freshwater phreatic diagenetic environments are not favorable. However, the marine phreatic diagenetic environment is favorable.

The transgressive-regressive couplets, which consist of numerous upward-shoaling cycles, provide for generation and accumulation of hydrocarbons. The transgressive cycles are generally favorable to preservation of organic matter, whereas the regressive cycles are favorable sites for development of porosity. Where the transgressive-regressive couplets are buried at a sufficient depth to bring about the thermal degradation of organic matter to petroleum, major accumulations of hydrocarbons occur.

The synchronous and post-sedimentary tectonic events also seem to have a positive influence on the source-rock potential of carbonates and evaporites. Rapidly subsiding shelves would place the organic-bearing carbonates below the destructive influence of the freshwater phreatic zones. Late structural movements could produce the microfracture systems which would form the avenues for petroleum migration from source to reservoir rocks.

Geochemical data on ancient rocks strongly suggest that sabkha evaporites should be seriously considered as a possible source rock for petroleum.

MANCINI, ERNEST A., and D. JOE BENSON, Univ. Alabama, University, Ala.

Regional Stratigraphy of Upper Jurassic Smackover Carbonate Rocks of Southwest Alabama

Upper Jurassic Smackover deposition in southwest Alabama was primarily controlled by the Mississippi interior salt basin and the Manila and Conecuh embayments, and closely approximated carbonate sedimentation in the present Persian Gulf. These depositional sites are characterized by distinctive lithofacies and fossil assemblages. Early salt movement produced local variations in carbonate-sediment distribution, and pre-Jurassic paleo-highs, such as the Wiggins uplift and Conecuh arch, also modified carbonate sedimentation.

Throughout much of southwest Alabama, the Smackover Formation consists of a lower predominantly mudstone lithofacies which overlies the Norphlet sandstone and an upper lithofacies sequence dominated by grain-supported textures which is overlain by the Buckner anhydrite. Where present, the lower Smackover lithofacies include laminated mudstone and some peloidal wackestone, peloidal-oncolitic packstone, and dolomite. The upper lithofacies sequence consists of oolitic or oncolitic grainstone, peloidal or oncolitic wackestone to packstone, and some dolomite and mudstone.

Petroleum traps in southwest Alabama are principally combination traps involving favorable stratigraphy and salt anticlines, faulted salt anticlines, or extensional faults associated with salt movement. Reservoir rocks include grainstones; leached and dolomitized wackestones, packstones, and grainstones; and dolomite. Porosity is facies-selective and is developed chiefly in lithofacies of the upper Smackover. Porosity includes primary interparticulate, secondary grain moldic, intercrystalline dolomite, vuggy, and fracture. The algal mudstones that characterize the lower Smackover and are interbedded with upper Smackover lithologies throughout most of southwest Alabama make excellent petroleum source rocks.

The flanks of the Wiggins-Conecuh ridge and updip Smackover grainstones associated with salt structures are excellent areas for petroleum exploration in southwest Alabama. The key to successful prospecting is the delineation of traps associated with salt movement and recognition of either high to moderate energy lithofacies that have had their primary interparticulate porosity preserved or of lithofacies that have been dolomitized or leached with the development of intercrystalline dolomite or secondary grain moldic porosity.

MASON, ROBERT C., Independent, Houston, Tex.

Geology of Gum Island North and French Island Areas, Jefferson County, Texas

The Gum Island North field is adjacent to a small topographic feature of the same name elevated over 5 ft (1.5 m) above tidal marsh about 13 mi (21 km) west of Port Arthur, Texas. French Island field along Taylors Bayou is 4 mi (6.4 km) due north of Gum Island. The two fields, discovered as a result of the same initial exploration effort, are combination stratigraphic and structural traps. The principal reservoirs are Oligocene middle Frio–Hackberry in age. They are localized as a result of rapid filling of downward troughs created by older growth-fault structural movement, principally of Vicksburg age, but persistent during lower and middle Frio. Pre-Hackberry structural maps, Hackberry sand-distribution maps, and structural and stratigraphic maps, both prior and subsequent to discovery, as well as seismic and subsurface cross sections, demonstrate the nature of the oil and gas traps, as well as the geologic history of the area.

At both French Island and Gum Island, an erosional surface of significant magnitude is at the base of the Hackberry. The resulting unconformity does not greatly affect Hackberry accumulation at French Island, but at Gum Island the stratigraphic position of the unconformity relative to older beds is not only indicative of strong structural uplift, but it also bears a direct relation to individual subsequently deposited Hackberry sand reservoirs.

Exploratory drilling prior to discovery is described, along with an exploration philosophy requiring knowledge of the geologic history and depositional patterns of the trend, detailed geologic analysis of drilling results, stratigraphic integration of paleontologic data, as well as detailed and imaginative geologic use of seismic data, all with a long-term will to persist.

Statistics concerning reserves of oil and gas discovered as a result of this exploration are not made a part of this report. However, the results are expected to be 150 to 250 Bcf of gas and 6 to 10 MM bbl of oil and condensate when ultimately developed. The topside numbers could easily double when additional expected local turbidite "potholes" are drilled.

MCGOWEN, MARY K., O. K. AGAGU, and CYNTHIA M. LOPEZ, Bur. Econ. Geology, Univ. Texas at Austin, Austin, Tex.

Depositional Systems in Nacatoch Sand (Upper Cretaceous), East Texas Basin and Southwest Arkansas