Mines Corp., and Ranchers Exploration and Development Corp. to examine their uranium drill logs for information on coal. Over 1,400 logs spudded above the base of the Gallup formation were examined, and depth to coal, coal thickness, and coal stratigraphic horizon were determined for coal beds at least 3 ft (1 m) thick. Coal isopachs have been drawn, and depth from the surface to the first coal have been contoured for the Crevasse Canyon and Menefee Formations. Data from an earlier study, which used geophysical logs from petroleum test borings, has been incorporated. The relationship between the coal resources determined from uranium drill holes and known coal deposits and mines in the southern San Juan basin is discussed.

FERTL, WALTER H., Dresser Atlas, Houston, TX

Log-Derived Evaluation of Shaly Sandstone Reservoirs

Significant natural gas resources are known to exist in the United States in tight, low-permeability sandstones that cover a prospective area of 1,000,000 mi^2 (2,590,000 km^2). Characterization and reliable estimation of their production potential based on well logs are important although difficult task.

Proper evaluation of low permeability sands based on conventional log-interpretation techniques is frequently inadequate. Furthermore, while empirical rules of thumb assist in the evaluation of localized conditions, they only provide guidelines.

Recent developments in quantitative log-analysis techniques incorporate natural-gamma-ray spectral data and application of the Waxman-Smits model for detailed reservoir description. Quantitative correlations of cation exchange capacity (CEC), water salinity, porosity, and conductivity of water- and hydrocarbon-bearing shaly sand reservoirs are based on resistivity, density, neutron and natural-gamma-ray spectral data. These correlations provide important information about clay volume, reservoir porosities (total, effective) and fluid-saturation distribution (total, effective), type of clay minerals (smectite, illite, chlorite/kaolinite), their distribution in the reservoir (dispersed, laminated, structural), and log-derived indicators of potential formation damage.

Field experiences are reviewed for logging and evaluating tight formations in south Texas; the Jurassic Cotton Valley trend in east Texas, Louisiana, and Arkansas; and the Tertiary Fort Union and Cretaceous Mesaverde Formations of the Piceance basin in Colorado.

FINLEY, R. J., S. J. SENI, NOEL TYLER, and Z. S. LIN, Bur. Econ. Geology, Univ. Texas at Austin, Austin, TX

Depositional Systems and Productive Characteristics of Major Low-Permeability Gas Sandstones in Texas

Major tight gas sandstones in Texas range from lenticular to blanket geometry, from hydropressured to geopressured, and from Pennsylvanian to Eocene in age. The Cotton Valley sandstone (East Texas basin) includes barrier- and marine-bar sandstones (blanket) derived from prograding fan deltas with associated braided stream, delta-front, and prodelta deposits. The overlying Travis Peak Formation contains a lower deltaic facies, a middle, dominantly braided fluvial facies (broadly lenticular), and an upper transgressive clastic-to-carbonate transition. Estimated gas in place varies from 53 tcf (Cotton Valley) to 25 tcf (Travis Peak); most wells initially produce from 500 to 1,500 mcf and few wells produce 2,500 mcf. Tight gas sandstones in the Wilcox and Vicksburg Groups (Gulf Coast basin) are mostly geopressured delta-front, shelf, and slope deposits. These lenticular sandstones isolated in shale have pressure gradients up to 0.81 psi/ft (18.3 kPa/m). Initial well yields are mostly 300 to 2,400 mcfd; resource estimates for tight Wilcox and Vicksburg trends are not available.

Canyon Group sandstones of the Sonora basin (parts of the Ozona arch, Concho platform, and Val Verde basin) contain 24 tcf of estimated gas in place and initial flow rates are commonly 100 to 1,000 mcf. These sandstones are broadly lenticular and are interpreted to be submarine fan and possibly shelf-margin deposits. The Olmos Formation (Maverick basin) contains gas within broadly lenticular delta-front deposits of high-constructive delta systems; liquid hydrocarbons in the Olmos are trapped in more proximal facies. Gas in place in the Olmos is estimated to be 5 tcf and initial well yields are 300 to 3,000 mcf. In 1980, 893 wells were completed in formations designated as partially or completely tight by the Railroad Commission of Texas. These completions represent 2.5% of new gas wells in the state, but 28.0% of those completed in the 5,000 to 15,000-ft depth range in that year.

FINNERAN, JANE B., Stephen F. Austin State Univ., Nacogdoches, TX

Zuloaga Formation (Upper Jurassic) Shoal Complex, Sierra de Enfrente, Coahuila, Northeast Mexico

The Zuloaga Formation at Sierra de Enfrente may be divided into 7 interbedded carbonate facies. In order of abundance, they are: pell-ooid grainstone-packstone, lime mudstone, pelletal packstone-grainstone, ooid grainstone, pelletal wackestone, skeletal wackestone, and algal boundstone.

Three measured sections located on an east-west trending, overturned anticline (Sierra de Enfrente) were described and sampled. The sections are oriented along depositional strike and are roughly 395 m (1,300 ft) thick. Approximately 20 shoaling-upward "cycles" that display an upsection trend from mudstone-wackestone lithofacies to packstone-grainstone-boundstone lithofacies are readily distinguished in each section. The cycles vary in thickness with thick cycles correlating well from section to section along depositional strike. Within any cycle, interpreted subenvironments may include, from base to top: subtidal, outer shoal, inner shoal, and inter-tidal-supratidal.

The Zuloaga Formation sediments were deposited on a broad carbonate ramp dipping southward off the emergent Coahuila peninsula. The study area is located between Zuloaga-equivalent, near-shore, siliciclastic deposits to the north and outer-ramp Zuloaga lime mudstone facies to the south. This intermediate position was ideally situated for the development of high-energy shoals. Time-equivalent shoal facies that rim the Gulf of Mexico are prolific hydrocarbon producers (Smackover Formation, USA; San Andres Formation, Mexico).

FLINT, STEVEN A., and D. M. ROHR, Sul Ross State Univ., Alpine, TX

Paleoenvironments of Middle Member of Quitman Formation, Hudspeth County, Texas

The middle Quitman Formation is composed of 95-195 m (310-640 ft) of interbedded shale, sandstone, and limestone in the southern Quitman Mountains and Hueco Bolson, Hudspeth County, Texas. The lower and upper members consist of interbedded sandstone/limestone and thin to thick-bedded carbonate strata, respectively. The Quitman Formation was deposited along the eastern slope of the Chihuahua trough during the late Aptian and early Albian. The formation is interpreted as the oldest transgressive phase of 4 transgressive-regressive cycles that occur throughout the Lower Cretaceous within the Chihuahua trough.

Eight major facies representing nearshore to offshore environments of the middle Quitman Formation are listed below. They are: (1) nodular, sandy, peloidal to skeletal wackestone (lagoonal, basinal); (2) nodular, sandy, peloidal to skeletal packstone (lagoonal, basinal); (3) laminated to cross-bedded sandy ooid to skeletal packstone and grainstone (upper shoreface, storm); (4) laminated to cross-bedded sandstone/siltstone (upper shoreface, storm); (5) massive sandstone/siltstone (lower shoreface, lagoonal); (6) *Exogyra* biostromes (offshore-lower shoreface transition); (7) sandy, bioclastic, marly silt-shale (offshore-lower shoreface transition); (8) mudstone (offshore, lagoonal).

Vertical and lateral relations of strata within the middle member have shown several transgressive and regressive cycles. The more applicable terms of progradation and aggradation describe the lateral and vertical buildup of terrigenous and carbonate clastic rocks within the upper half of the middle member in the southern Quitman Mountains. These sequences are not present at the section west of the southern Quitmans.