age that are rich in organic carbon (C-org) are common in the deep seas and in shallow interior and shelf basins of the world. High concentrations of C-org and the presence of fine laminations suggest that these strata accumulated in environments that were anoxic or nearly anoxic at and possibly above the seafloor. Many organic-rich sequences display a marked cyclicity in amount of C-org and, if deposition was near or above the carbonate compensation depth, in $CaCO_3$ as well. These cyclic C-org and $CaCO_3$ variations result in interbedded lighter and darker shale, marlstone, and limestone that have cycle periods ranging from 20,000 to 100,000 years. Variations in degree of bioturbation parallel changes in C-org and $CaCO_3$ because burrowing organisms were most active at times of deposition of relatively low C-org and high $CaCO_3$ sediments.

Such cycles are best developed in sediments deposited during episodes of lower dissolved oxygen concentration (so-called "oceanic anoxic events"), but similar cycles of C-org and $CaCO_3$ variation having periods of tens of thousands of years occur in strata of almost every geologic age. The periodicities are similar to those in pelagic sediments of Pleistocene age that are known to be climatically induced. Studies of geochemistry, stable isotopes, and mineralogy show that older organic cycles are also related to climatic changes that produced fluctuations in the amount of wind- and river-borne clastic sediment and terrigenous organic matter delivered to the oceans, and to coincident variations in surface-water salinity, productivity, and mid- to deep-water oxygen concentration. Regional paleogeography and paleodepth determined the amount and type of organic matter preserved within the sediments.

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New Exploration and Evaluation of Coal Resources in Complexly Faulted Area Containing Old Petroleum Production

The use of standard core-drilling methods to evaluate commercial possibilities of deep Pennsylvanian coals in southwestern Indiana is difficult if not prohibitively expensive owing to complex faulting and the presence of numerous alluvial channels.

In Posey County, where complex faulting is common, more than 5,000 oil tests have been drilled, most having electric logs or other geophysical logs run more than 20 years ago. Correlation of these logs with nearby coal-test cores, lithologic strip logs of well cuttings, and sparse outcrop information has resulted in: (1) mapping of zones of closely spaced normal faults (as many as four individual faults in a single well) with vertical displacements of 20 to more than 300 ft (6.1 to >91.4 m) and horizontal lengths of as much as 20 mi (32 km); (2) rapid mapping of coal thicknesses to an accuracy of about 1 ft from old geophysical logs; (3) delimiting of channels that are contemporaneous with peat deposition (related to thickness and sulfur content of coals); and (4) correlating for the first time several lithologic units in rocks of Pennsylvanian age. Through study of modern mining techniques in an area of closely spaced drilling in Indiana and Illinois we are able to consider the potential for underground mining in highly drilled areas of old petroleum production. Data integration from these diverse sources facilitates rapid outlining of prospective areas of minable deep coals that would not be possible otherwise.

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Petroleum Prospects of Anambra Basin, Southern Nigeria

The Anambra basin occupies an area of about 40,000 sq km in southern Nigeria. Twenty-one exploratory wells have been drilled in the basin between 1952 and 1974. None tested formations older than lower Turonian. Five of the exploratory wells discovered gas while only one well encountered oil. These discoveries indicate that the basin is dominantly a gas-condensate basin. Because of plans to build an LNG plant in the neighboring Niger delta, an intensive exploration must be carried out in the basin to determine the gas reserves which can be tied into the proposed Niger delta LNG.

About 5,000 m of sediments ranging in age from Aptian(?) to Miocene are exposed in the basin. The sediment distribution consists of shales and limestones in the central part of the basin which grade into coarse-grained sandstones in the northwestern and eastern flanks of the basin.

Evaluation of wells drilled shows that the basin is most prospective where peripheral sandstones interfinger with or are overlain by shale units. Future exploration efforts should be concentrated on Turonian and Maestrichtian objectives which show good sand development beneath the zone of freshwater flushing.

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Promising Morrow Sandstone Discoveries in Southeastern Colorado

Eight new Morrow oil and gas fields have been discovered in southeastern Colorado during the past two years. The latest discovery resulted in a well flowing oil from a Morrow sandstone at an initial rate of 700 bbl of oil per day and 750 Mcf of gas per day. The trapping mechanism in this well, as in most, is a stratigraphic and structural combination.

The depositional history of Morrow sandstones in southeastern Colorado was strongly influenced by regional tilt into the Anadarko basin, established at the close of Mississippian time. Mississippian rocks were subject to truncation in the area of the Las Animas arch and development of karst topography on the erosion surface. Transgression of the sea from the southeast in Morrowan time resulted in the deposition of a sandstone and shale sequence.

The Morrow series consists of a basal transgressive sandstone member (Keyes sandstone) overlain by at least three sandstone units deposited during regressive pulses in an overall transgressive sequence. These Morrow sandstones generally trend from northwest to southeast toward the Anadarko basin; their source is inferred to have been the ancestral Rocky Mountain