environment because of the rapid facies changes in the Teapot. The Teapot Sandstone has a complex diagenetic history and diagenetic patterns are facies controlled.

Lithofacies of the Teapot Sandstone are analogous to the modern Nile delta. The Teapot Sandstone is interpreted as a regressive, wave/fluvial-dominated deltaic sequence which prograded eastward into the Cretaceous seaway. Marine lithofacies coarsen upward from bioturbated offshore siltstone to nearshore sandstone with large, pellet-lined ophiomorpha and overlying well-sorted, horizontally laminated foreshore sandstone exhibiting ridge and runnel topography. Marine foreshore sandstone is overlain by complexly interbedded sandstone and carbonaceous shale in stacked fining-upward sequences of the delta plain. Rootlets and contorted beds are common. Fining-upward units are interpreted as abandoned channels, whereas coarsening-upward sequences are interpreted as interdistributary bay or lagoonal deposits. Capping the sequence is a thick, cross-bedded fluvial section consisting of levee, point bar, and channel sand deposits. Slumped beds, intraformational basal conglomerates, and minor eolian ripple laminations are present in fluvial sandstone.

The Teapot Sandstone has a complex diagenetic history. Siderite and framboidal pyrite formed early in the diagenetic sequence at shallow depths of burial under anaerobic conditions. Pore-filling kaolinite, chlorite, and quartz overgrowths formed coevally following dissolution of relatively unstable framework grains. Poikilotopic calcite cement is locally abundant and extensively replaces framework grains. Depositional facies exert strong control on diagenetic patterns. Kaolinite occurs predominantly in fluvial sandstone. Chlorite is restricted to marine facies, and calcite is further restricted to well-sorted foreshore marine sandstone. Quartz overgrowths occur only in relatively well-sorted sandstone, whereas pyrite and siderite are common in shaly sandstone and siltstone.

Nearshore marine and fluvial sandstone are potentially hydrocarbon reservoirs, although authigenic clays have significantly reduced permeability. Reservoir potential of well-sorted foreshore marine sandstone was destroyed by pore-filling calcite cement. However, tightly cemented sandstone forms a potential diagenetic trapping mechanism.

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Tectonic Significance of Ross Pass Fault Zone, Central Bridger Range, Montana

The Ross Pass fault zone (RPFZ) in the central Bridger Range marks the boundary between Proterozoic Belt Supergroup rocks to the north and Archean metamorphic rocks to the south, and may represent the overlap of two Laramide styles of deformation: thin-skinned fold and thrust deformation to the north and basement-involved foreland deformation to the south.

The fault zone consists of three northwest-trending, northeast-dipping, oblique-slip thrust faults with varying amounts of displacement. The middle thrust, the Pass fault, is the most extensive within the zone; to the west, the Proterozoic LaHood Formation is faulted against Archean quartzo-feldspathic gneisses and amphibolites and overlying Middle and Upper Cambrian strata. Displacement decreases eastward as the fault offsets the lower Paleozoic section and dies out within the upper Paleozoic strata. This variation in displacement is caused by folding within the hanging wall strata along the fault plane during thrusting. The folded strata are again offset by another smaller thrust to the northeast, the Peak fault, which may have originated as an out-of-the-syncline thrust. The Dry Fork fault, southwest of the Pass fault, is largely an intraformational thrust within the Middle Cambrian Meagher Limestone which formed in response to buttressing against the Archean foreland block to the south.

South of the RPFZ, both the Archean and the overlying Phanerozoic strata have been deformed into a large asymmetric, steeply dipping, eastward verging fold typical of basement-involved foreland structures.

The structural relationships along the RPFZ developed as the southeast margin of the Montana salient of the Cordilleran fold and thrust belt impinged on the northern margin of the Laramide foreland province. The relatively small displacement within the thrusts indicates that the RPFZ is within or near the leading edge of the Montana salient. The RPFZ may be an extension of the inferred ancestral Willow Creek fault zone to the west, which was the southern margin of the Proterozoic Belt basin. Laramide compressional stresses exploited this long active zone of weakness and resulted in the impingement of fold and thrust structures upon a foreland uplift.

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Paleotectonics of Frontier Formation in Wyoming

The most intense and widespread pre-Laramide structural deformation of Cretaceous sedimentary rocks in Wyoming is associated with the Wall Creek sandstone of the Frontier Formation. Most of the evidence of structural deformation is found immediately below the regional unconformity at the base of this sandstone.

Regionally, an isopach map from the top of the Frontier Formation to the top of the Mowry Formation shows strong and persistent thinning onto a north-trending arch in western Wyoming and thickening into a northwest trending basin in eastern Wyoming.

Part of the thinning onto the western arch is caused by progressively deeper erosion of a regional unconformity at the base of the Wall Creek sandstone, and regional onlap of the Wall Creek sandstone above the unconformity. There is also some westward thinning of the lower Frontier interval, however, which is not related to the Wall Creek unconformity.

Of the more specific paleostructures discussed, the north-trending anticlines in the vicinity of the Moxa arch in southwestern Wyoming are particularly well developed. An east-west anticline in the Bison basin area appears to have been faulted on the south flank, and a broad arch on the west side of the Powder River basin may have influenced paleocurrents and sandstone depositional trends of the productive "First Frontier Sandstone" of that area.

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Vitrinite Reflectance of Coals from the Heath Formation, Central Montana

The Heath Formation (Mississippian) in central Montana is a black calcareous shale containing low to moderate amounts of oil (Fischer assay) and is considered a petroleum source rock for the overlying Tyler Sandstone.

Seven core holes were drilled in the summer of 1982 by the Montana Bureau of Mines and Geology in cooperation with the Mineral Management Service. Thin coal seams from the core samples were studied using vitrinite reflectance analysis. Since vitrinite reflectance is a method of determining thermal maturation of organic material in sediments (in this case, a thin coal seam near the base of the Heath Formation), it was possible to construct an iso-reflectance map of the Heath Shale in this area, and estimate the minimum temperature of heating undergone by the organic constituents.

Reflectance values show a regional trend caused by burial and the geothermal gradient. Little variation is present in these reflectance values (0.49% to 0.55%). The lowest reflectance values are in the central portion of the study area, and increase to the east and west. However, substantially higher vitrinite reflectances were recorded in the far eastern portion of the area. These high reflectances probably are the result of heating by an igneous intrusion, which was cored during drilling.

The sediments heated by the normal geothermal gradient have immature vitrinite which is below the limits of the petroleum generation window. In the small area where the intrusive was discovered, the vitrinite is mature and there is a good possibility of oil generation.

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Influence of Transcontinental Arch on Cretaceous Listric-Normal Faulting, West Flank, Denver Basin

Seismic studies along the west flank of the Denver basin near Boulder and Greeley, Colorado illustrate the interrelationship between shallow listric-normal faulting in the Cretaceous and deeper basement-controlled faulting. Deeper fault systems, primarily associated with the Transcontinental arch, control the styles and causative mechanisms of listric-normal faulting that developed in the Cretaceous. Three major stratigraphic lev-