munity patterns. Tidal flat and lagoonal communities (Walker and Laporte) and an offshore cystoid-ectoproct community (Anderson and Goodwin), which are both recognized in Ordovician rocks, persist into the Devonian and coexist with the Devonian brachiopod communities. Restricted subtidal and barrier communities are absent from progradational Helderbergian rocks. This pattern is analogous to Bretsky's three-community sequence of the Late Ordovician.

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GEOLOGY AND HYDROCARBON POTENTIAL, DEEP GULF OF MEXICO

The results from the deep drilling program in the central basin of the Gulf of Mexico provide convincing evidence that the Sigsbee Knolls are salt domes. This evidence raises many questions concerning the origin of the Gulf of Mexico and the possibility of vast hydrocarbon reserves beneath the deep-water areas. The fact that the Sigsbee Knolls are salt diapirs has led to the implication that buried Mesozoic salt is present across the entire basin. This concept has led to arguments concerning basic, worldwide, geologic processes. For instance, Belousov, who doubts the possibility of deep-water salt deposition, claims the presence of salt in deep-water areas validates his arguments for "basification"—making oceans from continents. However, the genetic model for deep-water salt deposition presented by Schmalz has made it possible to reconcile the hypothesis that the Gulf represents an ancient ocean basin which has been at oceanic depths at least since Mesozoic time with the presence of salt in the basin.

The basic premise in both these arguments is that salt is continuous across the deep basin and this may be invalid. The data available at present indicate that Mesozoic salt deposition was restricted to the margins of the western Gulf of Mexico and the presence of salt on the basin edges has been caused by the seaward migration of buried salt. The data also favor the hypothesis that whatever the origin of the Gulf of Mexico—foundered and oceanized continental crust or rifted ocean basin—it is a relatively old, undisturbed feature with great prospects for vast reserves of hydrocarbons in the southwestern section. This region includes the Sigsbee Knolls and their southwestern extension to the deep-water salt diapirs of the Bay of Campeche, adjacent to the Saline basin of Mexico. Petroleum prospects are suggested by the drillhole into the Challenger Knoll from which salt-dome caprock saturated with oil, gas, and sulfur was recovered and from short piston cores into knolls in the Bay of Campeche which contained either layers or scattered inclusions of solid hydrocarbons.

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PRE-PENNSYLVANIAN PALEOTECTONIC FRAMEWORK OF ANCESTRAL ROCKIES OF COLORADO

The tectonic framework that controlled the locations of the late Paleozoic Ancestral Rockies was well established in pre-Pennsylvanian time.

The Uncompahgre uplift in southwestern Colorado arose along tectonic lineaments that originated in the late Precambrian. Recurrent movements along the fault system continued through early and middle Paleozoic time and the resulting submarine topography controlled the sedimentation of reservoir facies in the adjacent Paradox basin.

The Front Range and Wet Mountains uplifts of central Colorado were apparently low and inactive prior to Late Devonian time; at least, evidence is lacking that they were source areas during the early Paleozoic. The relation between basement tectonic trends and the location of the Permo-Pennsylvanian uplifts is obscure.

The first demonstrable uplift of the Front Range element occurred in Late Devonian time when coarse clastic material was shed into the Parting sea from the west flank of the uplift and a satellite structure in the northern Sawatch Range. Uplift of these source areas recurred in Early Mississippian time and produced limestone conglomerates in the basal Leadville Formation.

The Wet Mountains lay dormant until Early Mississippian time, and a broad lowland occupied the general region in the Late Devonian. Local deposits of limestone conglomerates in the Leadville Formation attest to the Early Mississippian time of uplift.

Continued detailed petrologic and paleotectonic studies in the 1970s will lead to new petroleum discoveries in the related Paradox and Eagle basins by establishing favorable reservoir facies trends, paleohydrodynamic patterns, and times and paths of petroleum migration.

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CHEMICAL ASPECTS OF CRUDE OIL PRESERVATION

Previous studies indicate that although thermal maturation is an overwhelming control on petroleum composition within the deeper and hotter regions of the Western Canada basin, other processes significantly affect the quality and preservation of crude oil in areas where the burial is less deep. The objective of our study was to investigate, with as many analytic tools as possible, the nature of those processes which alter and degrade petroleum in less mature settings.

The Mississippian oils of Saskatchewan provide an excellent opportunity for isolating and examining those processes which might result from chemical interaction between oils and formation waters. Along the entire subcrop trend, only 3 geologic parameters change significantly; formation waters become less saline from east to west, and oils become heavier and more sulfurous and eventually disappear on the west.

Methods used include chemical analyses of formation waters followed by isotopic determinations of S, C, O, and H. Crude oils were analyzed for individual gasoline-range hydrocarbons, normal paraffins to $n$-$C_{35}$, sulfur, and API gravity. In addition, C and S isotope measurements were made on saturate, aromatic, NSO, and asphaltene fractions of selected crudes. The critical environments also were checked for direct evidence of microbiologic activity.

Preliminary results suggest that the western part of the study area was invaded by fresh meteoric water which resulted in the degradation of crudes through two processes. The disappearance of light hydrocarbons toward the zone of freshwater invasion indicates removal of these more soluble compounds by water washing. Light normal paraffins disappear much faster than expected from their relative solubility, and extended range chromatograms show that heavy, insolu-