2. The paleogeography of the eastern Gulf Coast during Jacksonian (Late Eocene) times was reconstructed by a combination taxonomic-morphologic method. For Tertiary faunules some of the precision lost by using taxonomic data alone, by the change from specific to generic level, is restored by adding morphologic data. This treatment of Jacksonian faunules is an elaboration of one introduced by L. W. Stach in 1936 and consists of determining relative frequencies of zoarial growth forms. Coupled with taxonomic data, these frequencies suggest water depths of 20–50 fathoms in Alabama and western Florida and 5–20 fathoms in peninsular Florida.

The morphologic approach seems especially versatile and capable of extension, but for proper evaluation the adaptive significance of many features, e.g., avicularia and vibracula, must be ascertained.

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EFFECT OF CLIMATE AND SOURCE AREA LOCATION ON BROWNS PARK FORMATION PETROLOGY

The Browns Park Formation of Miocene age consists dominantly of cross-bedded feldspathic sandstones and was deposited by a series of northward flowing rivers that headed in the vicinity of the San Juan Mountains. The sandstones were transported 150 to 250 miles to northwestern Colorado and south-central Wyoming.

Abundant plutonic and volcanic rock material show that the sandstones are largerly first cycle sediments. The quartz, feldspar, volcanic rock fragments, and heavy minerals all are considerably rounded; some are very well rounded. The freshness of much of the feldspar demonstrates that corrosion at the source is not responsible for the rounding, but the distance of fluviatile transport is too short to explain the degree of rounding. The quartz grains are commonly frosted and pitted, considered to be due to eolian action. The rounding of the sand grains apparently took place during intermittent periods of eolian activity. Fluviatile transport associated with eolian activity suggests a semi-arid climate.

Volcanic centers in northern Utah and southern Idaho have been suggested as a source of the volcanic material which occurs abundantly in the Browns Park Formation. Grain size determinations of quartz, feldspar and volcanic rock fragments showed an increase in size of all components toward the south and not toward the suggested western area. The mean grain size, sorting coefficient, and other grain-size parameters are similar in the quartz, feldspar and volcanic material. This relationship suggests that volcanic material was carried an appreciable distance with the other components in the sandstone. The grain-size characteristics of the volcanic-rich Browns Park sandstones indicate that most of this material was derived from volcanic centers in the San Juan region.

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MINOR SEDIMENTARY STRUCTURES IN A PROGRADING DISTRIBUTARY

Minor sedimentary structures were studied in cores taken at the mouth of a small prograding distributary within the Mississippi River delta. The mouth of Johnson's Pass in Garden Island Bay was mapped and the following environments were recognized: subaerial and subaqueous natural levee, channel, distributary mouth bar, interdistributary bay, and marsh. Oriented, undisturbed cores were taken from each environment. These cores were split, dried, and photographed and the types of minor sedimentary structures within each environment were tabulated. Natural levee deposits contained abundant current ripple bedding, unidirectional cross-laminations, parallel and wavy laminations, distorted layers and burrowed oxidized silty sands, whereas channel fill deposits consisted of alternating beds of clay and silt containing trough cross-laminations, scour and fill structures, and distorted layers. The distributary mouth bar, composed predominantly of silt and sand, is characterized by a variety of small-scale multi-directional cross-laminations and air-heave structures. Three types of interdistributary bay deposits were recognized; highly burrowed interbedded silt and clay, homogeneous clay with scattered brackish-water fauna, and a predominantly clay section with thin parallel and lenticular laminations and ripple marks. The structures within these three types are a reflection of availability of coarse detritus. Marsh deposits are characterized by the abundance of peat, carbonaceous clays, calcareous nodules, and root disturbances.

Each environment is characterized by a distinct assemblage of structures. These assemblages can be used to interpret paleoenvironments in ancient sedimentary rocks.

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DEEP LOWER CRETACEOUS EXPLORATION ON THE WESTERN GULF COASTAL PLAIN

Hydrocarbon exploration in Lower Cretaceous rocks of the western Gulf Coastal Plain dates from the 1920's when such shallow fields as Luling, Darst Creek, and Salt Flat were discovered. Deeper exploration for objectives in the Lower Cretaceous increased sharply following the 1954 discovery of Stuart City field, LaSalle County, Texas.

The rock column under consideration, dates from Neocomian to upper Albian including, in ascending order, the following stratal units: Trinity, Fredericksburg, and Washita. While the deep Lower Cretaceous activity is often referred to as "the Edward reef play," objective horizons actually fall within the Edwards, Glen Rose, and Sligo limestones.

The middle Trinity Pearsall shale and middle to late Washita Del Rio shale are widely distributed, easily mapped units. Limestones between these key beds are composed of three generalized lithofacies grading from north-northwest to south-southeast as follows: (1) Carbonate rocks of shallow-water origin characterized by mudstones, wackestones, and packstones in which miliolid and larger foraminifers, oölites, and algal structures are common. Evaporites are locally abundant and dolomite is widely developed; (2) Wackestones, boundstones, and grainstones of shallow-water origin in which the dominant faunal elements are rudistids, corals, algae, and stromatoporids; (3) Carbonate mudstone of somewhat deeper-water and more open-sea origin bearing pelagic foraminifers and calcispheres.

Lithofacies 1 and 3 have widespread distribution whereas the rudistid-bearing rocks are limited to a rather narrow band along platform margins, and have thus become known as "the Edwards reef."

These Lower Cretaceous rocks produce from fault closures in the Edwards and Glen Rose where dolomitization and dissolution have greatly improved the reser-