the Sierra Campana. The Campana tuff contains a blue crystal-rich basal unit that grades upward into a blue crystal-poor phase containing clumps (lapilli) of sanidine (Or_{40}) plus quartz phenocrysts. Distinctive light-colored clumps (1 cm to 1 m) also occur in the lower part of the tuff. These clumps contain abundant dendritic and coarse vapor phase riebeckite which imparts a speckled blue-white color to the unit. Sanidine phenocrysts are low in CaO (0.1%) but typically contain high FeO (0.6%). The tuff was derived from a magma chamber characterized by a well-developed transient zone of crystallization which was disrupted and mixed with the magma during early eruptive phases. The Campana tuff has been downfaulted at least 300 m along a north-south range-front fault.

Major and trace element analysis of 70 samples defines a distinctly peralkaline suite, with average molecular $Al_2O_3/Na_2O + K_2O + CaO = 0.9$. SiO_2 ranges from 73.7 to 77.6%. The low average Al_2O_3 content (10.9%) and the high Fe_2O_3 content (3.2%) place the suite in the comendite field. The entire suite exhibits a highly fractionated trace element chemistry, with abnormal enrichment of Rb(495 ppm), Zr(970 ppm), Y(144 ppm), and Nb(120 ppm); more significantly, there is very strong depletion of Sr(< 5 ppm), Ba(< 5 ppm), V, Ni, and Cr. The peralkaline volcanics are interpreted as the end product of extreme crystal fractionation under quartz-feldspar ternary minima restrictions.

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Limestones of Pena Blanca Uranium District, Chihuahua, Mexico

Mexico's largest uranium deposit occurs in the Pena Blanca Range of central Chihuahua. At Pena Blanca, Tertiary silicic pyroclastics overlie middle Cretaceous (Albian and Cenomanian) limestones. The limestones comprise a large rudistid reef, with extensive fore-reef and lagoon facies, at the edge of the Chihuahua trough. Younger, basin limestones overlap the lower edges of the fore-reef slope. The reef itself is of Albian age and shares faunal and lithologic characteristics with both the El Abra Formation of Mexico and the Edwards Formation of Texas. A total thickness of 230 m of reef limestone is exposed in the central and southern part of the range. Important rudistids include caprinids (especially *Mexicaprina),* radiolitids (especially *Eoradiolites* and *Sauvegesia*), and requienids (*Toucasia*). Other faunal elements are gastropods, corals, bivalves, algae, calcisponges, and forams (including *Nummoloculina* sp., useful in correlations). Lagoon, back-reef, requienid rudistid mounds, near back-reef carbonate sand, caprinid and radiolitid rudistid reef core, fore-reef carbonate sand, and fore-reef debris-slope facies are all evident in outcrop. In the reef core, rudistids predominate over all other organisms. None of the reef facies possesses significant porosity. The abundant carbonate mud and diagenetic calcite cement have occluded all available pore space.

The basin limestones include the rhythmically layered Cuesta del Cura, upper Tamaulipas, and Aurora Formations. Approximately 120 m of Tamaulipas Formation interfinger with and lap onto the fore-reef slope facies of the El Abra Formation. The Tamaulipas in this region is a foraminiferal mudstone, locally replaced by rudistid wackestone. It is a deeper water limestone characterized by calcisponges, benthonic, and planktonic Foraminifera, and rudistid debris shed from the reef. The Cuesta del Cura Formation consists of 50 m of interbedded argillaceous limestones and calcareous shales. It covers both the El Abra and Tamaulipas Formations. The calcareous units are mudstones and wackestones containing globigerinid, rotalinid, and rotaliporid Foraminifera and scattered gastropods and bivalves.

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Oil and Gas Exploration Wells in Pedregosa Basin

In the Pedregosa basin and adjoining areas covering 49,500 sq mi (110,700 sq km) in southeastern Arizona, southwestern New Mexico, northwestern Chihuahua, and northeastern Sonora, 37 petroleum-exploration wells have penetrated Paleozoic and/or Precambrian rocks. Several shows of oil and gas have been reported, but no commercial production has been found. Many of the wells have been drilled on Basin and Range uplifts where reservoirs tend to be flushed with meteoric water. The best remaining prospects lie below the deeper parts of graben valleys where preservation of petroleum is more likely.

The highest ranking objective of the region is in Upper Pennsylvanian–Lower Permian rocks at the margin of the Alamo Hueco basin where shallow-marine dolostone reservoirs are juxtaposed with deep-marine, organically rich limestone and mudstone source rocks. A regional isopach and facies map of the Pennsylvanian shows that the basin axis trends generally southeastward from southern Hidalgo County, New Mexico, across the Ascension–Villa Ahumada area of Chihuahua. Several other petroleum-exploration objectives are indicated in the Paleozoic and Mesozoic rocks.

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Geophysical and Geologic Analyses of Cenozoic Basins in Trans-Pecos Texas and Southern New Mexico

Geophysical and geologic modeling of Cenozoic basins in Trans-Pecos Texas and southern New Mexico—the Salt Flat, Hueco, Tularosa, Mesilla Valley, Presidio, and Valentine basins—shows north to northwest-trending block faulting. The deep-seated faults could serve as hydrocarbon traps for older Paleozoic and Mesozoic source beds in the area. Interpretations are complicated by the Laramide orogeny and tectonism associated with the formation of the Basin and Range province and Rio Grande rift.

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Geology and Uranium Deposits Along Northeastern Margin of McDermitt Caldera Complex, Southern Malheur County, Oregon

The adjoining Aurora and Bretz uranium prospects are along the northeastern ring-fracture system of the Miocene McDermitt caldera. A series of block faults, constituting the ring-fracture system, divides the area into two contrasting terranes. The northern terrane, comprising the caldera wall and outflow facies, includes a series of mafic to silicic lavas and rhyolite ash-flow tuffs (Bretz Series). Rocks of the southern terrane (Aurora Series) represent infilling of the caldera after