
**Tectonic architecture of an arc-arc collision zone,
Newfoundland Appalachians**

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The Appalachian-Caledonian orogen records a complex history of the closure of the Cambro-Ordovician Iapetus Ocean. The Dunnage Zone of Newfoundland preserves evidence of an Ordovician arc-arc collision between the Red Indian Lake Arc, which forms part of the peri-Laurentian Annieopsquotch accretionary tract (ca. 480–460 Ma), and the peri-Gondwanan Victoria Arc (ca. 473–453 Ma). Despite the similarity in age, the coeval arc systems can be differentiated on the basis of the contrasts that are apparent across the Red Indian Line suture zone. These contrasts include structural and tectonic history, stratigraphy, basement characteristics, radiogenic lead in mineral deposits and fauna. The arc-arc collision is considered in terms of modern analogues (Molucca and Solomon seas) in the southwest Pacific and the timing is constrained by stratigraphic relations in the two arc systems. The Victoria Arc occupied a lower-plate setting during the collision and underwent subsidence during the collision, similar to the Australian active margin and Halmahera arcs in the southwest Pacific. The timing of the subsidence is constrained by three new ages of volcanic rocks in the Victoria Arc (457 ± 2 ; 456.8 ± 3.1 ; 457 ± 3.6 Ma) which immediately predate or are coeval with deposition of the Caradoc black shale. In contrast the Red Indian Lake Arc contains a sub-Silurian unconformity and distinct lack of Caradoc black shale suggesting uplift during the collision. The emergent peri-Laurentian terranes provided detritus into the newly created basin above the Victoria Arc. The evidence of this basin is preserved in the Badger Group, which stratigraphically overlies the peri-Gondwanan Victoria Arc but incorporated peri-Laurentian detritus. Thus the Badger Group forms a successor basin(s) over the Red Indian Line. Following the collision, subduction stepped back into an outboard basin, the Exploits-Tetagouche backarc, closing the Iapetus Ocean along the Dog Bay Line in the Silurian. Correlative tracts in the Northern Appalachians and British Caledonides support the Ordovician arc-arc collision; however, the evidence is less obvious than in Newfoundland.