CPTG Medal Lecture Tour:

SEMINAR

DEPARTMENT OF EARTH SCIENCES

DALHOUSIE UNIVERSITY

Dr. JoAnne Nelson
British Columbia Geological Survey, Emeritus
2017 Provincial and Territorial Geologists Medalist

"Caledonia in the Cordillera:
How Terminal Orogenesis in the Northern Caledonides led to Initiation of Active Tectonics on the Western Margin of Laurentia"

Tuesday, April 10, 2018

11:30 a.m.

Milligan Room, 8th Floor Biology-Earth Sciences Wing,
Life Sciences Centre, Dalhousie University

COFFEE AND DOUGHNUTS WILL BE AVAILABLE IN THE MILLIGAN ROOM BEFORE THE SEMINAR

CPTG stands for " Committee of Provincial and Territorial Geologists".

JoAnne Nelson was awarded the 2017 Provincial and Territorial Geologists Medal by the Committee of Provincial and Territorial Geologists (CPTG). The Medal is presented annually to an individual who has produced outstanding work at one of Canada's provincial or territorial geological surveys. The award recognizes major contributions in the areas of geoscience research and related developments or applications that serve to meet the mandates of Canada's geological surveys. JoAnne received her medal at the Energy and Mines Ministers Conference in St. John New Brunswick from the Federal Minister of Natural Resources Jim Carr and the New Brunswick Minister of Energy and Resource Development Rick Doucet (Fig. 3). The citation from JoAnne's nomination states:

"JoAnne Nelson is an exceptional scientist, mentor, and teacher who synthesizes research at many scales. This has led to a career of innovative and insightful studies on the tectonics and metallogeny of the northern Cordillera, as related through more than 125 publications that include geological maps, bulletins, and peer-reviewed papers. In 1986, JoAnne joined the British Columbia Geological Survey where she undertook bedrock mapping and the study of mineral deposits in the northwestern part of the Province. In addition to her many scientific contributions maps, she is the co-author of a book aimed at the general public titled "The Geology of British Columbia: A Journey through Time".

JoAnne is embarking on a cross-country lecture tour in the New Year to tell her remarkable stories of mapping in the Canadian Cordillera.

The link to these explanations
is http://www.empr.gov.bc.ca/Mining/Geoscience/PublicationsCatalogue/Fieldwork/Documents/2017/01Hickin_et_al.pdf and it can be posted on the website.

Caledonia in the Cordillera: How Terminal Orogenesis in the Northern Caledonides led to Initiation of Active Tectonics on the Western Margin of Laurentia

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BC Geological Survey, emeritus
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The initial search for "homelands" of Cordilleran suspect terranes focused mainly on the far side of the Pacific ocean. Current plate motions in the Pacific basin lend themselves to this concept, and the identification of Permian faunas of Tethyan, western Pacific affinity in accreted seamounts of the Cache Creek terrane confirmed its viability. However, over the last decade a new focus on the eastern Arctic basin, primarily the Scandinavian and Barentsian Caledonides, has greatly enhanced our understanding of Cordilleran terrane origins and also the Late Devonian onset of active tectonics on the western Laurentian margin.

The Canadian-Alaskan Cordillera comprises two main parts: an inner belt of peri-Laurentian terranes that were partly derived from and interacted with the western continent margin, and an outer belt of terranes that resided in the eastern Arctic region between Rodinia breakup and Silurian time, after which their histories diverged, some crossing the Arctic region (Chukotka), others entering the northern Pacific basin where they remained until Mesozoic accretion to the Cordilleran margin (Alexander, Wrangellia).

The Alexander terrane is a showcase of northern Caledonian affinity. It is a large, composite crustal fragment that extends from coastal NW BC to the St. Elias Mountains on the Yukon-Alaska border. The southern Alexander terrane is a primitive Neoproterozoic and Ordovician-Silurian arc complex, whereas the northern (St. Elias) part is pericratonic. Detrital zircon spectra in the pericratonic portion and Silurian sponges in the arc complex show Baltican affinities. The southern arc and northern pericratonic fragment did not interact until latest Silurian to Lower Devonian time, when clastic overlap strata of the Karheen and Mathiesen Channel formations incorporated mixed detrital populations derived both from the arc complex and Precambrian sources. These units bear strong similarities to Old Red sandstones of the Caledonides. The Karheen Formation of southeast Alaska was deposited in mixed fluvial and lacustrine environments, typified by fine, varve-like alternations of sandstone and carbonate. The Mathieson Channel Formation of NW BC unconfomably overlies Ordovician arc-related volcanic rocks of the Moira Sound unit. It consists mostly of reddish sandstone and sandstone-carbonate successions with local round-cobble conglomerate and a unique quartzite-clast breccia-conglomerate at Jorkins Point. Tochilin et al (2014) separated a clastic unit of pericratonic affinity, the Banks Island assemblage, based on the presence of significant Precambrian detrital zircon populations in more westerly samples. However, sands with only Ordovician-Silurian grains occur in close proximity to those with Precambrian grains, within the same mapped units. The Jorkins Point conglomerate passes within a hundred meters into finer, more mature, heterolithic conglomerate containing a dominant Ordovician peak and few Precambrian grains. It could represent a local uplift along a strike-slip fault that juxtaposed the arc and the pericratonic fragment. The suggested strike-slip setting is similar to the sinistral pull-apart setting of

Appalachian and Caledonian ORS basins. Large-scale sinistral motion on this and related faults could have been the mechanism to transport the Banks Island pericratonic source outboard of the southern primitive arc facies.

The microcosm of Late Silurian-Early Devonian strike-slip tectonics in the Alexander terrane mirrors large-scale westerly transport of peri-Caledonian terranes in the Arctic region: it is coeval with sinistral-transpressional emplacement of Pearya on the Franklinian margin and juxtaposition of Chukotka, the Doonerak arc, and the North Slope terrane. The stage was then set for entry of Caledonian fragments into the Pacific basin and their encounter with the western continent margin. Within the peri-Laurentian terranes of the Cordillera, pre-Late Devonian tectonism juxtaposed basement units of local origin with Ordovician-Silurian arc fragments and siliciclastic units with non-western Laurentian detrital zircon populations. From north to south (present positions) these include the southern prong of the Yukon-Tanana terrane, the southern Quesnel terrane, Chilliwack terrane, Eastern Klamath and Northern Sierran terranes. The Early Mississippian Antler orogeny of SW US is modelled as a further outcome of this continental-scale sinistral-transpressive regime. In the Late Devonian, an extensive west-facing magmatic arc was established across the outer continent margin and accreted Caledonian fragments, marking the transformation of the western Laurentian from a passive margin to an active, accretionary orogen. Thanks to the Caledonides for the kick start!