The stratigraphic sequence between the Paleozoic-Cretaceous unconformity and the first occurrence of the Foraminifera *Orbitolina* was studied in the areas of the Solitario, Shafter, Pinto Canyon, and the Van Horn Mountains of southwest Texas. Due to the scarcity of environmentally indicative fossils in these sections, most environmental interpretations are based on physical structures such as cross-bedding and ripple marks, geochemistry, and the petrology of the sandstones and carbonates.

As the sea transgressed into the area during the late Neocomian, it eroded a topographically high Paleozoic terrane into a gently sloping surface. A basal conglomerate, the initial deposit in the sequence, is gradational upward into lagoonal, tidal flat, and beach facies, characteristic of a low-relief shoreline. During deposition, terrigenous clastic input was influential in sedimentation, and perhaps created turbid water, prohibiting development of a filter-feeding community. The stratigraphic sequence grades into the sequential development of milliolid biosparite and oosparite facies, followed by *Exogyra* banks and intrasparites, and finally a rudistid-bearing biosparite facies, indicating a gradual increase in water depth.

These facies patterns are recognizable in all four study localities, but were probably not synchronously deposited. The absence of correlatable biostratigraphic units makes time equivalency extremely speculative for this part of the Cretaceous section.

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Geology of Aurora Uranium Prospect, Malheur County, Oregon

The Placer Amex Aurora uranium prospect is located 2,000 ft (610 m) southwest of the old Bretz mercury mine and adjacent to the Cordex Syndicate Bretz uranium prospect, within the northern rim of the McDermitt caldera complex. Drilling has defined 17 million tons (Mg) of mineralization at a grade of 0.05% U_3O_8. The shallow mineralized zone is 500 by 1,500 ft (152 by 457 m) in area and up to several hundred feet thick. The long axis of the deposit is subparallel with the northwest-trending caldera rim fracture passing through the Bretz open pits.

Uranium mineralization occurs dominantly as very fine-grained uraninite and coffinite localized in highly altered vesicular to scoriaceous flow tops and breccia layers within a complex, intermediate lava sequence. Volcanic rocks are locally covered by several hundred feet of tuffaceous lacustrine sediments. Rhyolitic rocks beneath the Aurora lavas possess an asymmetric, anticlinal upper surface, the axis of which coincides with the trend of mineralization.

Associated alteration minerals include montmorillonite, leucoxene, opal, clinoptilolite, and framboidal pyrite. Mineralization was apparently introduced by an epithermal mechanism which added altering fluids and uranium-bearing solutions along a complex, steeply dipping fracture system coincident with the axis of the mineralized zone. A supergene mechanism may then have spread the altering and mineralizing solutions laterally along the more permeable layers within the lava sequence. Mineralization may have occurred during the time of deposition of 50 to 70 ft (15 to 21 m) of uranium-enriched tuffaceous sediments which directly overlie the Aurora lavas.

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Petrochemical Characteristics of Volcanic Rocks Associated with Uranium Deposits in McDermitt Caldera, Nevada-Oregon

Rhyolitic volcanism within the McDermitt caldera complex in northern Nevada and southern Oregon occurred during four episodes in a 5-m.y. time span from 18.5 to 13.7 m.y. ago. The first three episodes were characterized by eruption of large-volume ash-flow tuffs which led to caldera collapse. Each episode began with eruption of comendite ash-flow tuff with a SiO_2 content of 75% and Al_2O_3 content of 11.2% and each ended with ash flows lower in SiO_2 content (70 to 62%) and higher in Al_2O_3 (13 to 15%). The early high-silica rhyolites show large enrichments of F, Th, U, Zr, and depletions of Ba, Ca, Mg, P, Sr, and Ti relative to the last tuffs erupted. The systematic change in chemistry of the ash-flow tuffs during each episode is believed to reflect venting from progressively lower levels of a zoned magma chamber. The fourth episode of volcanism consisted of the emplacement of small intrusives and domes with composition similar to the early high-silica rhyolite erupted in each of the previous three episodes. The last rhyolites erupted tapped only an upper part of a similarly zoned magma chamber.

