ASH FALL

Newsletter of the Volcanology and Igneous Petrology Division
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In this issue

A message from the VIP Chair

In this first year as Chair of the VIP Division, I am having a hard time filling the past-president's (David Lentz) shoes! Thanks in large part to the past executive 2021 saw the VIP Division maintain the momentum it has built over the past few years, despite the many COVID-19 related restrictions that have altered in many ways how we meet and disseminate our work and ideas.

Our VIP virtual seminar series this year resulted in 9 well-attended webinars. A special thanks is offered here for all those speakers who made the series possible, and of course to David Lentz for organizing. The VIP also sponsored a Special Session, **"Magmatic-hydrothermal systems through time"** at the hybrid "GAC-MAC London 2021 Joint Annual Meeting", which included 8 oral and 5 poster presentations. The AGS 47th Colloquium and Annual Meeting (2021) was held online in February and included several VIP-related talks in the "Developments in Mineral Resources Research in the Northern Appalachians" special session - including many contributions by our members. At the upcoming GAC-MAC in May the VIP Division will be very active, sponsoring 4 special sessions and 2 field trips!

VIP continues to welcome new and continuing members of GAC and VIP, as well as invite you all to contribute to future ASHFALL and GEOLOG newsletters. We are interested in all activities related to VIP and those that spread the word about this GAC Division. Remember you are invited you to the AGM that will occur in May 2022 as part of the GAC-MAC meeting. Hope to see you in Halifax!

Above: Landmannalaugar Iceland. Cover photo: View from Hekla, Iceland; courtesy M. DeWolfe.

GAC-VIP Virtual Seminar Series

The VIP virtual webinars continued this year. In 2021 nine speakers covered a variety of topics from PGM in magmatic sulphide deposits to granite-hosted deposits and volcanoes. Here is a list of speakers:

January 7, 2021, Dr. Louis Cabri
Reflections on mineralogy over nearly seven decades - anecdotes from the past - PGM and trace element analyses

January 20, 2021, Dr. Brendan Murphy
Appinite suites: small igneous complexes provide big clues into how continents are made

February 18, 2021, Nadia Mohammadi
Greisen-Related Sn-W-Mo-Mineralized Mount Douglas Granite, New Brunswick, Canada: An Analysis of Fertility Indicators

April 21, 2021, Dr. Dante Canil
The lithosphere-asthenosphere boundary: a view from xenoliths and alkaline lavas

May 13, 2021, Dr. Brendan Murphy
Appinite suites and their genetic relationship with coeval granitoid batholiths

May 27, 2021, Xue-Ming (Eric) Yang
Estimating crystallization pressure(s) of granites: Analysis of equilibrium, consideration of redox, textural aspects, emplacement processes with implications for metallogenesis

June 17, 2021, Amy Ryan
Insight into the Rheology and Outgassing Behavior of Bubbly Melts from Deformation Experiments

July 22, 2021, Wyatt Bain
Evidence for Carbonate-Sulfate Melts as a Key Factor in the Formation Iron Oxide-Apatite (IOA) Systems

August 26, 2021, Marie-Claude Williamson
In-depth Volcanology: Evidence for Late Cretaceous Explosive Volcanism at the Alpha Ridge, Arctic Ocean

Seminars available at http://www.youtube.com/channel/UCErZFfwdDwz86qy_gwzKUiA or the GAC-VIP Division Website (http://www.vip-gac.ca/Webinars.html).
Thanks again to all of our speakers!

Career Achievement Award

The Volcanology and Igneous Petrology Division of the Geological Association of Canada in recognition of career achievements in the field of volcanology and/or igneous petrology present the Career Achievement Award. Candidates are judged on their lifetime scientific contributions.

Dr. Brendan Murphy for his lifetime scientific contribution to the fields of Volcanology and Igneous Petrology

Nomination Letter

This letter enthusiastically nominates Dr. Brendan Murphy for the prestigious Volcanology and Igneous Petrology (VIP) Career Achievement Award for 2021. His impressive career spans 40 years and has yielded hundreds of refereed publications, numerous Canadian and international awards, and millions of dollars in research grants. His knowledge and expertise have been transmitted to thousands of students in dozens of mineralogy and petrology course deliveries and the writing of two text books. His many editorships/associate editorships/guest editorships, memberships on dozens of national and international scholarly organizations, and hundreds of reviews for journals, books and grant committees demonstrate he is an international scientific ambassador for igneous petrology and Canadian geoscience.

Dr. Murphy's research has focused on relationships between tectonism and magma compositions, using them to unravel the evolution of mountain belts and reconstruct how the Earth and continents developed. His earliest refereed publications (~1985) dealt with Proterozoic and Cambrian volcanic rocks in Nova Scotia. Since then he published over 300 papers cited an astounding 12000+ times. Articles include his 1991 "Geology" publication (nearly 300 citations) that defined Interior and Peripheral Orogens and connected magmatism to the Supercontinent Cycle; and his 2006 article on the tectono-magmatic origin of the Rheic Ocean (> 300 citations). In the past decade he has authored numerous papers on relationships between subduction, water in magmas, the formation of appinites and granites, and the origin and evolution of continental crust. The observation that he is first-author on perhaps 1/3 of his publications demonstrates that graduate students have not been writing the papers for him. His two Geoscience Canada articles in the Volcanology and Igneous Petrology, Igneous Rock Associations Series may have more citations (total >75) than any other articles in the series. With an astounding h-index of 61, Murphy is a Canadian rock star whose impact on the Earth Sciences is difficult to rival.

Murphy's contributions to science have been acknowledged by the awarding of over 3 million dollars in research funding, numerous research awards/honors from international sources (e.g. Fulbright Scholar, Yale, USA; Hadyn Williams Fellowship, Curtin University, Australia; Geological Society of America Fellow; Gledden Senior Research Fellowship, U. Western Australia) and from Canadian organizations (Fellow, Royal Society of Canada; Gesner Distinguished Geoscientist Medal) as well as his employer (St. Francis Xavier (St. FX), W.F. James Chair, University Research Award and President's Research Award).

Dr. Murphy's research prowess led to service on prestigious international committees (e.g. International Geological Correlation Program; 7 committees some as "Leader" spanning 1992 to 2009), five NSERC committees (two as chair), the executive of the Atlantic Geoscience Society (President and various committee roles, 1983-2018), member of the Geological Association of Canada Council, Director of the Canadian Geoscience Foundation and duties on the Atlantic Provinces Council on the Sciences (Chair 4 years and on council 4 years). The service list goes on.

Journal editorships are perhaps even more impressive. Murphy has been, or is, an editor for four journals: Geology, Geological Society of America Bulletin, Geoscience Canada and Canadian Journal of Earth Sciences. He has been an associate Editor with these as well as the Geological Society of London, Zeitschrift für Geologische Wissenschaften, Geologica Saxonica, Global Tectonics and Metallogeny, and Revista de la Sociedad Geológica de España (RSGE). In addition he has been a Guest Editor/coeditor for 9 special issues in 7 different journals. There have been hundreds of reviews for journals, granting agencies, and awards committees.

Given all the above, it is not surprising that he has received many service awards including: Science Atlantic Service Award, Ambrose Medal (Geological Association of Canada), Geological Society of America Distinguished Service Award, St. FX Outreach Award, Atlantic Geoscience Society Service Award and Best Referee (Geoscience Frontiers).

