STRUCTURE CONTOUR MAP OF THE PRE-PENNSYLVANIAN SURFACE IN ILLINOIS*

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Uplift, warping, and peneplanation of the surface previous to the deposition of Pennsylvanian sediments in Illinois caused truncation of the Mississippian, Devonian, Silurian, and upper and middle Ordovician systems on the margins of the basin and truncation of local structures. The pre-Pennsylvanian surface was not reduced to a flat peneplain. In places features of local erosional relief are evident. In the Beardstown area, western Illinois, a pre-Pennsylvanian hill stands about 50 feet high with four Pennsylvanian cyclothems wedging out on its flanks on or against the Salem and St. Louis formations of the Mississippian system. It is difficult to locate these erosional features merely from subsurface information, but geologic conditions in the outcrop areas indicate that isolated shallow basins were first filled with Pennsylvanian sediments which later accumulated to such a depth that they covered the hills leaving a flattish surface.

The LaSalle anticline (Fig. 1) extends in a northwest-southeast direction for more than 250 miles, from northern Illinois north of the Pennsylvanian boundary to the Indiana border of northern Wabash County in southeastern Illinois. This structure in northern Illinois is a very asymmetrical anticline with a west flank dipping more than 25° in pre-Pennsylvanian rocks and an east flank dipping less than 1°. South of LaSalle County, the structure is imperfectly outlined in Livingston and McLean counties due to lack of drill data. It is better known in Champaign, Douglas, Coles, Clark, Crawford, Lawrence, and Wabash counties where it has been extensively tested by drilling for oil and gas. In this southern portion it is asymmetrical, as in northern Illinois, but generally has a somewhat less steep western flank.

Along the Illinois River near LaSalle, the minimum differential uplift along the anticline was 900 feet, near Tuscola in Douglas County it is about 1400 feet, in Lawrence County about 400 feet and in Wabash County only 250 feet. This suggests a maximum movement near Tuscola with a gradual dying out of the structure in each direction. The area of maximum deformation moved progressively southward from the LaSalle area, with the maximum differential elevation in pre-Pennsylvanian times occurring in Douglas County, and, after Pennsylvanian deposition had begun, in Lawrence and Wabash counties.

The most notable structure in the area east of the LaSalle anticline is the Oakland anticline[1] which trends nearly north and south through Champaign, Vermilion, Douglas, Coles and Clark counties and a synclinal basin between this anticline and the Indiana line, also with a north-south trend. The east flank of the Oakland anticline appears to be somewhat steeper than the west. The structural relief is between 600 and 700 feet in southwestern Edgar County. Two eastward-pitching noses extend from the Oakland anticline toward the syncline in Edgar County. A narrow anticlinal fold trending northeast-southwest is shown in northeastern Clark County terminating the syncline at its southern end. The Oakland anticline intersects the trend of the LaSalle anticline near Casey, Clark County.

The western portion of the Illinois basin is characterized by a gentle eastward dip toward the basin amounting to 5 to 20 feet per mile. Just west of the Pennsylvanian margin are situated the Media, Warsaw, Colmar-Plymouth, Pittsfield-Hadley, Cap Au Gres, Valmeyer, and Dupo-Waterloo structures which influence the trend of the Pennsylvanian boundary but are not well shown by the structure contour map. A weak anticlinal zone extends from central Henry County southeast across northeast Knox, Stark and Peoria counties, dying out in central

