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ASSOCIATION ROUND TABLE

ROCKY MOUNTAIN SECTIONS
AAPG-SEPM-EMD
28TH ANNUAL MEETING
Casper, Wyoming
June 3-6, 1979

Theme: "Rocky Mountain High"

Field trips—Sunday, June 3: Precambrian on Casper Mountain; Cretaceous stratigraphy of Casper; uranium mining in the southern Powder River basin including Highland (Exxon), 28-33 S. Monument Hill (Kerr-McGee), and Morton Ranch (United Nuclear). Thursday, June 7: coal mining in the Powder River basin at Rawhide (Exxon), Black Thunder (Atlantic-Richfield), and Belle Ayr (Amax).

Core seminars—Sunday, June 3: major oil and gas discoveries in Rocky Mountains.

Social activities—Ice breaker on Sunday evening, June 3, at the Ramada Inn. Cocktail party and barbeque followed by a dance and casino on Monday evening, June 4, at the Ramada Inn.

Exhibits—Over 40 technical and educational exhibits will be available for viewing from midday Sunday through midday Wednesday.

Registration—Ramada Inn, Sunday and Monday, June 3 and 4, 1979.

Ladies activities—Brunch, luncheon, art exhibit, and seminars for ladies only.

For further information—General, W. J. GUY, Union Oil Co. of California (307-234-1563); housing, R. J. VAN DYKE, Pacific Transmission Supply Co. (307-265-1027); registration, L. P. WORKS, Gulf Energy and Minerals Co. (307-235-1311); field trips, P. BRYANT, Marathon Oil Co. (307-235-2511).

Abstracts of Papers

BEYER, L. A., U.S. Geol. Survey, Menlo Park, Calif.

Borehole Gravity Study of Density and Porosity of Selected Frontier, Tensleep, and Madison Reservoirs in Bighorn Basin, Wyoming

Borehole gravity surveys in the Gebo, Garland, and Big Polecat oil fields of Wyoming uniquely assess the density and porosity of the reservoir and associated rocks. The borehole gravity method is unique because (1) unlike other well-logging techniques, gravity measurements depend directly on rock bulk density; (2) the large radius (and volume) of investigation ensures that the measurements are unaffected by borehole fluids and by rugosity, casing, cement, or any area close to the borehole that may be modified by flushing or invasion by drilling fluids; and (3) the high precision of the measurements makes this method sensitive to very small variations in formation density (usually <0.005 to 0.04 g/cc, depending on length of the borehole interval).

Interval density and porosity profiles determined from the Bighorn basin surveys were compared with gamma-gamma density logs, neutron porosity logs, and density and porosity measurements of core samples. Discrepancies between the density and porosity methods arise because borehole gravity, owing to its large radius of investigation, measures an average porosity that includes the irregularly distributed component (e.g., vugular porosity of reservoir rocks in the Madison Limestone at Garland) which is less effectively evaluated by conventional shallow-penetration logs or core samples. Other discrepancies are usually due to the inherent limitations of one or several of the methods and are mostly dependent on the composition and coherence of the rocks.

Variations in the contribution of fracture porosity to total porosity in the Tensleep Sandstone reservoir at Gebo are masked by much larger fluctuations in intergranular porosity caused by differences in the cementation and abundance of dolomite. Whatever the cause, the magnitude of fracture porosity is probably below the threshold of detection with borehole gravity. High-porosity ($>15\%$) and/or gas-filled sandstone units, principally in the Frontier Formation, were easily detected behind casing in the three oil fields. An abrupt and possibly widespread downward increase in porosity in the upper part of the Frontier Formation may (1) reflect lithologic and mineralogic variations owing to changes in the depositional environment, (2) be related to a previously proposed unconformity, and (3) have exploration significance.

BLACK, BRUCE A., Colorado Plateau Geol. Services, Inc., Farmington, N.M.

Oil and Gas Potential of Santa Fe Embayment, Santa Fe County, New Mexico

Exploration for oil and gas in the Tertiary grabens and basin of the Rio Grande rift system has been sporadic and noncommercial. Several factors may change this situation in the future, at least in basins such as the Santa Fe embayment of the Espanola basin. The confirmed presence of source rocks, adequate reservoirs, and a favorable maturity history in the Santa Fe embayment suggest that parts of this subbasin may ultimately prove to be productive.

Significant oil and gas shows have been reported in the four wildcat wells drilled to date. Oil-stained outcrops and numerous stratigraphic and structural anomalies appear to make the area an attractive exploration target. Jurassic and Cretaceous rocks are the primary objectives and a close look at the structural evolution of the basin may provide clues to exploration in the related rift basins both north and south of the area.

BOBERG, W. W., World Nuclear Co., Casper, Wyo.