The above accomplishments are more impressive considering that Murphy has taught 14 different geology courses with a total of 152 1-term course deliveries; a load of ~5 courses per year. He supervised over 90 theses, with 10 of them Ph.D. students and 23 M.Sc. In addition to all of his teaching, he spent nearly a decade as Chair of the St. FX Earth Sciences Department and five years on the Board of Governors during the post energy-crisis years when departments were imploding (or closed). It may be that St. FX University has an Earth Sciences Department today as a result of his herculean teaching, administrative, outreach and research efforts.

A survey of Murphy's Curriculum Vitae shows that his accomplishments are far more extensive than can be detailed in a letter. We summarize that he has had an exceptional career with extensive contributions to igneous petrology and igneous relationships to tectonism. We believe that his astounding accomplishments deserve to be recognized through awarding of the Geological Association of Canada, Volcanology and Igneous Petrology Division, Career Achievement Award.

John D. Greenough
Professor, University of British Columbia, Okanagan
Jaroslav Dostal
Professor Emeritus, St. Mary's University

Acceptance letter

I thank the Volcanology and Igneous Petrology Division of the GAC for this recognition. I am honoured (and a little embarrassed) to be added to a list of recipients that includes many of Canada's petrological icons. I thank my nominators, John Greenough and Jarda Dostal for their efforts and exaggerations!

I suppose a career award means that I have graduated from “young turk” to “old turkey” status. There are many that have guided (and maybe pushed and kicked) me along this random walk and so this honour really belongs to my mentors, friends, colleagues and students who guided me along this amble that began nearly 50 years ago. That random walk started as a first year student (1971) when I learned that geology labs at my university (University College, Dublin) were in the mornings, thereby allowing more time for indulging in my ability to back horse race winners! Having embarked on this truly random walk, fate took over. My love for petrology was seeded by the wonderful lectures of Padraig Kennan, who turned every class into a mystery tour. The combination of Padraig's lectures and a reasonable return for my “investments” got me through my undergraduate degree. Two friends urged me to go to graduate school, we selected Canada in a heartbeat, applied to Canadian universities in alphabetical order, and we all arrived at Acadia in October of 1975. Without realizing it, I had picked the place that suited me best. In my first year as a graduate student, my interest in igneous petrology was nurtured by Harold Nathan, whose lectures and labs were really exercises in mental gymnastics using petrology as catalyst. I am not sure whether my mind ever recovered.

Then Harold introduced me to Duncan Keppie. At the time, I had never heard of Yogi Berra, but that moment was a fork in the road. For all I knew, it could have been a spoon! Duncan provided career-long opportunities, guidance, mentorship, and friendship and introduced me to Andrew Hynes who must have seen something through his mental telescopic lens. He tried his best to instill some academic rigour. I was a slow learner! In the late 1970s, I met Damian Nance under a table in a bar (you had to be there!), and in the early 1980's Duncan introduced me to Jarda Dostal. Damian's influence nudged me towards tectonic implications of petrology and broadened my horizons, while Jarda nudged me from the crust into the mantle and patiently tutored me in the role of trace

elements in understanding magmatic systems. All have been profound and long-lasting influences on my career.

I have also been the beneficiary of the wonderful geoscience culture in Atlantic Canada. Other than the annual GAC-MAC, my two favourite conferences are the Atlantic Geoscience Society Colloquium (where the genuine interest in some of my bizarre presentations give me an annual injection of adrenalin) and the Atlantic Universities Geological Conference (where undergraduate students inspire us all with passionate presentations of their research). Our department at StFX also has a strong research culture. In my early days, I learned so much from the late Randy Cormier and for the past 30 years from the many tea/coffee/bevvy breaks with Alan Anderson (a real petrologist!), and latterly with Jamie Braid and Donnelly Archibald. Mike Melchin (a venerable paleontologist) is a long-suffering, but patient listener who could instantly recognize if we were going off the rails. Generations of undergraduate and graduate students have also been a major ongoing stimulus and inspiration. Among many things, they taught me that learning is a two-way street. I would not be receiving this, or any other award, without them. To see many of them have successful careers after graduation is something that gives me the greatest satisfaction as I begin to navigate through my dotage.

One of the few indulgences of finally graduating to "old turkey" status is being able to delude oneself that emerging scientists are grasping for advice. I have two themes. First, add an international dimension to your research. In the 1980s, Duncan and Damian convinced me to participate in UNESCO-IGCP projects, and that stimulation has seeded many research collaborations and firm friendships across the globe, including (to name a few) with Josep Casas, Bill Collins, David Evans, Gabi Gutièrrez-Alonso, Zheng-Xiang Li, Ross Mitchell, Sergei Pisarevsky, Cecilio Quesada, Chris Spencer, and Rob Strachan. If I have forgotten any names, apologies, it just proves that the aforementioned navigation has begun! Second, if opportunities arise to review or to edit manuscripts, take them. It is the best way to learn, not only the science, but what it takes to write good papers.

Two Canadian organizations have been instrumental in nurturing my career; the Geological Association of Canada through its annual meetings, field trips, publications, and many other activities, and NSERC, for continuously funding my curiosities since 1983. Having seen the hoops my international colleagues must jump through to obtain their funding, I am convinced we have the best granting system.

Finally, a career in research means a lot of time away from home, and a lot of inspiration from those with whom you most closely share your life. I thank my wife Cindy, and (now grown-up) kids Orla and Declan for their love and support. Without those pillars, you wouldn't have had to read any of the preceding paragraphs.

Brendan Murphy
St. Francis Xavier University

Upcoming 10th Hutton Symposium

The 10th Hutton Symposium (on Origin of Granites and Related Rocks) will be held in Baveno (near Milano, in Italy) in mid-September 2023 and will be co-chaired by Olivier Bachmann (ETH Zurich, Switzerland), Federico Farina (Milano, Italy), and Jeff Moyen (Saint-Etienne, France). The 9th Hutton symposium was held in Nanjing China at the Xianlin Campus of Nanjing University in mid-October 2019.

Check the website for further information on this fantastic 2019 meeting.
http://www.hutton9.com/index.aspx

There are two extensive journal Special Issues from this meeting that were recently published; these two comprehensive Special Issues are published in Lithos and Journal of Earth Science.
https://www.sciencedirect.com/journal/lithos/vol/402
https://link.springer.com/journal/12583/volumes-and-issues/32-6

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Field Work in Northern Nevada – Better Late than Never!

Getting field work done during the pandemic has not been easy, especially if the field work is outside of Canada. The Canadian government has recommended no travel outside of Canada since March 2020, and this recommendation was just lifted in early November 2021. Our research group has been investigating the igneous petrology and geochemistry of continental arc volcanism in northern Nevada, and Sabrina Chan is focusing on the Stone Cabin caldera, tuffs and lava flows located south of Ely, Nevada. The problem was getting there to meet with our colleague, Chris Henry (Nevada Bureau of Mines and Geology), to complete a geological map of the proposed caldera for this Eocene igneous event, and sample tuffs and lavas both in and outside the proposed caldera. For the first 13 months of Sabrina's MSc program, all that we had were a dozen rock samples from the area collected by Chris in 2015, and without further field work the thesis was in jeopardy.

