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Recent Salina and Trenton Discoveries Reflect Trend Toward Deeper Formational Drilling in Michigan Basin

Good producers, large lost circulation zones, blowouts, and high proration have focused the attention of the petroleum industry on southern Michigan. The Trenton-Black River formation play in this area and the basal Salina-Niagaran plays in eastern and western Michigan have rejuvenated a declining oil industry in Michigan.

Structurally, Michigan can be defined as a part of an intracratonic basin, flanked on the east and southeast by the Cincinnati arch, on the south and southwest by the Kankakee arch, on the west by the Wisconsin arch and peninsula and on the north and northeast by the Canadian shield.

Previous to the present activity, all the oil production of any consequence had been associated with sediments of Devonian age. However, the present developments have been mainly in Silurian and Ordovician sediments. This activity has been more or less confined to the flanks of the structural basin where the older formations are at a relatively shallow depth.

In eastern Michigan, St. Clair County, the Silurian production is from reef-type build-ups which occurred during late Niagaran deposition. Production has also been obtained from the overlying basal carbonates of the Salina group.

In Western Michigan, Allegan, and Ottawa counties, the producing units are the basal carbonates of the Salina group, namely, in descending order, the A-2 dolomite and the A-1 dolomite. Unlike eastern Michigan, this production is associated with regional structures which appear to have been affected by the lowermost evaporite unit of the Salina group, the A-1 salt.

The present Trenton-Black River development of Middle Ordovician carbonates is located in south-central Michigan on the southern flank of the Michigan basin. Production has been from a secondary dolomite confined to a fracture zone. Structurally, the fracture zone is directly associated with a shallow narrow depression which plunges in a north-northwesterly direction about 50 feet per mile. Approximately 25 linear miles has been partially proven productive with efforts being made to extend the trend and also to prove the inside acreage.

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Geology and Petroleum Possibilities of Quebec

Six regions in the Province of Quebec are geologically favorable for exploration of oil and gas. Very little is known about one of them, the 1,500-square-mile area of flat Devonian (?) rocks just south of James Bay.

The St. Lawrence Lowlands region, about 10,000 square miles in extent, has gently folded Cambrian and Ordovician formations attaining a total thickness of nearly 10,000 feet.

Anticosti Island, near the mouth of the St. Lawrence has an area of about 3,000 square miles. It is underlain by low-dipping Ordovician and Silurian strata, the total exposed thickness of which ranges from 1,500 to 4,000 feet. No drilling has been done on the Island, and there has been only reconnaissance geological mapping.

No drilling for oil and gas has been done, either, in the Mississippian and Pennsylvanian rocks that form the Magdalen Islands, a small archipelago in the Gulf of St. Lawrence.

In the Gaspé region, between two belts of highly disturbed Ordovician rocks, there is a central zone, with an area of about 5,000 square miles, where from 5,000 to probably as much as 20,000 feet of Silurian and Devonian strata are arranged in a series of large anticlinal and synclinal folds. Recent surface mapping is showing that this central Silurian-Devonian belt continues several miles westward beyond the limits of Gaspé Peninsula proper.

Oil seepages and petroliferous strata have been observed in all these regions excepting possibly, Magdalen Island. Gas, in notable although not as yet commercial quantities, has been found in several of the wells drilled in the St. Lawrence Lowlands region. Further testing is required to determine if the formations in themselves possess persistent zones of porosity or if the gas occurrences are related to fracture zones. Oil has been found in several wells in Gaspé, but commercial production has not been obtained yet; most of the wells drilled in this region, however, were either poorly located structurally or did not go deep enough to reach all possible favorable zones.

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Thickness of Sedimentary Section in Appalachian Basin

Nine parallel aeromagnetic traverses were flown by the U. S. Geological Survey across the southern Appalachian Mountains and the plateau regions to the west. These traverses are at right angles to the prevailing structural trend and form a strip approximately 20 miles wide and 250 miles long, extending from the Blue Ridge, just north of Asheville, North Carolina, to the Ohio River at Louisville, Kentucky.

There is a pronounced northeast linearity in the trends of the individual magnetic anomalies and the larger magnetic units which parallels the regional tectonic trends of the Appalachian Mountains. The anomaly pattern implies several sharp contrasts in magnetic expression of the crystalline basement rocks. The dominant feature on the profiles is a group of exceptionally large anomalies which delineate a block of strongly magnetic rock, approximately 100 miles in width, underlying the Appalachian Plateau. Available gravity data along this same strip, although sparse, show a marked resemblance to the over-all magnetic pattern. A positive Bouguer anomaly of about 30 milligals coincides with the group of large magnetic anomalies. It is concluded that these magnetic and gravity anomalies are produced by a large mass of predominantly mafic igneous rock underlying the Paleozoic sedimentary rocks of the Appalachian Plateau.

Estimates of depth to magnetic rock have been made from many individual magnetic anomalies. These magnetic rocks presumably are part of the Precambrian complex underlying the Paleozoic sedimentary rocks. The depths obtained were generally consistent and indicate that in the Appalachian Plateau there are 8,000–10,000 feet of sedimentary rock and the basement surface is 7,000–9,000 feet below sea level. These thicknesses are less than those predicted from stratigraphic considerations but are supported by data from recently drilled wells which reached basement. One well in Leslie County, Kentucky, entered granite 9,412 feet below the surface or 8,233 feet below sea level. The depth analyses of magnetic anomalies in the Valley and Ridge province indicate that the Paleozoic section