work controlled by plate morphology helps localize later diagenetic events, which ultimately produce a well-connected, predominantly large-pore network. This provides for large initial production rates and relatively high recovery factors, which are very desirable reservoir attributes from an economic standpoint.

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Cycles in Gasperian (Mississippian) Basin-Edge Sediments of Indiana

Basin-edge sediments of the Gasperian Stage (Upper Mississippian) in southwestern Indiana consist of four limestone formations that alternate rhythmically with three terrigenous formations. Each formation exhibits an aggregate of supratidal to subtidal lithofacies having characteristic fossil assemblages and diagnostic parameters of depositional turbulence. Areal distribution patterns of lithofacies for each widely correlative stratigraphic unit have analogs in known lithotope patterns of modern inner shelf sediments. Certain Gasperian patterns were influenced by antecedent topography. Lithofacies succeed one another in predictable sequences representing distinctive regressive and transgressive lithotopes of seven principal cyclothems. Two successive, homotaxial cyclothems are represented wholly by carbonate facies. Other cyclothems maintain greater individuality and are partly or entirely terrigenous. Lithofacies of all but one cyclothem are arranged asymmetrically with either prolonged transgressive or prolonged regressive phases. Sudden lithotope shifts are discernible. Local influxes of terrigenous sediments coupled with progressive changes in strike of the contemporaneous shoreline from N25° W to N5° W effected disappearance of three cyclothems toward the north.

Although Gasperian formations maintain essentially the same sequential order throughout the Illinois basin, those exposed in Indiana differ fundamentally from equivalent strata near the structural axis of the basin in thicknesses, proportion of carbonates, strike of sedimentary bodies with respect to paleoslope, and magnitude of shoreline migrations. Gasperian sediments in Indiana accumulated in a relatively stable coastal region influenced by shoreline processes. This area differs from the basin center which other authors have shown to be the locus of terrigenous deposition in an unstable deltaic regime.

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Stratigraphic Correlation and Reservoir Distribution in Mid-Atlantic Part of Atlantic Coastal Plain–Continental Shelf Geosyncline

Analyses of stratigraphic correlation, reservoir distribution, and facies change in Mesozoic and Cenozoic sediments in the subsurface of the Salisbury embayment can be used as a model for stratigraphic projection into the submerged part of the geosyncline. The sediments studied are unlithified with a thickness greater than 7,700 ft near the coast. Onshore Cretaceous marine and nonmarine sand and clay correlate with a published geophysically identified semiconsolidated sediment unit as thick as 14,000 ft. Paleocene, Eocene, and Miocene sediments project into a zone of up to 5,000 ft of unconsolidated sediment. A thin veneer of Quaternary marine and nonmarine sediments covers almost the entire coastal plain-shelf area. Limited onshore evidence suggests that lithified Triassic or Jurassic sediments comprise a significant deeper part of the offshore basin.

Correlations range from simple, long-range correlations of widespread, uniform, marine units to difficult, short-distance correlations where abrupt facies changes in marine and nonmarine sediments take place. Identification of the Upper-Lower Cretaceous boundary is in doubt and previously has been placed at different levels within a stratigraphic interval 3,000 ft thick. The diversified and complex terminology applied to sediments on the northwest geosynclinal flank demonstrates the complexity of correlation in this area of abrupt facies change. Detailed geophysical log correlations also suggest the presence in the subsurface of this area of abrupt facies changes in marine and nonmarine stratigraphic units. Local minor unconformities may be common in the margin of the geosyncline.

A salt-water wedge protrudes to within 20 mi of the basin edge and commonly is found at depths greater than 1,000 ft. Excellent reservoir conditions occur throughout the onshore stratigraphic section.

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Recognition of Pre-Pleistocene Glacial Environments

Pleistocene glacial deposits are identified easily; however, the existence of pre-Pleistocene glacial deposits has been challenged for several reasons. Recognition of earlier widespread glacial deposits is associated by many workers with continental drift, a process that complicates paleomagnetic and paleoclimatic reconstruction. In addition, pre-Pleistocene glacial deposits can be interpreted environmentally in several ways. Alleged tillites containing poorly sorted clasts, striated rock fragments, and rock flour are similar to deposits formed by subaerial and subaqueous mass movements. Few criteria alone are decisive; therefore many environmental criteria must be sought.

Among the more important physical characteristics of glacial deposits are ultramicroscopic markings on the surfaces of quartz sand grains; massive, nonsorted debris with abundant rock flour, silt, sand, and blocks; striated stones; deflection and penetration of laminae by stones; stone shape; presence of erratics; extraordinarily large boulders; ice-molded structures; striated and polished pavements; and thickness and extent of stratigraphic units.

The more important chemical criteria include comparisons of chemical and mineralogical composition of clasts and matrix, differing mineralogy of the stones, and oxygen-isotope ratios of fossil shell material.

Biological criteria include fossil invertebrates and vertebrates capable of existing in cold climates; and the identification of fossil floras which may be characteristic of cold climates.

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Submarine Lithification of Jamaican Reefs

Widespread lithification of recent reef framework is occurring just below the reef-water interface in all zones of the reef to depths of at least 70 m on the north coast of Jamaica. Several different framework-