Figure 1: Map of central Nevada showing location of the Stone Cabin Formation study area (black box). Map from https://gisgeography.com/nevada-map/.

Finally, Carleton University gave Sabrina and I permission to fly to Reno to do field work in the latter half of October, 2021. We were both pretty excited, and this was my first trip to Nevada in the fall season. Other than COVID tests, the flying was pretty easy, and getting to the field area was a routine drive along Highway 50 (The Loneliest Road in America) from Reno. The weather was very good, generally sunny with temperatures ranging from near-freezing in the early morning to low 20s C in the afternoons, with only one morning of snow flurries. Given the topography of the area that we were working in (elevations 1700-2500m), fall was way ahead of Ottawa and most of the trees had lost their leaves.

The Stone Cabin Formation, consisting largely of quartz-rich pyroclastic rocks, is a well-known unit in this part of Nevada (Best et al., 2013). However, the source of the pyroclastic flows was unknown until 2018, when the White River caldera was proposed to be the source of the Stone Cabin formation (P. Gans, unpublished field guide, 2018). Dating by Chris Henry has confirmed that White River intracaldera pyroclastic rocks are of the same age as the Stone Cabin outflow tuffs exposed in the Pancake Range to the west (Radke, 1992). The intracaldera tuffs and rhyolitic lava flows are only gently tilted, and the White Pine Range forms the spectacular western caldera wall. In the western caldera, drilling has indicated that the intracaldera tuffs are ~1000m thick. The intracaldera tuffs commonly exhibit thick columnar jointing. Many of the western caldera and all of the eastern caldera rocks are variably quartz-rich rhyolitic lava flows that have the same age as the Stone Cabin tuff (~35.8 Ma). Also found in the western caldera is a sequence of unwelded to poorly welded tuffs and reworked volcaniclastic rocks that, at the base, includes abundant large vitrophyre fragments and alternating pumice-rich and lithic-rich layers. This package of tuffs is overlain by a mafic to intermediate lava flow of unknown age.

Figure 2: Looking west over the western part of the White River caldera at the White Pine Mountains.

Figure 3: A creek cutting through densely welded intracaldera Stone Cabin tuff. Note the fall colours in the trees.

Figure 4: Outcrop of poorly welded tuff in the western part of the caldera. Note the large obsidian lithic fragments in this lower part of the tuff.

Figure 5: View of the more pumice-rich, lithic-poor, upper parts of the poorly welded tuff unit.

The outflow Stone Cabin formation tuffs are superbly exposed in the eastern Pancake Range (Radke, 1992) and to the west at Portuguese Mountain (Quinlivan et al., 1974). The formation consists of at least three units, commonly with poorly-welded bases grading upwards into more welded tuff. The tuffs sit on older rhyolite lava flows and, in the eastern Pancake Range, on a basaltic andesite flow, that we will attempt to date.

Figure 6: Looking west at the lower and middle units of the extracaldera Stone Cabin Tuff exposed in the eastern Pancake Range. White unit is poorly welded and grades up into moderately to densely welded tuff. The pyroclastic rocks dip gently west, as seen to the left of the hill. The low hills in the foreground are younger andesite flows.

Figure 7: View of the upper unit of the extracaldera Stone Cabin tuff in the Pancake Range. The basal poorly welded unit (white, foreground) includes reworked volcaniclastic layers. The basal tuff grades upwards into a devitrified, moderately welded tuff (buff coloured hill).

Figure 8: Close-up of a basal vitrophyre of intracaldera Stone Cabin tuff. The tuff includes quartz, feldspar, and biotite.

The return drive to Reno was during a huge rain and snow storm that blanketed much of central northern Nevada in snow, sent cars off the road, and deposited over a metre of snow in the eastern Sierra Nevada. Lucky that we had completed all of our work by then!
Armed with a preliminary geological map of the caldera and thorough sampling of the volcanic and intrusive units, Sabrina is now completing rock preparation for geochemistry and radiogenic isotope analyses. Once completed, her thesis will be a significant contribution to igneous petrology in this part of the western US.

Submitted by Dr. Brian Cousens and Sabrina Chan (Carleton University)

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For more information, see:
https://mypage.science.carleton.ca/~bcousens/2021_Stone_Cabin.html.

VIP sessions at the GAC-MAC 2021 Conference in London

A Special Session (SS-01) entitled **"Magmatic-hydrothermal systems through time"** was held at the hybrid "GAC-MAC London 2021 Joint Annual Meeting" on Wednesday November 3rd 2021 co-chaired by Lucie Mathieu (Université du Québec à Chicoutimi), Michel Jébrak (Université du Québec à Montréal), Nadia Mohammadi (Carleton University), Matthew Leybourne (Queen's University), and Bertrand Rottier (Université Laval).

A total of eight live presentations along with five posters were presented from 8:40 am to 14:40 pm. The session initiated with three presentations in the morning, including Lucie Mathieu, Taylor Wasuita (UQAC), and Zeinab Azadbakht (Ontario Geological Survey) and continued with a key-note presentation by Lucie Mathieu and Michel Jébrak on "Archean magmatism and gold deposits". The morning session finished with a talk presented by Douglas Kreiner (USGS).

The afternoon session initiated with a review of the five posters (Tatyana Mayorova, Patrik Berthoty, Esther Bou, Claude Lamy Morissette, Alexandre Crépon, and co-authors) and was followed by three additional talks by Nadia Mohammadi, Fazilat Yousefi (University of New Brunswick), Yanbo Cheng (Geological Survey of Norway) and co-authors.

The main focus of the session was on geochemical and petrological insights into ancient and modern magmatic-hydrothermal systems, and associated magmatic systems (e.g., petrogenesis, physical-chemical parameters).

The session was sponsored by the GAC Volcanology and Igneous Petrology Division (VIP) and the Minerals journal, an Open Access Journal by MDPI. The presenters can publish their work in the Joint Special Issue "Magmatic-Hydrothermal Systems through Time", with the invited co-editors Lucie Mathieu, Michel Jébrak, and Nadia Mohammadi, and with a 20% discount or a 200 CHF *discount* on article processing charge.

The 2021 fall field trip of the GAC Newfoundland and Labrador Section (GAC-NL) involved a daylong tour of the eastern Avalon Zone, led by Greg Sparkes and Andrea Mills of the Newfoundland and Labrador Geological Survey and Dr. Luke Beranek of Memorial University. The Avalon Zone consists of fault-bounded Neoproterozoic volcano-sedimentary belts that are covered by a Cambrian-Ordovician platformal sedimentary succession (van Staal and Barr, 2012; Landing et al., 2004). The field trip focused on the late Ediacaran arc environment and overlying siliciclastic cover rocks of the St. John's Peninsula, eastern Avalon Zone, Newfoundland. The east-central part of the Avalon Peninsula is underlain by the Holyrood Horst composed of late Neoproterozoic volcanic rocks of the Harbour Main Group and the Holyrood Intrusive Suite, both of which returned U-Pb zircon ages between 640 and 580 Ma (King, 1988a, 1990; O'Brien and O'Driscoll, 1996; O'Brien et al., 1997, 1998; Figure 1).

