Four distinctly different vertical and lateral progressions of facies are evident in the Marble Falls Group. This progression lends itself to recognition of 4 depositional phases.

The vertical sequence for each phase results from lateral shifts of 1 or 2 facies tracts that are unique to each phase. As a consequence each phase can be described by means of 1 or 2 generalized facies models.

In places where porosity is fabric-selective, the models should allow prediction of reservoir geometry. They also may be useful in predicting target directions, and in locating the updip limits of potential stratigraphic traps.

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DEPOSITIONAL SYSTEMS IN WOODBINE FORMATION (UPPER CRETACEOUS), NORTHEAST TEXAS

The Woodbine Formation is composed largely of terrigenous sediment eroded from Paleozoic sedimentary and weakly metamorphosed sedimentary rocks of the Ouachita Mountains in southern Oklahoma and Arkansas, and subsequently deposited in a complex of nearshore environments along the margins of the broadly subsiding Northeast Texas basin. Three principal depositional systems are recognized in Woodbine rocks—a fluvial system, a high-destructive delta system, and a shelf-strandplain system. Their recognition is based on a regional outcrop and subsurface investigation in which external geometry of framework sandstone was integrated with lithology, sedimentary structures, fossil distribution, and bounding relations.

Two components of the fluvial system, a tributary channel sandstone facies and a meander belt sandstone facies, are developed in the Dexter Member (lower Woodbine) northeast of a line from Dallas to Tyler. On the south and southwest, a high-destructive delta system is persistent throughout the entire Woodbine section. The 3 component facies of the delta system are: progradational channel-mouth bar sands; coastal barrier sands, deposited along shore adjacent to the channel mouth; and prodelta-shelf muds. The Lewisville (upper Woodbine) shelf-strandplain system, developed in the northern third of the basin marginal to principal deltaic facies, is composed of 2 facies: shelf muds and strandplain sands that accumulated along shore.

Near the end of Woodbine deposition, but before transgression by Eagle Ford seas, emergence of the Sabine uplift resulted in erosion of Woodbine sediments, which were subsequently redeposited along margins of the uplift as the Harris sand.

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PENNSYLVANIAN DELTAIC STRATIGRAPHIC TRAPS, WEST TUSCOLA FIELD, TAYLOR COUNTY, TEXAS

Hydrocarbon occurrence in Strawn (Pennsylvanian) sandstones in West Tuscola field, near Abilene in Taylor County, Texas, is the result of stratigraphic entrapment in deltaic sandstones. The origin of the reservoir rock in the field area and the overall geometry and internal character of the deltaic complex were determined from the vertical sequence in numerous cores of the Gray sandstone and associated units and from numerous E-logs of uncored wells.

The vertical succession of deltaic facies consists from base to top of a progradational sequence (prodelta and delta front), an aggradational unit (delta plain–marsh and interdistributary bay), and an overlying "transgressive" shallow-marine interval. Reservoir sandstones are present within the delta-front facies as stream-mouth-bar deposits, known locally as the "Gray sandstone."

The stream-mouth-bar sandstones within the West Tuscola reservoir are lenticular, highly irregular in outline, and have varying trends of porosity; these are characteristics to be anticipated in deltaic deposits. Such features present problems in developing effective secondary-recovery methods and in predicting occurrences of other deltaic sandstones.

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DEPOSITIONAL MODELS OF SANDSTONES

Determination of the depositional environment for sandstone bodies generally improves the accuracy in estimating sandstone reservoir trends. Depositional framework is best understood by comparing the geometric and internal features of each sandstone to those of models, which are sand and sandstone deposits of known depositional environment. The different environments are distinguishable most commonly, not by a unique property, but by diagnostic combinations of the various features, such as trend, width, thickness, nature of contacts, sequence of sedimentary structures, textural sequence, and constituents. These characteristics are catalogued for 18 different environments, ranging from eolian to deep-marine basin floor, and models of alluvial valley, alluvial plain, and deltaic environments are illustrated.

The Pennsylvanian Kisinger Sandstone, which crops out in north-central Texas, was deposited in a deep and narrow valley by a westerly flowing river. Each textural sequence of massive-bedded conglomerate, crossbedded conglomeratic sandstone, and convolute-bedded sandstone represents a genetic unit formed at one position of the river, which was 200–300 ft wide. The fine-grained sandstone and carbonaceous shale in the upper 30 ft of the 150-ft section were deposited under near coastal conditions as the valley filled in response to a continued rise of sea level.

