates that Deep Fork once played a much more important role than it does now.

Economic geology. Oil and gas are the most important mineral resources of the county. Nonmetallic mineral resources include sand and gravel, shales and clays, limestone, building stone, and volcanic ash, most of which have not been extensively used owing to lack of market. Ground water suitable for municipal and industrial use occurs principally in alluvium and in sandstones of the Calvin, Wewoka, Nellie Bly, and Vamoosa formations.

Geologic Features of the Vinita Area

by Carl C. Branson

Southeastern Craig County, with the city of Vinita at its center, is of great interest to geologists. The rocks exposed range from Chattanooga black shale, the oldest rock cropping out, on up through the Fort Scott limestones. The pattern of resistant rocks has governed erosion in forming escarpments, buttes, and unusual water courses. In addition, there are mineral resources and materials of potential economic value in the region. The rocks of the entire area have been mapped in detail by C. D. Claxton, L. P. Chrisman, Clarence Lohman, Jr., R. B. Branson, and L. E. Thomas as master's thesis problems at the University of Oklahoma. Dr. G. G. Huffman directed the work of Bob Branson and L. E. Thomas.

Along Cabin Creek 7 miles south of Vinita is Cedar Bluff. The bluff is a scenic and spectacular cliff composed of about 200 feet of Mississippian limestone (St. Joe, Reeds Spring, and Keokuk) exposed at the axis of an anticline. Near water level, Chattanooga black shale is exposed for about 200 yards. The view of Cedar Bluff is especially good from the hills west of Cabin Creek.

The buildings of Eastern State Hospital are on a hill which is capped by the Warner sandstone. This sandstone crops out in Vinita at the west end of the Bull Creek bridge. The Warner forms a tree lined cliff along the west side of Little Cabin Creek northeast of Vinita. The same sandstone caps the cemetery hill and the isolated hills northeast of town to the county line.

The hills north of Ketchum are composed of chert and cherty limestone (Keokuk) exposed on the upthrown side of a fault, the Whiteoak fault, which extends eastward from south of Whiteoak and makes the escarpment on the north side of Locust Creek. The rocks on the north side have dropped as much as 200 feet relative to those on the south side. A striking structure is excellently exposed in the railroad cut three miles southwest of Afton. The structure is the southern end of the Miami syncline, a long, narrow downfold. In the railroad cut, the Warner sandstone is in the center, thirty feet of shale beneath on both sides, the Fayetteville limestone and dark shale at the ends of the cut. The Fayetteville shale is crowded with fossils, especially Chonetes, and the limestone has many corals and bryozoans.

The Fayetteville formation of the area is well known for its fossils. Near Todd School the formation yields fine specimens of crinoids (stone lilies). At most localities, as on the south side of the hill about one mile south of U. S. Highways 60, 66, 69, on Oklahoma Highway 82, the common fossil looks like a corkscrew. This is the axis of a colony of moss animals. Its name is Archimedes, for the Greek who established that the geometry of a screw is that of an inclined plane. Specimens are from 2 to 4 inches long.

West of Bluejacket is the isolated hill called Timbered Hill. The hill is capped by a remnant of a coarse sandstone, the Chelsea sandstone. Beneath the sandstone is a thick bed of coal which has been mined by shaft and drift on and around the hilltop. The east escarpment of the hill is supported by the Bluejacket sandstone, which is the Bartlesville oil sand of central Oklahoma. The high hills along the east side of Cabin Creek 3 to 5 miles northwest of Vinita are also capped by the Bluejacket.

South and east of Vinita a few isolated hills are capped by Atoka sandstone, which here appear to be channel deposits. In a cut on Highway 82, 3 miles south of Highways 60-66-69, the sandstone rests on Fayetteville dark shale, and is almost certainly in a channel. At one place, 3 miles southeast of Vinita, the sandstone is saturated with asphalt.

The isolated hill at Estella is a hill of Chelsea sandstone. Coal has been dug from beneath the sandstone on the east and south side of the hill. In the strip pit 2 miles northeast of Estella is an unusual relationship, conglomerate containing pebbles up to 6 inches in diameter rests directly upon the coal.

The continuous escarpment extending from northwest of the town of Chelsea to Kansas, west of Chetopa, is the Fort Scott escarpment. The escarpment is formed by four limestone beds, from top to bottom the Upper Fort Scott limestone, the Lower Fort Scott limestone, the Breezy Hill limestone and the Verdigris limestone. The escarpment is a conspicuous feature and divides the shale valleys on the east from the higher grasslands to the west. The escarpment is easily seen on U. S.

Highway 60 five miles east of the Nowata County line.

In the area there are several coal beds of workable thickness:

Iron Post coal 9-13 inches: Below Breezy Hill limestone, dug along rim of Ft. Scott escarpment, from Highway 60 to Kansas.

Croweburg coal 15-20 inches: 30 feet below Verdigris limestone. Dug in the southwest part of Craig County, and 6 miles west of Welch.

Mineral coal 10-16 inches: Dug west and northwest of Welch, 5½ miles west of Welch.

Weir-Pittsburg coal 20-22 inches: Dug in the Wolfe Creek valley 5 miles west of Welch and east of Estella, and west of Bluejacket.

Rowe coal 6-7 inches: Dug for farm use near Bluejacket.

East of Vinita is a quarry in the Hindsville limestone. The rock is oolite, which looks like it is made of small fish eggs. On top of the hill north of Rogers School, the county road crews dig the black shale with phosphate nodules and spread it on county roads. It breaks down to form a good even surface within a few months. At one time there was a brick plant just west of Vinita. The shale used for the raw material is good and it is difficult to understand why the enterprise failed.

Scenically Vinita is fortunate in having the nearby wooded hills south of Whiteoak, along Cabin Creek northwest of town, the buttes eastward near Highway 60-66-69, the hills and the escarpment at the Eastern State Hospital and beyond, and the cherty hills south of town around Cedar Bluff. Not far to the southeast is the fine scenery along Lake o' the Cherokees. Geologically, scientists are attracted by the interesting rock layers, the fossils, and the unusual faults and folds. Geologists will continue to visit Vinita whenever they can get into the field.

WARREN JOINS FRANKFORT OIL COMPANY

John H. Warren, who has been with the Survey as assistant geologist since 1948, has joined Frankfort Oil Company and he started work in Bartlesville on March 21. He assisted H. A. Ireland in preparing the map of pre-Simpson rocks in northeastern Oklahoma, published as Oil and Gas Investigations, Preliminary Map 52, by the U. S. Geological Survey in 1946. He wrote the chapter on ground water resources in Oakes' Geology of Tulsa County, published as Okla. Geol. Survey, Bulletin 69 in 1952, and is co-author of Mineral Report 25, Mineral Industries of Oklahoma in 1952. For some time he has been engaged in preparation of a new Economic Minerals Map of Oklahoma, and this map is now ready for the press.

Johnny has always been a center of friendship and good cheer. He was badly bitten by the collecting bug and is famous for his extensive accumulation of whatzits. We shall miss him, but are assured that he will be back to see us frequently, and he is always more than welcome.