ABSTRACTS OF TECHNICAL PAPERS

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October 5, 1964

GROVER E. MURRAY, LSU, Baton Rouge

"Indigenous Precambrian Petroleum?"

Accumulated evidence indicates that (1) the major portion of chemical and organic evolution occurred during the 3-5 x 10^9 years of the earth's history preceding the Paleozoic; (2) the basic elements constituting petroleum existed in the early phases of the earth's history; (3) unmetamorphosed Precambrian lithic types are similar to younger ones; and (4) the population of the later Precambrian seas was relatively rich and varied, though hard skeletal parts are notably absent in these rocks and, in all probability, were not widely developed.

As petroleum is now generally considered of organic origin and is a widely disseminated and integral part of most sedimentary rocks, should we not consider unmetamorphosed Precambrian strata to be prospective for petroleum?

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October 12, 1964

JOHN WONCIK, Apache Corp., Tulsa

"Recent Developments in Dewey and Custer Counties, Oklahoma"

Dewey and Custer Counties lie in the approximate geographic center of the Anadarko basin of western Oklahoma. Geologically, they are situated on the northern shelf area of the basin. No production of oil or gas existed in these counties prior to 1957. By the summer of 1964, in a period of seven years, over 200 wells had been drilled, which established one trillion cubic feet of gas and 30 million barrels of oil. The investment in these wells is approximately 30 million dollars and the value of the production is approximately 240 million dollars. The return on the investment should be 8:1. The accumulation of hydrocarbons is due to a variety of traps at various depths. The Putnam pool is a reef bank limestone accumulation of gas and oil in the Oswego Limestone of Pennsylvanian age and occurs at 9,700 feet. This pool contains 50 gas-condensate wells and 80 oil wells, accounting for 500 billion CFG and 30 million barrels of oil. The pool is three miles wide and approximately 30 miles long.

The Lenora pool produces from a stratigraphic trap in the Morrow sand of Lower Pennsylvanian age at a depth of 10,500 feet. Twenty wells on 640-acre spacing account for approximately 40 billion CFG. Custer City is a deep gas pool producing from the Hunton Limestone at 14,000 feet. Five wells have been drilled. Large open flow potentials, some exceeding 150 million CFGPD, characterize some of the wells. Individual reserves in this pool, in some wells, exceed 50 billion CFG.

Five new pipelines market gas in the area; whereas, seven years ago, no lines were present.

Future development in these two counties should see reserves doubled. New pools in the Morrow, Tonkawa, Cherokee, and Hunton are expected. The area is only 20 per cent evaluated.

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October 19, 1964

JOHN IMBRIE, Columbia University, New York

"Sedimentary Structures in Modern Carbonate Sands of the Bahamas"

A layer of unconsolidated Recent sediment, 0-20 feet in thickness, lies disconformably on a karst surface of Pleistocene limestone in the Bahamas. Geologists may think of this layer as an embryonic stratigraphic formation deposited during the past 5000 years as part of a transgressive hemicycle initiated by post-glacial sea-level rise. Although much has been learned about the sediments exposed on the sea floor, we are only beginning to study cores and understand in three dimensional terms the stratigraphy, paleontology, and sedimentology of the formation.

Emphasis is placed on sedimentary structures in Bahamian carbonate sands, particularly (1) surface forms such as ripples, dunes, bars, and linear furrows that can be studied on air photos and by underwater inspection; and (2) internal structures (burrows and stratification) that can be studied on the 1 square foot surfaces of box-cores. Three types of strata formed by bottom traction occur: avalanche deposits formed at the angle of repose on the lee sides of advancing ripples or embankments; accretion deposits formed at lower

angles; and nearly horizontal sheet deposits. These three deposit types are interpreted as representing in the order named an increase in the velocity of current flow tangential to the bottom.

The spectrum of sedimentary structures preserved at any one site is diagnostic of the geologic environment, although individual types commonly are not.

Structures similar to those found in the Bahamas may be seen in many ancient limestones. Examples from the Ordovician, Devonian, Mississippian, Permian, and Pleistocene are cited.

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October 26, 1964
JOHN ADAMS, Oil Producer,
Newark, Ohio
"Current Financial and Management Appraisal of the Ohio Cambrian Play"

This discussion portrays what has happened in central Ohio since mid-1961, the date of the prolific Trempealeau discovery by United Producing Company in its No. 1 Myers in Morrow County, Ohio.

The Trempealeau is the uppermost member of the Cambrian of the western slope of the Appalachian basin. In this area the Cambrian is about 1,100 feet thick, the uppermost 100 to 200 feet of which is Trempealeau. The Trempealeau thickness found depends on its position on the erosional surface. Producing drilling depths are from 2,800 to 3,700 feet. Limited gas production is found deeper in the basin at a drilling depth of 5,300 to 6,300 feet.

Except for a marginal well — the Monk No. 1 Fee — drilled in 1959 in the southeastern part of Morrow County, and the old Caledonia pool, in Marion County adjacent to the northwest corner of Morrow County, there had been no prolific Trempealeau production in this area until June, 1961. United Producing Company assembled a block of about 30,000 acres generally between these two spots. Reconnaissance, gravity, magnetics, and seismic work was done, and what was thought to be a large gentle closure about eight miles north and south and three miles east and west was found. Critical relief was about 100 feet. The Myers No. 1 well was drilled on this sparse data and resulted in a well capable of making 2,000 BOPD or more. Net pay of 100 feet of vuggy, fractured, and intercrystalline dolomite porosity was found.

Good prolific production was found immediately and a period of about a year passed where exploration techniques, occurrence of traps, content of the traps, and subsequent completion of wells fell into a rather simple pattern. This pattern amounted to shooting an area with density of about 40 acres per shot point, finding relief of 50 feet or more in the form of an erosional remnant, further finding the overlying Ordovician Glenwood Shale missing, and then simply completing the well by setting casing through the pay and perforating on a gamma-neutron log.

The next year of the boom might be called "time of confusion," where this simplicity began to fade and events started taking place which began to make geologists and engineers scratch their heads in perplexity. Some wells which were high and had sufficient remnant thickness to produce contained water instead of oil. Other wells were found similarly with good relief but contained insufficient porosity to produce. The final perplexing situation came to light when a fractured section in the basal Trenton, commonly called Gull River, was found to produce.

The foregoing has been as background material but essential to this discussion. Early in the play one considered leasehold acquisition cost at a top of $3.00 per acre, geophysical cost at a top of $4.00 per acre, dry hole cost at $20,000 per well and completed producer cost at $45,000. At the present time leasehold acquisition cost can easily run at $10.00 per acre and recently a major oil company paid $100 per acre to gain a large regional position. Density of shooting has caused seismic expenditure to increase to a figure of around $15.00 per acre. Drilling and completion costs have changed very little.

In early 1963 production was about 1100 BOPD, there were 17 producing wells, and there was probably 5,000,000 barrels of recoverable reserve. In early 1964 there were 200 producing wells, 30,000 BOPD of production and about 20,000,000 barrels of reserve. These figures today are 350 wells, producing 35,000 BOPD with reserves of 30,000,000 barrels. The overall success ratio has been one producer out of three wells drilled.

As there is no involuntary curtailment of production by purchaser or governmental agency in Ohio, the pay-out rate on producing wells is extremely rapid as compared to production in other states. Approximately 20,000 barrels gross oil production is required for return of investment in a producing well; it is thus easy to see that a