Applied Exploration Geology and Uranium Resources of Great Divide Basin, Wyoming

The Great Divide basin of central Wyoming has been the focus of intense uranium exploration for a decade. Over 10 million lb (4.5 million kg) of uranium oxide has been produced since 1957 from the Crooks Gap mining district in the northern part of the basin. This geologic province is estimated to contain at least 270 million lb (122 million kg) of uranium resources and is the least exploited of Wyoming basins known to contain significant deposits of uranium.

The Great Divide basin has the most complex structural, stratigraphic, and sedimentologic history of any Wyoming uranium-producing basin. These complexities have exerted significant controls on the ore-forming processes which have resulted in many variations in the characteristics of alteration features and the geometry of the uranium deposits.

The massive thickness of the Eocene Battle Springs Formation provides a host unit of up to 4,000 ft (1,200 m) at a maximum in the northern part of the basin and generally does not contain continuous shale breaks to allow for stratigraphic correlations or for the primary focusing of the ore-forming fluids. The result is a massive roll-front system which may be several thousand feet (1,000+ m) in vertical extent, a few miles wide, and tens of miles long exhibiting extreme irregularities caused by variations in both vertical and horizontal porosity and permeability as well as the structural complexities of the basin itself. Farther west and southwest, where the Battle Springs Formation intertongues with the Wasatch and Green River Formations, continuous shale beds are common, allowing for easier stratigraphic correlations, good focusing of the ore-forming fluids, and the development of roll-front features similar to those in other Wyoming basins.

Gross roll-front features indicate pervasive alteration through most of the basin leaving scattered areas of reduced ground as islands. The roll-front trends which outline these reduced islands display a significant influence by faulting and folding in the basins and contain deposits of uranium of variable tenor scattered along the trends at various lateral and vertical positions. The gross outlines of the redox interfaces outlining the reduced islands are very complex in detail and may represent multiple individual roll fronts, each of which must be mapped separately to insure a complete understanding of the frontal development and to result in the discovery of the greatest amount of uranium possible.

BRADY, RAY A., U.S. Geol. Survey, Grand Junction, Colo.

Mineral Evaluation of Oil-Shale Land Exchanges

Oil shale is a potential energy resource of the future, but full realization of this potential requires the development of technology and land-ownership patterns that permit efficient mining operations. Therefore, the policy of the Department of Interior has been to encourage oil-shale development through a program of land exchanges designed to consolidate land-ownership patterns. The first such proposals for exchange were submitted by the Colony Development Operation and the Superior Oil Co. and are now being considered. The U.S. Geological Survey and the Bureau of Land Management procedures to evaluate exchange proposals include a mineral and mining evaluation by the U.S. Geological Survey.

The oil-shale mineral and mining evaluation includes a determination of the total in-place resource, definition of minable intervals, and calculation of the in-place and recoverable mining interval resources for both the offered and selected lands involved in a proposed exchange. The evaluation is tailored to the geology and hydrology of each site, as illustrated by a description of the land-exchange evaluations for Colony Development Operation and Superior Oil Co.

BRENNER, ROBERT L., Univ. Iowa, Iowa City, Iowa

Stratigraphic and Sedimentologic Relations Among Three Frontier-Turner Depocenters in Wyoming Portion of Powder River Basin

During Turonian time, the western North American Cretaceous seaway covered a shallow shelf upon which sediments were deposited predominantly from western sources. Pulsating rates of sediment supply resulted in local regressions and transgressions along the seaway margins. The last three of these regressive-transgressive sequences affecting the Powder River basin are recorded by two sandstone complexes with western sources: the Torchlight and First Frontier sandstones, and the Turner sandstone, a shale-sandstone complex which prograded westward from the craton.

The Torchlight and First Frontier sandstones represent deltaic depocenters which consisted of distributary-channel and delta-front sand complexes, capped by well-sorted transgressive, reworked sands. The Turner sandstone represents isolated individual bars, channels, and splays within a mud-rich deltaic complex.

Stratigraphic analyses show that the Torchlight sandstone is slightly older than the First Frontier, and that the Turner complex is somewhat younger than the First Frontier. An isopach map of the lower, calcareous part of the overlying Niobrara Formation shows that calcareous shales are thickest over the western deltaic complexes, decreasing to zero along the seaward edges of the Turner lobes. Interpretation of the calcareous shales as representing periods of slow siliciclastic sediment influx indicates that the western complexes were inactive as depocenters for a significant period of time whereas the Turner distributaries were still supplying significant siliciclastic sediments from the craton to the eastern parts of the Powder River basin.

BROOKINS, D. G., and R. S. DELLA VALLE, Univ. New Mexico, Albuquerque, N.M.

Less Common Trace Elements in Sandstone-Type Uranium Deposits—Theory and Application

Trace elements commonly associated with sandstone-type uranium deposits include V, Mo, Se, and some As, Cu, and Pb. Because V, Mo, and Se are usually included in separate phases, all uranium-free, their use as pathfinders for uranium deposits is straightforward but often hindered by high background from the non-ore country rocks or other non-ore phases. Data for numer-