The orebodies are aligned approximately east-west and are generally arcuate. The geometry of the ore is controlled by the stream-channel systems in the Brushy Basin sandstones. Some of these orebodies coincide with the redox interfaces that have been found. Those that do can assume the geometry of a typical roll-front type of orebody.

Three hypotheses for depositional controls are: (1) Laramide structures are spatially associated with the ore and have been considered by some geologists as a depositional control; (2) the change of lithologies from sandstones to mudstones down the hydraulic gradient also may have affected ore deposition; and (3) stream channel systems with carbonaceous material localizing the ore is a viable control as well.

SACHDEV, SURESH C., Gulf Research & Development Co., Pittsburgh, Pa.

Mineralogical and Geochemical Zonation Across Roll-Type Uranium Deposits—Mariano Lake Type

The mineralogy and chemistry of samples from the cores obtained across Mariano orebody were determined and used to develop exploration tools for roll-type uranium deposits. Preliminary interpretations regarding the physicochemical conditions of ore deposition were made on the basis of paragenetic relations.

The host sandstones are confined between the bentonitic rock units, and contain scattered intercalations of detrital montmorillonitic material in the form of clay galls, stringers, and lenses derived from these bentonites. Authigenic clay minerals identified in the host rocks include cellular montmorillonite, platy chlorite, and pseudohexagonal "books" of kaolinite. The cellular montmorillonite is concentrated in the oxidized zone and appears to have formed prior to ore deposition. Authigenic chlorite is most abundant in the ore zone and has formed at the expense of cellular montmorillonite; its formation is interpreted to be related to the ore-forming processes. Kaolinite in sandstones is the last clay mineral to form, and is enriched in the reduced zone. Calcite, considered typical of such deposits, is found to be lacking in this orebody.

Iron-titanium oxides and their alteration products are the most abundant heavy-mineral species in the host rocks. In addition to anatase and rutile, the alteration products include hematite in the oxidized zone and pyrite in the ore and reduced zones. Carbonaceous material introduced later into the potential ore zone appears to have been responsible for the decomposition of Fe-Ti oxides and formation of pyrite.

The oxidation of pyrite by mineralizing solutions, resulting in reduction and subsequent deposition of uranium, is indicated by the paragenetic relationship. The positive correlation between organic carbon and uranium suggests that carbonaceous material also acted as a reductant for uranium.

A discriminant analysis was run using the chemical data to distinguish the geochemical zones (oxidized, ore, and reduced). Of the 15 variables used in this analysis, it was determined that the three zones could be separated using only six variables (Th, U, V, Zi, Ti, and Mn). The discriminant functions thus formulated could possibly be used to classify unknown samples in the area studied.

SAUCIER, A. E., Consultant, Albuquerque, N. M.

Tertiary Oxidation in Westwater Canyon Member of Morrison Formation

Hematitic oxidation in the Westwater Canyon Member of the Morrison Formation extends along the outcrop from the Pipeline fault northeast of Gallup, New Mexico, to the San Mateo fault north of Grants, New Mexico. The hematitic sandstone forms a broad lobe in the subsurface to a depth of 730 m (2,400 ft). The downdip edge arcs eastward from northeast Church Rock through Crownpoint, and southeastward to the west edge of the Ambrosia Lake district. The red sandstone is bordered on the downdip side by a band of limonitic oxidation which interfingers with reduced sandstones basinward. The limonitic oxidation forms a relatively narrow band along the north and west sides of the hematitic lobe, but expands progressively on the east and southeast. Weak limonitic oxidation, as indicated by the absence of pyrite and a bleached to faint yellowish-gray color, appears to extend from the San Mateo fault eastward under Mount Taylor to the Rio Puerco.

The hematitic oxidation is epigenetic and is believed to be of late Miocene to early Pliocene age. The limonitic oxidation follows the present groundwater flow pattern and probably dates from late Pliocene to recent. The oxidation patterns are important in uranium exploration because the hematitic area is essentially barren, whereas the limonitic areas contain ore deposits which are in the process of being destroyed by oxidation.

TESSENDORF, TIMOTHY NEAL, Reserve Oil & Minerals, Grants, N. M.

Redistributed Orebodies of Poison Canyon Mine

Since the early 1950s Poison Canyon has been a classic example of uranium geology. At the present time, because of economic conditions, a closer examination of the redistributed mineralization is being made.

Because of the evolution of the structure and geomorphology of Poison Canyon, the primary mineralization went through further oxidation and reduction. Enriched solutions of uranium migrated downdip through permeable sandstones, with calcium replacing silica near mudstone contacts. These solutions were controlled by north-trending fracture patterns, with some vertical movement along major faults. The uranium collected in structural and lithologic traps, then oxidized, forming amoebalike orebodies with the higher grade mineralization located in the fractures. The authigenic mineral is mainly tyuyamunite in the hexavalent state in sands deficient in carbon and associated, although rarely, with pascoite and ilsemannite.

