abruptly by narrow, broadly arcuate, shale-filled channels. These two fluvial interpretations are supported by mineralogy, textural gradation, internal structures, and sand-body geometry.

The average composition of lower Tuscaloosa sandstone is quartz, 60 percent; matrix, 32 percent; calcite cement, 4 percent; feldspar, 1 percent; muscovite, 1.5 percent; and other minerals, 1.5 percent. Average mean grain size of quartz is 0.24 mm (fine grained); mean grain size decreases upward within individual sandstone beds.

Four distinct sandstone zones produce oil at Mallalieu. The lower two zones are characterized by more extensive, point-bar sandstone whereas the upper two zones are narrow, channel-fill sandstone. This vertical sequence suggests an upward gradation from fluvial meander-belt deposition, through deltaic distributary deposition, to inner neritic deposition of the overlying marine shale—an overall transgressive sequence. The change from meandering below to braided above probably resulted from a change in stream gradient by basin subsidence.

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GEOLOGY OF MCALLEN-PHARR FIELD AREA, HIDALGO COUNTY, TEXAS

The McAllen-Pharr field produces gas and gas condensate from the lower, middle, and upper Frio Sandstone between the depths of 5,800 and 13,765 ft. The Frio is a regressive offlap sequence. Consequently, the environment of deposition of the productive sandstone bodies ranges from very shallow marine in the lower Frio through brackish and transitional to continental in the upper Frio. Hydrocarbon entrapment is in a simple faulted anticline in the upper Frio, a large stratigraphic trap in the Hansen sand, and many small complex fault blocks in the lower Frio. Structurally, the McAllen-Pharr field changes from a simple downthrown fault closure with basinward regional dip to a complexly faulted structure with steep, away-from-the-basin dips.

The great amount of deposition associated with the Rio Grande embayment, and the major contemporaneous McAllen fault system, have created two significant features in the McAllen-Pharr field that are characteristic of this area. They are the stratigraphic nature of the Hansen sand "fairway" and the development of "reverse dip" into the McAllen fault. A knowledge of these phenomena will aid in a clearer understanding of the overall geology and can be the key to future deep exploration in the area.

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FEDERAL ACTIVITY IN MARINE GEOLOGY IN GULF OF MEXICO

Seven agencies of the federal government are involved either directly or indirectly in marine geologic research in the Gulf of Mexico. These are: Naval Oceanographic Office; Office of Naval Research; Army Corps of Engineers, Department of Defense; Environmental Sciences Services Administration, Department of Commerce; Water Pollution Control Administration; Bureau of Commercial Fisheries; and Geological Survey, Department of Interior.

Activities by NOO and ONR are related to national defense and the development of undersea technology and include regional studies of sediments on the sea floor and the strata beneath by coring and by acoustical profiling. Corps of Engineers studies are concerned with the mass movement of sediments and erosional patterns along the coastline as they relate to marine processes.

ESSA is concerned primarily with charting and mapping the coastal and deep-ocean waters. Programs of ESSA are providing detailed bathymetry of the sea floor and regional surveys of bottom conditions.

Agencies of Interior are engaged in research that bears on both the stewardship of resources on public lands and exploration and development of both renewable and nonrenewable resources of the marine environment. WPCC, through the Office of Estuarine Studies, is establishing a program for the investigation of pollution and sedimentation in the inshore waters of lagoons and estuaries. BCF is studying intensively the environmental factors controlling the profileration and movement of edible sea life, including the effect of sediments on bottom dwellers. USGS, through its Water Resources, Conservation, and Geologic Divisions is the federal agency most heavily engaged in marine geologic research in the Gulf. The Water Resources Division is studying the effect of flooding in coastal bays and will have a leading role in estuarine studies. The Conservation Division acts in a managerial capacity in evaluating, on geologic grounds, prospective lease property on the continental shelf. The Geologic Division, through the Office of Marine Geology, is engaged in a broad research program that includes study of sedimentation and diagenesis processes in the nearshore and shelf environments, heavy metals content of sediments, geochemistry of sediments, and crustal structure of the Gulf basin. The Survey's overall program in the Gulf is following the pattern established for other marine provinces—the extension of geologic knowledge from peripheral land areas seaward as the public needs require.

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A STUDY OF WEST FLORIDA ESCARPMENT

Two magnetic models of the West Florida escarpment have been constructed. These models represent a synthesis of seismic reflection data recorded on the continental slope of western Florida by Texas A&M University, information from numerous oil companies, and early refraction results from the Gulf of Mexico basin. Theoretical magnetic anomalies computed from these models are consistent with previously published magnetic data for the slope, scarp, and basin.

These models show that the presence of a fault with a throw of 10,000 ft in the basement under the Florida escarpment can be reconciled with the essentially smooth magnetic field shown in previously published charts. These magnetic data had been interpreted earlier to indicate that no basement fault could be associated with the escarpment. In the models presented here, subsidence of both the platform and basin is considered, the assumption being made that the basin has subsided more rapidly.

On the basis of these data and the magnetic models, a geologic cross section is presented which includes basement faulting, reef buildup, and volcanic rocks. The volcanic rocks, although probably present, are not related to the origin of the scarp. This geologic model consists of a continental platform with an upper section of limestone, dolomite, and anhydrite deposited in a shallow-water environment. The outer edge of the slope is bordered by buried reefs and the