from bottom to top: black carbonaceous fossiliferous shale; gray shale locally fossiliferous; gray shale; cross-bedded micaceous sandstone which is interlaminated and interbedded at the bottom with shale. These rocks are believed to represent marine-lagoonal, tidal-flat, distributary-channel, or channel environments, respectively.

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Tidal-Inlet Sediment Dispersal

Tidal inlets along the southeastern coast of the United States from Cape Hatteras to Cape Canaveral (the Georgia Bight) and along the North Sea coast from the Netherlands to Denmark (the German Bight) reflect a range in physical processes from wave dominance (at the flanks of the two bights) to tide dominance (at the center of the German Bight). Studies of the hydraulics, sediment dispersal, and historic morphologic changes of several inlets within the two bights have led to the identification of a continuum of inlet types from microtidal wave-dominated inlets at one end to macrotidal tide-dominated inlets at the other. The factors controlling the inlet types are: (a) the longshore sediment-transport rate caused by the momentum flux of the breaking waves, (b) the onshore-offshore sediment-transport rate resulting from tidal currents, and (c) the flood-ebb asymmetry in tidal-current velocities. This last factor is determined by the hydraulic geometry of the back-barrier bay.

The wave-dominated inlets have all their shoals on the bay side of the inlet throat. The mixed-energy inlets have shoals landward of, in, and seaward of the throat, and there is a distinct increase in the volume of the seaward shoals (ebb-tidal deltas) with increasing tide range. The tide-dominated inlets reflect situations where the longshore sediment-transport rate is completely subordinate to the onshore-offshore transport. In these situations, barrier islands cease to exist and tidally controlled lunate, sigmoidal, and linear sand bodies occur throughout the estuary entrance.

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Eolian Sedimentology Interpreted from Dipmeter Results

The dipmeter is an effective tool for subsurface analysis of sedimentary bedding as well as for interpretation of structure. Improved computer processing of dipmeter surveys allows efficient and reliable dip (arrow) plots for interpretation of structural and depositional dips. Structural tilt and borehole deviation, which make precise analysis of sedimentary dips and transport direction impossible with standard cores, are routinely removed in processing dipmeter surveys for depositional analysis. Statistical analysis of sedimentary dips is possible using polar-frequency plots.

Dipmeter surveys of eolian formations have been analyzed as part of a systematic study of depositional environments. Applying eolian sedimentologic principles to dipmeter data allows regional analysis of eolian formations in hydrocarbon exploration and detailed modeling of eolian reservoirs. Dipmeter surveys clearly reveal cyclic dune and interdune deposits and distinguish lateral and longitudinal dune types, which may have different reservoir characteristics. Lateral-type dunes—barchan, transverse, and parabolic—are elongate perpendicular to the wind direction and are characterized by cross-bedding with a unimodal distribution of dip azimuths about the wind direction. Longitudinal, or seif, dunes are elongate parallel with wind direction and are characterized by a bimodal distribution of cross-bedding dip azimuths about the wind direction.

A polar-frequency plot of sedimentary dips from two dipmeter surveys of a thick North American eolian system revealed an association of the angle of dip with the relative azimuth position about the transport direction. The high-angle dips (10 to 40°) have the narrowest deviation of dip azimuth and should be used to interpret the transport direction. The medium-angle dips (5 to 10°) have a bimodal azimuth distribution with a greater deviation about the transport direction. The low-angle dips (<5°) have a greater bimodal deviation of dip azimuth about the transport direction. These results tend to support an interpretation of foresets of barchanlike dunes.

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Paragenetic and Stability Relations Among Authigenic Minerals—Indicators of Pore-Fluid Geochemistry

Both clay and nonclay authigenic minerals are common in the pores of early Paleozoic sandstones of the upper Mississippi Valley. The paragenetic and stability relations among these minerals provide clues to the diagenetic history, especially to the variations in pore-fluid geochemistry. The chemical compositions of authigenic mineral phases indicate ionic content of pore fluids. Paragenetic relations show the changes in the ionic content through time. In the early Paleozoic sandstones studied, five stages of authigenic mineral formation are evident. From oldest to youngest they are: (1) K-feldspar with some quartz, (2) illite-smectite-chlorite, sometimes with calcite or dolomite, (3) quartz (overgrowths), (4) pyrite, and (5) kaolinite. This paragenetic sequence indicates that pore fluids initially had a high Ph and K content, and that K concentration relative to Si and Al, as well as Ph, decreased through time. Kaolinite, for example, has formed only where pore fluids are presently fresh. Reversals in the paragenetic sequence, that is, some illite formation after quartz or some quartz formation after kaolinite, document slight fluctuations in pore-fluid chemistry.

Stability relations are useful for interpretation of diagenetic history and pore-fluid geochemistry only if disequilibrium exists between authigenic mineral species. Disequilibrium is common because solution is retarded by the slow movement of pore fluids. In early Paleozoic sandstones authigenic kaolinite may be precipitated before complete solution of K-feldspar or illite has occurred.