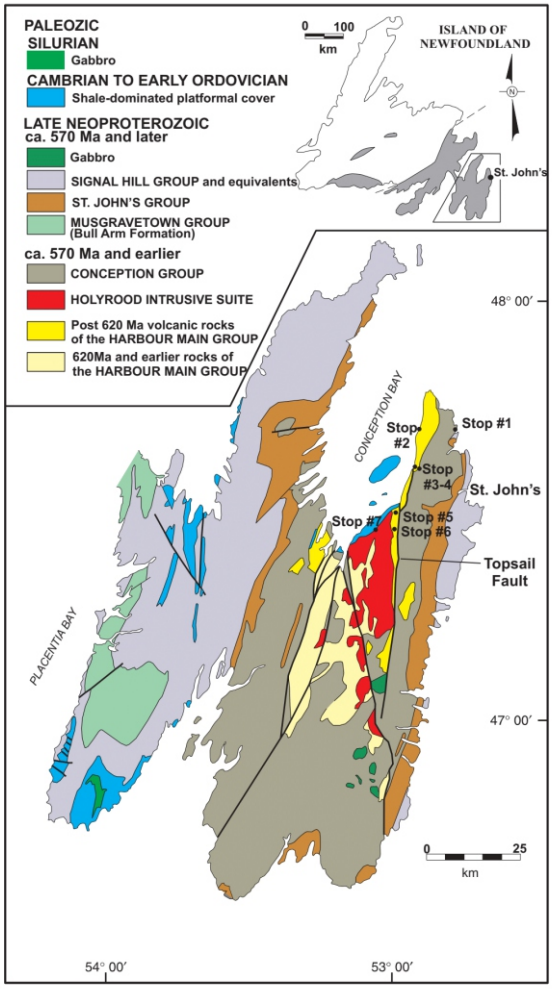

Figure 1: Simplified geology map of the Avalon Peninsula (modified from King, 1988; from O'Brien et al., 1996).

The Holyrood Horst is associated with several epithermal gold occurrences. It contains outliers of siliciclastic rocks and is flanked by younger marine, deltaic and fluviatile siliciclastic rocks of the Conception, St. John's and Signal Hill groups (King, 1988).

One of the stops (Stop #2) examined a complex bimodal dyke swarm, known as the Horse Cove Complex, intruded along a regional high-strain zone associated with the Topsail Fault. Exposures of the dyke swarm occur along the coastline in the community of Bauline (Figure 2 and 3). It includes several generations of dykes, ranging from mafic through to felsic in composition, hosted within submarine volcaniclastic, mafic volcanic, and plutonic rocks (Figure 3 and 4). Dykes in the area contain well-developed intrusive contacts displaying chilled margins and local flow-banding parallel to the contacts. Age dating of the dykes by Diane Skipton and Greg Dunning of Memorial University have bracketed the magmatism associated with their emplacement to a period of 6.5 Ma (or less) at ca. 580 Ma. The development of this dyke swarm is coeval with arc-related felsic and mafic volcanic rocks elsewhere on the northeastern Avalon, and represent potential feeders to this volcanism. The northeast-southwest striking, steeply westward dipping dyke swarm is locally overprinted by discrete, meter-scale shear zones, displaying dextral offset of dykes within the high-strain zone. These observations support the long-lived history of the Topsail Fault, which is inferred to have undergone multiple periods of reactivation.

Figure 2: Scenic view of the town of Bauline. Note the felsic, light weathering, dykes intruding the country rocks in the hills above the town. The high hills in the background represent the Herring Cove diorite.

Figure 3: Fieldtrip participants examining the coastal exposures of the dyke swarm at Bauline.

Figure 4: Mafic dykes of the Horse Cove Complex crosscutting the host Herring Cove diorite.

The field trip included a stop at the Steep Nap Road low-sulphidation, epithermal gold prospect discovered in 1995 (Stop #5). The occurrence is hosted in felsic pyroclastic rocks and consists of at least 100 gold-bearing quartz-hematite-adularia veins ranging in size from 1 mm up to 1.7 m (O'Brien et al., 1998; Mills et al., 1999, O'Brien et al., 2012). Samples collected by Rubicon Minerals Corp. have locally assayed up to 9.23 g/t Au (B.A. Sparkes, 2003).

The Oval Pit Pyrophyllite Mine (Stop #6), operated by Trinity Resources Inc., is located in an extensive advanced argillic hydrothermal system associated with the older, pre-620 Ma volcanic sequence and is unconformably overlain by sedimentary rocks (O'Brien et al., 2012; Figure 5). The alteration coincides with the Mine Hill Shear Zone separating the 620–625 Ma magmatic rocks to the west from the younger ca. 584 Ma volcanic rocks to the east (G.W. Sparkes et al., 2005). Alteration can be subdivided from east to west into subzones of argillic, advanced argillic and massive silica alteration. The advanced argillic zone contains subzones of massive pyrophyllite, sericite and diaspore, with minor barite and rutile (e.g., Oval Pit; Figure 6), and of silica, pyrophyllite and sericite, locally with 5 to 10% pyrite. Gold is associated with hydrothermal breccias at the edge of the advanced argillic zone.

Figure 5: A late, feldspar porphyry felsic dyke crosscutting earlier mafic dykes within the Horse Cove Complex.

Figure 6: Drone image of the Oval Pit Pyrophyllite Mine (by G.W. Sparkes)

The final stop (Stop #7) included a quarry exposing the granitic Holyrood Intrusive Suite composed of breccias of several magmatic phases and rare sedimentary xenoliths (Figure 7). The phases are inferred to be comagmatic, based on the regional U–Pb dating conducted to date. The granites are unconformably overlain by Cambrian sedimentary rocks.

Figure 7: Breccia of the Holyrood Intrusive Suite.

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Submitted by Greg Sparkes, Andrea Mills and Zsuzsanna Magyarosi (Geological Survey of Newfoundland and Labrador)

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Leopold Gélinas Awards

Every year, the Volcanology and Igneous Petrology Division of the Geological Association of Canada presents three medals for the most outstanding theses, written by Canadians or submitted to Canadian universities, which comprise material at least 50% related to volcanology and igneous petrology. A gold medal is awarded for the best Ph.D. thesis, a silver medal for the best M.Sc. thesis and an antique copper medal for the best B.Sc. thesis. Nominated theses are evaluated on the basis of originality, validity of concepts, organization and presentation of data, understanding of volcanology and petrology, and depth of research.

PhD Award
Dr. Amy Ryan
University of British Columbia

Nomination letter

Please accept this letter as a formal nomination of Dr. Amy Ryan for the GAC Gélinas Medal (2021) awarded annually for the best PhD Thesis in volcanology and igneous petrology. Amy's PhD research at the University of British Columbia concerns the timescales and consequences of solid-state sintering in volcanic systems. Her approach was largely experimental based on natural and synthetic materials but has been supported (and tested) most recently by a field campaign that she organized to Chaos Crags, Mt. Lassen, California.

The 2020 winner of the Volcanology and Igneous Petrology (VIP) Léopold Gélinas Gold Medal award for the best PhD thesis goes to Amy Ryan for her exceptional thesis titled “The timescales and consequences of solid-state sintering in volcanic systems” supervised by Dr. Kelly Russell at the University of British Columbia.

