landward margin of a broad shallow lagoon formed behind the Glen Rose reef. About 60% of the sedimentary volume consists of mudstone, silt, and sand, with brackish-water to hypersaline ostracod faunas believed to result from influx of flood waters from the Ouachita highlands a few miles to the north. The lower part of the formation contains discontinuous beds of gypsum, ranging in thickness from a few centimeters to composite beds > 3 m (10 ft), and displaying mosaic structure with vertically oriented, elongate nodules. These beds, which are lenticular, are interpreted to result from subaqueous precipitation of vertical selenite crystals (subsequently recrystallized) in discrete ponds and pools on microtidal-range mud flats. Intrastratal growth of gypsum nodules and displacive halite occurred at the margins of the pools.

The upper part of the formation contains no gypsum beds, but halite pseudomorphs at the base of and within some of the thin limestones suggest the presence of supratidal brine pools. Several minor unconformities exist, of which one has a regional extent and is underlain by red-brown mudstones. Algal-mat lamination, lenticular gypsum pseudomorphs (an intrastratal growth form), and syneresis cracks occur in the limestones, and a supratidal environment is envisaged for a significant proportion of the time of deposition.

The limestones generally have a restricted fauna of ostracods, bivalves, cerithid gastropods, serpulid worms, and miliolid Foraminifera, and range in texture from lime mudstones to grainstones. The most abundant grain types are pellets, superficial ooliths, and terrigenous quartz. A paucity of dolomite is a striking feature. Some of the thinner bedded units are rippled, and some ripples were truncated during periods of emergence. The limestones are believed to represent periods of shallow water, slightly hypersaline to slightly hyposaline conditions of variable energy. The regressive trend displayed by these two divisions continued with deposition of the overlying formation. The uppermost 3 m (10 ft) of the DeQueen consists of mudstone with a thin marl at the top. A conformable contact exists with the overlying Antlers formation, which has basal mudstones becoming more silt- and sand-rich upwards and finally giving way to the typical Antlers (Paluxy) sands.

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Depositional Setting and Characterization of Deep-Basin Oak Hill Lignite Deposit (Middle Paleocene) of Southwest Alabama

In southwest Alabama, deep-basin lignite with economic potential occurs in the Oak Hill Member of the Naheola Formation. This middle Paleocene lignite is the thickest (2 to 11 ft, 0.6 to 3.3 m) and most extensive lignite in the southwest Alabama region. The Oak Hill lignite deposit accumulated in lower delta plain coastal marshes located in interchannel areas behind of a barrier system. The source area for the deltaic sediments was probably to the west and/or northwest of Choctaw County, Alabama. The lignite occurs in a clay-dominated sequence. Oak Hill interdistributary bay ripple-laminated clays are interbedded with ripple-laminated, crevasse splay sands generally < 15 ft (5 m) in thickness. The glauconitic sands of the overlying Coal Bluff Member of the Naheola Formation represent marine encroachment into the interchannel basin area.

An estimated 8 billion short tons of hypothetical Oak Hill deep-basin lignite may be available in southwest Alabama. The lignite is of good quality and is characterized on an "as determined basis" as having 20 to 27% moisture, 8 to 10% ash, 0.8 to 3.0% sulfur, 0.1 to 1.0% pyritic sulfur, 30 to 39% volatile matter, and 28 to 36% fixed carbon. The calorific value of the lignite is 9,070 to 9,970 Btu/lb and averages 9,530 Btu/lb. Presently, this deep-basin lignite resource is beyond the depth for effective surface mining and, therefore, must be recovered by underground mining or in situ gasification or liquefaction recovery methods.

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Recognition of Sandstone Depositional Environment: A Grain-Shape Approach, With Example from North Padre Island

The shapes of 8,000 fine quartz sand grains from Malaquite Beach, North Padre Island, were analyzed with the Fourier shape technique. It was found with this technique that dune sands can be differentiated easily from beach sands on the basis of both their gross and fine (roundness) shape characteristics.

The analysis of samples from transects across the beach and dunes also reveals a high degree of grain-shape variation within these environments. This variation is due to the effects of hydrodynamic and aerodynamic sorting by swash and wind currents respectively.

The Fourier technique provides a rapid and objective manner to discriminate between beach and dune sands, and can be applied to ancient as well as modern sands with equal facility.

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Hydropressure Tongues Within Regionally Geopressured Lower Tuscaloosa Sandstone, Tuscaloosa Trend, Louisiana

A regional study of the Tuscaloosa Formation in Louisiana, undertaken to assess geopressured-geothermal potential, revealed lobate, downdip extensions of the hydropressured zone in lower Tuscaloosa massive sandstone facies below the regional top of geopressure. Normal pressure zones within geopressured section were identified by drilling-mud weights less than 13 lb/gal on electric logs of massive lower Tuscaloosa sandstone; cross sections demonstrated updip continuity of these zones with the regional hydropressured zone. These hydropressure "tongues" are permitted by the anomalously high permeabilities reported from the deep Tuscaloosa trend, and they are attributed to both primary and secondary porosity by investigators of Tuscaloosa sandstone petrography. The hydropressure tongues correspond with lobes of thick net sandstone, principally in Pointe Coupee, East Feliciana, East Baton Rouge, and Livingston Parishes in the central Tuscaloosa trend. Limited control suggests at least one hydropressure tongue in the Chandeleur Sound area to the east.

Dimensions of hydropressure tongues range up to 27 km (17 mi) parallel to strike and 17 km (11 mi) oblique to strike. In many places, tongues are terminated downdip by faults, which, by acting as pressure seals, prevent the tongues from extending to the downdip edge of the massive sandstone in the expanded sections of the downthrown blocks. The areal extent of geopressured Tuscaloosa sandstone is controlled updip by these fault zones, and downdip by pinch-out of the sandstone units basinward. Local hydropressure tongues diminish the geopressured-geothermal potential of the Tuscaloosa trend, but show no discernible relation to gas-productive areas.

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Unusual Calcite Cementing of Quartz Grains on Chandeleur Island Beach, Offshore Louisiana

A very unusual calcite cement was found in some beachchips from an unconsolidated beach surface of Chandeleur Island offshore approximately 35 nmi (65 km) south of Mississippi in the Gulf of Mexico. The beachchips are irregularly shaped and are well cemented by this unusual calcite. This calcite crystal structure has not been reported previously as existing in a marine environment. A similar cement has been found in freshwater lake beachrock and in some travertine samples. The calcite crystals are elongate parallel to the c-optic axis, and are composed of bunches of crystallite blades. The crystallite blades of each crystal bunch are pointed and are more bladed than freshwater cement crystals. The intercrystallite pore space contains no fine calcite silt as was observed in the lake samples. Fresh water provided by rainfall may be held in the pore spaces and bounded to the quartz-grain surfaces by ionic attraction. Marine spray above and saline water concentrated underneath form a sandwich effect at the micropore level, allowing rapid growth and precipitation of these very unusual calcite crystals in a single-phase low-salinity fluid.

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Regional Patterns of Diagenesis, Porosity Evolution, and Hydrocarbon Production, Upper Smackover of Gulf Rim

The exploration fairway of the Upper Jurassic Smackover, from the Rio Grande to the Panhandle of Florida, consists of a rather simple carbonate ramp depositional system characterized by thick, widespread blanket ooid sands. The ooid sand belt gives way landward to quartzose