laminated sandstones as displayed in cores. The composite bedsets of the point-bar facies are significantly thicker than the bedsets of the longitudinal-bar facies. The thinly stacked nature of the longitudinal-bar composite bedsets produce an apparent random dip pattern. However, individual bedsets within the sequence show a decrease in dip upward.

Azimuth-frequency plots of cross-bed dip directions yield valuable information on the reservoir morphology. A unidirectional azimuth pattern indicates a predominant paleocurrent direction characteristic of point-bar deposition. Longitudinal-bar sandstones produce a multidirectional azimuth pattern due to stream bifurcation. However, the general paleocurrent direction can be determined from a weighted average of the azimuths. The local sandstone trend of each facies is in the direction of the paleocurrent. Azimuth-frequency plots of the overlying shale drape are 90° out of phase with the paleocurrent direction, indicating that the thicker sandstones of the trend lie in the opposite dip direction of the shale drape. Paleogeographic reconstructions based on paleocurrent and shale-drape data show that the point-bar facies has a broadly arcuate, dip-trending morphology of high sinuosity, and the longitudinal-bar facies has a gently curving, dip-trending morphology or low sinuosity.

LOVICK, GINA P., Spindletop Oil and Gas Co., Grapevine, TX, and CHRISTOPHE G. MAZZINI and DAVID A. KOTILA, Arlington, TX

Atokan Clastics of Fort Worth Basin—Depositional Environments in a Foreland Basin

The sedimentary evolution of the Fort Worth basin may be explained by tectonic movement within the basin and bounding features. This tectonic activity was the primary constraint on the depositional environments and distribution of the clastic sediments from the basin's margins.

Previously, the lower Atoka Big Saline (Bend) conglomerates of the Fort Worth basin have been interpreted as a part of the larger Atokan clastic sequence derived from the Ouachita orogene. However, the distribution, progradation of depositional environments, and reservoir qualities of these sediments suggests an alternative interpretation. The Big Saline (Bend) conglomerates appear to be derived from the Muenster-Red River arch complex to the north and transported into the basin through a series of prograding, high-constructive deltas.

Seven primary deltaic facies are recognized for the Big Saline (Bend) sediments. The facies include (1) point bar; (2) distributary-mouth bar and bar finger; (3) distributary-channel fill; (4) meander-channel fill; (5) crevasse splay; (6) backswamp marsh; and (7) undifferentiated delta front and prodelta deposits.

Contemporaneous with Big Saline (Bend) deposition, clastics derived from the Ouachita orogene were deposited in the deeper, eastern part of the basin. Deposition occurred primarily in fan-delta complexes; however, deep-water sedimentation in the form of submarine-fan deposits is also recognized. This eastern influx of sediments continued after the cessation of Big Saline (Bend) deposition.

MADDOX, DARRYL W., Coastal Oil and Gas, Amarillo, TX

New Method for Determining Paleocurrent Direction

A new technique has been developed for determining paleocurrent direction for siliciclastic formations. Development of an efficient and accurate technique for determining this has been a recurring problem in both industry and university research labs for the past 20 years. The new technique measures variations in the intensity of a beam of coherent light reflected from a polished horizontal surface on an oriented core. These variations indicate the orientation of the resultant vector for the optic axes of the quartz grains in the surface. Since the optic axis of a detrital quartz grain is statistically subparallel to its long axis, determination of the orientation of the optic axes is equivalent to determining the orientation of the long axes. In most noneolian siliciclastic deposits, the orientation of the long axes of the sand grains are parallel with the flow direction of the depositing fluid. Paleocurrent data from oriented cores have two uses in the mature oil field. First, they would aid in development drilling by providing accurate sand-body trends. Second, since the permeability of a sandstone is greater parallel with the grains than across them, the data should be useful in designing secondary and tertiary recovery programs.

MAZZULLO, S. J., Geological Consultant, Midland, TX

Types and Controls of Facies-Stratigraphic Traps in Permo-Pennsylvanian Carbonates in Permian Basin—Exploration Models

Many existing and undiscovered hydrocarbon reservoirs in Permo-Pennsylvanian carbonates of the Permian basin are stratigraphic traps in various shallow-marine depositional facies. Paleoenvironmental interpretations and an understanding of the causal relations among facies occurrence, mappable paleogeologic features, and regional stratigraphy provide predictive models in the exploration for similar traps in the Permian basin.

Some of the depositional environments recognized in shallow-shelf carbonates in this area include strandline beaches, tidal channels and barrier bars, lagoonal and inner-shelf patch reefs, and shelf-marginal oolitic or bioclastic grainstone shoals and organic buildups. The areal occurrence, geometry, and reservoir-trap configurations of each of these facies and, hence, the strategy and model-approach toward their exploration, are dictated by an understanding of the interplay between several factors, including paleobathymetry, relative rates of subsidence and sedimentation, regional stratigraphy and history of transgression or regression, and complexities of diagenesis. The coincidence, or lack thereof, of preexisting structure or bottom topography and the predictability of occurrence of a given depositional facies are probability potentials dependent on the nature of regional sedimentation patterns and the types of sediments and/or organisms present during deposition.

Porosity evolution in these facies may or may not be related to and mappable together with depositional facies. Porosity formation or occlusion may occur in a spectrum of diagenetic environments from eogenetic (submarine and meteoric exposure) to mesogenetic (deep burial). Porosity types and reservoir permeabilities are dependent on original facies textures and timing of porosity formation.

