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REGIONAL OIL POSSIBILITIES OF ABILENE-NEMAHA ANTICLINE AREA, NORTHEAST KANSAS

The Abilene-Nemaha anticline area of northeast Kansas has potential commercial oil possibilities in rocks of Ordovician to Permian ages.

The area is structurally and stratigraphically complex and, in these respects, is one of the most unusual in the state of Kansas. Represented are horsts, grabens, faults, unconformities, and abrupt lithofacies changes.

Within these complex geological phenomena are oil and gas fields in reservoirs of the Simpson, Viola, Hunton, Mississippian, Cherokee, and Permian; oil shows have been recorded in units of other ages. Structural and stratigraphic traps abound, because all units from the Reagan to the Kansas City are truncated or pinch out around the high-relief granite knobs of the Nemaha trend.

Basement tectonics probably has controlled most of the structural movements, including present-day movements along the still-active Nemaha fault. Most isopachous "thicks" correspond in geographic position to the thick Rice Formation of Precambrian age. Conditions during deposition of the Rice set the stage for the creation of subsequent basins and tectonic highs.

Future oil will be found in buried structural highs masked by the unconformities, in cuestas formed by the truncation of successive stratigraphic units around the highs, and in stratigraphic traps caused by the abrupt changes in lithology within individual units.

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STRATIGRAPHIC APPLICATIONS OF DIPMETER DATA IN MID-CONTINENT

Dipmeter techniques recently developed to solve Mid-Continent stratigraphic problems use short-correlation-interval dip computations and a statistical approach to interpretation. These techniques extend dipmeter interpretation methods first introduced in Tertiary formations along the Gulf Coast.

Paleozoic sandstones, as in the Pennsylvanian section of the Anadarko basin, commonly were deposited on surfaces of low dip and low topographic relief. Lithologic unit boundaries usually are nearly parallel, providing little information with which to predict the direction of improved sandstone development. In these nearly parallel beds, cross-stratification anomalies produce most of the dips computed.

To detect cross-bedding and describe its orientation within thin sedimentary units, correlation intervals must be short, yielding computed dips for every few feet of hole. Correlations are influenced by many factors, including the attitude of the underlying surface at the time of deposition and subsequent tilting. Many of the dips computed were caused by current-bedding, and indicate the direction of sediment transport.

Random variations in sedimentation tend to cause confusion if the data are studied only superficially. To emphasize trends and minimize random events, statistical methods are used. Azimuth-Frequency diagrams and Modified Schmidt plots reveal the direction of sediment transport, the direction of interval thickening, and present structural dip. These methods produce greater accuracy and confidence in orienting and extrapolating sandstone isopachous contours.

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EARLY PALEOZOIC OVERLAP, SOUTHERN MID-CONTINENT

Cambrian volcanics and Precambrian basement rocks produced an irregular topography in the Mid-Continent during intermittent Late Cambrian-Early Ordovician inundations. Large islands remained until Roubidouxian time; highest peaks persisted until Mississippian. The early Paleozoic sequence is thickest in inter-island channels of northeastern Oklahoma and in the more rapidly and uniformly subsiding basinal area of southern Oklahoma.

Dresbachian transgression, spreading west, north, and possibly south, failed to reach most of Kansas and northern Oklahoma. During Franconian time, only southern Oklahoma and Missouri received sediments; Trempealeauan inundation covered all but central Kansas and the islands of northeastern Oklahoma. Sandstone and carbonate comprise the Cambrian.

Following post-Cambrian regression, Ordovician seas spread a blanket of carbonate over most of Oklahoma and Kansas. Sandstone is most abundant at the base of the Gasconade in eastern Oklahoma. It is also common in Roubidouxian rocks.

Paleogeographic maps and a worm's eye map illustrate the intermittent nature of the transgressions and emphasize the inherent problems of time correlation.

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PRE-PERMIAN PALEOZOIC STRATA OF LAS ANIMAS ARCH—NEW OIL PROVINCE

Drilling on the Las Animas arch during the past 3 years has provided the control for a more complex structural theory of development than has been considered previously. Pre-Pennsylvanian folding has a predominantly northwest-southeast trend, whereas Pennsylvanian and later movements are oriented primarily northeast-southwest. In addition, instead of being a broad simple arch, there is a record of obvious Early Pennsylvanian movement considerably east of the well-known Las Animas arch axis.

Many prejudices to the effect that the Las Animas arch is not an oil province have been disproved as a result of the reserves found in the Brandon field. In this field the Pennsylvanian is producing, or is capable of producing, from five separate zones, and the Mississippian is producing in the St. Louis, Spergen, Warsaw, and Osage zones, with the deepest pay being 325 ft below the Pennsylvanian subcrop.

The most significant development has been the completion of several wells that would have been plugged in the past because of the discouraging results of the drill-stem tests. This has caused scrutiny of many assumed dry holes in the arch area.

Success during the past 2 years and recent activity indicate that the virtually unexplored Las Animas arch is becoming "A New Oil Province."

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PETROLEUM HYDROGEOLOGY

Observations of the pressure and composition of interstitial fluids permit more intelligent interpretation of the geological data on the solid rocks in a prospective area. In plains areas, oil-field waters usually are