

of movement was generally northward and that greater movement occurred in the eastern part of the area than in the western part. Incompetent shale zones constituted gliding planes along which thrust movement took place, with the principal ones being the Womble shale, Springer formation, Caney shale, Stanley shale, and Johns Valley shale. One can postulate from indirect evidence the existence of an early period of faulting along the north margin of a late Mississippian-early-Pennsylvanian geosyncline. However, the structural development of the frontal Ouachitas started in Atoka time and continued until middle Pennsylvanian time and possibly as late as early Permian time.

Rocky Mountain Association of Geologists Symposium on Pennsylvanian Rocks of Colorado
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The Rocky Mountain Association of Geologists, Denver, Colorado, published in 1958 a volume with this title in conjunction with its field conference on Pennsylvanian rocks of the Maroon basin.

Pennsylvanian tectonism was dominated by vigorous growth of northwest-trending mountain ranges (Frontrangia and Uncompahgria) and their attendant depositional troughs. These obliterated the amoeboid patterns of gentle epeirogeny in Colorado established during early and middle Paleozoic time. Pennsylvanian depositional history began in Colorado with the accumulation of a red clay regolith, the Molas formation, upon the maturely dissected Mississippian Leadville limestone. Four Pennsylvanian basins (or troughs), the Denver, the Maroon, the Paradox, and the Raton, between and adjacent to Uncompahgria and Frontrangia, contain abundant thicknesses of all lithologic types common to cratonic sediments. Two basins in western Colorado, the Maroon and the Paradox, exhibit extensive evaporites, the Paradox and Eagle sequences. All the basins contain large volumes of red, arkosic conglomerates and finer clastics (the Fountain, Maroon, Cutler, and Sangre de Cristo formations) which grade laterally into marine limestones, shales, and sandstones with or without passing through an evaporite facies.

Western Colorado marine sequences bear the names Hermosa group, Morgan formation, and Weber sandstone. In the Raton basin the Sangre de Cristo and Madera formations, predominantly clastic, comprise the section. In the Denver basin, only the Fountain arkose facies crops out (except for a trace of Glen Eyrie claystone near Colorado Springs); the series terms Morrow, Atoka, Des Moines, Missouri, and Virgil have been borrowed from the Mid-Continent region as subdivisions.

The uplifts attained maximum development in the Des Moines epoch and continued tectonically active into middle Permian time. Pennsylvanian deposition carried over without hiatus into the Wolfcamp epoch of the Permian period. The existing Uncompahgre uplift and the Frontrange uplift (now masked by the Laramidian Front and Park Ranges) are part of the present tectonic pattern of Colorado.

The bulk of Colorado oil has been produced from three reservoir classes: (1) Cretaceous sandstone lenses scattered across the Denver basin, (2) the Weber sandstone of the Rangely pool in the Maroon basin, (3) the Hermosa carbonate reservoirs in the Paradox basin. The latter two, Permo-Pennsylvanian in age, are outstandingly important. The size and youth of Pennsylvanian carbonate pools indicate large reserves in these rocks.

Recent Developments in Alaska

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The discovery of commercially recoverable oil on the Kenai Peninsula by Richfield in 1957, coupled with the prior oil and gas discoveries made by the Navy in and adjacent to Naval Petroleum Reserve No. 4 in Northern Alaska, and the subsequent opening to public leasing of Interior Department lands east of the Reserve have caused the oil companies to renew their interest in Alaska.