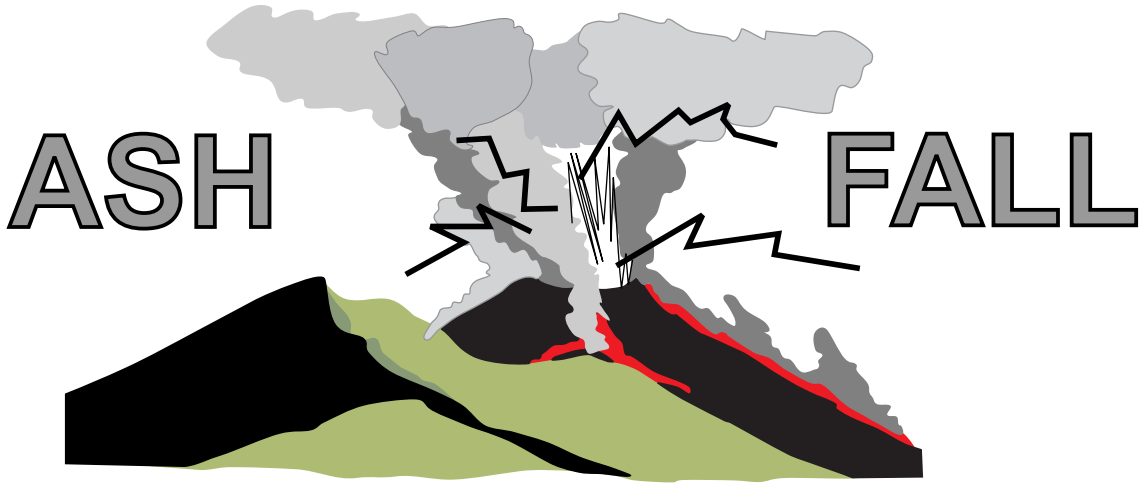

Newsletter of the Volcanology and Igneous Petrology Division
Geological Association of Canada

No. 87 January 22, 2025

In this issue

2024-2025 VIP Executive

Chair: Donnelly Archibald
darchiba@stfx.ca

Vice-Chair: Ian Coulson
Ian.Coulson@uregina.ca

Secretary/Treasurer: Zsuzsanna Magyarosi
ZsuzsannaMagyarosi@gov.nl.ca

Past Chair: Michelle DeWolfe
mdewolfe@mtroyal.ca

Councilor Central: Pierre-Simon Ross
pierre-simon.ross@ete.inrs.ca

Councilor East: Fazilat Yousefi
fazilat.yousefi@unb.ca

Student Councilor: Kiersty Malay
kmmalay98@gmail.com

Webmaster: Pete Hollings
peter.hollings@lakeheadu.ca

Ashfall Editor: Zsuzsanna Magyarosi

A message from the VIP Chair

My second year as the VIP Chair has been busy but made much easier by the dedicated members of the VIP and the VIP Division executive. Our secretary/treasurer Zsuzsanna Magyarosi continues to be the glue that holds VIP together. Ian Coulson is an excellent, supportive vice chair and has agreed to move into the chair's position when my term expires later this year. Pete Hollings continues to keep the website updated for us. We appreciate the time and effort put in by our regional councilors, student councilors and others who have helped adjudicate our three student thesis awards and the Career Achievement Award. Later in this issue we highlighted our 2025 award winners. We have vacancies in our Vice Chair and Outreach Coordinator positions so if you would like to get involved, please contact a member of the executive.

The 2023 GAC-MAC meeting was hosted by Brandon University in Brandon, Manitoba on May 19-22, 2024, with many sessions and several pre- and post-meeting field trips and workshops supported by VIP and attended by VIP members.

As many of you may know if you attended the past few AGMs, I had significant difficulty in dealing with our past supplier of our division medals. I located a new supplier in Halifax, but I had a few hiccups with the new supplier, which resulted in further delays. We are now three years behind in sending out the medals to our past winners. Our winners should be commended for their patience, and I apologize on behalf of VIP for the delays. However, there is a light at the end of the tunnel. The new stamps are cast, and I received proofs of the "backordered" medals in December 2024. So hopefully, this issue will be resolved soon!

There are several upcoming meetings with VIP content. The Atlantic Geoscience Society Colloquium will be held in Dartmouth, Nova Scotia on February 7-8, 2025. Included are several special sessions that will no doubt include VIP-related content. Check out the host website for more information (https://atlanticgeosciencesociety.ca/colloquium-2025). The upcoming GAC-MAC-IAH-CNC joint annual meeting will be held in Ottawa, Ontario from May 11-14. There are many sessions of interest to VIP members (too many to list in my short report). Please check out the GAC-MAC-IAH-CNC meeting website (https://event.fourwaves.com/ottawa2025/pages) and submit your abstracts by February 16.