Amy originally came to UBC from Colorado College to start her M.Sc. in September 2012 and successfully defended her thesis in November 2014. She published 2 papers (Am Min 2015, G-cubed 2015) before returning to the USA for work. Amy was awarded the 2015 Gélinas Silver Medal for her MSc thesis (Water solubility and bubble growth dynamics in rhyolitic melts at atmospheric pressures).

I was absolutely delighted (and fortunate), when Amy applied a year later to return to my lab for a PhD (2016). She was awarded a 4 year UBC graduate fellowship to support her studies and successfully defended her PhD in July 2020. From the moment Amy entered the PhD program and drove her research independently with only minor direction and supervision. During her PhD she was also the sole instructor (as research assistant) of other graduate students and visiting scientists on the experimental equipment we use daily in the lab: high-temperature furnace, permeameter, He-pycnometer, volcanological deformation rig, etc. Amy is a bright, highly motivated, scientifically curious, and productive young scientist and her energy, vitality and creativity greatly enhanced my laboratory during her PhD studies.

Amy Ryan is clever, persistent, industrious, and is passionate about research - especially when it addresses challenging volcanological questions via experimentation. She has been productive in publishing her science and its import in high quality international journals. Her PhD comprised 4 high quality, thematic, peer-reviewed journal articles: EPSL (2018), Am Min (2018), EPSL (2020) and JVGR (2020). Solid state sintering is a high-temperature process that converts unconsolidated granular materials into low porosity, impermeable solid rock. It is highly relevant to volcanic systems but has been largely ignored or unrecognized. Amy's PhD introduced solid state sintering as a process that governs porosity and permeability of conduit rocks and, thus, potentially controlling the explosivity of andesitic to dacitic volcanoes (e.g., Mt. St Helens; EPSL 2018). She then designed an experimental campaign to constrain the P-T-t conditions required for solid state sintering to operate – this culminated in a predictive model for the loss of porosity by solid-state sintering as a function of time (Am Min 2018; EPSL 2020). In many volcanic conduits the process operates on the time scale of days to weeks.

However models are only models and are only relevant when tested against Nature. Amy impressed me incredibly by her desire to take her lab-based ideas and models to the field. She organized an international team and ran a field campaign to study the exposed volcanic conduits and lava domes at Chaos Crags, Mt. Lassen in the US Cascades (JVGR 2020). She continues to be involved with her international collaborators who continue to publish their results from the field work. I was delighted to see Amy increase the band width of her expertise and impressed by her competence in organizing a field campaign and managing an international research team.

Throughout her PhD Amy fostered highly productive research collaborations. These collaborations led to 2 other 1st authored journal articles on a related research topic concerning the rheology and behaviour of bubble-rich melts (JNCS 2019; JGR 2019). This work is largely a spin-off of her MSc-based research and involved a network of collaborators from Munich, Strasbourg, and Rome. These efforts very much highlight her capacity for generating collaborative research projects and the respect her network has for her experimental skills.

In summary, Amy Ryan is a bright, dedicated, highly focused young scientist who has completed important, and technically-challenging research pertinent to the volcanological sciences. These attributes have secured her a post-doctoral fellowship in the experimental laboratory at the University of Minnesota. Although, Amy has a quiet, somewhat reserved personality she is a very good public speaker and communicator. She knows what she knows, and she knows how to communicate her science well without being bombastic. These are traits I admire.

Amy has my highest regard and my strongest recommendation for VIP Division's Gold Gélinas Medal which I know she would value greatly and proudly add to her Gélinas Silver medal (2015).

Yours truly,
Kelly Russel (University of British Columbia)

Acceptance letter

Thank you to the Volcanology and Igneous Petrology Division of the Geological Association of Canada for awarding me the Leopold Gélinas Gold Medal. It is a particular honor as they had already been generous in awarding me the Leopold Gélinas Silver Medal in 2015.

First and foremost, I would like to thank my doctoral supervisor Kelly Russell, who kindly nominated my work for this award. We have worked together for the better part of a decade and it was (and continues to be) a true pleasure. Kelly has profoundly shaped me as a scientist and I am indebted to him for his mentorship.

Completing a PhD requires persistence from the student, but also a wealth of support for them. In addition to Kelly, I am fortunate to have had lab mates, collaborators, friends and family to encourage and guide me along the way. I am also grateful for the financial support provided by the University of British Columbia, the Geological Society of America and the Mineralogical Association of Canada.

Thank you again to GAC-VIP for this distinction.
Amy Ryan

MSc Award
Anastasia Ogloff
Simon Fraser University

Nomination letter

It is with great pleasure that I nominate Ms. Anastasia Ogloff for the Silver Gélinas Medal. Anastasia graduated with an MSc in Earth Sciences from Simon Fraser University in May, 2020. Anastasia wrote an outstanding thesis entitled The Murray dyke swarm and its bearing on Cretaceous magmatism and tectonics in the Canadian Cordillera. The thesis examined the previously unstudied Murray Dyke Swarm in southern BC. Why is this such an outstanding thesis? Fundamentally, it is because Anastasia hit the ground running and never stopped. She worked tirelessly in the field, in the lab, and in the office. Her thesis shows what can be done in just over two years with dedication and drive.

Field work and geological mapping formed the basis for the thesis. After an initial visit to her thesis area with me, Anastasia came up with a plan for two months of field work. She executed the plan surgically, and produced a map which is professional in all regards. I emphasize that she was not part of a government mapping program. She also collected samples for laboratory analysis.

Through her field work, augmented by geochemistry and geochronology, Annie subdivided the swarm into seven distinct sets. She also mapped the Cretaceous volcanic and sedimentary stratigraphy in the area, identified a previously undocumented angular unconformity, and reversed the relative age of Cretaceous units from how they appear on the regional GSC map (she thoroughly discussed these findings with GSC map author Jim Monger and he now agrees with her interpretations).

Anastasia focused most of her attention on the core of the swarm, and documented a range of features including single and composite dyke morphologies, magma mingling and a temporal trend from intermediate to mafic. She also demonstrated that the area underwent 1.4 km of syn-intrusive dilation, a quality that she then linked to a regional model of Cretaceous crustal evolution.

Anastasia wanted to learn everything she could about her thesis area and how it related to the magmatic and tectonic evolution of southern BC and, indeed, the entire Cordillera. To that end, she needed to acquire a broad range of data and so we settled on those (listed above) that would allow her to mesh her findings with both magmatic processes and regional geology. Annie thoroughly treated all of her data (in communication with her committee and geochronologists Crowley and Benowitz). She matched the new information with what can only be described as a love affair with the literature, leading to 45 pages of cited references. Anastasia is now one of the most knowledgeable geologists on the Cretaceous evolution of western Canada. In the winter of 2020 she “held court” on this subject at the Cordilleran Tectonics Workshop in Anchorage, Alaska.

With such an inspired, deep thesis to summarize, it will be impossible for me to do justice to Anastasia and her work in proper detail. As such, I have provided only the main thesis outcomes and their significance.

1.The dyke swarm represents magmatism during an interval of regional extension at ca. 104 Ma.
2.The magmatism involved at least three distinct magma types derived from different depths. These magmas collected in a shallow-level crustal chamber from which high volumes of Cretaceous volcanics were generated.
3.The dyke swarm captures a change in the tectonic environment from arc-like to intraplate-like, a transition which reflects the end to eastward subduction of an inter-arc basin beneath Ancestral North America.

