

# PROLOGUE

Geoscience Canada intends to publish summaries of forthcoming field trip guides that are national or international in scope. Authors may wish to submit summaries of these guides in order to 'advertise' their trip to the broad geoscience community. They are strongly advised to do so well in advance of the field trip. In particular, we welcome summaries from field trips that accompany forthcoming GAC–MAC annual meetings, or divisional meetings. Here, we publish summaries from three of the field trips to be held in conjunction with the GAC–MAC 2012 annual meeting to be held in St. John's May 27<sup>th</sup>–29<sup>th</sup>.

## GAC–MAC 2012: FIELD GUIDE SUMMARY

### Peri-Gondwanan Arc-back-arc Complex and Badger Retroarc Foreland Basin: Development of the Exploits Orocline of Central Newfoundland

GAC–MAC 2012, St. John's post-meeting field trip

Brian H. O'Brien

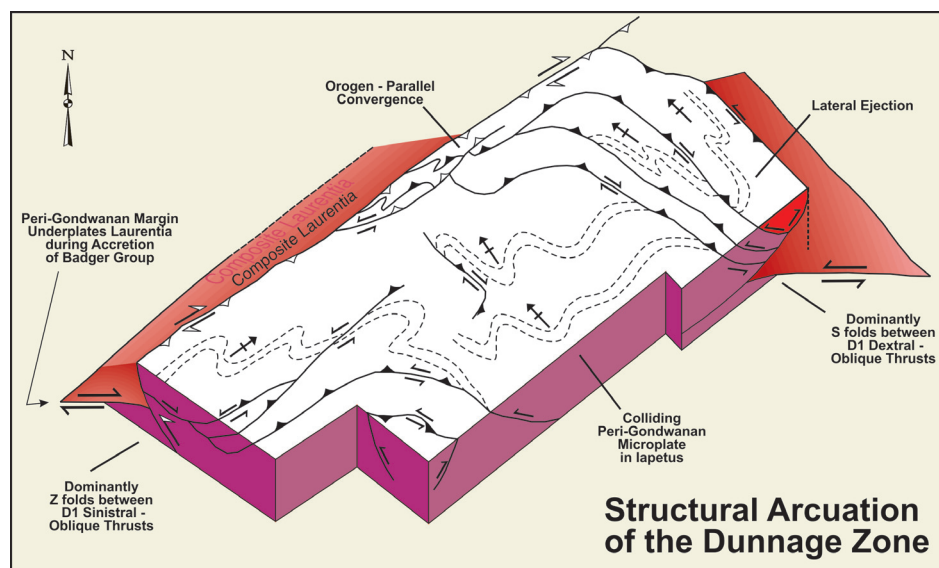
*Department of Natural Resources  
Geological Survey*

*St. John's, NL Canada A1B 4J6*

*E-mail: [brianobrien@gov.nl.ca](mailto:brianobrien@gov.nl.ca)*

#### FIELD TRIP OBJECTIVES

The main objective of this field trip to north-central Notre Dame Bay is to investigate the Ordovician evolution of the Iapetan island arc and back-arc rocks located within the type area of the Exploits Subzone of the Dunnage Zone. The approach will be to highlight the main depositional and magmatic events recorded in the Early and Middle Ordovician parts of the Exploits Group, the eastern Wild Bight Group and contemporaneous igneous complexes. The field stops are arranged in an effort to track the pre-tectonic geological history of the Early



**Structural Arcuation of the Dunnage Zone**

Model to explain the structural arcuation of the Newfoundland Dunnage Zone in the Mid Paleozoic. During the orogenic accretion and regional metamorphism of the Late Ordovician–Early Silurian Badger Group, composite Laurentia was underplated by a peri-Gondwanan microplate. Subsequent tectonic wedging was antivergent and resulted in the overthrusting of the peri-Gondwanan rocks along with their terrestrial cover. This was facilitated by a switch from sinistral to dextral movement during orogen-parallel convergence.

Ordovician volcanic and plutonic rocks that comprise the oldest peri-Gondwanan ensimatic arc, and to demonstrate their tectonostratigraphic linkage to a younger Middle Ordovician arc and a Late Ordovician overstep sequence.

Participants will also have an

opportunity to study some of the Middle Ordovician strata outcropping within the Red Indian Line mélangé belt at the margin of the peri-Laurentian Notre Dame Subzone and to compare or contrast them with coeval rocks in the peri-Gondwanan extensional arc and back arc sequence. The

various stratigraphical and structural relationships that Late Ordovician strata display with the above-mentioned rocks will be examined immediately south of the Red Indian Line near the margins of a mudstone-rich basin in the olistostrome-bearing Badger Group.