The equilibrium of the primary minerals differs from that of the redistributed minerals. The uranium has been leached from the primary minerals causing chemical values to be less than radiometric. The redistributed minerals are chemically greater than radiometric, producing a favorable equilibrium. Also, the percent extraction in the mill process is greater for the redistribut-

ed ore than the primary ore. The paragenetic position of the different minerals has a direct bearing on these observations.

THOMPSON, D. T., Gulf Research & Development Co., Pittsburgh, Pa.

Geophysical Experiments at the Mariano Lake Uranium Orebody

Several geophysical experiments were performed over the Mariano Lake orebody before mining began, including surface self-potential methods, surface-to-hole induced-polarization methods, and reflection seismic methods. These geophysical techniques are interesting from an exploration point of view, and they also provide some data which relate to our conceptual model of this orebody. Currents generated in the productive formation by oxidation-reduction reactions do not generate measurable potential anomalies at the surface. Surface-to-hole induced-polarization measurements appear to be capable of detecting an oxidation-reduction front in the vicinity of an exploration borehole. Reflection seismic techniques can provide information concerning the paleostructure of the area.

WRIGHT, ROBERT J., U.S. Dept. Energy, Washington, D.C.

New Mexico and World Uranium

New Mexico is endowed with the world's largest known concentration of uranium ore in sandstone. Through 1977 these orebodies yielded 129,150 short tons of U_3O_8, about 41% of the United States' supply and 18% of the free world's supply of yellow cake. Only one foreign nation, Canada, exceeds the state of New Mexico in production. From the 1977 level of about 7,600 tons U_3O_8, New Mexico's output is expected to double within the next 10 years, thus maintaining the state's relative position within the United States. However, the nation's share of world production is apt to slip as new mines come on-stream in such countries as Australia, Canada, and Niger.

The sandstone uranium deposits of New Mexico, Colorado, Wyoming, and Texas have provided models for exploration around the world, and orebodies of this type are now known in at least 10 countries. Some of the foreign deposits exhibit unusual geologic features or have distinctive exploration histories.

Argentina—At Sierra Pintada, the largest deposit, the ore is related to pyrite in an eolian sandstone.

Australia—In the Beverly basin ore was discovered by drilling continental sediments flanking Mt. Painter which contains uranium-bearing veins in granite.

Austria—At Forstau, pitchblende and coffinite mineralization in Perian sandstone beds was not remobilized during regional metamorphism to the greenischist facies.

Canada—The Blizzard deposit of British Columbia was found by application of the Tono, Japan, model.

France—The Herault deposit, in Permian sediments, is controlled partly by faults and partly by lithology.

Gabon—The deposits are in the oldest host rock (about 2,000 m.y.) known to contain sandstone ore.

Japan—In the Tono deposit, the ore is contained in paleochannel structures as a uranium-bearing zeolite mineral.

Niger—The largest resources in sandstone, exclusive of the United States, have been developed in Niger.

South Africa—The main deposits are in the lower part of the Beaufort Group (of the Karoo Supergroup), but northward the deposits are progressively higher in the section and in younger rocks.

AAPG-SEPM-EMD ROCKY MOUNTAIN SECTIONS 28TH ANNUAL MEETING June 3-7, 1979 Casper, Wyoming

"Rocky Mountain High"

Headquarters—Ramada Inn

Technical Sessions—America and Rialto Theaters in Downtown Casper

General Chairman: W. J. GUY, Box 534, Casper, Wyo. 82602

Entertainment

The traditional "Ice Breaker" cocktail party will be held on Sunday evening following the first day of registration. On Monday night the entire family will be welcome at an outdoor cocktail party and barbeque dinner. Later, the adults can dance to the music of the Milt Clark Trio and play at the exciting Monte Carlo Casino. Late Tuesday afternoon will be a time to gather again for the Exhibitors and Alumni "Happy Hour" as well as seeing and "hashing over" the SEPM-EMD "Poster Boards."

Ladies' Activities

For the ladies attending the convention, plans are under way for a brunch, a luncheon, and other interesting activities. During the convention we will have an art exhibit, where you may both view and buy. Early June weather in Wyoming is unpredictable, so bring a light wrap.

Exhibits

Approximately 35 professional and commercial exhibits will be presented in the Grand Ballroom of the Ramada Inn from Sunday afternoon to Wednesday noon.

Field Trips

Pre-convention field trips on Sunday will include a trip to Casper Mountain to study the Precambrian with the University of Akron, a trip to the Salt Creek area north of Casper to study the Cretaceous, and a trip to the Powder River basin to view three uranium mines—the Highland (Exxon), the 28-33 South Monument Hill (Kerr McGee), and the Morton Ranch (United Nuclear). A post-convention field trip on Thursday will go to the Gillette, Wyoming, area to view three coal