4.Collapse of the inter-arc basin requires changes to the most recent models of Cretaceous magmatism and tectonism. (Generally, these models have disregarded the need for separate subduction systems to the east and west of the Insular Superterrane.)
5.Cretaceous magmatism in south-central BC was followed almost immediately by a contractional event which led to uplift of oceanic terranes, collision with the Insular Superterrane, and the development of a regional angular unconformity within the Cretaceous stratigraphy.

Lastly, I must emphasize that Anastasia's thesis covers igneous petrology and geochemistry in great detail. Her Chapter 3 on petrogenesis is 50 pages long and employs geochemical modeling and integration of major element, trace element and isotopic data. This work forms what could have been a stand-alone product on the petrology of the dyke swarm but, because of Anastasia's insatiable thirst for learning, she took the additional step of applying her igneous findings to structural and regional geology. The thesis is incredibly rich and valuable. Annie is in the advanced stage of journal-article preparation.

With Sincere Appreciation,
Derek J. Thorkelson (Simon Fraser University)

Acceptance letter
I am so grateful for the huge recognition that the Volcanology and Igneous Petrology Division has awarded to my work with this Léopold Gélinas Silver Medal. Conducting my MSc research was incredibly rewarding and fun. I got to integrate mapping, structural geology, and geochemistry and isotopes to investigate an impressive dyke swarm located in a beautiful part of Canada while being surrounded by exceptional mentorship. My thesis took shape from my own thoughts and ideas, and I would like to thank my supervisor, Dr. Derek Thorkelson for his full support. I have benefitted hugely from all the time and effort he dedicated to not only guiding my research, but also to developing my skills as a geoscientist. I am so grateful that he provided the encouragement to be creative and the regiment to be disciplined while tackling a project with broad scope extending from igneous petrology to plate tectonics. I am more capable and a better version of myself because of it. An additional thank you to Dr. Derek Thorkelson for supplying the exciting geological problem, and to his NSERC funding for allowing the problem to be investigated.
The quality and scope of my research is owed to the support of many. Dr. Dan Marshall helped me dig deeper into the history of the dyke swarm. Dr. Jim Crowley gave much support and he and his team helped date the rocks with incredible accuracy. Dr. Ryan Ickert provided me with guidance in communicating my interpretations with discipline and accuracy. Dr. Jeff Apple Benowitz added impactful analyses and freely discussed ideas with me. I would like to thank you all deeply. Additionally, I would like to acknowledge many of the staff and graduate students in the Department of Earth Sciences at Simon Fraser University for open, intellectual discussion. Finally, thank you to the VIP selection committee for reviewing the many high-quality nominations.

Anastasia Ogloff

BSc Award
Sofia Panasiuk
University of Toronto

Nomination letter
I would like to nominate my student, Sofia Panasiuk, for the B.Sc. Gélinas medal. Her thesis "Remote predictive mapping of the Reykjanes

Ridge: Implications for the volcanic and structural evolution of a slow spreading mid-ocean ridge" is an excellent example of how remotely-sensed data can be used to map the volcanic facies and structures along mid-ocean ridges. Notably, this thesis is largely unedited by me, and showcases Sofia's excellent writing skills. I expect that this work will be prepared for submission to the journal Geochemistry, Geophysics, Geosystems over the summer.

Melissa O. Anderson (University of Toronto)

Acceptance letter

I am humbled to receive the Léopold Gélinas Bronze Medal and wish to extend my gratitude to the Volcanology and Igneous Petrology Division of the Geological Association of Canada for selecting my thesis for this award. I would like to thank Melissa for giving me the resources and mentorship to complete this ambitious project and for opening many doors for me along the way. I am grateful to Nico Augustin of GEOMAR who introduced and trained me in remote-predictive geologic mapping techniques, and to Melissa for organizing and funding my internship at the center for ocean research. A big thank you to my collaborators for their guidance and support throughout the project. Finally, I mention and thank the brilliant scientists, including the many members of the NSERC-CREATE (iMAGE) team who are doing fantastic work in marine geodynamics and georesources today, and those who came before me whose shoulders I stand on now. Lastly, I would like to thank my dad, Sergei, who has always encouraged me to pursue my dreams, and along with my family is an unwavering support.

Sofia Panasiuk

VIP related sessions at the AGS 2021 Colloquium

The AGS 47th Colloquium and Annual Meeting – 2021 was held online in February and included several VIP-related talks. The “Developments in Mineral Resources Research in the Northern Appalachians” special session organized by Kevin Neyedley, Aaron Bustard and Mitch Kerr focused on a variety of mineral resources in the northern Appalachians. Presentations related to volcanology and petrology included:

- M. MacDonald, D.R. Lentz, A. Cardenas, K. Thorne: Epithermal gold mineralization and associated alteration at the Golden Ridge Deposit, Poplar Mountain Volcanic Complex, southwestern New Brunswick: analysis of the role of pyrite and arsenopyrite during mineralization
- A.J. Anderson, T. Knoll, R. Schuster: The temporal relationship between two LCT pegmatites and the Streaked Mountain pegmatitic granite, Oxford County, Maine
- L. Bickerton, D.J. Kontak, I.M. Samson, J.B. Murphy, D. Kellett, G. Dunning, R. Stern: Constraints on the emplacement of the South Mountain Batholith using zircon petrochronology and implications for Sn-W metallogeny in the northern Appalachians
- J. Hanley, T. Kendall, B. Boucher: Characterizing the mineral domains of Li-(Rb-Cs) enrichment at the East Kemptville Sn-(Cu-Zn-Ag) deposit, Nova Scotia, Canada
- B. Maciag, J.M. Brenan, J. Hanley: Variation in the major and trace element geochemistry of biotite and apatite from the South Mountain Batholith, Nova Scotia
- A.L. Bustard, D.R. Lentz, J. A. Walker: Geochemical evaluation of mineralization and igneous activity in the vicinity of the Elmtree deposit, northeastern New Brunswick
- S.J. Piercey, S. Brueckner, D. Copeland, G.D. Layne, M. Pawlukeiwicz, J.-L. Pilote, S. Ybarra: Contrasting: gold-bearing volcanogenic massive sulfide (VMS) and orogenic gold deposits in the Baie Verte Peninsula, NL Appalachians

Luke Bickerton received the Sandra Barr Award for best graduate student presentation.

In the General Session, Margaret Scott, A.J. Anderson, M.A. Wise presented “Conditions of pocket formation in Zapot pegmatite, Gillis Range, Nevada” and Margaret Scott received the Rob Raeside Award for best undergraduate poster.

The Nelly Koziel Award, given to a person who recently has made a significant contribution to geoscience, beyond the call of duty, in the Atlantic Provinces, was awarded to our past president Dave Lentz (UNB) in recognition of the efforts he made to keep the geoscience community connected through the VIP weekly Zoom webinars throughout the past year.

Upcoming VIP sessions at GAC-MAC Halifax 2022

The following provides information on sessions and fieldtrips, being supported by the Volcanology and Igneous Petrology Division or organized by VIP members for GAC-MAC Halifax 2022 Joint Meeting.

Symposia **"SY-01 Supercontinents, orogenic processes and magmatism: a celebration of the career of Brendan Murphy"** is organized by Damian Nance, Rob Strachan, Cecilio Quesada, and Shoufa Lin and will include two days of oral presentations and posters. The symposium is intended to honour the career of Brendan Murphy, the winner of VIP's Career Achievement Award. The presentations will focus on processes related to supercontinents, orogenic processes, and magmatism.

