The distribution of potential hydrocarbon source beds within the New Albany Shale group of Illinois was determined by studies of the stratigraphy, lithology, and organic matter of the shales. Shelf-to-basin correlations (across western Illinois to southern Illinois and western Kentucky) reveal a complete and continuous transition from high-energy, aerobic, shallow-water (<50 m ?) environments (fossiliferous limestones) to low-energy, dysaerobic, moderately deep-water (~50 to 150 m ?) environments (bioturbated greenish-gray shales and thickly laminated olive-black shales) to very quiet, anaerobic, deep-water (>150 m ?) environments (finely laminated black shales).

The types and abundance of the organic matter preserved within the shales were predominantly controlled by the depositional environment. Appreciable amounts (3 to 15%) of mixed humic-sapropelic kerogen were preserved in the anaerobic black shale environments. The kerogen assemblage is interpreted to be well-preserved, locally derived organic material. Only small quantities (typically <1%) of humic (degraded ?) kerogen were preserved in the dysaerobic greenish-gray shale environments. This kerogen assemblage is interpreted to result from selective preservation of only the organic constituents most resistant to destruction by benthic invertebrates (detritus feeders) and aerobic bacteria.

Petroleum generation in the New Albany shales is likely to have occurred only in the anaerobic black shales where the sapropelic and liptinite fractions have been preserved and where sufficient organic maturation has taken place. Gas generation may have occurred in the greenish-gray shales where humic kerogen has been preserved selectively, but in very small quantities due to the low maturity and paucity of organic matter in these shales.

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Uranium Solution Mining—Integration of Exploration and Production Development

The observations and conclusions are based on a study of uranium deposits in Weld County, Colorado. The deposits occur along geochemical interfaces (roll fronts) in the sandstones of the Fox Hills and Laramie formations of Late Cretaceous age.

The uranium deposits are epigenetic and were formed by solutions moving down through a pre-Oligocene unconformity developed on the gently dipping Cretaceous strata in the southern part of the Cheyenne basin.

Uranium solution mining has become important as a means of exploiting roll-front deposits with geologic and hydrologic characteristics amenable to controlled solution flow.

The interaction between exploration and mine development in evaluating the technical, economic, and environmental feasibility is of paramount importance for a successful solution mining project. Exploration provides data such as total reserves, minable reserves, lithology, thorough interpretation of geophysical logs, and geohydrologic observations to assist mine development in establishing well field patterns, mine economics, well completion methods, and solution control and containment methods. Mine development aids exploration by providing information generated during metallurgical testing, groundwater evaluation, mining, and aquifer restoration. In particular, radon and gross alpha activity measurements which are made in the groundwater prior to mining are significantly valuable in developing the ore body, and in regional exploration in similar lithologies.

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Crystalline Overthrusting of Paleozoic Shelf in Southern Appalachians Mapped by COCORP Reflection Data

COCORP seismic reflection data have shown that the early Paleozoic shelf in the southern Appalachians has been overthrust by a thin sheet of crystalline rocks. The profiles extend from southeastern Tennessee to the Carolina slate belt in Georgia and show that the thrust sheet attains a maximum thickness of 15 km along this traverse. Sedimentary rocks which are interpreted as shelf sediments extend beneath the Blue Ridge and Inner Piedmont. Their discovery suggests an expansion of hydrocarbon exploration of the eastern thrust belt and perhaps other similar thrust belts. Near the Inner Piedmont-Charlotte belt boundary a transition in reflection character of the sediment layers and deep crust suggests that a major crustal transition was present in this area during the early Paleozoic. Preliminary field data and palinspastic reconstructions imply this transition marks the boundary between continental and oceanic crust of the early Paleozoic. Further profiling to be conducted in the winter of 1979-80 may provide important new information on the nature and extent of the overthrusting.

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Prospective and Future Hydrocarbon Provinces of Bering Sea, South of St. Lawrence Island

The Bering Sea can be divided into three hydrocarbon provinces that coincide approximately with three major geomorphic areas, namely the continental shelf, the slope rise, and the abyssal basin. The significant findings of several recent USGS studies on the regional tectonic framework and hydrocarbon potential of these provinces are summarized.

The shelf province is underlain by a continental platform that is extensionally rifted along its outer edge. Mesozoic rocks form the basement complex and thick Mesozoic(?) and Cenozoic sedimentary sections fill the rift basins. Recent evidence documents (1) several deep sedimentary basins within the shelf province, (2) shallow-water Mesozoic and Cenozoic sedimentary rocks from the continental slope, and (3) confirmation of postulated subsidence along the shelf edge.

The slope-rise province, which includes the marginal Umnak plateau, delineates the deep-water transition from oceanic to continental crustal rocks. In Mesozoic time, oceanic crust may have collided with continental crust beneath this province. At present, thick (6 to 10 km) accumulations of Cenozoic and Mesozoic(?) sedi-