ern half of the zone is down on the northwest side.

Another conspicuous feature related to the wrench-fault system is the Ash Creek oil field on a small faulted anticline. Isopach mapping of the producing Upper Cretaceous Shannon Sandstone Member of the Steele Shale shows that folding and faulting were initiated prior to deposition, thus providing optimum conditions for early migration of hydrocarbons into the structural trap.

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Hot-Spring-Generated Karst Features Near Salida, Colorado

Several types of karst features related to hot springs are developed in the Ordovician to Mississippian carbonate rocks exposed along both banks of the Arkansas River east of Salida, Colorado. The area is also one of current hot-spring activity. The karst features show a degree of development and morphology which separates them from karst features formed solely by cold groundwater. Part of the difference reflects the solutional agents, H_2S and H_2SO_4, the latter forming where the hydrogen sulfide-bearing hot-spring waters mix with oxygenated groundwater.

The karst features occur in both dolomite and limestone but are much better developed in the latter. The best developed small- and moderate-scale features are present in the Mississippian Leadville Formation.

Individual solution features include shelter caves up to 40 ft (12 m) high and 30 ft (9 m) wide, spongework-type cave development, and ascending water chimneys. Multiple "spongework" caves up to 3 ft (1 m) high occur within a zone 12 ft (3.6 m) thick in one exposure.

The hot-spring solution activity is localized by structure occurring along fractures and bedding planes, and in one place is channeled along a tight syncline. Similarly, it may also produce structure. At one exposure the removal of tens of feet of carbonate rock across an area a few hundred feet wide has produced a synclinal sag and local anticlinal closure at one edge of the syncline.

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Importance of Secondary Porosity in Sandstones to Hydrocarbon Exploration

Terrigenous sandstones in many basins owe their reservoir quality to secondary porosity that developed by the dissolution of detrital framework grains (chiefly plagioclase, carbonate rock fragments, and unstable heavy minerals), carbonate fossil fragments, and cement minerals (chiefly calcite and evaporite minerals). This dissolution event is responsible for changing tight sandstones to porous and permeable sandstones slightly prior to the major episode of hydrocarbon migration. Dissolution of most non-evaporite minerals is accomplished by formation water containing carbon dioxide generated during the thermal or bacterial breakdown of hydrocarbons. Dissolution porosity is commonly well developed at 6,000 to 9,000 ft (1,828 to 2,743 m), but gradually is lost during deeper burial stages by recementation (chiefly by ferroan calcite, ferroan dolomite, and kaolinite). Variations in the simple scheme during sandstone burial of cementation→decementation→recementation is complicated in basins with complex "plumbing" systems and those that experience uplift. For example, dissolution porosity in some uplifted sandstones develops during invasion by meteoric water flowing downdip.

Dissolution porosity in sandstones can be suspected from certain log responses and water saturation characteristics, but is best identified from clues visible in thin sections made of dyed epoxy-impregnated perm plugs. Clues to secondary porosity in thin section include: (1) oversize pores formed where framework grains have been dissolved, (2) patchy distribution of carbonate or evaporite cement, (3) honeycombed feldspar grains, (4) fossil molds, (5) corroded grains whose margins were etched by previous cement, (6) broken silicate framework grains that formed when rapid compaction followed removal of cement minerals, and (7) quartz grains that have been reduced to a pile of shards when calcite, which invaded quartz along hairline fractures during cementation, was dissolved.

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Pennsylvanian Coarse-Grained Meandering Fluvial Deposits, Taos Trough, North-Central New Mexico

Rocks of middle Desmoinesian age are well exposed in the Sangre de Cristo Mountains of northern New Mexico. In the Tres Ritos area, Taos County, these rocks consist of several laterally persistent sandstone units 6 to 50 m thick, interbedded with thick sequences of siltstone and shale. The sandstone units were deposited by eastward-flowing, low-sinuosity, bed-load rivers which fed lobate deltaic systems associated with an extensive platform along the western margin of the Taos trough.

The dominant sedimentary structures of the fluvial sandstone units are large-scale (2 to 10 m) sigmoidal cross-beds (epsilon cross-stratification) formed by lateral accretion of point bars. The cross-strata dip 4 to 24° and show a gradual rotation of dip direction moving up through a single point-bar deposit. Individual accretionary beds range from 10 to 150 cm in thickness, with an average thickness of 40 cm. Internal bedding is generally parallel with the accretionary bed sets, with some low-angle cross-bedding (particularly at the base of a point bar). The accretionary beds commonly have a gravel veneer on their upper surfaces and are usually separated by micaceous, carbonaceous silt to fine-sand drapes. Average grain size of point-bar sediments is conglomeratic, very coarse sand with a slight fining-upward trend within individual point-bar deposits. Locally the point-bar sands grade into overbank siltstone and sandstone. These coarse fluvial sandstone units overlie deltaic or marine sediments.

Lateral accretion occurred on coarse-grained point bars during flood discharge when sand and gravel were transported across the bars. During the waning stage of floods, organic-rich fine sediment was deposited from suspension and formed mud drapes on the bar surfaces. Lateral migration of these rivers coupled with rapid