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Thermal Maturation of Lower Paleozoic Shales in Northern Appalachian Nappe Structures Around Quebec City, Canada

Progressive changes in organic matter maturation and clay mineral diagenesis have been studied in transverse and longitudinal profiles in the external domain of the Quebec Appalachians. Reflectance measurements (90 samples) on dispersed organic matter, probably asphaltic pyrobitumen, and illite crystallinity values reveal an increasing degree of diagenesis from northwest to southeast.

In the northwest, reflectance in oil ranges from 1.70 to 2.30 in the Cambrian Chaudiere nappe, from 1.53 to 1.90 in Cambrian to Ordovician Bacchus nappe, from 1.08 to 1.27 in Lower Ordovician Pointe de Levy nappe, and from 0.99 to 1.21 in Middle Ordovician Quebec Promontory nappe. Illite crystallinity ranges from 4 to 8 mm (0.53 to 1.05° 2θ). In individual nappes, reflectance increases with stratigraphic depth but may not have been affected significantly by tectonic burial resulting from the superposition of nappes. Predeformational burial diagenesis is therefore suggested as the principal agent of thermal maturation.

In the southeast, the Middle Ordovician St. Henedine nappe, representing the anchimetamorphic zone, has reflectance values from 2.82 to 3.79% R_o and illite crystallinity ($<$3mm = 0.40°2θ) lower than in the northwest. In this region, high reflectance in conjunction with low illite crystallinity may be related to elevated temperatures resulting from syndeformational or postdeformational regional metamorphism.

For hydrocarbon exploration in the Quebec Appalachians it appears significant that the trend of decreasing thermal maturation with increasing tectonic "burial" depth may continue into the little deformed platform sequence of the St. Lawrence Lowlands underlying the nappes of the external domain.

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Sulfur and Oxygen Isotope Geochemistry of Abu Dhabi Sabkha

Sulfur and oxygen isotope data vary in a laterally systematic manner across the sabkha at Abu Dhabi. At least three different mechanisms are required to explain the variation of $\delta^{34}S$ and $\delta^{18}O$ of sulfate in evaporite minerals and interstitial brine. Gypsum is precipitating in the seaward zone, and extensive postcrystallization exchange maintains isotopic equilibrium between bulk gypsum and dissolved sulfate. Anhydrite is the dominant sulfate mineral in the central zone where bacterial sulfate reduction results in heavier $\delta^{34}S$ and $\delta^{18}O$ values. In the landward zone both minerals and brine reflect mixing with the isotopically distinct sulfate of continental brines. Laterally systematic isotopic variation supports Patterson's chemical discrimination between seaward, mixed and landward hydrologic regimes, and is consistent with vertical variation of $\delta^{34}S$ demonstrated by Butler et al for this regressive sedimentary sequence. Gypsum-anhydrite transitions do not have significant effects on the isotopic composition of sulfate. Some ancient marine evaporite formations consisting mainly of dolomite and anhydrite may have formed in environments similar to the seaward and central zones of the Abu Dhabi sabkha; considerable isotopic variation would probably accompany subaerial deposition of laterally extensive marine evaporites.

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Oligocene Transgressive Sediments of New Jersey Continental Margin

Sediments deposited by a middle-late Oligocene transgression are present as a thickening downdip wedge in the subsurface of the New Jersey coastal plain. Glauconitic sands and silts, designated as the Jobs Point formation, were deposited under inner mid-shelf depths (15 to 80 m). Middle-upper Oligocene glauconitic silts in the COST B-2 well which were deposited in outer shelf–upper slope depths (180 to 225 m) are a facies of the Jobs Point formation. The Oligocene transgression followed a major regressive event which occurred at the close of Eocene time. A regional hiatus resulted from this event.

Benthic forams in cores from the type wells of the Jobs Point cluster into three assemblages which represent biofacies of distinct depths ($<$30 to 35 m; $<$50 to 60 m; 45 to 80 m). The distribution of these biofacies in the Jobs Point shows an initial rapid transgression and a more gradual regression toward the top of the Oligocene sequence. The presence of the planktonic foraminiferal *Globigerina ampliapertura* Zone in the basal part of Oligocene sediments indicates that the transgression began about 32 m.y.B.P.

Structural-contour and isopach maps of the Jobs Point show that tectonic movements of the Salisbury Embayment and the South Jersey high influenced deposition of the Oligocene sediments.

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Availability of Remotely Sensed Data

A large amount of remotely sensed data has been acquired over many areas of the world, but it is difficult for an individual to identify sources of existing data and to determine coverage, imagery characteristics, availability, and costs. Many federal and state agencies do not distribute descriptions of remotely sensed data holdings to the public. A comprehensive survey conducted by J. R. May in 1978 identifies many sources of these data in federal and state organizations.

The U.S. Geological Survey's EROS Data Center (EDC) is the national distribution facility for LANDSAT and other remotely sensed data products. Data stored at EDC at the end of 1978 included over 1,200,000 frames of LANDSAT imagery; over 56,000 images from Skylab, Apollo, and Gemini; over 1,400,000 images from the NASA research aircraft programs; and over 3,300,000 aerial mapping photographs from the U.S. Department of the Interior, U.S. Department of Commerce, and other federal agencies. Availability and