Three prominent periods of Mesozoic carbonate-shelf development in the Gulf Coast are represented by the Smackover-Haynesville, the Hosston-Sligo, and the Glen Rose-Edwards-Georgetown. In spite of obvious differences in character of shelves of these three intervals, certain similarities of depositional pattern should be helpful in predicting stratigraphic trends in unexplored areas or at untested depths. The most useful parameters for mapping were found to be percentages of the carbonate section having (1) dolomite and (2) oölites. Regionally the depositional patterns and consequent porosity patterns were dependent on climate and supply of clastics as well as on water depths and the distribution of the Louann Salt. Smackover depositional and structural patterns were affected by faults involving the pre-Mesozoic rocks. Reefs and shellbanks became more important in determining depositional patterns in the Cretaceous. Reef distribution appears to be related to the extent of the salt dome basins.

As additional subsurface control becomes available, patterns of reefing will be found to be more complex than can be demonstrated at present, with a possibility of echelon arrangement of some barrier reefs, and with more of the reefing demonstrably related to salt movement. There is also a possibility that some of the earliest salt movement may be related to loading by growth of thick carbonate shelves, as well as to triggering by movement on major faults.

The present economic limitations in some of the carbonate trends will be overcome by improved deep drilling techniques, more effective seismic methods, particularly at great depths and in the salt dome basins, and by new knowledge of the regional geology as a factor in determining porosity patterns.

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RECENT GEOLOGIC HISTORY OF WEST COAST OF FLORIDA: COASTAL MANGROVE SWAMPS, AND FLORIDA BAY

The Recent (last 10,000–11,000 years) geologic history of the northeastern corner of the Gulf of Mexico, *i.e.*, western and southern continental shelves of peninsular Florida, is recorded by the character and stratigraphy of outer-shelf and nearshore deposits. These deposits chiefly reflect the interplay of a generally rising sea level and the proximity of sources of terrigenous detritus, especially detrital quartz. For example, seaward of west-central Florida the outer shelf is essentially a bedrock surface overlain by a thin veneer of bioclastic sediment and biogenic reef growths that initially formed in a shallow nearshore environment. In contrast, the inner part of the shelf is flooded with shelly quartz sand or silt. Some of this detrital debris has been transferred to the shore to form prisms of quartzose beach sand, tracks of prograding beach ridges, and high coastal dunes. The quartz is chiefly derived from reworking of residual shelf and terrace deposits and drowned coastal plain sediments of Pleistocene age. Sources of detrital quartz disappear toward the south; consequently the inner belt of quartzose deposits narrows and becomes increasingly mixed with shell debris and finer calcilutaceous components in this direction. As an important constituent of shelf sediments, detrital quartz essentially vanishes by the latitude of Cape Sable (25°15′N). Attesting to this, the carbonate content of unconsolidated sediment in Florida Bay (just south of the cape) averages nearly 90 percent. This sediment is primarily composed of comminuted molluscan, foraminiferal, and algal debris, 80–85 percent of which consists of "metastable" aragonite and high-magnesian calcite.

The calcarenitic and calcilutaceous deposits of Florida Bay are as much as 4 m thick and overlie a thin stratum of fresh-water peaty and calcareous sediment resting on a karsted bedrock surface of Pleistocene age. The basal fresh-water deposits have a radiocarbon age of approximately 4,000 years, which implies that sea level at this time was about 4 m lower than its present position. Also beginning about 4,000 years ago marine water slowly inundated the western margin of the fresh-water swamps of the Everglades, thereby providing the necessary paralic environment for the growth of the magnificent coastal mangrove forest and swamps of southwestern Florida. Strata underlying submerged waterways, intra-forest bays, and tidal channels of the swamps form a simple transgressive sequence consisting of a basal fresh-water unit of peat and calcitic mud, a middle unit of paralic and brackish-water peat, and an upper marine unit of organic-rich quartzose sediment or shell debris. Deposits underlying the floor of the mangrove forest, or associated salt-grass marshes, range from peaty and calcareous quartzose sand and silt to compact, fibrous autochthonous peat. These organic-rich units also indicate approximately 4 m of marine submergence during the last 4,000 years. Concomitant with this submergence a complex sequence of peaty and calcareous sediments accumulated along the western margin of the Everglades.

If lithified, the modern shelf and coastal deposits of the northeastern corner of the Gulf of Mexico would be mapped as a somewhat discontinuous and slightly time-transgressive stratigraphic sequence consisting of a variety of shallow-water facies composed of mixtures of three lithologic end members: (1) calcarenite and calcilutite, (2) quartzose sandstone and siltstone, and (3) coal. These facies, and their stratigraphic relations, duplicate some of the essential aspects of Paleozoic cyclothems.

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STRATIGRAPHY OF UPPER CRETACEOUS AUSTIN GROUP, CENTRAL TEXAS

The Austin Group in central Texas represents a distinct cycle of carbonate deposition that consists predominantly of soft, white, sparse to well-packed, pelecypod and foraminiferal biomicrite, popularly called chalk. The abundance of biomicrite and the general absence of biosparite suggest deposition below wave base on a broad carbonate shelf.

Between Dallas and San Antonio the Austin Group can be divided into four geologically distinct areas based on facies changes and thickness. These changes reflect the presence of two slightly positive areas, the San Marcos arch and the Belton high, that represented a more stable part of the shelf than the adjacent, more rapidly subsiding areas. The negative area between the San Marcos arch and the Belton high has been named the Roundrock syncline and the negative area north of the Belton high is referred to as the Dallas basin.

