ponds, and marshes. Overbank siltstones are in interfluvial areas. Measurements of 398 Lance channel-trough (festoon) axes plotted on rose diagrams indicate a general southeastern paleoflow direction. However, some paleoflow directions in all quadrants suggest meandering. This scatter of paleocurrent direction is supported by multistoried channel complexes that show diverse axes.

Sedimentary structures are exposed best in a multistoried channel complex on the Peterson Ranch in central Niobrara County. Three upward-intersecting channel sequences totaling 23 m thick, each with a scoured surface at the base, are present in this complex. Clay clasts and, at some localities, dinosaur bones are above this scour surface. The lower channel deposits consist sequentially upward of a current-rippled bed, horizontal or near-horizontal beds, low-angle tabular cross-beds, and large-scale trough cross-beds. The upper part of the channel sequences contains alternating ripples, small trough cross-beds, clay drapes, and very thin horizontal beds. These sequences of structure suggest lateral-accretion point-bar type of channel deposits.

The Lance Formation contains uranium, but no known mining operations are in progress. Exploration in the Lance and equivalent formations has increased sharply in the past few years.

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Geoelectrical Investigations of Boise, Idaho, Geothermal System

Electrical conductivity in rocks is enhanced profoundly by elevated pore-fluid temperatures. Of the potentially useful geophysical tools, this makes the electrical techniques most directly useful in delineating geothermal systems. The bipole-dipole mapping method has gained popularity in geothermal exploration because of the inherent sensitivity of the method to lateral changes in resistivity. This characteristic makes the method useful in defining certain structural controls as well as locating the boundaries of anomalously conductive regions associated with geothermal systems. The addition of a rotating-source field enhances the method sensitivity to lateral boundaries, making interpretations more straightforward.

These techniques have been helpful in the initial investigations of the Boise, Idaho, geothermal system, particularly in defining fault and fracture systems which appear to control access to the resource.

These studies were made possible by an ERDA grant.

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Uranium Exploration in Precambrian(?) Conglomerates in Guyana, South America

The Roraima Formation of Guyana, probably of Precambrian age, consists of nearly flat-lying sandstones, pebbly sandstones, and conglomerates. Gabbroic sills are intercalated in the sediments. The Roraima lies unconformably on a complex of shaly sedimentary, and volcanic and pyroclastic rocks.

Because of its gross similarity to other uranium-producing conglomerates, such as the Witwatersrand of South Africa, and the lower Huronian of the Blind River area in Canada, the Roraima was believed to have potential for uranium deposits. In 1968, an exploration program for uranium was initiated over a large area of Roraima in western Guyana. The program consisted of airborne radioactivity surveys, ground recovery of anomalous areas, geologic mapping in the anomalous areas, and diamond drilling.

Core from the drill holes showed minor anomalous amounts of uranium, but concentrations were too low to permit mineral identification. Results of the program were not considered to be sufficiently encouraging, so the program was terminated at the end of 1970.

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Geothermal Potential of Crazy Mountain Basin

The "normal" Late Cretaceous sedimentary cycles in the Crazy Mountains area held until Eagle time when volcanism from the Livingston centers began adding pyroclastic material. The structural downwarp along the south and west edges of the basin began in the Tertiary near the close of the Laramide compressional phase and continued on into the Eocene, receiving great thicknesses of andesitic ejecta, some agglomerate beds, and interlayered arenaceous sediments. The final Eocene episode was the intrusion of the Crazy Mountains stocks and associated radial dikes. There are no extrusive rocks involved. The entire region then was uplifted as a stable block.

Geothermal seeps are few, and are limited to the basin margins. Wells drilled for oil and gas do not show a significant thermal gradient change, except for the one at McLeod which now flows water at 120°F (49°C) and the Ringling well which flows at 110°F (43°C).

The heating mechanism may be either depth where the normal earth temperature affects the water before it rises to the surface, or proximity to magma or cooling igneous material fairly close to the surface. Many of the hot or warm springs in western Montana have been relegated to the former category. Recent geologic and geophysical studies in the Yellowstone Park region indicate a continuing northward or northeastward migration of the hot spot in the mantle which has now reached the north part of the park. This, plus Holocene faulting, makes the southwest part of the basin, as well as the upper Yellowstone Valley, an area of great geothermal potential.

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Overview of Exploration Geophysics—Recent Breakthroughs and Challenging New Problems

Recent spectacular advances in geophysical technology are improving the explorationist's efficiency in his search for new hydrocarbon reserves. Each new development, however, usually points out some previously unrecognized shortcoming in geophysical techniques or the need for more precise geologic information in the interpretation of geophysical data.

For example, it is remarkable that hydrocarbons can be detected directly with "bright-spot" amplitude anomalies but the correct interpretation of these anomalies requires a more detailed knowledge of the stratig-