A 200-km Right-Hand Offset in the Cratonic Margin at the Crowsnest Pass Cross-Strike Discontinuity: Tectonic Heredity with Late, Middle and Early Proterozoic Antecedents

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The structural style and orientation of the Rocky Mountain foreland thrust and fold belt changes conspicuously at a cross-strike discontinuity near Crowsnest Pass, in SE British Columbia and SW Alberta. This discontinuity coincides with a conspicuous re-entrant in the fold and thrust belt, separating the Southern Canadian Rocky Mountains structural salient of the fold and thrust belt, which stretches northwestward, in an 800 km long arc, from the Crowsnest Pass re-entrant to the Peace River re-entrant, in northeastern British Columbia, from the northern Montana structural salient, which extends 450 km southeastward into central Montana.

Two important northwest-dipping, transverse faults occur within this zone of profound change in stratigraphy and in structural trend and style in the foreland thrust and fold belt. The transverse, northeast-trending segments of both the Moyie-Dibble Creek (MDC) fault and the St. Mary fault-Lussier River (SMLR) fault are right-lateral reverse faults of Early Cretaceous and/or Late Jurassic age. Both change northeastward, in the western Canadian Rockies, into north-trending thrust faults, and both also change southwestward, in the western Purcell Mountains, into northwest-trending thrust faults. Contrasting stratigraphic successions on either side of both faults indicate that the northeast-trending segments are controlled by older (early Paleozoic, Late Proterozoic, and Middle Proterozoic) structures. In the case of the northeast-trending segment of the MDC fault, the antecedent structure had the opposite stratigraphic separation (downthrown to the northwest) with more than 7 km of structural relief beneath the sub-Fairholme unconformity. In the case of the northeast-trending segment of the SMLR fault, the eastern part of the antecedent structure had the same sense of stratigraphic separation (downthrown to the southeast) during Early Paleozoic time as it has now; but the western part had the opposite stratigraphic separation (downthrown about 10 km to the northwest) during Late Proterozoic time. Middle Proterozoic rocks of the Purcell (Belt) Supergroup also show conspicuous facies and thickness changes that appear to be controlled by these transverse faults. The transverse structures are aligned with conspicuous northeast-trending magnetic and Bouguer gravity anomalies in the Precambrian basement rocks of the Interior Plains of southern Alberta that mark the locus of Archean (or Early Proterozoic?) structures in the basement of the Western Canada Sedimentary basin. Evidently reactivation of these Archean (or Early Proterozoic?) basement structures gave rise to transverse faults that controlled the margins of the Middle Proterozoic Belt-Purcell sedimentary basin, the Late Proterozoic Windermere basin, and the Early Paleozoic continental margin of North America. In the latter case a 200 km right-hand offset formed in the boundary between the Cordilleran miogeoclone and the North American craton.

The contrasts across the MDC fault between the thin condensed Middle Cambrian platformal succession that occurs southeast of the fault and is characteristic of "Montania", and the thick Cambro-Ordovician miogeoclinal succession that occurs northwest of the fault, together with the lateral facies and thickness changes in the thick succession, show that most of the sub-Fairholme stratigraphic relief developed during the Cambrian and Ordovician. However, the sub-Fairholme