able targets. If governmental restraints are minimized the widespread use of computerized industry data can assist attainment of adequate energy supply.

TANNER, W. F., Geology Dept., Florida State Univ., Tallahassee, Fla.

Mexican "Island" Arc

The idealized island-arc system includes a deep-sea trench on the ocean side, a chain of islands (at least partly volcanic) landward of the trench, and a wide saltwater basin between the islands and the continental mainland. There may be a large negative gravity anomaly along either the trench or the chain of islands, and there is typically an active seismic zone which dips landward from a line beneath the trench. The Japanese Islands and the Marianna Islands have been cited as good examples of island-arc systems.

The southern half of Mexico exhibits the characteristics of an island-arc system except for the fact that it is composed of no islands: neither large like Japan nor small like the Mariannas. The Mexican trench, the volcanic chain, and the northward-dipping active seismic zone are present; furthermore, the Gulf of Mexico has the same approximate size and characteristics as the middle-sized basins along the eastern edge of Asia.

In general, the trench-volcano-basin transect looks very much like cross sections taken through recognized mature island-arc systems. The gravity anomaly, although present, is small, but this is not unusual along other trenches and island arcs.

The entire system is associated with well-developed north-south tension; that is, the Mexican "island" arc lies along the narrow trailing tensional edge of a roughly triangular continent. The absence of islands is the result of two facts: (1) the Mexican system is mature in the sense that the Japanese system is mature, rather than immature like the system in the Mariannas; and (2) the development near the tip of a roughly triangular continent makes fragmentation into islands unlikely. The Mexican system is approximately the length of the main Japanese island (Honshu) which likewise is not cut by straits, and is smaller than the main Indonesian island.

Knowledge of the other island-arc systems of the world can be applied in a useful way to the Mexican system; knowledge of the petroleum production continentward from the Mexican arc (on both Mexican and U.S. sides of the Gulf of Mexico) can be extrapolated to the middle-sized basins in other parts of the world.

THAYER, P. A., Program in Marine Sciences Research, Univ. of North Carolina at Wilmington; A. LA ROCQUE, Dept. of Geology, Ohio State Univ.; and J. W. TUNNELL, JR., Dept. of Biology, Texas A&M Univ.

Relict Lacustrine Sediments on Inner Continental Shelf, Southeast Texas

Using scuba, 27 rock samples were collected from a small northwest-trending ridge with 5.5 m of relief located 74 km south of the northern entrance to Padre Island National Seashore and 3.2 km offshore from Padre Island (26°51′N, 97°18′W) in 14 m of water. All are massively bedded subarkoses and sublitharenites cemented by low-Mg micritic calcite. The acid-insoluble residue, which averages 73 percent, is a subrounded muddy, fine sand ($M_z = 3.06\Phi$) that is poorly sorted ($\sigma_I = 1.74\Phi$), extremely leptokurtic ($K_G = 4.32$), and strongly fine skewed ($Sk_I = +0.65$). Most contain mesovugs and channels that are lined with sparry calcite, clay, or fibrous chalcedony. Irregular shaped lumps and clots of iron and manganese oxides are common. Land snails (*Helicina orbiculata tropica, Polygyra septemvolva febigeri*) and freshwater snails (*Helisoma trivolvis, Physa* sp.) have been extracted from the rock. Teeth and bones of Pleistocene mammals (*Mammuthus columbi, Mammut americanum, Bison* sp.) also have been found in crevices in the ridge.

The ridge is interpreted as an intermittent lake deposit that formed on a late Pleistocene extension of the South Texas eolian sand sheet. Mud and fine sand were blown into the lake from surrounding dune fields and mixed with accumulating carbonate deposits. During dry periods, the sediments developed soils that were vegetated and later calichified. Because of their superior hardness, the lake sediments survived the Holocene transgression and have become a submarine prominence.

WALPER, J. L., Texas Christian Univ., Fort Worth, Tex.

Origin of Bahama Platform

The origin of the Bahama platform and its continued subsidence to permit the accumulation of a thick carbonate cap have been a problem of Middle American geology. The relation of this feature to previously published reconstructions of the late Paleozoic–early Mesozoic "fit" of North America, Africa, and South America also has posed a problem. A new model incorporating the volcano-tectonic rift and ignimbrite-sheet association is proposed to explain the origin of the Bahama platform as an integral part of Caribbean plate tectonics. A new North America–South America join is utilized to account for the major geologic and tectonic continuities of Paleozoic age throughout Mexico and Central America.