Special Session **"SS-02 From the mantle to the crust, the geochemical signatures of igneous processes: a session in honour of Jarda Dostal"** is organized by John Greenough and Nance Van Wagoner. Dr. Jarda Dostal has been a leader in using geochemistry to decipher the petrogenesis of diverse types of igneous rocks. In the spirit of his innovations, this session will examine new research advancing the understanding of igneous rocks, as well retrospectively look at where Jarda's discoveries have taken igneous petrology. Abstract submissions are welcome on new innovative research as well as papers that examine the impact of Dr. Dostal's past contributions to igneous petrology. (Submitted by John Greenough)

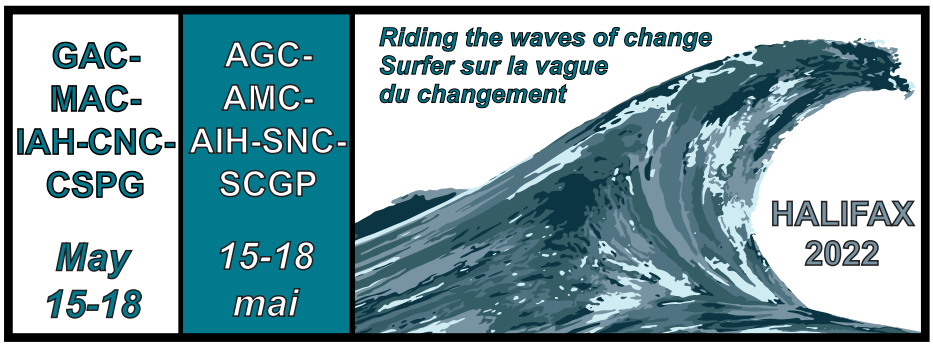
Special Session **"SS-03 Zooming in to see the big picture: using nano- to micro-scale observations to better understand Earth processes"** is organized by Noah John Phillips, Crystal LaFlamme, and Stan Roozen and will focus on advances in microanalytical techniques that allow us to quantify changing physio-chemical conditions, kinetics, mechanics, rates, and timing of Earth processes.

Special session **"SS-10 Current perspectives on the setting and origin of volcanogenic massive sulfide (VMS) Deposits"** is organized by Steve Piercey, Michelle DeWolfe, and James Walker and will focus on the setting and origin of VMS deposits including their evolution through time, stratigraphy, volcanic facies, ore mineralogy, sources of metals and fluids, and other related topics.

Several sessions are related to volcanology and igneous petrology and may be of interest to VIP members. Special Session **"SS-04 It's about time! Advances in petrochronology/thermochronology and applications to tectonics"** organized by Antoine Godet, Jamie Cutts, Jeff Marsh, Dawn Kellett, Isabelle Coutand, Chris McFarlane, Kyle Larson, Jeff Pollock, will focus on advances in petro-/thermochronological techniques and methods (either conceptual or analytical) and their applications in metamorphic, magmatic, structural, and detrital provenance studies.

Special Session **"SS-06 Expressions of mantle plume–lithosphere interaction on the Earth's surface"** organized by Florian C. Krob, Ulrich A. Glasmacher, and Hans-Peter Bunge, will focus on tectonic and basin evolution, thermochronology and long-term landscape evolution, geophysical data, paleoclimate research - and ore deposits.

Special Session **"SS-08 The critical metal-magma connection: Tracing metal source, transport, and ore formation"** organized by James Brenan, Erin Adlakha, Neil Bennett, and Jacob Hanley, will focus on all aspects of critical metal deposits related to magmatic and magmatic-hydrothermal processes.



Upcoming VIP field trips at GAC-MAC Halifax 2022

Field trips with VIP focus include **"FT-A6 Geology of the Coastal Volcanic Belt exposed along the coast of Passamaquoddy Bay"** 4-day pre-conference field trip organized by Nancy Van Wagoner and Dave Lentz, which will focus on mineral deposits, volcanic facies, sequences, and lithogeochemistry of the Coastal Volcanic Belt in New Brunswick.

Bedded and cross bedded felsic lithic-crystal-tuff and lapilli tuff of cycle 2 interpreted to be surge, flow and minor airfall deposits, distal to source. Photo by K. Dadd

Field trip **"FT-B2 Stratigraphy and tectonic setting of the Bathurst Mining Camp"** will be a 4-day post-conference field trip organized by Jim Walker, Aaron Bustard, Dustin Dahn, and will examine the stratigraphic and structural setting of the volcanogenic massive sulphide (VMS) deposits of the Bathurst Mining Camp.

Description of the possible North Mountain Basalt Fieldtrip

Stretching from Cape Breton Island (NS) to off the coast of Maine, crossing the Bay of Fundy (original width wider but unknown) and probably averaging ~100 m thick, the lower unit of North Mountain Basalt appears to be the largest preserved basaltic lava flow on Earth. The great thickness produced astounding and unique geochemical and textural layering but because it is a flow, and experienced rapid cooling, the layering sheds light on early, rapid differentiation processes that probably also occur right after emplacement in layered mafic intrusions. The astounding layering and textures, discovered by Powers, led Bowen to examine the rocks and declare that if flows can show such differentiation then the processes must be what yield the layering in intrusions. This one day fieldtrip on the north shore of the Bay of Fundy will examine a possible fissure/feeder vent for the flow at Five Islands Park, the astounding layering in the basalt at McKay Head, and the more-southerly and primitive (orthopyroxene-bearing) flow at Cap Dor. Participants will observe the astounding variations in texture in this incredible lava flow but, the bonus is that they will also see the breathtaking natural wonders associated with the highest tides in the world (e.g. 5 km-wide mudflats covered twice a day; tidal currents so strong that ships cannot fight them). Anyone interested in participating should e-mail john.greenough@ubc.ca. (Submitted by John Greenough)

For more information on GAC Halifax 2022 visit https://halifax2022.atlanticgeosciencesociety.ca/.

Volcanism of the Eastport formation of the Coastal Volcanic Belt, Passamaquoddy Bay, New Brunswick: Introduction to pre-meeting field trip, GAC-MAC 2022

N. Van Wagoner[1], L. Fyffe[2], D. Lentz[3]

[1]Thompson Rivers University, Department of Physical Sciences, Kamloops, British Columbia, V2C 0C8
[2]Retired Director, New Brunswick Geological Surveys Branch
[3]Department of Earth Science, University of New Brunswick, Fredericton, NB, E3B 5A3

Late Silurian to Early Devonian bimodal (basaltic-rhyolitic) volcanism is a common feature of the northern Appalachians, forming three main belts; the Central Volcanic Belt in Maine, the Tobique in New Brunswick and Quebec, and the Late Silurian Coastal Magmatic/Volcanic Province that extends from the southern coast of Maine to Passamaquoddy Bay coast of southwestern New Brunswick. This is among the largest bimodal volcanic provinces in the world, with evidence for supervolcano-scale eruptions (Seaman et al., 1999, 2019).