In the field trip area, the Notre Dame Bay oroclinal flexure is outlined by greenschist facies stratified rocks that illustrate evidence of inhomogeneous regional ductile deformation. As the oroflex evolved, the early formed tectonites were locally overprinted by secondary transpressional structures as regional metamorphism continued. The presumed Silurian structural history will be addressed, in part, by examining the development of folds, foliations and oblique faults in (a) the southern margin of the Red Indian Line mylonite zone and (b) an arcuate slate belt that controls disposition of the rocks of the Exploits Subzone and its overstep sequence in this part of central Notre Dame Bay.

### SUMMARY OF FIELD TRIP STOPS

For all stops on this field trip, the guide book systematically lists 1) geographic access, 2) large-scale stratigraphic and structural position, 3) pertinent features in the exposure examined, and 4) regional tectonic significance.

### LIST OF STOPS FOR THE AFTERNOON OF DAY ONE:

**Stop 1-1:** Early Tremadocian peri-Gondwanan primitive oceanic-arc sequence disposed in a tectonic horse (sericitic alteration zones in metabasite schist of the Glovers Harbour Formation of the Wild Bight Group)

**Stop 1-2:** Early Tremadocian tonalite within the infrastructure of the oldest peri-Gondwanan magmatic arc (syntectonic intrusion in ductile shear zones confined to the South Lake Igneous Complex arc ophiolite)

**Stop 1-3:** Tonalite-bearing pebbly wacke sourced from Exploits Subzone rocks near the southwest margin of the Point Leamington basin (Badger Group channel-fill deposits above a scoured earliest Katian – latest Sand-

bian substrate)

**Stop 1-4:** Concretionary shaley flysch in the distal part of the Point Leamington basin (graptolite-bearing abyssal mudstone and siltstone turbidite of uppermost Katian age in the Point Leamington Formation of the Badger Group)

**Stop 1-5:** Multiple mudstone-rich olistostromes within an unbroken formation of siltstone turbidite (intraclasts and extraclasts within slump sheets of latest Katian age in the centre of Point Leamington basin)

### LIST OF STOPS FOR DAY 2:

**Stop 2-1:** The Tea Arm–Saunders Cove transition from hematized boninitic andesite to jasperite and replacement chert in the lower Exploits Group (compacted, silicified and slumped blocks of cupriferous pillow lava in a size-graded carbonate-bearing breccia)

**Stop 2-2:** Chert–mudstone–turbidite transition in a condensed overstep sequence of the graptolite-bearing Upper Ordovician Shoal Arm Formation (southwest-directed structures in part of a triangle zone below overthrust sheets of the Exploits and Wild Bight groups)

**Stop 2-3:** Pillow breccia of island arc tholeiite composition within the Phillips Head volcanoplutonic complex (thrust-bounded inlier of the Wild Bight Group extensional arc sequence within the New Bay Formation of the Exploits Group?)

**Stop 2-4:** Mudstone-rich olistostromal sequence within the early Middle Ordovician Saltwater Pond Member of the upper New Bay Formation of the Exploits Group (detrital megaraft of arc-derived pillow lavas associated with re-sedimented beds of plutonic boulder conglomerate)

**Stop 2-5:** Volcaniclastic turbidites, pyroclastic flows and gabbro sills of the Charles Brook Member of the lower New Bay Formation (northeastern subbasin of the Lower–Middle Ordovician Exploits Group near the

refolded slates of the Sunday Island Syncline)

**Stop 2-6:** Strong Island radiolarian chert and Lawrence Head within-plate basalt of the uppermost Exploits Group (late Middle Ordovician infill of the Exploits back arc basin in the north-central Exploits Subzone)

### LIST OF STOPS FOR THE MORNING OF DAY 3:

**Stop 3-1:** Primary depositional features and block-within-block hierarchy in the Boones Point Complex (giant olistolith of slump-folded sandstone turbidite and re-amalgamated granite-bearing conglomerate set in the black shale matrix of the *mélange*)

**Stop 3-2:** Altered tectonic sliver of Notre Dame Subzone mid-ocean ridge basalt within folded turbidites of the Middle Ordovician Moores Cove Formation (bivergent faulting and lithostratigraphic separation in the Cottrells Cove Group within the Red Indian Line imbricate thrust belt)

**Stop 3-3:** Polydeformed block-in-matrix *mélange* and scaly-foliated pebbly mudstone near the Red Indian Line (strongly cleaved turbidites from the Notre Dame Subzone thrust southwestward above a Boones Point *mélange* tract marked by large exotic blocks)

**Stop 3-4:** Boundary between the Moores Cove and Fortune Harbour formations on the southwesterly-overturned limb of the Cottrells Cove Syncline (large displacement or non-deposition at the contact between Tremadocian island arc lavas and Darriwilian abyssal plain turbidites?)