zones of Gulf of Mexico: DeSoto and Campeche Canyons
24. W. R. Bryant, Charles S. Wallin: Stability and geotechnical characteristics of marine sediments, Gulf of Mexico

FRIDAY AFTERNOON, OCTOBER 25, 1968

25. M. Malek-Aslani: Habitat of oil in carbonate rocks
26. Ed Goodin: Reintegration: synthesis EDP techniques in geology
27. Dudley J. Hughes: Salt tectonics as related to several Smackover fields along northeast rim of Gulf of Mexico basin
28. Harold E. Karges: Pelahatchie field—Mississippi giant?
29. J. A. Hartman: Norphlet sandstone, Pelahatchie field, Rankin County, Mississippi
30. Marvin L. Oxley, Edward D. Minihan: Jurassic geology of Alabama and Florida panhandle
31. Richard L. Bowen: Paleoclimatologic and paleobiologic implications of Louann Salt deposition
32. Dewey J. Bushaw: Gulf basin-East Texas shelf-Lower Cretaceous—an environment history
33. Oscar L. Paulson, Jr.: Relation between interior salt domes and basin morphology

ABSTRACTS OF PAPERS

(In order of presentation)

WILLIAM F. TANNER, Florida State Univ., Tallahassee, Fla.

Origin of Gulf of Mexico, II: Additional Data

Paleomagnetic data indicate that North America is now moving northward, and has had a measurable northward component of motion since late in Paleozoic time. The Gulf of Mexico is thought to have formed as a tensional feature in the wake of the continent. Twenty-two lines of supporting evidence include: earthquake-epicenter alignments, first-motion data (still very scanty), new offset information on a major fault, migration rates from paleomagnetic data, a new east-west graben, the apparently tensional nature of features such as the Mexico and Cayman Trenches, Appalachian?-type strata recently described from Mexico, tensional effects in the central Mississippi Valley, tensional indications along the St. Lawrence Valley, long-term subsidence of the Blake Plateau, the tapered shape of the Atlantic coastal plain, diapirism in the coastal plain, and several well-known items such as the general east-west orientation of grabens in, for example, Louisiana and southeastern Mexico.

The rate of north-south widening during Mesozoic and Cenozoic time has been approximately 2 cm/yr. This should have produced a Gulf 1,000–2,000 km wide in the north-south direction.

A time summary of 12 specific deformational events shows that the southeastern part of North America underwent an important change in tectonic style, during the Pennsylvanian-Permian-Triassic interval. The "Paleozoic style" can be described in terms of compression and left-lateral displacement along the southern Appalachian trend; the "Mesozoic-Cenozoic style" can be characterized in terms of north-south tension (and its corollary, right-lateral displacement along the same trend). Part of the difficulty inherent in understanding the tectonic history of the southern and southeastern part of North America arises from this major reversal. The northward migration of the continent in Mesozoic and Cenozoic time appears to have had the second-order result of thinning from east to west. This thinning may have caused a gentle widening (over a period of about 10^8 years) of the North Atlantic basin. The proposed widening was not, however, nearly as great as that envisaged in the Wegener-du Toit hypothesis of continental drift.

H. J. McCUNN, Mobil Oil Corp., Shreveport, La.

A Theory of Crustal Development Based on Experimental Analysis of Vertical Uplift

By constructing simple model experiments it can be shown that vertical uplift can produce first-order tectonic features similar to those seen in nature. Models of known tectonic features such as the orogen and tensional furrow can be simulated by inflating and deflating a large elongate balloon below layers of clay and lime slurry. Symmetrical and asymmetrical orogens can be simulated as well as simultaneous and migrational orogens. The simultaneous orogen forms as the result of the balloon inflating as a unit along its length. The migrational orogen is formed by the balloon expanding progressively along its length. The migrational expansion causes compressional folds to develop ahead of the expanding front. Drag folds and wrench faults are formed along the flanks.

The first-order tectonic features of known areas can be modeled by using simulated orogens placed in the same relative positions as the naturally occurring features. Some of the areas modeled are the Rocky Mountains, the California system, and the central Western Hemisphere.

Transverse and extension faults can be produced experimentally by vertical uplift. Offsetting uplifts of model orogens produce transverse faults as does differential uplift along the same model orogenic belt. The model transverse and extension faults compare favorably with those observed in nature.

JAMES E. CASE and W. R. MOORE, Texas A&M Univ., College Station, Tex

Gravity Anomalies, Basement Rocks, and Crustal Structure, Central and Southeast Texas

Regional gravity surveys have been conducted (1) between Bryan-College Station and Austin, Texas, across the margin of the Gulf Coast geosyncline and the buried Ouachita fold belt, and (2) across the northwestern Llano uplift, in the Llano-Mason-San Saba-Brady area. These new gravity data have been incorporated with those previously published in order to construct a regional gravity-anomaly map, contoured at a 5-mgal interval, of a large part of central and southeast Texas.

Gravity anomalies in the Llano region can be interpreted readily in terms of exposed major Precambrian rock units. Characteristic anomaly patterns then can be used to interpret basement lithology where concealed around the periphery of the uplift.

Gravitational effects of the thick wedge of Cenozoic and Mesozoic sedimentary rocks in the Gulf Coast geosyncline were calculated for several different density contrasts; thicknesses were based on extrapolations of regional well data. Similarly, gravitational effects of Paleozoic clastic rocks in the "foreland basin" between the metamorphosed Ouachita facies and the crystalline rocks of the Llano uplift were calculated for several density contrasts and basin configurations.

