Plate tectonics provides a valuable descriptive framework for understanding the evolution of the earth over the past 200 m.y. However, many important questions remain unanswered as to processes occurring at plate boundaries, the evolution of the ocean environment, and the relation between continental and oceanic crust. The Ocean Margin Drilling Program (OMDP) represents a cooperative effort by industry, academic, and government scientists to investigate these topics.

The scientific objectives of OMDP may be conveniently grouped under the headings of passive and active ocean margins, ocean crust, and ocean paleoenvironment. They will be addressed by a comprehensive program involving regional marine geologic and geophysical studies, drilling and coring, and subsequent downhole experiments. The program will place particular emphasis on the ocean margins. As the basis for future planning, several regions have been selected to form a model drilling program. This model program will be refined as the program evolves.

Although OMDP is a basic research effort, it will begin to build the geologic framework against which to assess the resource potential of the region beyond the continental shelves.

DOMERACKI, DANIEL D., ERICH R. GUNDLACH, and LARRY C. THEBEAU, Research Planning Institute, Inc., Columbia, SC

Coastal Planning for Offshore Petroleum Development

The increased likelihood of an oil spill near exploration sites and tanker lanes along the Atlantic Coast requires detailed oil spill contingency plans to lessen the adverse effects of spilled oil. To this end, a system called the Environmental Sensitivity Index has been developed which delineates spill-sensitive shoreline environments, wildlife resources, and socioeconomic features. Coastal environments are ranked on a scale of 1 to 10 on the basis of information from previous spill studies; least sensitive environments are designated as 1 and the most sensitive as 10. Oil-sensitive biologic resource information, presented with color-coded markers, shows the distribution of major, legally protected or oil-sensitive wildlife such as marine bird rookeries, anadromous fish spawning sites, marine turtle nesting beaches, and intertidal shellfish beds. Unlike the identification of coastal environments which are determined almost entirely by field observations, most wildlife resources information is taken from the literature. Sources for biologic information are published and unpublished literature, communications with state and local wildlife investigators, and federal documents such as the U.S. Fish and Wildlife Ecological Inventory. Socioeconomic information concerns coastal facilities that would be affected by a spill—public beaches, parks, recreational areas, marinas, etc. Once these spill-sensitive areas are known, the appropriate response activity (primarily boom and skimmer deployment) is added.

Although this system has been applied to most of Alaska, Puget Sound, southern California, Texas, south Florida, South Carolina, and Massachusetts, only two states (with Virginia in progress) have been mapped along the entire Atlantic Coast—not a very good record in light of the expected offshore petroleum potential in the area.

DOMERACKI, DANIEL D., LARRY C. THEBEAU, and GEOFFREY I. SCOTT, Research Planning Institute, Inc., Columbia, SC

Effects of Oyster Beds on Back-Barrier Geomorphology—a Three-Dimensional Model

Studies along the South Atlantic coastline show that the geomorphology of tidal flats and salt marshes is commonly altered or controlled by the development of *Crassostrea virginica* oyster mounds. Two major mechanisms for geomorphic control have been recognized. (1) The oyster mound is a long sinuous bar encompassing large parts of the tidal-flat fringe. This bar acts as a barrier, slowing and in some areas completely impeding drainage of the flat during the receding tide. The impoundment of sediment-laden water increases the rate of deposition over the flat, eventually raising the surface topography and accelerating the progradation of the fringing salt marsh. (2) An oyster mound grows perpendicular across a small tidal channel, effectively damming the channel, causing increased rates of sedimentation. Sometimes the tidal prism of the channel has been sufficiently altered so that an initiation of lateral tidal-creek migration occurs. Migration rates up to 1 m/year have been measured. In other cases, the channel fills with a fine-grained plug.

Coring of two marsh systems in South Carolina shows that oyster mounds can play an important role in the depositional history of the marsh. In areas where lateral tidal creek migration occurs, much of the stratigraphic record is dominated by channel-fill point-bar sequences. Combining modern process data with subsurface cross sections derived from over 20 cores, a three-dimensional model showing the effects of oyster mounds on the back barrier environment has been developed.