PHILLIPS, SANDRA, Texas A&M Univ., College Station, TX

Dipmeter Interpretation of Cherry Canyon Reservoir Sandstones, Delaware Basin, New Mexico

Stratigraphic interpretation of high-resolution dipmeter logs can provide important information concerning the mor-

phology and distribution of reservoir sandstones. Stratigraphic dip data were correlated with primary rock properties observed in cores and with borehole-log data to define the internal morphology of turbidite channel sandstones in the Cherry Canyon Formation at Indian Draw field. Characteristic dip patterns allowed the delineation of erosional unconformities, channel sequences, slump faulting, contorted and massive bedding, and sedimentary drape.

The erosional unconformity which marks the base of the Indian Draw channel exhibits a characteristic dip pattern consisting of an abrupt change in the trend of dip magnitude and dip azimuth across the unconformity, marked by higher dips (6 to 9°) above the unconformity in the channel-fill, and lower dips (2 to 4°) in the basin-plain sediments below. Slump faults exhibit an abrupt increase in dip with depth over a small interval, and an associated progressive dip azimuth rotation approaching the fault. Contorted beds show a random dip pattern, often marked by poor-quality, high-magnitude dips. Massively bedded sandstones lack computed dips and sedimentary drape patterns typically consist of a decrease upward within basinal deposits overlying a sandstone.

Detailed mapping of the reservoir sandstones indicates deposition as stacked, laterally discontinuous lenses within a previously eroded channel. Direction of sedimentary drape over sandstone lenses can be used to map their trends. Channel-fill lenses are 5 to 30 ft (1.5 to 9.1 m) thick, and are elongate parallel with depositional dip with a sinuous geometry. Such turbidite channel deposits can be anticipated to form complex multilayered reservoirs, consisting of a series of isolated sandstone lenses of restricted areal extent.

REED, B. K., Independent, Oklahoma City, OK

Viola Potential, Southern Oklahoma

No abstract available.

REID, ALASTAIR M., II, Moseley Petroleum Corp., Midland, TX, and SYDNEY K. LAWLER and JAMES D. PAULSON, Texaco USA, Midland, TX

A Joint Geological-Engineering Study of Cogdell Canyon Reef Unit, Scurry and Kent Counties, Texas

In 1974 Texaco Inc. initiated a detailed geological-engineering study of the reservoir in the Cogdell Canyon reef unit. The goal of this study was to improve production. The Cogdell Canyon reef unit is located in the Horseshoe Atoll of northern Scurry and southern Kent Counties, Texas.

Detailed lithologic, paleontologic, and depositional environmental analyses indicate the presence of nine vertical zones ranging from late Strawn to early Cisco time. Six zones are recognized by paleontologic criteria alone, with three additional zones defined by lithologic criteria.

Each zone exhibits multiple depositional environments. Each environment produced a different rock fabric. Porosity and permeability, partly controlled by the original rock content and fabric, change laterally within each vertical producing zone.

The geologic model consisting of vertical stratification and lateral change within the Cogdell Canyon unit is compatible with engineering data resulting from known production since 1949. This geologic model also is compatible with increased oil production resulting from infill well drilling and redirection of the waterflood.

ROBICHAUD, STEPHEN R., Border Exploration Co., Midland, TX

Predictive Model for Hydrocarbon Entrapment in Marathon Fold-Thrust Belt of Southwest Texas

The requisites for hydrocarbon entrapment (source rock, reservoir rock, and sealed trap) are present in the Marathon fold-thrust belt. The Pennsylvanian and Wolfcampian shales in the Marathon area probably yielded hydrocarbons during diagenesis and porosity has been observed in several potential reservoir strata. Thrust and reverse faults are among the trapping mechanisms that have been observed and evidence of stratigraphic porosity and lithology pinch-outs and tectonic wedge-outs has been reported. A predictive model of the subsurface occurrences of such traps is based on the premise that compression from the Permo-Pennsylvanian collision of North America with South America created a back-arc fold-thrust belt at Marathon. This model identifies some of the components of the collision orogene and it describes some of the geologic processes that created those components.

ROBINSON, WILLIAM C., Gulf Oil Exploration and Production Co., Midland, TX, DONALD F. REASER and CHARLES I. SMITH, Univ. Texas at Arlington, Arlington, TX

Sedimentary Facies and Depositional Environments of Cenomanian Buda Limestone, Northern Coahuila, Mexico

Buda Limestone in northern Coahuila ranges in thickness from 15 to 35 m and consists mostly of lime wackestone and mudstone. Two major facies developed in the area in response to contrasting environmental conditions: a northern mudstone-wackestone facies composed mostly of benthic fossils deposited in water depths less than 100 m and a southern wackestone facies with abundant pelagic fossils deposited in water as deep as 500 m. A fossiliferous, intraclast packstone facies developed on shoal areas in adjacent trans-Pecos Texas. These shoals may have been related to areas of tectonic adjustment.

Subfacies developed in the north differ in intensity of bioturbation, fossil content, and amount of terrigenous clastic content. The lower and middle Buda contain a diverse benthic fauna, abundant burrows, and up to several percent quartz silt and clay in places. The upper Buda contains a benthic fauna low in diversity and number of specimens, rare burrows, and a lesser amount of terrigenous clastics.

Distribution of the two principal facies of the Buda in northern Coahuila conforms to late Albian paleogeographic features—the broad flat carbonate platform north of the Stuart City reef, and the deeper basinal area on the south. In the north, a broad low-relief shelf over the preexisting platform was characterized by open marine conditions although there is some evidence of restricted water circulation in the northeast part. The water was deep enough so that the sea floor was rarely disturbed by wave action. Normally clear waters were periodically muddied by an influx of terrigenous clay and silt. South of the preexisting Stuart City platform margin, waters were clear and deep.

THOMPSON, DIANA MORTON, Chevron USA, Denver, CO

Lower Atoka Group (Lower Middle Pennsylvanian), Northern Fort Worth Basin, Texas—Depositional Systems, Facies, and Hydrocarbon Distribution

Lower Atoka is an informal name applied to the lowermost