Finally, we continue to welcome new and continuing members of GAC and VIP, as well as invite everyone to contribute to future Ashfall and GAC GEOLOG newsletters. We are interested in all activities related to VIP and spreading the word about this GAC Division. Hope to see you in Ottawa! If you are not able to make it to Ottawa, we invite you to the hybrid VIP AGM in May.

Donnelly Archibald (2023-2025 VIP Chair)

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.

Dr. Brian L. Cousens for his lifetime scientific contribution to the fields of Volcanology and Igneous Petrology

Nomination Letter

We are thrilled to nominate Prof. Brian L. Cousens from Carleton University for the 2024 Career Achievement Award offered by the Volcanology and Igneous Petrology Division of the Geological Association of Canada (GAC). Professor Cousens has made outstanding contributions to geochemistry, volcanology, and petrology of igneous rocks over his 35-year career, demonstrating exceptional mentorship, leadership, and innovation.

Brian has had a robust academic background, holding a Ph.D. in Geological Sciences from the University of California, an M.Sc. from the University of British Columbia, and a B.Sc. from McGill University. Throughout his esteemed career, he has held various academic positions, currently serving as a Full Professor in the Department of Earth Sciences at Carleton University since July 2017. Brian's longstanding association with Carleton University began in January 1992, initially as a Research Associate, then Assistant Professor (2007-2009) and Associate Professor (2009-2017). Before joining Carleton University, he was appointed as an Invited Researcher at the Département de Géologie, Université de Montréal (1990-1992).

Brian has received notable recognition for his exceptional teaching abilities and academic contributions. Voted a "Favorite Faculty Member" by students at Carleton Student Residences in 2017 and 2018, a testament to his impactful mentorship and dedication to student success. Brian demonstrates a distinctly impressive ability to simplify and explain complex ideas in a very accessible fashion that truly allows students to quickly grasp the concepts and then build upon those in their own research efforts. His teaching expertise led to a nomination for TV Ontario's Best Lecturer Award in October 2010. He has received Excellence in Teaching Awards from the Faculty of Science at Carleton University and the prestigious Julian Boldy Award from the Mineral Deposits Division of GAC in 2002.

Brian has conducted research projects throughout Canada in a diversity of regions (e.g., British Columbia, Northwest Territories, Yukon, Timmins–Ontario, Avalon and Meguma Terranes–Nova Scotia, Slave and Western Churchill Provinces, and Nunavut) and across the globe, spanning from Northeast Pacific to the northwestern Pacific Ocean, Gran Canaria (Canary Islands), Rarotonga and Tubuai (French Polynesia), Hawaii, Long Valley Caldera–California, and the Ancestral Cascades volcanic arc in northern California and western Nevada. The results from his travels have significantly advanced our understanding of mantle and crustal composition, particularly the heterogeneity of the source of mid-ocean ridge and seamount basalts, the effect of minor mantle phases on the chemistry of oceanic basalts, and the relative importance of asthenosphere, lithosphere, and crust as reflected in the chemistry of continental basalts in arc and rift settings. Additionally, his research using the application of geochemical models to decipher the origin of ancient volcanic rock sequences and environmental applications of Pb, Nd, Hf, and Sr isotopes, has changed our understanding of the evolution of the Archean crust and contributed to broader insights into Earth's geological processes. The fields of isotope geochemistry and geochronology have been significantly advanced through Brian's illustrious career. His pioneering work includes the establishment and development of the renowned Isotope Geochemistry and Geochronology Research Centre

(IGGRC), which has become one of the cornerstones of research excellence in North America.

Brian's prolific scholarship has contributed over 300 publications, with 123 papers (21 as first author) appearing in renowned journals (Lithos, Contributions to Mineralogy and Petrology, Journal of Petrology, Geological Society of America Bulletin, Precambrian Research, among others) that have garnered over 4000 citations. Additionally, Brian has authored numerous book chapters (18), Government Open File Publications (19), and meeting abstracts (196). His expertise has earned him invitations to deliver over 40 lectures both nationally and internationally, as well as to participate in over 40 public outreach presentations, letters, and interviews (e.g., TV Interview (Earthquake in Ottawa). Notably, Brian's engagement extends to social media platforms, including his YouTube channel, and Carleton 1006FieldTrip.

Beyond his outstanding research contributions, Brian has been an exceptional mentor and educator. He has inspired and mentored over 120 students, both at the undergraduate (91 students) and graduate levels (25 M.SC. theses and 10 PhD theses), guiding them to successful careers in academic, industry, and government positions. Since 1993, Brian has played a pivotal role in training and mentoring over 100 students in isotope geochemistry and mass spectrometry techniques at Carleton University, fostering the next generation of leaders in the field. Brian's leadership in fostering patience, equity and inclusivity in the field, the laboratory, and his publications has been a valuable transformative influence on his graduates, who have continued to promote these values in their respective careers. His dedication to education and research has had a profound impact on the scientific community, shaping the landscape of isotope geochemistry and geochronology research both nationally and internationally.

