in Dallas, Texas, is to Leigh Charles Price for his paper, "Evidence For and Use of the Model of a Hot Deep Origin of Petroleum in Exploration."

Price, after receiving his bachelor's degree in chemistry and his doctoral degree in geology from the University of California at Riverside, has worked in 1973-1974 as geologist with Exxon Production Research Company in Houston, Texas, and since 1974 with the U.S. Geological Survey in Denver, Colorado. His award-winning paper was written to demonstrate that the geology of oil is compatible with and supports the model of a hot, deep origin for petroleum.

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Shreveport, Louisiana
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Keynote Speakers
Charles H. Murphy, Jr., and John D. Moody

Abstracts of Papers

ANDERSON, DON R., Peppard-Souders and Associates, Houston, Tex.

Ancient Delta Systems in Gulf Coast Area

The interpretation of ancient sedimentary environments of deposition best is done by using petrographic criteria coupled with the study of sedimentary structures and three-dimensional geometry. However, in subsurface studies data other than three-dimensional geometry seldom are available.

The recognition of subsurface deltas and associated environments, which have proved to be the most important reservoirs for hydrocarbons in the Gulf Coast and elsewhere, depends on the use of gross-interval isopach and net-sand maps, and the use of the spontaneous-potential log profile as an indicator of vertical trends in grain size. Examples from the Wilcox (Eocene) of southwest Texas, the upper Miocene of southeast Louisiana, and the Mississippian of the Black Warrior basin (Mississippi and Alabama) illustrate the technique.

BEAVERS, WENDELL M., and PETER A. BOONE, Energy Resources Research Div., Geol. Survey Alabama, University, Ala.

Depositional Environments and Petroleum Potential of Asphaltic Hartselle Sandstone in North Alabama

Asphalt and heavy oil are present in sandstone and limestone of Mississippian age in north Alabama. These petroliferous rocks are in the Pride Mountain Formation, the Hartselle Sandstone, and the Bangor Limestone. Of these units, petroleum is more extensive areally in the Hartselle. The Hartselle Sandstone consists of two major lithofacies: a medium to very thick-bedded, cross-laminated facies with little or no matrix; and a thin to medium-bedded ripple-laminated to very thick-bedded facies with significant terrigenous matrix and interbeds of mudstone. The richest impregnation is in the "clean" facies; this facies is also responsible for formation of prominent sandstone ridges on outcrop. The Hartselle Sandstone is a linear northwest-southeast-trending body probably deposited as a tidally influenced nearshore or strandline sand system.

Oil saturation in the impregnated intervals of the Hartselle ranges from 1 to 60 percent and averages about 27 percent. The porosity of the saturated zone of the Hartselle ranges from 0.4 to 24.0 percent and averages about 13 percent. The impregnated interval ranges from 1 to 55 ft (0.3 to 17 m) thick with an average thickness of 21.3 ft (6 m).

Resource calculations indicate that average oil in-place is 258.5 bbl/acre-ft (2,133 bbl/hectare-meter) or 5,269.6 bbl/acre (13,174 bbl/hectare) or 3.6 gallons (13.6 l.) of oil per ton of impregnated sandstone. The indicated subeconomic petroleum resources of the Hartselle Sandstone are estimated as being 1.18 billion bbl of oil in 350 sq mi (910 sq km) where the Hartselle is greater than 150 ft (36 m) thick.

BEBOUT, D. G., and R. G. LOUCKS, Bur. Econ. Geology, Univ. Texas, Austin, Austin, Tex.

Geopressured Geothermal Prospects in Frio Formation of Texas Gulf Coast—Ideal Versus Actual Models

The Bureau of Economic Geology, University of Texas at Austin, has been searching for geopressured geothermal prospects in the downdip part of several offlapping, basinward-thickening wedges of Tertiary sandstone and shale along the Texas Gulf Coast. The ideal prospect model is a reservoir with a volume of at least 3 cu mi (which translates into a cumulative sand thickness of greater than 300 ft or 91 m and areal extent of 50 sq mi or 130 sq km), greater than 250° F (121° C) uncorrected subsurface fluid temperature, permeability greater than 20 md, and water saturated with methane.

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Three geothermal prospects have been identified in the Frio Formation—the Armstrong, Nueces, and Brazoria prospects; these three represent the actual models. The sand bodies in these models range in cumulative thickness from 200 to 600 ft (61 to 183 m) and each extends over an area of greater than 50 sq mi (130 sq km), with the exception of the Brazoria area where the sandstones may have more limited area extent. In the prospective reservoirs the fluid temperature ranges from a marginal 250° F (121° C) to at least 330° F (164° C). A few core analyses from above and below the potential geothermal reservoirs indicate that 18-20 md permeability is present at depths of 11,000 to 12,000 ft (3,353 to 3,658 m) with 250° F fluid temperature; permeabilities are considerably lower in the deeper, hotter reservoirs. Therefore, permeability is a major limiting factor in identifying a geothermal prospect.

