

**AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003**

Murray Gingras¹, Michael J. Ranger², Mark Caplan³ (1) University of New Brunswick, Fredericton, NB
(2) Geological Consultant, Chestermere, AB (3) Shell Canada Ltd, Calgary, AB

The Incised Valley Fill of the McMurray Formation, Northeastern Alberta, Comprises Estuarine and Deltaic Deposits

The McMurray Formation has traditionally been interpreted as a complex arrangement of estuarine facies preserved within an incised valley. This is supported by the valley-form of the sub-Cretaceous unconformity, brackish ichnofossil assemblages, and rhythmic tidal deposits. However, the depositional geometry of two key facies associations (FA1 and FA2) is inconsistent with the interpretation that McMurray strata accumulated solely in an estuary.

FA1 consists of cross-stratified, rhythmically-grain-striped sand; it shows local flow reversals, and contains rare *Skolithos*, *Cylindrichnus*, and *Conichnus*. FA1 is commonly identified as fluvial due to overall low degrees of bioturbation. A more parsimonious interpretation suggests sediments were deposited in basinward, marginal marine locales.

Rhythmically inclined sand/mud beds representative of inclined heterolithic stratification comprise FA2. Sedimentary features include: sedimentary couplets, partial tidal bundles, local flow reversals, flaser through lenticular bedding, and locally high degrees of bioturbation. Common ichnofossils are *Gyrolithes*, *Cylindrichnus*, *Skolithos*, *Arenicolites*, and *Planolites*. FA2 is interpreted as sediment accumulation in brackish-water channels. The sedimentary features of FA2 suggest deposition in more landward portions of the system, intermediate between FA1 and fluvial channels.

FA2 normally overlies FA1 above an erosional or abrupt contact. The common association of FA2 over FA1 implies the two assemblages represent a progradational succession, not genetically distinct sedimentary units. The architectural arrangement between FA1 and FA2 is demonstrated by linking them as depositional elements of an estuary in which the internal fill prograded basinward, thus possessing some of the sedimentary and stratigraphic characteristics of tide-dominated deltas. In this framework, FA1 represents an outer estuarine/deltaic tidal sand complex, and FA2 estuarine distributary channels.