This field trip is an excursion through the exquisite, nearly pristine exposures of the Late Silurian, bimodal volcanic and sedimentary sequence of the Eastport Formation in the Passamaquoddy Bay area of southwestern New Brunswick, which forms the northern extent of the Coastal Volcanic Belt. Here, the Eastport Formation has a minimum thickness of about 4 km and preserves at least four cycles of basaltic-rhyolitic volcanic rocks, intercalated with sedimentary rocks. The lowest part of the sequence is not seen and the rocks are in unconformable contact with the overlying alluvial sediments of the Perry Formation. The basaltic rocks were interpreted to be mantle melts modified by crustal contamination and mantle metasomatism from a previous subduction event, while the rhyolitic rocks were interpreted to be crustal melts, modified by crystal fractionation (Van Wagoner, et al., 2002). Rhyolitic units are the most voluminous in the first three cycles. The final cycle, represents the waning stages of volcanism with mafic volcanics being more abundant than rhyolitic, and sedimentary rocks predominating. Sedimentary facies indicate that volcanism occurred at or near sea level in cycles 1 and 2, with alluvial facies dominating cycles 3 and 4. There were three periods of relative volcanic quiescence and each is associated with a relative rise in sea level, possibly as a combined response to deflation, crustal relaxation, and a decrease in the sedimentation rate. A spectrum of eruptive and depositional styles is represented ranging from the Hawaiian and Strombolian-type volcanism of the basaltic units to the more highly explosive rhyolitic phreatomagmatic eruptions. Flows and domes interacted with wet sediments to form a variety of peperitic breccias (Van Wagoner, et al., 1994, 2002; Dadd and Van Wagoner, 2002; and Van Wagoner and Dadd, in prep.)

This field trip provides an opportunity to examine the volcanic facies associations identified in the area (Van Wagoner and Dadd, in prep.), their depositional products and the diagnostic features of these products that are keys to interpreting the mechanisms of eruption and modes of deposition (Figures 1-4). Exposures in outcrop will be viewed

Figure 1. Rhyolitic peperite, formed by the interaction of a rhyolitic flow with wet sediments, Barker Road. Cycle 1, rhyolitic flow 2. Photo by L. Fyffe.

Figure 2. Accretionary lapilli tuff, forming distinctive layers within a crystal-vitric tuff, Oven Head, Cycle 2. Photo by N. Van Wagoner.

Figure 3. Basaltic peperite, Highway 1. Cycle 2. Photo by L. Fyffe.

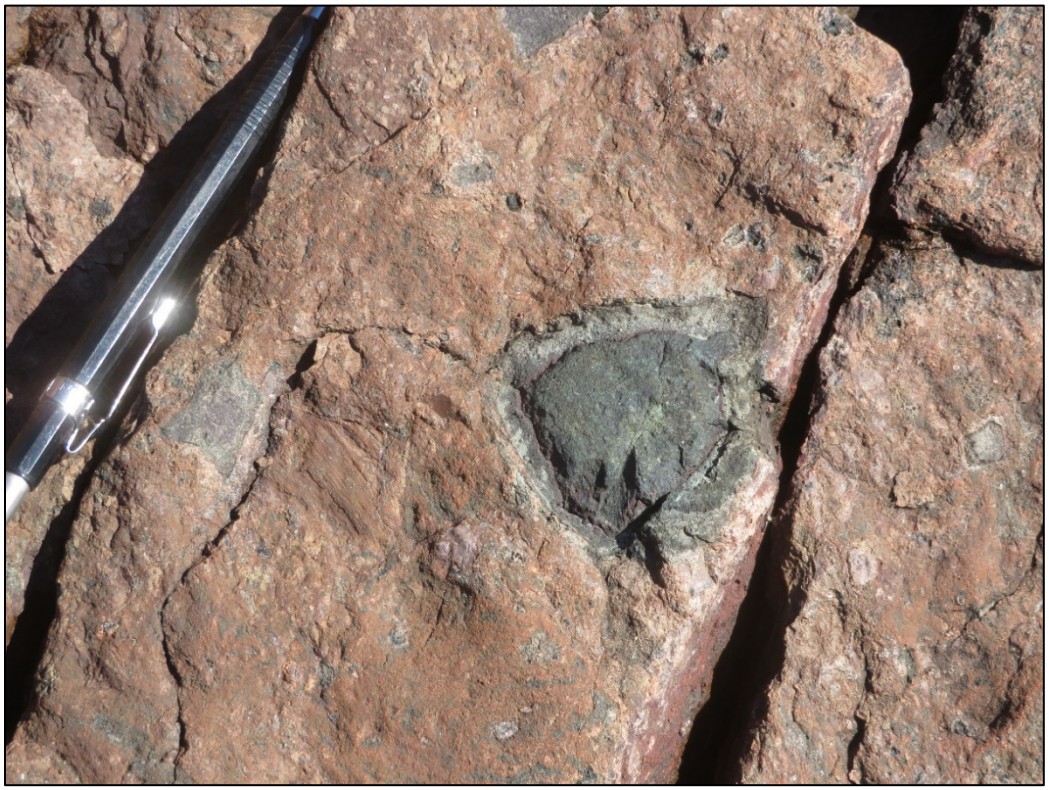


Figure 4. Vesicular mafic pyroclast in rhyolitic lithic-vitric tuff, Oven Head, Cycle 2. Photo by N. Van Wagoner.

simultaneously with textures visible in microphotographs, and geochemical characteristics provided by the field guide. Key exposures include a mafic scoria cone, phreatomagmatic explosion breccias, extensive rhyolitic flows and domes, and the deposits of surge, air fall, and pyroclastic flows.

The Late Silurian and Early Devonian bimodal volcanism is spatially and temporally associated with arc-related volcanism (Piñan Llamas and Hepburn, 2013). This association along with the within plate tectonic affinity of the bimodal volcanic rocks led some workers (e.g. Van Wagoner et
al., 2002; van Staal et al., 2014; Seaman et al., 2019; Fyffe et al., 1999) to suggest that the volcanism was related to extension in a backarc tectonic setting. However, there are other interpretations, and the drivers and tectonic setting of the volcanism remains unresolved.
Along with the geochemical characteristics of the rocks, during this field trip we will consider the constraints that the volumes, modes and environments of eruption and deposition place on tectonic models for the Lat Silurian evolution of the northern Appalachians.

This field trip is also an opportunity to experience the spectacularly beautiful Bay of Fundy coastline in the Passamaquoddy Bay area (Figure 5). Accommodation will be at the Huntsman Marine Science Centre in St. Andrews by the Sea, and includes a tour of the aquarium. For those who will be travelling with a non-geologist partner, St. Andrews is worth a visit with lots to do from visiting the small shops, bakeries, and cafes, to whale watching.

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Figure 5. Passamaquoddy Bay coastline. Photo by S. Van Wagoner.

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VIP Awards Reminders

The Career Achievement Award - the deadline is 14 March 2022.

The Gold Gélinas medal for an outstanding PhD thesis in the fields of volcanology and igneous petrology - the deadline is 14 March 2022.

The Silver Gélinas medal for an outstanding MSc thesis in the fields of volcanology and igneous petrology - the deadline is 14 March 2022.

The Bronze Gélinas medal for an outstanding Honours thesis in the fields of volcanology and igneous petrology - the deadline is 15 April 2022.

Please send all nominations to zsuzsannamagyarosi@gov.nl.ca.

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