Uranium ore deposits are associated with the emplacement of the last phase of comendite magma in the complex. Although these rocks are not distinct chemically from the older high-silica rhyolites, their emplacement in a nonexplosive manner resulted in the formation of the ore bodies by localizing magma and vapor in a small chamber rather than dispersing it in ash-flow sheets.

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Peterson and South Peterson Multipay Fields, Roosevelt County, New Mexico

The Peterson and South Peterson fields, located on the northside of the generally east-west-trending Matador arch in southern Roosevelt County, New Mexico, are on relatively small structural features separated by dry holes. Both fields produce from the Middle Silurian Fusselman carbonate and from bedded Upper Pennsylvanian limestone. Production from the Fusselman in the Peterson field is limited to one well whereas production in the South Peterson field covers a wider area. The Peterson field produces from the Fusselman because of structure whereas the South Peterson field produces as the result of combination structure and pinch-out of Fusselman against the granite high on the south. The field was found using common depth point (CDP) seismic data.

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Tom-Tom and Tomahawk San Andres Oil Fields, Chaves and Roosevelt Counties, New Mexico

The Tom-Tom field was discovered by Amoco in 1967 and the nearby Tomahawk field was discovered by Sundance Oil Co. in 1977. As of September 1, 1979, there were 49 wells producing at Tom-Tom and 22 wells at Tomahawk. Cumulative oil production to August 1, 1979, is 913,725 bbl at Tom-Tom and 331,917 bbl at Tomahawk. Geologic studies indicate no separation between the two fields and at the present rate of drilling activity, the fields should link up in early 1980. Both fields are stratigraphic traps in the P-2 zone of the San Andres formation. The P-3 zone is also productive from a small stratigraphic trap in the Tomahawk field. The P-2 zone is approximately 100 ft (30 m) thick, with the main field pay developed in the upper 50 ft (15 m). This interval is a sucrosic, vugular dolomite in which two predolomitization facies can be recognized, an upper oolitic limestone facies and an underlying crinoidal, argillaceous limestone facies. A dolomite bed near the base of the P-2 zone has 4 to 15 ft (1 to 5 m) of porosity over most of the field and is productive in several local areas. Productive porosity in the P-2 zone ranges from 4 to 10% and the thickness of net pay ranges from 10 to 45 ft (3 to 14 m). Good permeability is dependent upon fractures. Several locally successful techniques for fracture detection are used.

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Magnetotelluric Petroleum Exploration—Technology Update and Case Histories

The use of magnetotelluric soundings for the estimation of subsurface electrical conductivity structures and properties has been increasing during the past several years. Greater interpretational capabilities and improved techniques for achieving higher data quality, coupled with the experience gained, have made the method a practical and effective exploration tool. Magnetotelluric exploration has been applied to a large variety of structural and stratigraphic problems and has proven effective and capable of yielding information even in areas which give poor or uninterpretable seismic results.

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Uranium in Challis Volcanic Field, Idaho

Recorded uranium production and known resources in the Challis Volcanics and the Challis-related epizonal silicic plutons of Eocene age are small, but the potential resource is moderately high. Former production was from arkosic conglomerates and sandstones at the base of the Challis Volcanics in Stanley basin and from a scheelite deposit on the contact of the Summit Creek stock. Uranium mineralization also occurs in water-laid rhyodacite pumice-rich tuffs, in the Twin Springs pluton, in the Beaverhead stock, and in shear zones in the Castro granite.

The Challis Volcanics are potash-rich, calc-alkaline rocks and, in general, are not known to be enriched in uranium. However, numerous highly differentiated silicic intrusions that acted, in part, as feeders to the closing phases of Challis volcanism are rich in uranium and thorium. These intrusions range from rhyolite, rhyodacite to granite, and from plugs, domes, dikes, stocks, to batholiths.

Exploration in the Challis field should be concentrated in areas of silicic tuffs and breccias or in arkosic beds that occupy depressions in pre-Challis basement or volcanic-tectonic subsidences. Few such structures are known because detailed mapping of the field is incomplete; one exception is a trap-door graben that contains the uranium-rich arkoses of Stanley basin. Mineralized indicators of uranium are hematite staining, disseminated pyrite, and opaline silica alteration. Radioactive anomalies in present-day valleys can result from the fixation of uranium in organic-rich bogs or from accumulations of coarse detritus from granitic plutons.

