another supply/demand cycle. The opportunities for advanced-degree graduates probably will continue during this decade and the energy crisis should guarantee a long and exciting professional career.

The intense search for non-Arab, non-OPEC oil-producing areas in the world will continue. The present 28/1 reserves/production ratio of world oil probably will not decline rapidly as long as OPEC nations restrict production to levels significantly below capacity. Other nations with recently expanded oil-production capacity may choose also to maintain moderate export levels. High import prices, supply insecurity, and balance-of-payments problems will keep extreme pressure on production of domestic oil and gas, coal, atomic energy, hydroelectric power, synthetic fuels, and other energy alternatives. In addition, strong compulsory conservation measures probably will be imposed. Rapidly rising leasing, exploration, and production costs and their relation to wellhead prices (minus tax) may result in a deterrent to U.S. oil and gas production.

The outcome of environmental, political, and economic constraints on domestic energy production is more problematic than are the scientific and technologic questions. Three-fourths of our oil and gas reserves and production are in giant fields. Most future discoveries of large fields will be in the frontier areas, largely offshore and in Alaska. National energy policy should encourage exploration in frontier areas, in addition to conservation and development of other energy sources.

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Paleogeography of Eustatic Model for Deposition of Mid-Continent Upper Pennsylvanian Cyclothems

The hypothesis that eustatic sea level changes formed Upper Pennsylvanian cyclothems in Mid-Continent North America has been supported by recent documentation of many episodes of Mississippian through Permian glaciation in Gondwanaland. Changes in Mid-Continent paleogeography and sedimentation during a single eustatic advance and retreat are described in 6 phases. (1) At maximum transgression, deep water promoted development of a thermocline, quasi-estuarine circulation, and upwelling, all leading to widespread deposition across the Mid-Continent of phosphatic black shale, which graded in shallower peripheral areas to gray marine shale and carbonates. (2) Progressive shallowing during early regression destroyed the thermocline, restored bottom oxygenation, and caused deposition of gray shale, and then algal-skeletal calcilutite. Deltas began prograding from Oklahoma and the Appalachians, and shoreline carbonates began prograding southward from the Dakotas. (3) During late regression extensive shoal-water calcarenites developed over most of Kansas, carbonate shoreline facies prograded into southern Nebraska and Iowa, and deltas of Appalachian origin prograded across Illinois. (4) At maximum regression, the sea was confined to the deep basins of west Texas and Oklahoma. Karst, caliche, and residuum developed on the exposed carbonate terrane to the north. The extensive deltaic deposits to the east underwent channeling, alluviation, and soil formation. (5) Expansion of the sea during early transgression restored shoal-water calcarenite deposition across western Kansas, caused gray shale deposition in embayments and lagoons along the inundated deltaic terrane to the east, and impounded Appalachian-derived streams flowing westward across the immense alluvial plain to form widespread coal swamps in Illinois. (6) During late transgression deeper seas restored skeletal calcilutite deposition across the Mid-Continent, caused marine shell accumulations over coals in Illinois, and shifted coal swamp formation eastward into the Appalachian region.

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Stratigraphy and Depositional History of Powell Formation (Uppermost Canadian) in Northern Arkansas

Subsurface geologic data reveal that uppermost Canadian carbonate rock units previously designated as the Smithville and Black Rock Formations in northeastern Arkansas are intertonguing lithofacies of the Powell formation, which trends east-west across northern Arkansas, and do not overlie the Powell as tabular formations. Therefore, these units are considered members of the Powell.

The Powell of northeastern Arkansas was deposited in and marginal to a transgressing epeiric sea along the hinge line of the Reelfoot basin, which lay to the east. Transgression, coupled with subsidence, resulted in Black Rock wedging to the northwest, onlapping the Smithville. Numerous minor regressions superimposed interfingering upon the overall transgressive pattern. Influx of quartz sand terminated Powell deposition, initiating deposition of the Everton Formation without interrupting sedimentation.

Constantly shifting environments resulted in complex intertonguing of carbonate lithofacies, with nonmarine lithofacies in the west progressively giving way to marine lithofacies toward the east. The Powell of northwestern and north-central Arkansas is characterized by nonfossiliferous, unburrowed cryptalgalaminate dolostone deposited above the strand on occasionally inundated algal mudflats. The Smithville Formation of northeastern Arkansas is characterized by fenestral carbonates and an abundant gastropod fauna, deposited above the strand on frequently inundated algal mudflats. The Black Formation is characterized by two distinct marine lithofacies: burrow-mottled cryptalgalaminates, deposited below the strand but above wave-base in a low-energy, schizohaline environment; and abundantly fossiliferous sponge-bearing biomicrudite, deposited below the strand but above wave-base in a moderately agitated, normally saline marine environment.

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Scientific Ocean Drilling near United States

Deep sea drilling by the *Glomar Challenger* is scheduled to phase out in October 1981. Plans are being made to phase in the *Glomar Explorer* or a drill ship with more capabilities after that time. These additional capabilities include longer drill string, a riser, a blow-out