New Evidence for Distinction Among Laurentian Fragments and Avalonian and non-Avalonian Terranes in the Northern Appalachian Orogen[1]

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More than a decade of stimulating controversy has followed from the proposal (Barr and Raeside, 1989; Barr and White, 1989) that the classical Avalon zone in the northern Appalachian orogen contains terranes that are distinct from the Avalon terrane *sensu stricto*. The disagreements have focused mainly on (i) whether Grenvillian basement rocks of the Blair River inlier in Cape Breton Island are part of the Laurentian Grenville Province, and (ii) the relationship between Late Neoproterozoic elements within the "Central Mobile belt" and the Avalon terrane.

We present a more detailed interpretation of terranes in Atlantic Canada that incorporates recent new field, petrochemical, and chronological data from southern New Brunswick and northern Cape Breton Island. These new data enable us to extend the detailed terrane correlations made previously between Newfoundland and Cape Breton Island (Barr *et al.,* 1998) through southern New Brunswick (Fig. 1). The interpretation is compatible with some recent models (e.g., Van Staal *et al.,* 1998) but differs significantly from other recently published interpretations (e.g., Hall *et al.,* 1998; Williams *et al.,* 1999).

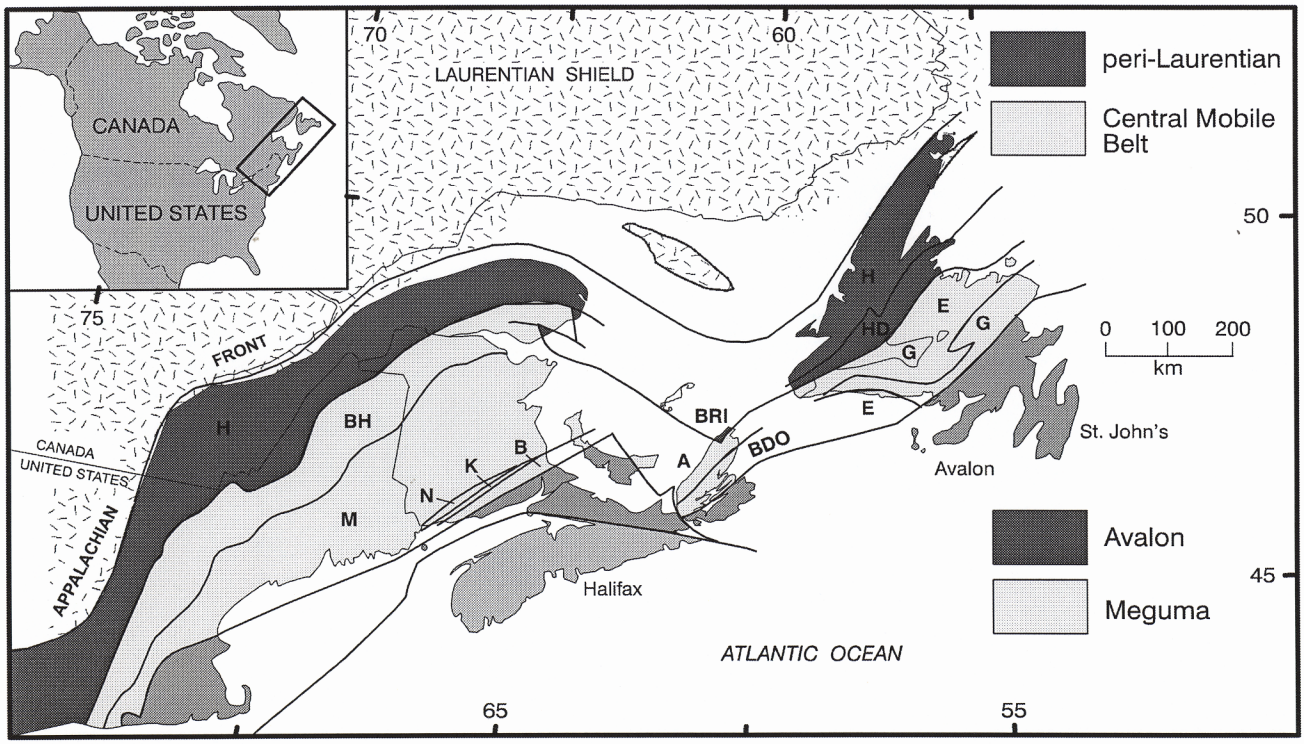

Figure 1. Simplified map of the northern Appalachian orogen showing crustal blocks and terranes (A, Aspy; B, Brookville; BDO, Bras d'Or; BH, Bronson Hill; BRI, Blair River inlier; E, Exploits; G, Gander; H, Humber; K, Kingston; M, Miramichi; N, New River; ND, Notre Dame).

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Petrochemical, geochronologic, and isotopic data have without exception supported a Laurentian Grenvillian affinity for the Blair River inlier in northern Cape Breton Island (Fig. 1). Like the Humber zone of western Newfoundland, the inlier was affected by Silurian plutonism and amphibolite facies metamorphism. New U-Pb data from meta-gabbro dykes in the Blair River inlier indicate Late Neoproterozoic igneous crystallization ages like those of the Long Range dykes in western Newfoundland, interpreted to reflect rifting during the birth of the Iapetus Ocean. The new data further support correlation between the Blair River inlier and similar basement inliers in western Newfoundland.

Inconsistent interpretations continue to be presented for components of the "Central Mobile belt" (Fig. 1), in part because the complexity of geological components is still being unravelled. Isotopic data show that Neoproterozoic rocks of the "Central Mobile belt" in the Bras d'Or, Brookville, and New River terranes in Cape Breton Island and New Brunswick are distinct from those of the Avalon terrane *sensu stricto.* These rocks are interpreted to represent peri-Gondwanan terranes that form the basement for Lower Paleozoic rocks of the Gander and Exploits terranes of the Central Mobile belt. Similar Neoproterozoic "basement" rocks exposed in southern and central Newfoundland have been inaccurately included in "Avalon". The presence within the Central Mobile belt of Silurian arc-type volcanic-plutonic belts such as the Kingston terrane in southern New Brunswick (Barr *et al.,* 1999; Fyffe *et al.,* 1999) and the Belle Cote Road orthogneiss in Cape Breton Island (Price *et al.,* 1999) indicates that some of these elements represent separate peri-Gondwanan terranes subsequently amalgamated by subduction-collision events and modified by transcurrent movements. They are located inboard of the Avalon terrane *sensu stricto.*

In contrast, the Meguma terrane (Fig. 1) is located outboard of the Avalon terrane, but may also have been the site of Silurian subduction and subsequent terrane amalgamation (Acadian orogeny). It seems clear that Iapetus was not the only ocean that closed during the Paleozoic tectonic evolution of Atlantic Canada.

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Biographical Note

Robert Raeside graduated from the University of Calgary in 1982 with a Ph.D. in metamorphic and structural geology. He has been teaching in the Department of Geology at Acadia University since 1982, and has been department head since 1995.