The Pennsylvanian Robinson Sandstone in southern Illinois was deposited by a river flowing west-southwest on an alluvial plain. Unidirectional medium-scale and small-scale crossbedding, upward decrease in grain size, and sharp basal and lateral contacts indicate stream deposition. The absence of allochthonous pebbles suggests deposition on a plain rather than in a valley. The absence of marine indicators suggests alluvial rather than deltaic conditions.

The Davis sand (Yegua) in the Hardin field of southeast Texas was deposited by a deltaic distributary. A width-thickness ratio of approximately 30, and abrupt lower and lateral contacts, together with interstratification and the microfauna of equivalent beds, are suggestive of deposition near the mouth. The narrow width of 1,250 ft suggests further that the sand represents a genetic unit, with insignificant lateral migration.

Most of the Cretaceous Newcastle Sandstone in North Dakota represents deposition on a broad, slowly subsiding deltaic plain which formed as streams advanced west-northwestward from South Dakota, and southward from Saskatchewan. In the deltaic complex Skull Creek prodeltaic clays underlie delta-margin coastal sands and distributary sands, which together are thought to represent most of the sandstone in the Newcastle. Very gentle slopes, shallow sea floor, and slow rate of subsidence were primary reasons for the widespread distribution of a relatively thin sandstone section and the wide variation in sandstone trends.

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GEOLOGIC STYLING AND DIPMETER

Geologic styling has played a role in the economic interpretation of dip data. The classic dip patterns obtained from modern dipmeter computations can be related to a myriad of academic meanings, and an economic answer results only after the geologic styling within the area has been applied.

Geologic styling may be a dubious factor, and perhaps modern dip data, properly applied, can confirm or deny preconceived ideas. In either case, the full import of the economics is self-evident.

A broader concept and understanding of measured dip data will contribute significantly to the economic search for hydrocarbons.

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HISTORY AND ANATOMY OF ARKANSAS RIVER SAND BAR NEAR TULSA, OKLAHOMA

Several authors have demonstrated the dipmeter's ability to resolve internal crossbed dips. Analyses of the dip patterns, which result from paleocurrent flow directions, are interpreted to determine different sand body types.

This paper shows the relation between crossbed variation in a fluvial sand bar and known channel patterns which existed during deposition. The sand bar studied is in the Arkansas River valley approximately 10 mi upstream from Tulsa. From aerial photo sequences plus discharge and river stage records, it can be shown that the entire sand bar (600,000 cu yd) was deposited during two floods—May 19–22, 1957 (60 hours), and October 3–6, 1959 (96 hours).

The sand bar was studied in detail along a 500-ft natural cutbank parallel with the valley and in a 700-ft trench dug at right angles to the valley. Crossbed types were studied and 210 crossbed measurements (true dip direction and true dip angle) were recorded at 12 vertical sections.

Results show that the highly variable patterns of crossbed dips match the erratic and changing flow directions prevalent during flood stages. In some vertical sections crossbed dip directions are at many angles to the overall east-west orientation of the Arkansas River valley. These results verify the expected crossbed variability in fluvial sands and suggest that dipmeter patterns from wells in channel sandstone bodies should be interpreted and projected with caution.

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PETROLOGY OF PENNSYLVANIAN CARBONATE BANK AND ASSOCIATED ENVIRONMENTS, AZALEA FIELD, MIDLAND COUNTY, TEXAS

The Azalea carbonate biogenic bank developed on a broad shallow shelf during early Strawn deposition. Study of cores and well cuttings defined 3 major facies. The "deeper water" micrite is dark brown with scattered crinoid fragments and was deposited in water from approximately 50 to 200 ft deep. The biogenic bank facies is composed of coarse fossil fragments including crinoids, Bryozoa, pelecypods, brachiopods, fusulines, and platey algae. The "sheltered" micrite is light brown with small fossil fragments consisting mainly of bivalves and Foraminifera deposited behind the bank.

Bank development was confined to the west edge of an Atokan structural terrace where oscillation waves were impinging upon the rising sea floor. Moderately high energy, shallow water and the associated supply of nutrients provided necessary ingredients for prolific growth of organisms which formed the biogenic bank.

Hydrocarbon production has been obtained from the bank over 13 mi of its length. Recently production has been extended 1¾ mi on the south end and 1½ mi on the north end. There is a good possibility that additional biogenic banks have developed on the broad Strawn shelf.

THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS 56TH ANNUAL MEETING

and

SOCIETY OF ECONOMIC PALEONTOLOGISTS AND MINERALOGISTS 45TH ANNUAL MEETING

Houston, Texas, March 29–31, 1971

Host Society: Houston Geological Society
Convention Headquarters: Shamrock Hilton Hotel
Headquarters Hotel: Shamrock Hilton Hotel

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Houston has a population of over 1,200,000 and the Metropolitan area exceeds 1,800,000. With this growth