The clockwise rotation of North America as it separated from South America and Africa caused the counterclockwise bending of the entire peninsula of Mexico and Central America, with the newly accreted Caribbean plate into a subduction zone that was to evolve into the arc-trench system of the Greater Antilles. The rotation and beginning of subduction of this Caribbean plate into the Cuban trench, in Jurassic time, triggered volcanic eruptions that provided the foundations for the Cuban volcanic arc. Additionally the eruptions provide the usual thick and widespread ignimbrite sheet behind the arc in the area now occupied by peninsular Florida and the Bahama Banks.

Not only is evidence for this feature found in wells drilled in Florida, but it also provides the foundation on which was deposited the thick sequence of carbonate strata that form the Bahama Banks. This interpretation eliminates the overlap of the Bahama salient onto Africa, explains the origin of the Old Bahama Channel, serves the same purpose as the sedimentary prism proposed by Dietz and others, and has the volcanic character to meet the geophysical requirements indicated by Uchupi *et al.*

WARD, R. W., Alaskan Arctic Gas Pipeline Co., Anchorage, Alaska

Arctic Gas—New Natural Gas for United States

After over six years and $50 million worth of environmental and engineering studies, officials from Alaskan Arctic Gas Pipeline Co. and Canadian Arctic Gas Pipeline Ltd. submitted simultaneous applications to the United States and Canadian federal governments last March, for permission to build a 2,600-mi pipeline from the Arctic to the United States.

The 100 pounds of filing materials represent the most thorough environmental study ever undertaken for a project such as this—in addition to engineering studies which have been massive.

The 48-in. Arctic Gas pipeline will transport to U.S. markets all of the Alaskan gas from Prudhoe Bay as well as that Canadian gas from the Mackenzie delta which is surplus to Canada's needs.

Although the Arctic Gas pipeline will end at the northern U.S. border, three companion pipeline facilities will be constructed to transport the gas directly to markets throughout the country in what will be the most economical way of distributing Arctic gas directly to U.S. consumers.

Northern Border Pipeline, a consortium of six Arctic Gas members, will construct a 1,600-mi, 48-in. telescoping line from the midwestern to the eastern states.

On the west coast, Pacific Gas Transmission Company, a Pacific Gas & Electric subsidiary, will upgrade existing lines from the U.S.-Canadian border to northern California. Interstate Transmission Associates (Arctic) will construct a pipeline extending from the U.S.-Canadian border near Kingsgate, B.C., to the Nevada-California border which will transport Arctic natural gas to various markets in the western United States, including the Pacific northwest and southwest. Southern California Gas Co. will transport gas from the California border to serve markets in central and southern California.

WAYNE, C. J., Dept. of Geology, Florida State Univ., Tallahassee, Fla.

Effect of Artificial Sea Grass on Wave Energy and Nearshore Sand Transport

The emplacement of offshore, artificial sea-grass beds directly influences nearshore sand transport. Artificial sea grass will decrease wave energy because of bending of the fronds, increased bottom drag, internal deformation, and refraction. The latter three effects change as a result of the increased bottom slope caused by the sea grass beds. In turn, the mean longshore current and longshore component of wave power are reduced. Total wave power and incident angle to the beach specifies the longshore component of wave power (P_L) which is equated to the quantity of sand moved per unit distance (dq/dx).

The average bending moment per individual frond was calculated to be approximately 2.0 lb-in. A dense bed of sea grass has the potential to reduce wave energy by 20 percent, on the basis solely of energy lost to bending. The reduction of wave height, corresponding to the energy loss, results in decreased wave power per unit distance expended at the breaker zone.

Ginsburg and Lowenstam reported that *Thallassia testudinum* offers a suitable substrate for many benthic communities. Algae, foraminifers, bryozoans, *etc.*, attach to the fronds, whereas mollusks, echinoderms, and crustaceans use the network of baffles for protection and food gathering. These organisms add substantially to the binding ability of the grass, and sediment will be accumulated readily within the bed. Variations in the type of community present will depend on wave energy (turbulence), temperature of the water, tidal range, and salinity. In areas of low-wave energy, embankments may grow forming a series of offshore bars which further will influence approaching orthogonals.

WILLIAMS, C. E., L. R. TRAVIS, and E. M. HOOVER, Exxon Co., Houston, Tex.

