the buried Ouachita Mountain overthrust belt. Gently dipping surface strata of Permian, Pennsylvanian, and Cretaceous rocks mask most of the deep subsurface structure.

JOHN G. NIKKEL, Pan American Petroleum Corporation, Abilene, Texas

Stratigraphy of Lower Pennsylvanian Gas-Bearing Sediments of Eastern Bend Flexure

The lower Pennsylvanian formations which produce oil and gas along the Bend flexure and in the Fort Worth basin crop out in the Llano uplift area. These outcrops have been studied extensively from both paleontological and lithological viewpoints from which several conflicting classifications have evolved. With the addition of subsurface terminology, stratigraphic classifications vary with individuals and companies.

From a regional subsurface study, it becomes apparent that there are three lithologic units of lower Pennsylvanian age which are of paramount economic importance. These units are the Comyn, Marble Falls, and Big Saline formations. These formation names were used because of their prominence in published literature and their descriptive nature.

The Comyn and overlying Marble Falls are very similar, both in lithologic character and depositional history, but can be separated in the subsurface on the basis of electric-log correlations. It is the contention of the author that these units are equivalent to the undifferentiated "Marble Falls" outcrops in San Saba, Llano, and Burnett counties and that they are Morrowan in age.

Hydrocarbon production from the Comyn has been minor and appears to be limited to porosity traps near its western edge in Eastland and Stephens counties. The Marble Falls deviates from this pattern and produces gas from porosity development along its depositional axis in Comanche and Hamilton counties.

The Big Saline outcrops in McCulloch County are believed to be Atokan in age due to rather wide lithologic variation and depositional history between it and the underlying Morrowan units. This is substantiated by paleontological evidence. The Big Saline is lithologically heterogeneous, with graded sediments in Jack and Wise counties. Both limestone and coarse clastic reservoirs are basically gas-bearing, but oil production is commonly found in either lithologic type of rock.

ORVAL DENMAN, independent, Decatur, Texas

Boonesville Bend Gas Field of Wise County, Texas

The Boonesville Bend gas field is one of the largest in North Texas, more than 470 wells producing from an area of approximately 450 square miles, predominantly in Wise County, at the north end of the Fort Worth basin. A thin Cretaceous cover unconformably is underlain by Mississippian limestone which in turn is underlain by the Ellenburger dolomite. The Boonesville pay produces from stratigraphic traps in highly variable lenses of fine- to coarse-grained, well cemented to porous sandstones and fine, poorly sorted conglomerates. The field is producing 5 billion cubic feet of gas per month. Total ultimate recovery is estimated at one trillion cubic feet of gas. The boundaries of the fields are fairly well defined and drilling of inside locations will be the principal future development in the field.

HAROLD C. BEAIRD, Lone Star Producing Company, Abilene, Texas

Pottsville Gas Area of Hamilton and Comanche Counties, Texas

The Pottsville Gas Area, as it is defined in this paper, is geographically located 90 miles southwest of Fort Worth in Hamilton County and southern Comanche County, Texas. Geologically, it is in the west part of the Fort Worth basin approximately 20 miles east of the Bend flexure. The Marble Falls limestone in the Atoka series of the Middle Pennsylvanian is the gas-producing formation of the area. This limestone occurs in an area 25–35 miles wide trending northeast from its outcrop on the Llano uplift in San Saba County. Under the Pottsville gas area the Marble Falls limestone is deposited on top of the Comyn limestone and is encountered at depths ranging from 2,369 feet to 3,850 feet.

The Energy field of Comanche County and the Pottsville and South Pottsville fields of Hamilton County are Marble Falls gas fields located in the west part of the Pottsville gas area. These fields overlie adjacent anticlinal structures developed on a horst which was formed by post-Marble Falls forces associated with the Llano uplift. Structural relief on the Marble Falls in these fields ranges from 300 feet in the Energy and South Pottsville fields to 500 feet in the Pottsville field with synclinal troughs separating the individual features.

Exploration in the Pottsville gas area for undiscovered fields of the Energy, Pottsville, and South Pottsville type should be confined to the depositional limits of the Marble Falls limestone. Seismograph work guided by subsurface control appears to be the most efficient method to explore for these traps.

RAYMOND C. MOORE, The University of Kansas, Lawrence, Kansas

Permian System in Texas

ROBERT B. TOTTEN and PAUL H. HORN, Sun Oil Company, Amarillo, Texas

Geology of Gas Fields of Western Anadarko Basin, Texas and Oklahoma Panhandles

The general area of this paper consists of the six most northeastern counties of the Texas Panhandle, namely, Hansford, Ochiltree, Lipscomb, Hutchinson, Roberts, and Hemphill counties, and the two eastern counties of the Oklahoma Panhandle, or Texas and Beaver counties. This area is part of the Western Anadarko basin, which is an asymmetrical sedimentary basin with its main axis trending northwest and southeast. This basin actively subsided during Pennsylvanian time. Gas fields have been found scattered over much of this area and these fields produce gas from rocks ranging in age from Permian to the Mississippian with Morrow (lower Pennsylvanian) sands furnishing the greatest number of reservoirs. The depths of production range from 2,600 feet to 13,600 feet. Most of these reservoirs result from stratigraphic traps but structural anomalies control, in part, the gas accumulation in a few fields. Sandstone forms the principal reservoir rock. With rare exceptions these reservoirs have moderate to low pressures, and with few exceptions, the gas is fairly dry. Generally accepted reserves estimates for these various reservoirs range from 350 MCF per acre foot to more than 500 MCF per acre foot. Several gas fields cover large areas and comprise many individual reservoirs which are separated both horizontally and vertically; other fields consist of one, two or few wells. The separate reservoirs of the multipay fields commonly comprise sand lentils each with separate but similar physical characteristics. Dual and triple completions are not