Subsurface geology, paleontology and thermal maturity of Hunt *et al.* Port au Port #1 and Long Point M16, and their bearing on the structural history of the Port au Port Peninsula

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With recent hydrocarbon exploration in western Newfoundland, significant data have emerged shedding new light on the region. In the last decade, a number of geophysical and structural studies have indicated widespread thrusting and triangle zones and the probability that all of the Early Paleozoic rocks of the region are actually allochthonous. A number of these structures have good potential for hydrocarbon traps. These observations were complemented by the results from several exploration wells drilled over the past four years. During this recent round of investigation, we have been involved with drilling projects by Hunt, PanCanadian, Mobil, Delpet and LMX Resources; of these, confidentiality restrictions have now been lifted for Hunt–PanCanadian Port au Port #1 and Hunt–PanCanadian–Mobil Long Point M16 wells.

Port au Port #1 and Long Point M16 were drilled to test radically different subsurface geology and structure. Models suggested that Port au Port #1 would pass through Paleozoic platform carbonates and into the Long Range Complex, before re-entering the Paleozoic in the footwall of the Round Head Thrust. Long Point M16, on the other hand, was expected to pass through a thick package of deep marine sediments of the Humber Arm Allochthon before passing into "autochthonous" platform carbonates below. Play models envisaged reservoir development related to karstification and dolomitization of early Ordovician carbonates, with early Ordovician black shales of the Humber Arm Allochthon as the most likely source.

Our work provided data on three different aspects: (1) age and confirmation of stratigraphic succession in the wells, (2) estimates of thermal maturity and correlation with surface surveys, and (3) modelling of thermal and burial histories and constraints on age of structural deformation. Paleontology proved to be a key to the identification of a number of stratigraphic levels in lithologically similar carbonates and clastics, recognition of major structures, and guidance on source rock maturation and burial history; this demonstrates the need for continued use of biostratigraphy and thermal maturity studies during hydrocarbon exploration in the complex terranes of the Canadian Appalachians.