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ASSOCIATION ROUND TABLE

SOUTHWEST SECTION AAPG
13TH ANNUAL MEETING
Abilene, Texas
February 7–9, 1971

The annual meeting of the Southwest Section of AAPG will be held February 7–9, 1971, in the Abilene Civic Center, Abilene, Texas. The theme of the meeting is "Keys to Finding Oil and Gas."

R. R. BLOOMER, *General Chairman*
132 Devonian Building
Abilene, Texas 79603

TECHNICAL PROGRAM SUMMARY

MONDAY MORNING, FEBRUARY 8

Symposium: Economics—Key to Objective Reservoir Evaluation

1. M. T. HALBOUTY: Economics: without which—what?
2. A. V. JONES, JR.: Prospecting for oil and gas in mature area
3. W. S. HOWARD: Let's get the last drop

MONDAY AFTERNOON, FEBRUARY 8

Symposium: Clastic Depositional Systems—Key to Reservoir Rocks

1. R. LEBLANC: Résumé of significant studies of clastic sedimentation
2. W. L. FISHER: Tertiary depositional systems, Gulf of Mexico basin
3. W. OLIVER: Depositional systems in Woodbine Formation (Upper Cretaceous), northeast Texas
4. J. H. MCGOWEN: Alluvial fans and fan deltas: depositional models for some terrigenous clastic wedges
5. L. F. BROWN, JR.: Virgil and Wolfcamp fluvial, deltaic, and interdeltaic embayment depositional systems in north and west-central Texas
6. W. E. GALLOWAY: Facies of Cisco-equivalent slope deposition systems and their role in construction of Eastern shelf

TUESDAY MORNING, FEBRUARY 9

Symposium: Depositional Models—Key to Genetic Interpretation of Reservoirs

1. D. A. BUSCH: Genetic units and delta prospecting
2. J. W. SHELTON: Depositional models of sandstones
3. J. N. NAMY: Facies patterns in Marble Falls Group, southeast Burnet County, Texas
4. J. P. SHANNON, JR., AND A. R. DAHL: Pennsylvanian deltaic stratigraphic traps, West Tuscola field, Taylor County, Texas
5. R. STEINMETZ: History and anatomy of Arkansas River sand bar near Tulsa, Oklahoma

TUESDAY AFTERNOON, FEBRUARY 9

Symposium: Understanding the Reservoir—Key to Prediction and Prospecting

1. K. KLEMENT: Genetic classification of porosity formation and destruction in carbonate rocks
2. S. E. COLLINS: Evolution of Smackover play, Texas to Florida.
3. C. M. THOMAS: Petrology of Pennsylvanian carbonate bank and associated environments, Azalea field, Midland County, Texas
4. J. D. SHORT: Geologic styling and dipmeter

ABSTRACTS

BROWN, L. F., JR., Bur. Economic Geology, Univ. Texas, Austin, Tex.

VIRGIL AND WOLFCAMP FLUVIAL, DELTAIC, AND INTERDELTAIC EMBAYMENT DEPOSITIONAL SYSTEMS IN NORTH AND WEST-CENTRAL TEXAS

Virgil and lower Wolfcamp sediments on the Eastern shelf were deposited within 3 depositional systems—Bowie fluvial system, Cisco delta system, and Lake Hubbard interdeltaic embayment system—which are the subjects of this report. Complementary shelf-edge bank, slope, and basin systems, to be discussed by William E. Galloway, complete the facies tract.

Bowie fluvial facies compose tabular and belted sandstone bodies characterized by braided and coarse-grained meander-belt sequences and sedimentary structures. Fine-grained meander-belt facies generally becoming finer upward, lateral accretionary point bar deposits, and characteristic sedimentary structures commonly occur high in the Bowie fluvial system, indicating decreasing tectonic activity in source areas. Basal fluvial channel facies normally cut subjacent deltaic facies and may overlie rocks of previous depositional episodes.

Cisco deltaic facies are composed of prograding, prodelta mudstones that become coarser upward, delta front, channel-mouth bar and distributary channel sandstones, and aggradational crevasse splay facies, delta-plain mudstones, and coal or organic-rich clays. Local sandstone bars of destructional origin may fringe the delta facies.

Lake Hubbard interdeltaic embayment facies flank deltaic lobes and are composed of mudstone, thin extensive sheet sandstone, and thin impure detrital coal. Some sheet sandstones reflect strandplain accretion, but more commonly they are reworked delta-front sands.

Deltas prograded rapidly westward across the slowly subsiding Eastern shelf. Sediments from the east supplied crevassing delta lobes until avulsion of over-extended systems occurred. Delta construction, accompanied by deposition of complementary facies within nearby interdelta embayments, restricted open-shelf limestone facies to areas downslope or in areas of abandoned deltas. Channels were cut deeply into subjacent facies as prograding deltas extended fluvial erosion and deposition far across older deltaic facies. Marine processes slowly modified abandoned, compacting, and subsiding deltas. Winnowed sediment was swept into interdeltaic embayment mudflats and strandplains. In the absence of local terrigenous sediment, shelf limestones transgressed upslope and along the coast to coalesce over marsh-stabilized deltaic and interdeltaic areas. All environments could occur simultaneously, shifting with distribution of delta sites to produce repetitive sequences of thin superposed depositional systems. Deposition of fluvial and deltaic facies was rapid; deposition of destructional and transgressive facies represents most of the time consumed by deposition. Depositional systems shifted westward through time as the eastern flank of the basin was filled.

