sandstone with a southwest-northeast sand body orientation; Facies B, a low permeability, rippled, 0 to 25 ft (8 m) thick, glauconitic sand also oriented in a southwest-northwest direction, and Facies C, a high-angle (20° to 30°) cross-bedded, permeable, producing sand oriented in a northwest-southeast direction ranging from 0 to 18 ft (5 m) thick.

Facies A sands may represent the remains of a thin progradational beach sequence ending in production of a thin shale. Facies B sands are interpreted as the erosional remnants of a "drowned" barrier-bar system with successive parallel bars, each 1 to 3 mi (2 to 5 km) wide, up to 20 mi (32 km) long and oriented southwest-northeast. The bars are incised by tidal channel-tidal delta deposits, approximately 0.25 mi (0.4 km) wide and 1 to 4 mi (1.6 to 6 km) long, oriented northwest-southeast. Between the barriers are sandy shales, shales, and limestones, representing back-barrier deposits, with very thin (< 5 ft, 1.5 m) facies B sands. No evidence of permeable facies C sands are recorded between bars. The sequence is analogous to modern barrier bar-tidal inlet sequences proposed by Kumar and Sanders for the Fire Island area of New York.

Oil producing tidal channel-tidal delta sands show evidence of migration to the north based on (1) a wedge-shaped isopach thickening to the north across the width of the channel, (2) a slight bowing to the northeast in reaction to longshore currents, and (3) isolated fossil-hash lime bodies paralleling the long direction of the channels to the north, representing fill in deposits of the last position of the channel that was inundated by a transgressive sea.

GULF COAST ASSOCIATION OF GEOLOGICAL SOCIETIES and GULF COAST SECTION SEPM

October 26-28, 1983
Jackson, Mississippi

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Burial Diagenesis and Reservoir Development in North Haynesville (Smackover) Field, Louisiana

Smackover carbonates were deposited on a regional ramp which was locally affected by salt-generated paleotopography and basement structures. The paleobathymetry at North Haynesville field was a salt-generated high on which oolite grainstones accumulated. These shoals consisted of tide-dominated sand waves that were flanked by algal-rich grainstones and packstones which, in turn, were surrounded by open marine, peloidal wackestones.

The sand shoals were lithified primarily in the marine phreatic environment, but as they had accumulated significant depositional relief, they became exposed during minor regressions. Consequently, the shoals were affected by early meteoric phreatic diagenesis. Blocky calcite cements and inversion of metastable allochems marked this diagenetic episode.

Subsequent burial diagenetic history can be charted from early to late by the sequential appearance (in order) of the following characteristics: microstylolites, dolomitization, macrostylolites, poikilotopic calcite cements, baroque dolomite cements, and late leaching.

Whole-rock trace element analyses indicate that magnesium, iron, and manganese correlate strongly with dolomitized horizons; strontium correlates with algal-encrusted grains; and aluminum correlates with tight, argillaceous micrites. To an extent, the algal-encrusted grains are also correlated with late, dissolution-enhanced intergranular porosity.

The North Haynesville reservoir is both selective and nonselective for certain depositional microfacies. Selection is for those sand shoals that had the highest primary porosity and permeability and that were affected by dissolution enhancement in the subsurface. However, the same late dissolution processes affected both micrite and allochems in the nonfacies-selective sectors of the reservoir.

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Smackover Platform Sand Bodies: A Bahamas Model

Stave Creek field, a potential multimillion-barrel Smackover oil field in Clarke County, Alabama, owes much of its prolific production to an extensive, 100 ft (30 m) thick buildup of porous ooid and peloid grainstones.

Seismic profiles and residual gravity maps indicate the field is located on the edge of a large, Jurassic, northeast tilted block of approximately 12 mi^2 (31 km^2). The block, which formed a shallow platform for Late Jurassic deposition, is bounded on the west by an older component of the Jackson fault, and slopes eastward into the present graben complex of the Gilbertown and West Bend faults. This location placed the platform in a position between the mouth of the Manila embayment and the eastern edge of the Mississippi interior salt basin. Tidal fluctuation between basins and the open marine conditions to the west had a strong influence on sedimentation across the platform.

Cores from the area indicate a pronounced westward trend in increased carbonate grain stability and sediment winnowing. Smackover sediments from the deeper east side of the platform are composed primarily of peloidal lime mudstones and wackestones. Those of the central platform are peloidal and onchoidal wackestones and packstones. Those of the western edge form a high-energy facies of well-sorted ooid and onchoidal grainstones, e.g., the Stave Creek field reservoir.

A modern analog to the deposition on this Jurassic platform is found along the margins of the Great Bahama Bank, and specifically the north Andros-Joulters Cays area.

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Depositional History and Petroleum Potential of Middle and Upper Ordovician of Alabama Appalachians

Middle and Upper Ordovician deposits occupy a significant position in the Paleozoic sequence in the southern Appalachians, since they represent a transition from passive margin carbonate to active margin clastic deposition. In the Alabama Valley and Ridge these Middle and Upper Ordovician deposits are exposed in two northeast-southwest trending outcrop belts separated by the Helena fault. Units west of the fault are essentially autochthonous, while those east of the Helena have been displaced some distance to the west by late Paleozoic thrusting.

Middle Ordovician units show a transition from shallow-water deposits in the west to deeper water basinal deposits in the east. West of the Helena fault the Middle Ordovician is represented by peritidal to shallow subtidal lithologic characteristics of the Chickamauga Limestone. East of the Helena these shallow-water deposits are replaced by deeper water carbonates of the Lenoir and Little Oak Limestones and graptolitic shales of the Athens Formation. As this deep-water basin filled during the late Middle Ordovician, tectonic uplift generated clastic sediments which prograded into the basin from the east. Red-green mudrocks of the Greensport Formation were deposited in shallow-shelf to tidal-flat environments and were in turn overlain by quartz arenites of the Colvin Mountain Sandstone, deposited as part of a shallow-barrier system.

With continued uplift during the Late Ordovician, additional clastics prograded westward over the filled basin. Early Late Ordovician shallow-shelf to tidal-flat mudrocks of the Sequatchie Formation grade westward into shallow-water carbonates of the Inman and Leipers Formations. With continued input, Sequatchie clastics prograded westward and overrode the westerly carbonates. A relative sea-level rise during the late Late Ordovician was accompanied by deposition of open-marine shelf, bio-