PBS-SEPM Technical Luncheon

01/18/2022, 11:30 AM, Museum of the Southwest
Blakemore Planetarium

$25 Early Bird Rate, $30 Walk-In, $10 BYOL/Student, $5 Virtual

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"Themes in Western Canada Foreland Basin Stratigraphy"

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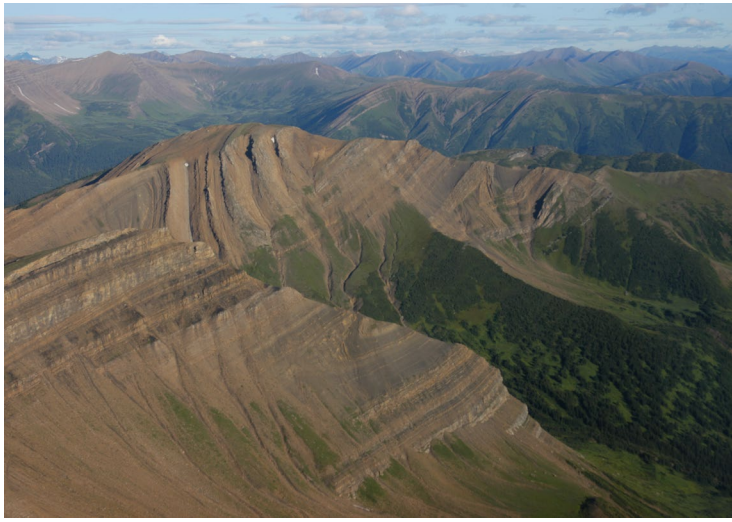
ABSTRACT: Thirty-five years of subsurface and field investigation of mid-Cretaceous strata in the Western Canada Foreland Basin have revealed a number of recurring stratigraphic and sedimentological features that reflect large-scale, allogenic controls on basin subsidence and filling. Before the late 1980's, coarse-grained tongues extending into the foredeep were interpreted to correspond to phases of active uplift in the adjacent fold and thrust belt, whereas mudrocks represented tectonic quiescence and lower relief. Numerical models, such as Flemings and Jordan (1989) inverted this thinking, showing that active tectonic loading resulted in rapid flexural subsidence, when coarse sediment was trapped at the proximal basin margin, and a thick wedge of mud accumulated across the basin centre. Only when the rate of loading, and subsidence, diminished, were sandy deltaic systems able to prograde far into the foredeep. The observed facies and stratal geometry in Western Canada strongly support this model prediction. Thick *wedges* of mudrock record rapid subsidence whereas thin *sheets* of sandstone and conglomerate record a low accommodation rate that allowed extensive coastal progradation. A still-popular model of Western Interior bathymetry (e.g. Kauffman, 1984) includes an 'axial basin' up to 500 m deep. Western Canada stratigraphy shows no evidence of an 'axial basin': The sea floor formed an extremely low-gradient, storm-influenced ramp no more than a few tens of meters deep. Flexural models of foredeep subsidence typically show a linear foredeep parallel to the orogenic belt. This picture may be true when viewed on a timescale of tens of myr. However, when stratigraphy is resolved on timescales of 1 myr or less, it is clear that subsidence occurs in arcuate 'moats' that reflect temporally and spatially localized loading along c. 200-300 km sectors of the orogen. Within each 'moat' stratal geometry shows an upward change from short blunt wedges to thin sheets. This pattern is interpreted to reflect an initially rapid, then diminishing subsidence rate linked to initally rapid thickening of the adjacent fold and thrust belt, followed by slow erosional degradation. Orogen-proximal areas of the foredeep are typified by aggradational muddy floodplain and fine-sand dominated anastomosed river systems, punctuated, on a 10^5 yr timescale, by paleovalleys filled with medium sand to conglomerate. The recurrence interval, length, and coarser-grained fill of valleys cannot be explained solely by sea-level changes. Changes in rainfall over the Cordillera, paced by Milankovitch-scale climate cycles, offer a more reasonable explanation for valley incision and filling, and advance and retreat of the gravel front in rivers.



BIOGRAPHY: *Guy Plint received a BSc from the University of Reading in 1977 and a DPhil from the University of Oxford in 1981. Postdoctoral fellowships at the University of New Brunswick (1981-84) and McMaster University (1984-86) were followed by appointment to the faculty of the University of Western Ontario (1986-present). He has conducted 37 field seasons in Western Canada, supervised 33 graduate theses, and published over 90 papers on the Cretaceous rocks of the Western Canada Foreland Basin.*