In the Roundrock syncline, from the type area in Travis County north through Bell County, the Austin Group ranges in thickness from 350 to 550 ft and is

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divisible into five formations. In ascending order they are named the Atco Chalk, Vinson Chalk, Jonah Limestone, Dessau Chalk, and Burditt Marl. The group as a whole is characterized in this area by medium- to massive-bedded chalk and marly chalk with distinct, laterally persistent key beds and a general absence of fragmental limestone.

From Travis County south to Bexar County, on the southwest flank of the San Marcos arch, the Austin Group thins to approximately 100 ft. Formations recognized in the Roundrock syncline lose their identity as the entire section changes facies to a thin- to medium-bedded, slightly fragmental, commonly glauconitic, dense biomicrite. Diastems occur within the unit and a disconformity separates the Austin Group from the overlying Anacacho Limestone.

From Falls County north through McLennan County the Austin Group thins over the Belton high to less than 150 ft, and facies changes occur which are similar to those on the San Marcos arch. A disconformity separates the Austin and Taylor Groups in the area.

From Hill County north to Dallas County the Austin Group thickens into the Dallas basin to more than 600 ft and can be subdivided into three informal units called the "lower," "middle," and "upper chalk." Farther north in Grayson and Hunt Counties another positive element, the Preston anticline, separates the carbonate sequence of the Austin Group from its clastic equivalents in northeast Texas.

General criteria that may be useful in the recognition of positive areas that existed during deposition of the Austin Group include the following: (1) thinning of the group; (2) a facies change from massive-bedded chalk and marly chalk to thin-bedded, commonly fragmental, and glauconitic chalk; (3) loss of identity of formations and key beds recognized in adjacent negative areas; and (4) the appearance of local diastems in the section.

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Delta-Front Diapirs off Magdalena River, Colombia, Compared with Hills off Other Large Deltas

Exploration of the slope off the Magdalena River with reflection profiling has shown a series of large diapiric intrusions with hills rising as much as 600 ft above the sea floor. These diapirs mostly are bordered by down-bent formations in contrast to the usual, but not invariable, upbending around salt domes. Because salt domes are unknown in the entire area, and because plastic mud layers must be common in the delta-front beds, it seems likely that these are mud diapirs or possibly some type of underwater mud volcanoes.

The mud lump islands off the Mississippi delta generally have been considered rather unique. However, the finding of diapiric intrusions, which are probably mud, off the Magdalena delta and the finding of many hills off other deltas suggest that such intrusions may not be unusual.

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Environmental Relationships of Recent Ostracoda in Mesquite, Aransas, and Copano Bays, Texas Gulf Coast

(No abstract submitted.)

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Subsurface Upper Cretaceous Stratigraphy of Southwestern Arkansas

The subsurface Gulf Series of southwestern Arkansas is characterized by uniformity in lithologic features, a minimum of facies variations except on a local scale, general eastward thinning of units toward a shoreline area, and features typical of neritic, eulittoral to sublittoral, and alluvial to prodeltaic environments.

The Woodbine Group of southwestern Arkansas consists of the Lewisville Formation of fluvial to littoral varicolored shale and sandstone and the overlying Eagle Ford Formation of dark gray to black littoral to sublittoral shale. The Woodbine is unconformable on Comanchean rocks throughout the area studied. The Austin Group in this area is represented by the Tokio Formation of littoral to sublittoral ashy sandstone and shales and the Brownstown Formation of more offshore calcareous, glauconitic shale and sandstone.

The Taylor Group here consists of the Ozan Formation of slightly calcareous shale and glauconitic sandstone with a basal glauconitic sandstone (Buckrange Sand Lentil) followed above by the neritic Annona Chalk, Marlbrook Marl, and Saratoga Chalk. The Ozan Formation tends to thin southwestward in contrast to the underlying Gulf deposits which generally thicken in that direction. The chalk formations of the Taylor Group mark the onset of large numbers of Senonian planktonic coccoliths and foraminifers in this region. In northeastern Texas the Austin Chalk (Tokio equivalent) represents an earlier Senonian invasion of calcareous planktonic organisms. In this region the Austin and Taylor planktonics are associated with typical benthonic fossils and require a neritic environment.

The Navarro Group of southwestern Arkansas consists of the Nacatoch Sand and Arkadelphia Marl. The Nacatoch is neritic, littoral, and sublittoral glauconitic sandstone and shale whereas the Arkadelphia is neritic calcareous shale and marl, in part glauconitic.

The base of the Paleocene marine Midway Group is distinct throughout the area studied but there is little or no evidence of an unconformable relation with the Gulf Series. There is some evidence of a paleontologic break at the contact, and it probably should be termed a paraconformity.

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Faults of South and Central Texas

The map entitled "Faults of South and Central Texas" shows the location, depth of trace, and approximate vertical displacement of the various normal faults located in the area covered by the investigation. The information on the faults was derived from: published sources (listed in text); various individuals including especially, William Pittman, Wilford Stapp, and Porter Montgomery; and studies in company files.

The writer found that most reports on a particular area were broadly about the same, but might differ considerably in detail. Certainly, no two maps were identical; each geologist seems to have his particular style of fault interpretation. Additional faults undoubtedly will be discovered in the future and the interpretations presented will require alteration.

Most of the faults in the region occur within the