Actual prospects identified thus far do not meet all of the requirements of the ideal geopressured geothermal model. Enormous reservoirs extending over hundreds of square miles with hundreds of millidarcys permeability predicted by previous workers have not been found in the geopressured zone in the Frio. However, initial studies indicate that the smaller reservoirs which are being delineated are capable of producing significant quantities of thermal energy and methane.

BECHER, JACK W., Phillips Petroleum Co., Odessa, Tex., and CLYDE H. MOORE, Dept. Geol., Louisiana State Univ., Baton Rouge, La.

Walker Creek Field: Smackover Diagenetic Trap

The Walker Creek field is the largest so-called stratigraphic trap yet discovered in the Smackover state-line trend. The porosity at Walker Creek is developed in an upper Smackover oolite sequence thought to represent a regressive, high-energy shoreline deposit modified by contemporaneous structural movements associated with salt diapirism. The southern Persian Gulf shelf is its Holocene analogue. The upper Smackover oolite reservoir is a continuous sequence of very well-sorted lime grainstones containing no interstitial, low energy lime muds. Porosity occlusion and ultimate trap formation are the result of early cementation associated with meteoric water-table conditions developed during periodic exposure of the Smackover during its depositional history. The porosity-occluding, early carbonate cements formed in the meteoric phreatic zone directly beneath the water table, while primary porosity was being preserved in the overlying meteoric vadose zones. This primary porosity has been preserved preferentially over the active diapiric structures because vadose conditions persisted across the topographic highs for longer periods of time. Thus, porosity distribution within the Smackover at Walker Creek is not controlled by original depositional processes—such as the pinchout of a porous sand into a lagoonal clay—but is the direct result of the early cementation history of a carbonate-sand sequence that exhibited little variation in original porosity.

The demonstration that Walker Creek is a "diagenetic trap" rather than a true stratigraphic trap gives the explorationist and production engineer in the Arkansas-Louisiana Smackover trend a valid alternative model for potential reservoir characteristics.

BERG, ROBERT R., and RAINA R. POWELL, Dept. Geology, Texas A&M Univ., College Station, Tex.

Density-Flow Origin for Frio Reservoir Sandstones, Nine Mile Point Field, Aransas County, Texas

Upper Frio sandstones are low-permeability reservoirs for natural gas at depths from 10,300 to 11,800 ft (3,139 to 3,597 m). Most of the sandstones and interbedded sandy shales are highly bioturbated which suggests that they were deposited in relatively shallow marine waters, and foraminifers indicate a neritic environment of water depths on the order of 100 to 300 ft (30 to 90 m). Some thin sandstones, however, retain their primary sedimentary structures, and these beds range from 10 to 30 cm in thickness and commonly display a lower massive unit and upper laminated unit. The beds have mean-grain sizes that typically range from about 0.10 mm at the base to 0.08 mm at the top. The bedding sequence and textural gradation suggest that the sands were transported by density (turbidity) flows that probably originated near the shoreline by storm surge and waves. Similar graded beds were deposited off Padre Island, Texas, in water depths from 60 to more than 120 ft (18 to 36 m) after hurricane Carla in 1961. Frio sandstones demonstrate that turbidity currents were an important mechanism for transport of sand into the shallow-marine environment. Locally, sand deposition may have been controlled by bottom topography related to growth faults.

BRAUNSTEIN, JULES, and CLAUDE E. MCMICHAEL, Shell Oil Co., New Orleans, La.

Door Point: Buried Volcano in Southeast Louisiana

An exploratory well, the Shell Oil Co., State Lease 3956 No. 1, offshore St. Bernard Parish, Louisiana, was completed in 1963 at a total depth of 8,538 ft (2,602 m). The last 1,300 ft (3,962 m) of hole was cored and drilled through volcanic material of Late Cretaceous age.

Predrilling seismic data had revealed the presence on this prospect of intrusive material with a density slightly higher than that of the surrounding sedimentary rocks. Gravity data defined a weak maximum here, and no salt was believed to be present.

The igneous material consisted of angular fragments of altered porphyritic mafic rock. In cores it proved to be evenly bedded and cemented by sparry calcite. Radioactivity age dating fixed a minimum age of crystallization of this rock at 82 m.y. + 8, or middle Late Cretaceous (Austin). Bulk density of the igneous rock ranged from 2.02 gm/cc near its top to 2.53 gm/cc near the bottom of the well.

Three gas accumulations, with an aggregate thickness of 38 ft (12 m) were encountered in the Miocene section between 5,092 and 6,219 ft (1,552 and 1,896 m) in the well. Gas bearing sands were not present in two other wells drilled later on the same structure.

Although evidence of Late Cretaceous volcanic activity is widespread in northern Louisiana, as well as in Mississippi, and southeast of Louisiana in the Gulf of Mexico, the Door Point prospect lies within an area that