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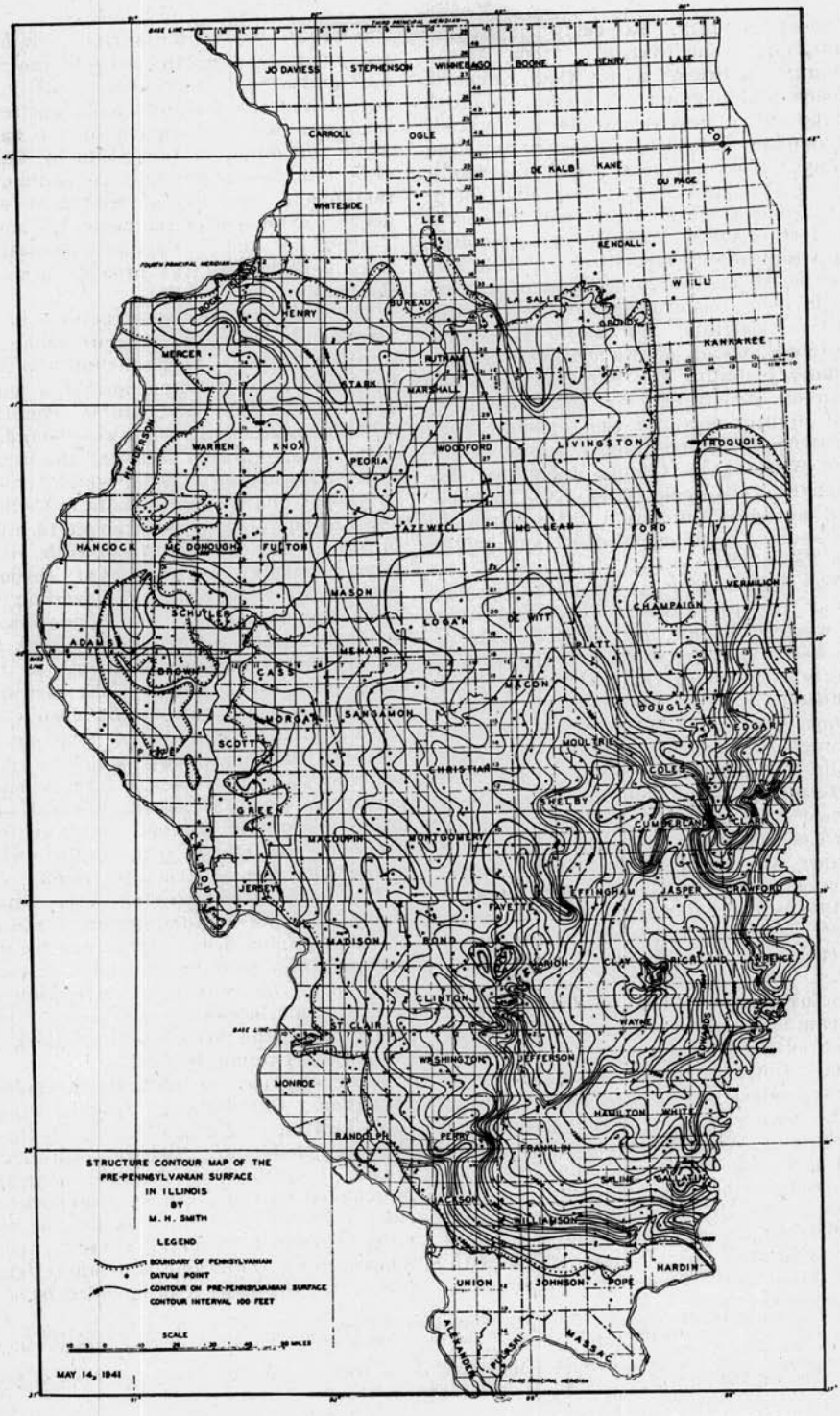
[1] Mylius, L. A., Oil and Gas Development and Possibilities in East-Central Illinois, Maps and Tables of Well Data: Ill. State Geol. Survey, Bull. 54, plate 21, 1927.


JO DAVIESS
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KENDALL
HENRY
BUREAU
LA SALLE
GRUNDY
KANKAKEE
MERCER
PUTNAM
STARK
MARSHALL
WARREN
KNOX
PEORIA
WOODFORD
LIVINGSTON
IROQUOIS
TAZEWELL
MC LEAN
FORD
HANCOCK
MC DONOUGH
FULTON
MASON
SCHUYLER
LOGAN
DE WITT
CHAMPAIGN
VERMILION
ADAMS
BROWN
CASS
MENARD
PIATT
MACON
MORGAN
SANGAMON
DOUGLAS
EDGAR
SCOTT
MOULTRIE
CHRISTIAN
COLES
GREENE
SHELBY
CUMBERLAND
MACOUPIN
MONTGOMERY
EFFINGHAM
JASPER
CRAWFORD
JERSEY
FAYETTE
MADISON
BOND
MARION
CLAY
RICHLAND
LAWRENCE
CLINTON
ST CLAIR
WAYNE
WASHINGTON
JEFFERSON
MONROE
HAMILTON
WHITE
RANDOLPH
PERRY
FRANKLIN
JACKSON
WILLIAMSON
SALINE
GALLATIN
HARDIN
UNION
JOHNSON
POPE
ALEXANDER
PULASKI
MASSAC
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BOUNDARY OF PENNSYLVANIAN
DATUM POINT
CONTOUR ON PRE-PENNSYLVANIAN SURFACE
CONTOUR INTERVAL 100 FEET
SCALE
MAY 14, 1941

FIG. 1.

Tazewell County. An eastward-pitching anticlinal zone extends from Mason County eastward across Cass, Menard, Logan and northern Sangamon counties dying out in DeWitt and Macon counties. A shorter southeast-pitching anticline extends from northern Macoupin County across southeast Montgomery, and northern Bond County, dying out in southwestern Fayette County corresponding with the Sorento structure.[2] A little farther south another parallel structure extends from western Bond County southeast to Centralia. An eastward pitching anticline extends across southern Clinton County including the Bartelso and Hoffman oil structures. An anticline pitching slightly north of east extends from northern Randolph County across southern Washington County including the Nashville oil pool. The Ava-Campbell Hill anticline[3] pitches a little north of east across northern Jackson and southern Perry counties.

The deeper part of the basin is separated from the structurally flatter area of western Illinois just described, by a markedly asymmetrical anticline with a nearly north-south trend extending from southern Fayette or northern Marion County southward across Marion County through the Patoka, Sandoval, and Centralia oil fields and western Jefferson and eastern Perry counties. It has been named the DuQuoin anticline from a town of that name in southeastern Perry County. It has been considered a monoclinal flexure by some geologists because of the very slight westward dip from its crest. Although somewhat interrupted by eastward pitching anticlines and synclines, the east flank of the fold has structural relief of 500 or 600 feet with a general eastward dip amounting to as much as 100 feet per mile.