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Brachiopod Biostratigraphy of Hueco Group (Wolfcamp), Franklin Mountains, Texas and New Mexico

The Franklin Mountains are located in the extreme western tip of Texas and extend northward into south-central New Mexico, approximately 23 mi (37 km) from El Paso which is built around the southern end of the range.

The outcrops of Permian strata in the Franklin Mountains consist of small outliers on the western edge which are separated from the main range. The Permian is represented by the Hueco Group (Wolfcampian) which is divided into three formations, in ascending order: the Hueco Canyon, Cerro Alto, and Alacran Mountain Formations.

The 1,350-ft (411.5 m) thick Hueco Canyon Formation contains 22 genera and 23 species of brachiopods. These are *Orthotichia* sp., *Accosarina* sp., *Acritosia silicica* Cooper & Grant, *Rhipidomella hessensis* R. E. King, *Derbyia* sp., *Chonetinella* sp., *Kozlowskia capaci* (d'Orbigny), *Reticulatia huecoensis* (R. E. King), *Dasyaria undulata* Cooper & Grant, *Dasyaria wolfcampensis* (R. E. King), *Cancrinella parva* Cooper & Grant, *Linoproductus cora* (d'Orbigny), *Pontisia franklinensis* Cooper & Grant, *Stenocisma* sp., *Hustedia huecoensis* R. E. King, *Rhynchopora* sp., *Crurithyris tumbilis* Cooper & Grant, *Cleiothyridina rectimarginata* Cooper & Grant, *Composita cracens* Cooper & Grant, *Beecheria bovidens* (Morton), *Chondronia obesa* Cooper & Grant, *Dielasma* sp. 1, and Dielasma sp. 2.

The 350 to 425-ft (106.7 to 129.5 m) thick Cerro Alto Formation contains 8 genera and 9 species of brachiopods. These are *Derbyia* sp., *Chonetinella* sp., *Squamaria moorei* Muir-Wood & Cooper, *Cancrinella altissimia* R. H. King, *Linoproductus cora* (d'Orbigny), *Pontisia franklinensis* Cooper & Grant, *Crurithyris quadalupensis* (Girty), *Composita cracens* Copper & Grant, and *Composita mexicana* (Hall).

The 315 to 739-ft (96 to 225.2 m) thick Alacran Mountain Formation contains 24 genera and 27 species of brachiopods. These are *Crania modesta* White & St. John, *Meekela* sp., *Enteletes* sp., *Derbyia* sp., *Pseudoleptodus* sp., *Micraphelia* sp., *Costellarina costellata* (Muir-Wood & Cooper), *Hystriculina convexa* Cooper & Grant, *Kutorginella* sp., *Nudauris* sp., *Kozlowskia capaci* (d'Orbigny), *Dasysaria undulata* Cooper & Grant, *Dasysaria wolfcampensis* (R. E. King), *Linoproductus* sp., *Pontisia franklinensis* Cooper & Grant, *Stenocisma hueconians* (Girty), *Hustedia hessensis* R. E. King, *Hustedia huecoensis* R. E. King, *Crurithyris* sp., *Neophricadothyris* sp., *Composita cracens* Cooper & Grant, *Composita mexicana* (Hall), *Reticulariina heuconiana* Cooper & Grant, *Gypospirifer nelsoni* Cooper & Grant, *Beecheria bovidens* (Morton), *Chondronia obesa* Cooper & Grant, *Dielasma* sp.

Other faunal taxons present in the Hueco Group of the Franklin Mountains include Foraminifera, Fusulinida, Porifera, Coelenterata, Bryozoa, Polyplacophora, Gastropoda, Cephalopoda, Bivalvia, Scaphopoda, Crustacea, Trilobita, Annelida, Crinoidea, Echinoidea, Conodonta, and Vertebrata.

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Petrology and Geochemistry of Peralkaline Volcanics of Sierra Campana, Chihuahua, Mexico

Peralkaline welded tuffs (and flows?) make up the steep walls of the lower Campana Canyon and the east-facing scarp of the Sierra Campana, approximately 100 km north of Ciudad Chihuahua. The sequence includes crystal-poor, highly contorted welded tuffs and the distinctly peralkaline Campana tuff that forms the steep columnar-jointed cliff atop