EPSTEIN, SAMUEL A., Cities Service Co., Houston, TX, and GERALD M. FRIEDMAN, Rensselaer Polytechnic Inst., Troy, NY

Gulf of Elat (Aqaba): Modern Analog to Mesozoic U.S. East Coast Shelf and Slope

The tectonic setting and depositional environments in the Gulf of Elat (Aqaba) may be similar to those along the ancient margin of the U.S. East Coast. The Gulf of Elat is the northern continuation of the Red Sea rift zone, where carbonates are accumulating contemporaneously with clastics under arid conditions. The clastics are primarily deposited in submarine alluvial-fan complexes—wadis which impinge upon the shelf. Carbonate deposits and reef complexes sit along the shelf break. Calcium carbonate cementation has significantly reduced the porosity and permeability (θ 28%, k, 0.01 md) of both clastic and carbonate deposits. However, Pleistocene carbonates on uplifted blocks in the adjacent onshore have undergone dissolution due to the meteoric leaching. They contain high secondary porosity and permeability (θ 60%, k, 10,000 md).

The U.S. eastern continental margin initially rifted during the Triassic. Jurassic-Cretaceous sediments reflect early stages of rifting. Offshore east coast sediments are comprised of continental clastics, which are believed to grade progressively into carbonates to the east (approaching the shelf break). To date, only the clastic facies have been extensively drilled.

We have seen that reservoir quality in carbonates of the Gulf of Elat can be significantly enhanced by subaerial exposure. Thus, exploration for good carbonate reservoirs should be focused on unconformity surfaces, where subaerial exposure may have created or enhanced secondary porosity and permeability. Such unconformities cutting the carbonate buildup have been identified, and suggest good potential reservoirs under the U.S. East Coast shelf break and slope.

FOLEY, FRANCIS D., and VERNON J. HENRY, Univ. Georgia, Savannah, GA

Neogene Seismic Stratigraphy and Depositional History of Lower Georgia Coast and Continental Shelf

Correlation of high-resolution seismic profiles from the Georgia continental shelf with available core data reveals a stratigraphic interval of Miocene to recent age. The sedimentary components consist of relatively thin, aerially extensive units which grade from primarily shallow-water carbonates and clastics nearshore, to predominantly open-marine, fine-grained clastics offshore.

A prominent erosional scarp, developed in the middle Miocene adjacent to and beneath the present coastal area, extends from Ossabaw Sound, Georgia, to Daytona Beach, Florida. Prograding seaward over this scarp are large-scale clinoforms of Pliocene age.

Although the regional tectonic framework of the Georgia coast and continental shelf is considered to be that of a stable, passive margin, several large-scale, low-relief, north-south trending undulations within Miocene and Oligocene sediments are present: a high beneath the coastline and inner shelf of Georgia which follows the trend of the Beaufort arch; the Inner-Shelf low, into which Pliocene clinoforms have prograded; and the Outer-Shelf high, which broadens and rises to the north. These features probably resulted from gentle folding and subsequent erosion. The latter two features significantly influenced sedimentation on the shelf during late Miocene and Pliocene time.

The Neogene stratigraphic section consists of a sequence of deposits, separated by unconformities that appear to be related to glacio-eustatic fluctuations in sea level. With the notable exception of the Pliocene section, the sequences are comparable with the third-order global cycles of sea level changes proposed by Vail et al.

Irregular bottom topography, shallow, large subbottom channels, and smaller cut-and-fill structures similar to sedimentary structures in present-day barrier island inlet and back-barrier complexes are evidence of a midshelf Quaternary stillstand event at or about the 30-m isobath.

FORDE, EVAN B., and TERRY A. NELSEN, NOAA, Miami, FL

Variability of Sedimentary Textures and Processes on Continental Margin North of Wilmington Canyon

Sedimentary properties and processes of a 7,500-km² corridor seaward of the Baltimore Canyon Trough off New Jersey were studied in detail using over 100 bottom samples consisting of grab samples and box, hydroplastic, and piston cores.