The DuQuoin anticline also has a marked effect on the westward thinning of the Pennsylvania system,[4] especially in Perry and Washington counties. This indicates that movement along the fold occurred during Pennsylvanian sedimentation. The Illinois basin extends eastward from the edge of the DuQuoin anticline with the lower portion filled with Caseyville and Tradewater sediments. The pre-Pennsylvanian surface originally consisted of an upland area in the west half and a basin in the east half of the region and the DuQuoin anticline represents the western margin of the basin. After the filling of this basin by Caseyville and lower Tradewater sediments, the strand line moved westward with general extension of the basin, the upper Tradewater and Carbondale formations were deposited in the broader basin to the west.

The most complicated structures in the Eastern Interior basin occur along its southern border. These include the Alto Pass fault zone trending northwest-southeast in Jackson and Union counties, which determines the southwest boundary of the Pennsylvanian area, and the Rough Creek-Shawneetown zone which enters Illinois at Shawneetown, Gallatin County, and extends directly west about 15 miles in Gold, Wildcat, and Cave hills, then turns sharply southwestward through Saline and Pope counties extending beyond the border of the Pennsylvania about 20 miles before disappearing beneath the Cretaceous sediments of the embayment area. South of the east-west segment of this fault is the deep eastward pitching Eagle Valley syncline in southern Gallatin County which extends eastward into Kentucky to form a basin nearly as deep as that in Edward and adjacent counties, Illinois. South of this basin is the Hicks Dome uplift with nearly 4000 feet of structural relief.

The map accompanying this paper shows only the broader general features of this complex area. There are no important differences in thickness or composition of the Pennsylvanian section in several fault blocks of this region, indicating that the structures are largely post-Pennsylvanian in age.

The deeper part of the basin in Shelby, Effingham, Cumberland, Jasper, Crawford, Lawrence, Wabash, Richland, Clay, Marion, Jefferson, Wayne, Edwards, White, Hamilton, and Franklin counties is bounded on the south by a monoclinal slope with dip of as much as 200 feet per mile associated with the Rough Creek-Shawneetown fault zone and other structures. On the west it is bounded by the

[2] Bell, Alfred H., The Sorento Dome: Ill. State Geol. Survey, Ill. Pet. No. 6, Fig. 2, sec. 4, 1926.
[3] Root, T. V., The Oil and Gas Resources of the Ava-Campbell Hill Area, Ill. State Geol. Survey: Rept. Inv. No. 16, Fig. 2, 1928.
[4] Henbest, L. G., Pre-Pennsylvanian Surface West of the DuQuoin Anticline. Trans. Ill. Acad. of Sci., 20, pp. 265-68, 1927.

steep east flank of the DuQuoin anticline, and on the north, from Cumberland County to Wabash County, by the steep west flank of the LaSalle anticline. Between Wabash and Gallatin counties, the deeper part of the basin extends beyond Illinois into southwest Indiana and western Kentucky. The structural relief of the basin from the base of the various surrounding slopes to its deepest part is 1000 feet to 1100 feet. The average dip is 10 to 50 feet per mile toward the deepest part of the basin, which consists of a narrow trough trending south across central Richland and western Edwards counties curving southwest across eastern Wayne County to northern Hamilton and White counties. Recent intensive drilling in this region has disclosed several anticlinal or domal structures within the deeper part of the basin or as pitching anticlines extending out into the basin from its flanks. Among these are the Loudon structure in Fayette County near the northwest margin of the basin;[5] the Salem structure, in Marion County[6]; a southeast-dipping monocline extending northeast in Jefferson County to southwestern Wayne County; an anticline trending northeast across southern Hamilton County and including the Hoodville oil field; an anticline extending northeast from northwest Gallatin County across central White County, including the Omaha oil structure; an anticline trending north in eastern White County, including the New Haven, Stroms, and Calvin oil structures; two westward pitching anticlines in Wabash County including the Keensburg and Mt. Carmel oil structures; an anticline pitching south in west-central Cumberland and northwest Jasper counties; and a southwest pitching anticline in southwest Coles and eastern Shelby counties. Within the deeper part of the basin a prominent domal structure in southeast Clay and northern Wayne counties includes the Clay City oil structure. The anticlines around the borders of the deeper part of the basin tend to pitch toward the basin from all margins. The total relief from the center of the basin in Richland, Wayne, and Edwards counties to the margin of the Pennsylvanian sediments in western Illinois is near 2000 feet.

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[5] Randall, D. C., Geology and Development of the Loudon Pool, Fayette County, Illinois: 25th Annual Meeting of the A.A.P.G., p. 16, 1940.

[6] Arnold, H. H., Jr., Salem Oil Field Marion County, Illinois: Bull., A.A.P.G., Vol. 23, p. 1352-73, Figs. 4, 5, and 6, 1939.