spread eastward to the inner craton margin. In southeastern Idaho, less detritus was available from the Antler highland in Early Mississippian time, and a starved basin developed between the foreland basin on the west and the inner craton margin on the east. Carbonate-bank deposition followed on both sides of the Snake River plain in Late Mississippian time, as the northern flysch basin ceased subsidence.

By Middle Pennsylvanian time, the flysch deposits rose to form a highland from which coarse detritus was shed west, east, and south to interfinger with the fine-grained craton-derived, in part subarkosic, sands of the Wood River and Sublett basins, which gradually deepened through Late Pennsylvanian into Early Permian (pre-Phosphoria) time. Carbonate-bank deposition continued into Early Permian time east of the Copper Basin highland.

The Lower and Upper(?) Permian Phosphoria Formation is recognized throughout southeastern Idaho and in south-central Idaho as far west as the Lemhi Range. West of the Lemhi Range, mollusk-rich fine-grained Phosphoria-equivalent rocks are known from one locality in the White Knob Mountains and from two localities in the Pioneer Mountains. Fine-grained, banded and graded siltites of Phosphoria age, which resemble continental-rise contourites, are present in the Boulder Mountains. Phosphoria-equivalent andesitic and dacitic volcanic rocks in western Idaho record a contemporaneous volcanic arc west of the continent.

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Basins, Basement, and the Drill

Subcircular to broadly elliptical sedimentary basins of cratonic interiors remain among the more enigmatic elements of continental geology. Such basins may be characterized by significant, preserved sediment thicknesses (approaching 4 km); long subsidence history ($>100 \times 10^6$ year); non-systematic but, commonly, globally synchronous variation in subsidence rates; and obscure relation to anomalies of the magnetic or gravity fields or of crustal thickness. Mechanisms involving thermal contraction and/or loading of the crust appear inadequate to explain subsidence history and amplitude. Lacking new, critical data, progress toward rational concepts is slow.

Deep drilling of basement rocks of sedimentary basins, including adequate sample recovery and measurement of thermal, magnetic, density, and stress parameters, holds the exciting promise of providing essential information for testing concepts. It is held, for example, that basins lie along ancient continental margins or at the triple junction of sutures. Remanent magnetism and petrologic and structural data from oriented cores could be definitive.

The basement rocks of the continent hold the keys to many fundamental earth science problems. The early history of the planet, the mechanisms of continental development, the nature and timing of pre-Mesozoic global tectonics, and the sources of many materials essential to society, are examples. The drill can probe the third dimension of the basement, interpolate through cover between surface exposures, extend basement data to outer continental margins, and target critical features. Measurements of the dynamic state of the crystalline crust can provide insights to seismic hazards, geothermal energy potential, hydrothermal ore-forming processes, and possible suitable settings for long-term toxic waste disposal.

A feasible basement drilling program, integrated with appropriate surface studies designed to achieve maximum scientific yield, can probe one of the great frontiers in the earth sciences.

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Cretaceous Niobrara Gas Play

The Upper Cretaceous Niobrara Formation has yielded natural gas of biogenic origin from structural closures on the gently dipping east flank of the Denver-Julesburg basin and the northern plunge of the Las Animas arch. Present production is from the Smoky Hill Member of the Niobrara Formation. The majority of fields located to date are in Colorado and Kansas; however, several new fields have been discovered in the Nebraska part of the basin. Potential for significant Niobrara gas production exists in the Kennedy and Salina basins of Nebraska, and from parts of South Dakota, North Dakota, Montana, and Canada. The formation has high porosity and low permeability and requires hydraulic fracture stimulation for economic production. Production depths range from 1,000 to 3,200 ft (305 to 975 m).

The chalk beds of the Niobrara were deposited in the deep, quiet water of the Cretaceous interior seaway.

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Geophysical Exploration for Precambrian-Related Uranium Deposits

Genetic models for uranium mineralization found at Proterozoic unconformities between fluvial sandstones and crystalline lithologies include three general geologic features: (1) structural relief at the unconformity; (2) permeable zones controlled by lithology and faulting; and (3) graphitic and sulfide-bearing zones commonly associated with mantled gneiss domes. Though radiometric surveys have been successfully used where the fluvial rocks are thin or eroded away, non-radiometric geophysical methods are commonly used in the interior parts of the sedimentary basins to detect one or more of the above geologic features to define favorable areas for uranium. In the Athasbasca basin of Canada, airborne and ground electromagnetic (EM) methods as currently used are thought to have a depth of exploration of 200 m. Application of these non-radiometric geophysical methods to Precambrian sedimentary basins in the United States is not likely to produce as great a depth of exploration because the fluvial cover rocks are not as geophysically transparent as the Athabasca sandstone. We suggest that two approaches be used to improve the