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GENETIC UNITS AND DELTA PROSPECTING

Deltas generally are formed at river mouths during stillstands of sea level under conditions of either cyclic transgression or regression. Consequently, they are rarely isolated phenomena, but are present in multiples in a predictable fashion. Reservoir facies consist of both continuous and discontinuous, bifurcating channel sandstones that thicken downward at the expense of the underlying prodelta clays.

All the lithologic components of a deltaic complex are related to each other and are collectively referred to as one type of "genetic increment of strata" (GIS). The GIS is a sequence of strata in which each lithologic component is genetically related to all the others. It is defined at the top by a time-lithologic marker bed (such as a thin limestone or bentonite), and at the base by either a time-lithologic marker bed, an unconformity, or a facies change from marine to nonmarine beds. It generally consists of the sum total of all marginal marine sediments deposited during one stillstand stage of a shoreline, or it may be a wedge of sediments deposited during a series of cyclic subsidences or emergences. An isopach map of a GIS clearly shows the bifurcating trends of the individual distributaries and the shape of the delta, regardless of the variable lithology of the channel fills.

A genetic sequence of strata (GSS) consists of two or more GIS's and, when isopached, clearly defines the shelf, hinge line, and less stable part of a depositional basin. An isopach map of the McAlester Formation of the Arkoma basin is a good example of a GSS. The oil-productive Booch Sandstone is a good example of a deltaic complex occurring within a GIS of this GSS. The upper Tonkawa, Endicott, and Red Fork Sandstones of the Anadarko basin are deltaic accumulations within different GIS's.

A hypothetical model serves to establish the criteria for (1) recognizing successive stillstand positions of a shoreline, (2) predicting paleo-drainage courses, (3) predicting positions of a series of deltaic reservoirs, (4) locating isolated channel sandstone reservoirs, and (5) tracing related beach sandstone reservoirs.

COLLINS, STEPHEN E., Independent, Dallas, Tex.

EVOLUTION OF SMACKOVER PLAY, TEXAS TO FLORIDA

The Smackover limestone is the primary exploration target in the updip part of the entire Gulf Coast area, extending from East Texas to Florida. Accordingly, the Smackover provides most of the new reserves being found in this area and most major companies and many independents have virtually stopped Cretaceous exploration to concentrate on the Jurassic reservoirs (Smackover and Cotton Valley).

Smackover exploration started on a major scale during the 1940s in southern Arkansas where relatively shallow (above 9,000 ft) oil was found. Production was predominantly from oolitic limestones on relatively simple anticlinal structures that were located by reflection seismograph. Nearly 20 years later, in the 1960s, major Smackover exploration began in East Texas. There, a different set of problems confronted explorationists—more radical facies changes, predominantly dolomite reservoirs, gas condensate–sulfur rather than oil pays, abundant inert gases, complex salt intrusions, greater depths (over 12,000 ft), and erratic porosity developments!

Nearly 5 years later, in the late 1960s, Smackover exploration expanded to Mississippi, Alabama, and most recently, to Florida. There, producing rates are higher and multipays of both oil and gas are common in the Cotton Valley and Norphlet sandstones, in addition to the Smackover. Broad limits of the favorable producing facies in the Smackover are fairly well recognized in Mississippi and presently are being extended eastward into Alabama and Florida where recent discoveries by Humble have started "hot" lease plays.

Although local structure and stratigraphic variations are extremely complex, the regional picture of Smackover deposition is viewed as a simple "wedge" of predominantly carbonate rocks rimming the Gulf Coast, and underlain by salt along the downdip area and an old Paleozoic landmass on the north in the updip area. Most Smackover fields have been found in areas of post-Smackover (Buckner anhydrite) "thins," seismic "salt swells," and very low relief Lower Cretaceous structures. Most of the recently discovered fields cover less than 1,200 acres; however, pay sections of more than 100 ft are not uncommon, yielding large reserves over small geographic areas. Consequently, several tests commonly are required to pinpoint the accumulation.

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TERTIARY DEPOSITIONAL SYSTEMS, GULF OF MEXICO BASIN

Thick, offlapping, terrigenous clastic wedges make up the principal fill of the Gulf basin. Proximal parts of these wedges consist of paralic deposits formed either as large-scale, high-constructive delta systems (with related strike systems) or as a series of smaller, high-destructive delta systems. Distal parts accumulated as continental slope deposits associated with salt diapir fields at the terminus of prograded paralic systems.

High-constructive delta systems (*e.g.*, lower Wilcox, Yegua, and Jackson) are comparable in scale and facies to Holocene Mississippi deltas. They were supplied by rivers with large-volume sediment discharge; fluvial facies are concentrated locally along the basin margin. These deltas consist dominantly of fluvial and fluvially influenced deposits, with extensive coal-bearing delta-plain facies, thick progradational delta-front sandstone facies, and very thick, organic-rich, prodelta mud facies. Progradational sandstone facies show either lobate or elongate patterns in plan. Delta systems of this type supported extensive strike-fed systems comparable to strandplain and barrier bar systems of the Holocene northwestern Gulf Coast.

High-destrutive delta systems (*e.g.*, upper Wilcox and Frio) are analogous to the Rhone and other Holocene deltas with significant marine modification (chiefly wave action) of fluvially introduced sediments. These deltas were supplied by numerous, relatively small rivers with moderately high sand load; updip fluvial facies persist along the entire basin margin. High-destructive deltas are composed of a series of sandstone bodies with thickness axes roughly parallel with