The sediments in both canyon and intercanyon areas are primarily bioturbated, olive-gray, sandy silts with local features indicative of gravity-induced mass sediment movements (i.e., graded sequences and load structures). C^{14}-based sediment accumulation rates vary by a factor of three in cores separated by as little as 6 km. These variations seem to be a function of shelf-edge spillover rates.

Detailed analyses of the sand grain-size distribution throughout the corridor reveal that the sand component of the slope and rise sediments contains a high percentage of material currently present on the adjacent shelf. The relatively large percentage of sandy sediment in the upper parts of cores from Spencer Canyon suggests its recent role in transporting shelf sediments seaward. Sandy intervals in other slope cores are commonly obscured by intense bioturbation. Cores from the continental rise show an upward decrease in the number of sand layers and lenses.

Active transport of sediment to the slope and rise occurred during the late Pleistocene and, although the intensity has declined, the slope is presently the site of deposition for both fine and coarse sediment.

GIBSON, THOMAS G., U.S. Geol. Survey, Washington, D.C.

Stratigraphy and Depositional Environments of Miocene Strata of Central Atlantic Coastal Plain

Transgressive pulses of relatively short duration inundated the middle Atlantic Coastal Plain during Miocene time, resulting in a discontinuous depositional pattern. The spottiness of the strata is more pronounced in the Albemarle Embayment of North Carolina than in the Salisbury Embayment which extended from New Jersey to Maryland. The locus of deposition also changed, which further fragmented the continuity of the record. In the Salisbury Embayment, the depocenter generally moved southward during the Miocene, but a northward movement of the locus is indicated for the Albemarle Embayment.

Biogenic deposition of highly diatomaceous clay took place in two pulses in the Salisbury Embayment during the early and early middle Miocene; three pulses of phosphatic clay and sand and intercalated diatomaceous clay characterize the Albemarle Embayment during the early and middle Miocene. Depositional environments are interpreted largely on the basis of faunal data combined with sedimentologic characteristics. Miocene strata preserved onshore generally range from marginal-marine to shallow open-marine environments; environments approaching middle-shelf water depths are present in the Albemarle Embayment.

The southward building of deltas from southern New Jersey into the northern part of the eastern shore of Maryland brought significant amounts of clastic sediment into the Salisbury Embayment during the early middle Miocene, and deltaic sedimentation continued throughout the rest of the Miocene. Uplift of the Appalachian source area, beginning in the northern part of this area in the middle Miocene, brought widespread clastic sedimentation to both embayments during the late Miocene.

GRADSTEIN, FELIX, Geol. Survey of Canada, Dartmouth, Nova Scotia, JOHN EXTON, Petro Canada Exploration Inc., Calgary, Alberta, and JIM OGG, Scripps Inst. Oceanography, La Jolla, CA

Jurassic Chronology and History of Atlantic Basins

Stratigraphic backbone for the eleven stages of the Jurassic period, 200 to 135 m.y. ago, are ammonite zonations with local resolution close to 1 m.y. Micropaleontologic zonations largely have stage-level resolution. Facies-dependence and provincialism limit universal application, and calibration to ammonite and (at the Jurassic-Cretaceous boundary) to calpionellid zonations is limited. The geomagnetic reversal scale (with few events only), stage designations, and linear time scale are not well integrated either. Uncertainty may be on the order of a stage.

Two examples of recent progress in Jurassic stratigraphy are: (1) calibration of the Early Jurassic foraminifer and ostracod zonation for Portugal and Grand Banks to a standard ammonite scheme; it shows that the post-evaporite–dolomite marine transgression occurred at the Sinemurian-Pliensbachian boundary as in east Greenland and northwestern Europe; (2) acquistion of a continuously cored, fossiliferous Middle and Late Jurassic record in Deep Sea Drilling Site 534, Blake Bahama Basin, in the Jurassic magnetic quiet zone. Oceanic pillow basalt (31.5 m) occurs below a strong basement seismic reflector, which proves normal ocean crust exists under the Jurassic magnetic quiet zone.