ROBERT P. PARKE
Biographical Review

Robert P. Parke is a native of North Central Texas. As a youth he played around oil drilling rigs and by the age of sixteen he was working in the oil fields. Mr. Parke earned three degrees at Texas A & M University: a B.S. in Petroleum Engineering, a B.S. in Geology, and a Masters Degree in Geology. Mr. Parke has been employed by the Atlantic-Richfield Corporation in Midland, Texas for twenty years. Now titled Senior Exploration Geologist, Mr. Parke's career is marked by a long array of special research assignments.

Mr. Parke's balanced education and long experience in both reservoir engineering and geology throughout West Texas and Southeast New Mexico have made him a highly respected expert on the Permian Basin. His many research projects include regional stratigraphy, secondary recovery reservoir analysis and computer applications to geologic problems. Mr. Parke was Atlantic-Richfield's technical representative at the creation and development of the Permian Basin computerized Well Data System. He has been very active in the affairs of the Permian Basin S.E.P.M. and the West Texas Geological Society. He is a popular leader of many of these societies field excursions which were meticulously planned and logged-out while on weekend camping trips with his family. Mr. Parke taught geology, geomorphology, and structural geology for 13 years at Odessa College. He is a member of the American Association of Petroleum Geologists and is on the Board of Directors of the Odessa, Texas Meteorological Society.

OCCURRENCE OF DEEP GAS IN THE DELAWARE BASIN OF WEST TEXAS

by
Robert P. Parke

ABSTRACT

Deep gas of West Texas' Delaware Basin occurs in reservoir traps whose geologic origin includes the full spectra of stratigraphic and structural conditions known to result in hydrocarbon accumulations. The 20,000 feet of Paleozoic sediments in the Basin provide vast possibilities. Reservoirs are found in clastics ranging from delta complexes through deep water sediment gravity flow systems, and carbonates ranging from huge allocthonous blocks surrounded by deep water sediments through all varieties of shallow water biogenetic and aggregational units.

All types of structures exist, such as fault systems ranging from wrench faults and secondary fault patterns, folds ranging from simple differential compaction type through

large scale asymmetrical folds as well as giant scale gravity slump phenomena, including decollements. Trap geometries depend on (1) natural depositional limits of clastic units porosity and permeability, (2) fortuitous coincidence of structures with reservoir units, and (3) growth-type structures that influenced local water depth during some periods of time and caused deposition of local reservoir units.

Major gas producing strata are lower Ordovician Ellenburger dolomites and Siluro-Devonian dolomites and limestones. Less abundant gas occurences are found in Upper Ordovician Montoya carbonates; Mississippian Limestones; Pennsylvanian carbonates and sands (including the widely publicized Morrow play of SE New Mexico); and Permian carbonates and sands. Each of these productive units is locally significant but still has the potential of being included as a major producing horizon as Delaware Basin exploration expands.

Gas quality ranges from rich to dry and is consistent with reservoir temperature according to the maturation concepts. Carbon dioxide content in the Ellenburger has been an exploration problem in a part of the Basin, but demands for CO_2 and improved understanding of CO_2 patterns are steadily easing this difficulty.

Production rates vary greatly from the Siluro-Devonian completions and especially from the Ellenburger in the same areas. This unpredictability has, on more than one occasion, resulted in a decision not to develop or explore. Such decisions have been later proved wrong by someone (who "didn't know any better") drilling prolific wells, both wildcat and development.

Exploration in the Delaware Basin is extremely expensive and technically complicated. Well costs can reach the 2 million dollar range. Leases are expensive, highly competitive and short-term, considering that a deep well requires 10 to 12 months to drill. Application of seismic techniques in the Delaware Basin has historically been adversely influenced by diverse surface and near-surface problems, rapid facies and velocity changes, and by the great depths of reservoirs being mapped. Thus, the success in overcoming many of these technical problems is a credit to the geophysical profession. Nevertheless, geophysical tools are still imperfect.

Closely integrated geologic and geophysical skills are essential for effective exploration in the Delaware Basin, as well as in other provinces which contain such a variety of geologic conditions influencing seismic data quality.

Rewards for exploration can be great in the Delaware Basin. Here, fields in excess of 1 trillion cubic feet of gas have been discovered. Numerous "bread and butter" quality fields in the 10-150 billion cubic feet range can still be found. When one considers the cost of exploration, leasing and drilling, it is quite obvious that neither the major oil companies nor independents will reap riches, in spite of $1.00/mch gas price, unless geologic skill can reduce development dry holes. It is evident that the very expensive oil and gas leases must be selected with great care.