Combined gravitational effects of the models have been applied as corrections to the Bouguer anomaly map to obtain a gravity-anomaly profile that generally represents effects of changes in crustal thickness or density. The granitic crust is considerably thicker under the Llano uplift than under the Gulf Coast geosyncline.

At present, the region is at or near isostatic equilibrium, but near the end of the Paleozoic it was out of equilibrium, with an excess mass at the present site of the Gulf Coast geosyncline. The writers speculate that gulfward migration of depocenters during Mesozoic and Cenozoic has taken place in response to a mechanism for gradual restoration of regional isostatic equilibrium.

E. H. RAINWATER, Tenneco Oil Co., Houston, Tex.

GEOLOGICAL HISTORY AND OIL AND GAS POTENTIAL OF CENTRAL GULF COAST

The area described includes the coastal plain and continental shelf between Texas and peninsular Florida, and includes the Mississippi embayment. The stratigraphic section includes sediments of all ages from Triassic through Holocene. The maximum composite thickness probably exceeds 80,000 ft, but only about 50,000 ft of Mesozoic-Cenozoic sediments is present at any locality in the deepest part of the Gulf Coast geosyncline. Oil and gas currently are produced in numerous fields in this area from both silicate clastics and carbonate rocks of Jurassic, Cretaceous, Tertiary, and Quaternary ages. The sedimentation history clearly indicates that the potential for future discoveries is great.

The structure and stratigraphy of this richly petroliferous basin are described and the possibility of discovering more oil and gas than has been found is pointed out. Thickness, lithology, and depositional environments of each major division of the Mesozoic and Cenozoic are shown on maps and sections.

W. L. FISHER, Bureau of Economic Geology, Austin, Tex.

BASIC DELTA SYSTEMS IN EOCENE OF GULF COAST BASIN

Studies of certain of the thick terrigenous clastic wedges that comprise most of the Eocene fill of the western Gulf Coast basin indicate that principal deposition of sediments occurred as parts of major delta and associated systems.

Two basic types of delta systems are recognized in the Gulf Coast Eocene. One type developed at the mouths of a few, very large, distant-source streams which resulted in extensive shoreline progradation of numerous, elongate to lobate, terrigenous, delta lobes. Streams supporting this type of delta system entered the basin at only a few places and deposited local fluvial facies along the updip basin margin. The second type developed at the mouths of several, relatively small, local streams, and consists of a series of nearly uniformly prograding arcuate to cuspate delta lobes. Streams supporting this type of delta system entered the basin at many places and deposited a more or less continuous fluvial facies along the basin margin.

In the first type of delta system sediment input was great and exceeded the energy of coastal processes so that, within the component facies of the system, the ratio of constructional or progradational facies to destructional facies is high. In the second type, sediment input was moderate and only slightly exceeded the energy of coastal processes so that ratio of constructional to destructional facies is relatively low.

Extensive delta systems of the lower Wilcox in the Gulf Coast basin (Rockdale system in Texas, Holly Springs system in Louisiana and western Mississippi) are of the first type; large delta and associated systems of the Jackson (Fayette) in Texas and the Cotton Valley in the northern Gulf Coast basin also are primarily of this type. The recent counterpart is the Mississippi delta system. Main component facies of this delta system include: (1) extensive delta-plain deposits with abundant lignite or peat (distributary-channel and interdistributary deposits); (2) well-developed delta-front sand deposits made up chiefly of distributary mouth bars; (3) very thick, dark prodelta mud; and (4) interdelta mud. Lobes are elongate perpendicular to the coast where associated with sequences containing large amounts of mud, or are rounded where associated with sequences which are relatively low in mud content. Destructional components include thin, locally persistent, marine units across distal parts of abandoned delta lobes and widespread lignite or peat on the landward or updip parts of abandoned lobes. Constructional and destructional units are vertically distinct. Associated depositional systems include well-developed delta-flank mud facies along margins of the delta-fluvial systems, and prominent strandplain and barrier-bar (with complementary lagoon) systems along strike and down longshore drift.

The large delta systems of the upper Wilcox in Texas and Louisiana, of parts of the Vicksburg, and probably of the Frio in Texas are chiefly of the second type. Recent analogues include the Appalachicola, Rhône, and certain of the U. S. Atlantic coast delta systems. Because of approximate balance of moderate sediment input and energy of coastal processes, much of this type of delta consists of locally redistributed marine sediments; construction and destruction were more or less contemporaneous and units of these phases are not vertically distinct. Principal facies consist of numerous coastal barrier-sand bodies. Constructional delta-plain facies (including distributary-channel and interdistributary deposits) are only partly preserved. Lignite or peat is not important. Frontal shoal-sand facies commonly mark the original progradation of individual deltas. Lagoon, marsh, and lacustrine deposits are minor components. Prodelta mud is not thick and generally is similar to open-shelf deposits. No extensive marginal delta-flank deposits nor prominent strandplain and barrier-bar systems developed along strike.

Significant, and commonly multipay, oil and gas reservoirs are present within both types of delta systems in the Gulf Coast basin. In the first type, main trends are chiefly coincident with marine delta-front sand; in the second type, marine coastal barrier- and frontal shoal-sand bodies are the principal reservoirs. Distribution of deltaic oil and gas trends depends on the type of delta system in which they are present. Reconstruction of the system from facies composition and three-dimensional facies geometry and facies relations provides a useful guide for exploration.

WILLIAM E. GALLOWAY, Univ. of Texas, Austin, Tex.

DEPOSITIONAL SYSTEMS OF LOWER WILCOX GROUP, NORTH-CENTRAL GULF COAST BASIN

The lower Wilcox Group (Eocene) of Louisiana,