Vertical successions in the Coaledo Formation typically show siltstone-mudstone facies at the base, overlain by the hummocky-bedded facies, and capped by coarse delta-front or delta-margin deposits. These upward-coarsening or progradational sequences number at least 15 in the Coaledo Formation alone, and indicate a complex history of delta-distributary switching coupled with subsidence and/or eustatic changes.

Wave-dominated deltaic deposition was a repetitive and persisting style of sedimentation throughout much of the Eocene period in southwest Oregon. This scenario is useful for distinguishing vertical and lateral relationships applicable to other ancient wave-dominated systems and to predictions in potentially economic units of the Pacific Northwest.

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Developing an Oil Generation Model for Resource Assessment of Bakken Formation, Williston Basin

A model was developed for oil generation in the Devonian and Mississippian Bakken Formation, which has been proposed as the main hydrocarbon source rock within the Williston basin. The data consisted of formation temperatures and of density, neutron-porosity, resistivity, and gamma-ray logs from more than 250 wells in North Dakota and Montana. The upper and the lower shale members of the Bakken Formation were studied. Regression analysis, analysis of residuals, and cluster, discriminant, and factor analyses were used in an attempt to separate depositional effects—especially variations in organic content—from maturity.

Regression and analysis of residuals indicate differences both areally and between the upper and lower members. In the upper member, and less strongly in the lower member, the center of the basin differs from the basin margins in that it has extreme residuals—either high or low. Clustering and residual analyses show roughly the same areal patterns.

Inverse relationships, similar to those suggested by other workers, were found between formation temperature and organic content and between density logs and organic content. Also found, though, was that the addition of other factors, such as neutron porosity, helps to indicate organic content.

Preliminary results show that it may be possible to model oil generation by using statistical techniques on well-log data. In particular, the model has the potential to refine estimates of the amount of hydrocarbons generated by the Bakken Formation in the Williston basin.

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Assessment of Role of Metamorphic Remobilization in Genesis of Uranium Ores from Ralston Buttes Area, Colorado

The Ralston Buttes mining district, the principal source of commercial uranium in the Front Range since the late 1940s, is located northeast of Golden and southeast of the Front Range mineral belt. Uranium ore occurs in veins emplaced in fault breccia in Precambrian metamorphic rocks. The progenitors of the metamorphic rocks are a possible source for the uranium. Hornblende gneisses of the Idaho Springs Formation is the major rock type in the area, thus its origin is a major consideration in assessing the quantity of uranium that might have been contributed by metamorphic processes. To evaluate this, 41 rock samples (19 hornblende gneisses, 7 biotite gneisses, 5 chlorite gneisses, and 10 metapelites) were analyzed for major elements, and 3 rock samples (16 hornblende gneisses, 8 biotite gneisses, 4 chlorite gneisses, and 5 mica schists) were analyzed for trace metals (Rb, Sc, Zr, V, Ni, Co, Cr, Ba, U, and Th). Four samples of hornblende gneiss and 1 sample of mica schist were also analyzed for rare earth elements.

Major elements and rare earth data indicate that the hornblende gneiss was derived from sediments and tholeiitic basalts. Trace element data suggest a volcanic provenance for these sediments. Rare earth patterns and uranium and thorium abundances of metapelites are similar to average North American shales. Low uranium and thorium values and low thorium-uranium ratios in hornblende gneisses and mica schists preclude large-scale uranium remobilization during metamorphism of these source rocks.

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Paleoenvironments of Late Albian Stage (Early Cretaceous) of Eastern Trans-Pecos, Texas

Upper Albian rocks in eastern Trans-Pecos Texas consist of a depositional sequence that records a major transgressive-regressive cycle, beginning with an initial transgression of the early late Albian seas over a regionally disconformable surface and ending with the onset of late Albian regression.

The history of these events is recorded in rocks of the Fort Lancaster Formation and its western equivalent, the Boracho Limestone. These rocks were deposited in several depositional systems that developed on the Comanche shelf and an associated shelf basin called the Fort Stockton embayment. These depositional systems include the carbonate-shelf system, the shelf-basin system, and the carbonate-shoal system. Each system is recognized by unique suites of lithofacies, differentiated on the basis of petrographic and outcrop characteristics: skeletal wackestone, interbedded shale and wackestone, oyster packstone/shale, skeletal grainstone, and calcareous shale. Associated with these lithofacies are the following biofacies: *Protocardia-Macraster, Globigerina, Nuculana-Syncyclonema, Texigryphaea, Lopha,* and *Miliolina.*

Within a biostratigraphic framework based on ammonite zones, the geographic and stratigraphic distribution of depositional systems and their associated lithofacies and biofacies indicate that late Albian deposition primarily was influenced by periodic terrigenous influxes from the northwest over the Comanche shelf. This was coupled with tectonically controlled subsidence in the Fort Stockton embayment. The depositional sequence culminated in the development of widespread carbonate sand shoals prior to the onset of emergence.

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Evaluation of Coalbed Methane Resource in Western United States

Of the new or unconventional fossil energy resources studied in recent years with federal, state, or industry funding, the recovery of methane from coalbeds is the one resource with the greatest probable near-term commercial potential. Well completion records and production data indicate that much, if not most, of the gas currently produced from the Fruitland Formation of the San Juan basin, for example, has its origin in or from coalbeds.

All of the intermontane sedimentary basins of the Rocky Mountain region underlain by coal deposits, also contain methane that is genetically associated with those coals. Discussed will be individual characteristics of some of these basins that bear on methane formation and accumulation in each basin, techniques for estimating methane resources and defining target areas for exploration, amounts of gas contained in the basins, and identification of some completion and production problems. Basins specifically discussed will include Piceance, San Juan, Raton, and Powder River.

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Three-Dimensional Plane Pass Filtering as a Regridding and Interpolation Technique

Efficient and accurate interpretation of dense irregular 2-D seismic data is an ongoing problem in virtually every exploration area. Developing interpolation algorithms which would create pseudo 3-D volumes from sparse 2-D data could allow a geophysicist an efficient means of interpreting the broad geologic features in an area. An interpolation algorithm which uses the 3-D nature of the irregular 2-D data can be developed which is analogous to sinc function interpolation in 1-D. A Gaussian 3-D plane pass filter is demonstrated to produce reasonable interpolated results within the pass region of the filter. This particular technique has the built-in flexibility of allowing the geophysicist to choose a broad pass volume which essentially regrids existing data with very little interpolation or allows the choice of a narrow pass volume to interpolate those spatial frequencies which are not aliased by the irregular sampling of the input data.