Depositional Environments Interpreted from Stratigraphic, Seismic, and Paleoenvironmental Analyses, Upper Wilcox, Katy Field, Texas

Upper Wilcox deposits at Katy field in southeastern Texas are composed of terrigenous clastic facies. These rocks are the uppermost beds of the Wilcox Formation (late Paleocene to early Eocene), which crops out in central Texas and extends basinward to a known total subsurface thickness of 9,100 ft at Katy field. The upper Wilcox is 1,800 ft thick at Katy; however, only the upper 800 ft were included in this study. Analyses of the regional stratigraphy, structural trends, and paleobathymetric relations indicate that beds were deposited by high-constructive and destructional delta systems marginal to the subsiding Gulf of Mexico basin; resultant deltaic and interdeltaic facies ultimately were transgressed by open-shelf environments.

The depositional interpretation in vertical sequence begins with prodelta silty clay at the base and coarsens upward to very fine and fine-grained sands in a typical progradational delta-front sequence. Progradation was repeated after subsidence, yielding a second series of delta-front and overlying fluvial facies. The next vertical sequence consists of thinly laminated and burrowed silty clay and thin sand beds which locally are slumped and microfaulted, and sand units containing shale clasts. These thin units represent a period of minor sediment influx and consist mainly of interdeltaic marsh to offshore silty clay and destructional delta-front sand; local distributary channels cut into the bay-marsh transition facies. The third vertical sequence is largely offshore silty clay, thin glauconite beds, and thin silty sand units which transgressed the area as a result of increased subsidence. Local relict shoreline sand beds were deposited during temporary stillstands as the shoreline shifted landward.

WIND, F. H., Dept. of Geology, Florida State Univ., Tallahassee, Fla.

Calcareous Nannoplankton of Salt Mountain Limestone (Jackson, Alabama)

A sample of the Salt Mountain Limestone (Paleocene) from Jackson, Alabama, has yielded a diverse nannoplankton flora. Preservation differs greatly between species. Some forms are well preserved whereas others have been subjected to extensive dissolution and/or recrystallization. Placoliths generally are well preserved, but the centers of many specimens are obscured by pelatoid overgrowths. Many specimens also bear sparry extensions of isolated shield elements.

The presence of *Discoaster gemmeus*, and the absence of recognizable specimens of *Discoaster nobilis* and *Heliolithus riedeli*, places the Salt Mountain Limestone within the *Discoaster gemmeus* Zone. This suggests that the Salt Mountain Limestone is older than the Nanafalia Formation which has been placed in the *Heliolithus riedeli* Zone. Toulmin suggested that the Salt Mountain Limestone was an offshore facies equivalent of the *Ostrea thirsae* beds of the Nanafalia Formation.

WOOD, M. L., Bass Enterprises Production Co., Fort Worth, Tex., and J. L. WALPER, Texas Christian Univ., Fort Worth, Tex.

Evolution of Interior Mesozoic Basin and Gulf of Mexico

The evolution of the Interior Mesozoic basin is presented in terms of an evolving Gulf of Mexico which had its origin with the rifting and breakup of Pangea, particularly with the separation of North and South America. This Mesozoic event was preceded by the formation of Pangea in the late Paleozoic when plate collision produced the Appalachian-Ouachita-Marathon orogeny. As a result of this orogenic episode of plate collision and accompanying crustal dislocation along three major transcurrent-fault systems, the Texas, Wichita, and Mississippi megashears, a proto-Atlantic was closed and a distributive pattern of pre-Mesozoic rocks was created that was to have a lasting effect on the shape of the Interior Mesozoic basin.

Rifting in the Early Triassic created an incipient Gulf of Mexico with associated peripheral grabens that defined the shape of Mesozoic sedimentation. Crustal thinning and attenuation accompanied the divergent rifting of Pangea and early sedimentation in rift grabens are represented by the Eagle Mills Formation. Deltaic prisms are postulated, coincident with the three megashears, and represent the positions of ancestral Rio Grande, Red, and Mississippi Rivers. They augment the continental redbeds of the grabens formed during early rifting and the succeeding marine-shelf sediments of a diverging plate margin and constitute exploratory objectives.

The thick evaporite deposition, represented by the Werner evaporite and Louann Salt, in a shallow basin on a subsiding-plate margin is the result of a unique combination of events. The updomed rift margin of the trailing plate formed a restricting barrier that allowed the continued influx of sea water into the attenuated and rifted part of the plate that was subsiding to form the Interior Mesozoic basin. The sea water, on encountering the