Range and extensive refolding and refaulting of the allochthons throughout the range. At the mountain front, autochthonous Triassic and older sedimentary rocks are at depths of over 8 km except in the northeast, where they are exposed by erosion of a regional Late Cretaceous and Tertiary vertical uplift centered in the Romanzof Mountains. North of the range an Albian and Late Cretaceous molassoid wedge derived from the south and west is deformed by decollement that dies out northward; the zone of detachment is incompetent Albian shale.

Oil and gas potential is greatest to the north, where Cretaceous sedimentary rocks truncate and prograde over the rifted plate margin. At Prudhoe Bay, northward onlapping Carboniferous to Jurassic platform sedimentary rocks are truncated by organic-rich Cretaceous shale beds, which are the hydrocarbon source and part of the trap. Southward the basin is dominantly a gas-prone stratigraphic trap province; however, potential reservoirs are limited. In the Brooks Range, reservoir potential exists in only a few areas of Carboniferous carbonate rocks that have extreme structural complexity.

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Nodular Submarine Cementation on Bahamian Slopes—Possible Model for Origin of Some Nodular Limestones

Submarine cemented nodules (< 6 cm across) floating in a muddy matrix have been recovered by piston coring from carbonate slopes (depths 300 to 800 m) in the northern Bahamas. These nodular units are usually associated with peri-platform oozes, and range in thickness from 9 to 345 cm. Petrographic data indicate that the nodules are multi-generation, deep-water, grain-supported intramicrites to intramicrudites cemented by pelloidal high-Mg calcite. Carbon-14 activities indicate that the nodules are 4 to 5 × 10^3 years younger than surrounding sediment. Carbon and oxygen isotopes plus paleotemperature data suggest that the nodules were cemented in situ near the sediment-water interface.

The origin of these nodular units involves a complex interplay of physical, biologic, and chemical processes that act concomitantly above the permanent thermocline. Bottom currents play a key role in the cementation of the nodules by controlling the permeability of the sediment via winnowing and thus the degree of interstitial circulation. Burrowing organisms may enhance submarine cementation by "irrigating" the shallow subsurface, and may be responsible for the vertical mixing of nodules. On the slope north of Great Bahama Bank facies transitions from hardgrounds at depths < 375 m, to nodular sediment at depths of 375 to 500 m, to soft, unlithified peri-platform oozes at greater depths correlate with a downslope decrease of bottom current strength. These observations suggest that bottom currents in conjunction with bioturbation may have major influences on the degree of early diagenesis and thus facies relations. Recognition of similar facies in the rock record may be useful in interpretation of open-marine carbonate slope deposition, synsedimentary submarine cementation, deposition above the permanent thermocline, and the existence of contour-following currents.

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Origin of Subsurface Fracture Systems—Example from Altamont Field, Uinta Basin, Utah

The Altamont field is a major, naturally fractured, overpressured oil reservoir situated on the gently northward-dipping flank of the asymmetric Uinta basin. Low porosity Tertiary clastic and carbonate rocks form a stratigraphic trap beneath thick Green River Formation carbonate mudstones. The reservoir occurs at depths between 2,450 and 5,200 m, and thickness of the producing interval commonly exceeds 700 m. Permeability is derived mainly from vertical fractures in sandstones and carbonate rocks.

Joints in surface rocks within the basin occur predominantly as orthogonal sets whose orientations correlate with major tectonic features bordering the basin. Fractures in oriented core of reservoir rock exhibit a single dominant north-northwest trend. Rock mechanics tests on samples from the core indicate anisotropy coincident with the trend of microcracks.

Timing of subsurface fracture development relative to basin subsidence and uplift is interpreted from fluid-inclusion thermometry conducted on quartz and carbonate crystals which line open fractures. Results indicate that fractures opened when strata were near their maximum burial depth. The fracture system became more extensively developed as uplift and erosional unloading continued.

Various geologic processes interact during the burial, diagenetic, tectonic, and unloading history of rocks in a sedimentary basin. Their combined effect determines the state-of-stress in stratigraphic units. At Altamont the effect of overpressuring has been critical in fracture genesis. Thorough evaluation of the relative influence of individual geologic processes on the stress history of rock units in a basin can be usefully applied in exploration for fracture reservoirs.

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Uranium Occurrence in Leadville Dolomite at Pitch Mine, Saguache County, Colorado

Uranium ore in the Pitch Mine occurs chiefly in brecciated Mississippian Leadville Dolomite along the Chester upthrust zone and, to a lesser extent, in sandstone, siltstone, and carbonaceous shale of the Pennsylvanian Belden Formation and in Precambrian granitic rocks and schist. Uranium mineralization is generally thicker, more consistent, and of higher grade in dolomite than in other hosts; roughly 50% of new reserves are found in dolomite. Most ore distribution is controlled by dolomite and probably by brittle behavior (pervasive faulting and brecciation) in a "forced fold" environment during Laramide basement uplift.

Leadville Dolomite in the ore zone is bounded by faults and its maximum known thickness in the area is about 17 m. The Leadville is predominantly dolomicrite