Moreover, Brian has contributed to the profession of geoscience by serving in various leadership roles and academic committees, contributing significantly to scholarly review processes (over 100 manuscripts across esteemed journals) and research proposal evaluations, such as the National Science Foundation (NSF) and NSERC. His involvement in organizing conferences and workshops underscores his dedication to advancing the field. Brian's membership in esteemed academic and professional societies, such as GAC Volcanology & Igneous Petrology Division and Geological Society of America underscores his commitment to scholarly excellence and collaborative engagement. Brian's collaborations with scholars from diverse regions globally have enriched the academic environment at Carleton, facilitating invaluable exchanges of knowledge and ideas.

Sincerely,
Nadia Mohammadi (Geological Survey of Canada)
Richard Ernst (Carleton University)
Hendrik Falck (Government of the NWT)
Ann Timmermans (University of New Brunswick)
Hafida El Bilali (Carleton University)

Acceptance letter

What a complete surprise to be the winner of the 2024 Career Achievement Award from VIP, but a very satisfying one. I was notified of the award by Richard Ernst at the end of a hot, dry hike back from the Papakolea cone and green sand beach at the south end of the island of Hawaii, along with the other participants in my Carleton field course. A great end to a great day of geology!

Thanks to the Awards Committee for my selection, and major thanks to my nominators Nadia Mohammadi, Hendrik Falck, Richard Ernst, Hafida El Bilali and Ann Timmermans.

My love of teaching goes back to being a M.Sc. student at UBC. The 1st-year lab coordinator for the Department of Geological Sciences was Carlo Giovanella, who saw that I loved to TA. He would choose me to be a TA for new courses, and was always challenging me. I did my first TV interview while at UBC, doing a segment for the local CTV station on seafloor hydrothermal vents, and discovered that having a TV camera in front of me did not make me nervous. I found out the next day from my mother that the segment made the CTV National News that evening!

After my PhD from UC Santa Barbara, I moved to Ottawa, and was a soft-money researcher and contract instructor for 15 years. This was a lot of fun, working with many geologists across Canada, the western US, and elsewhere, plus helping out grad students at Carleton with their isotope work. Kudos to Keith Bell and John Blenkinsop for giving me complete freedom in the isotope lab at Carleton. I have also been very lucky to have been part of a supportive Earth Sciences department at Carleton including all the faculty and staff over the last 32 years. A VIP member who also helped get me started was Jarda Dostal. Jarda flew me to Halifax on several occasions, introduced me to other

Atlantic geologists including Brendan Murphy, and involved me in research projects in Atlantic Canada and on the West Coast. He also got me involved in the VIP Division. Jarda has been an inspiration to me.

My own research went in three directions – greenstone belts in the NWT and Nunavut, modern seafloor and ocean island volcanism, and continental arc/extension igneous activity in eastern California and northern Nevada. I met Hendrik Falck in my second summer in Yellowknife, leading to a number of collaborative projects in the southern Slave Province, contributions to the Yellowknife EXTECH project, and later to research in the Selwyn Basin. I always remember Hendrik's advice about finding a group of collaborators who "play well together". He and other geologists in Yellowknife certainly fit that mold and made my geochemical research extremely enjoyable. The NWT research led to similar work in Nunavut through the Western Churchill NATMAP project guided by Simon Hanmer and Carolyn Relf. I was working with two other soft-money geologists, Larry Aspler and Jeff Chiarenzelli, both based in Ottawa and ex-grad students of Al Donaldson (note that Hendrik was also a Donaldson student – is there a theme here?). Larry and Jeff were super fun to work with, and I believe that we got the first journal article from that NATMAP published in Geology. One great memory was Jeff hoisting me on his shoulders to wade me out to the float plane that was taking me home, since the plane could not come all the way in to shore of the lake at our camp. It was nice to have dry feet for the trip home!

I had known Dave Clague (then at the USGS) for several years, and he then moved to the Monterey Bay Aquarium Research Institute. We met again over lunch at AGU in 2000, and he complained that he was waiting a long time to get radiogenic isotope data from the lab he was using. I volunteered to do isotope work for him, and this led to me and Carleton students being invited on several MBARI research cruises to Hawaii and the Juan de Fuca Ridge. I was very impressed with what ROV's could do, especially on a ship specially built for that task, and how Dave developed special sampling methods for seafloor research. The Hawaii cruise led to an extensive study of subaerial and submarine shield, postshield, and rejuvenated stage lavas from Kauai and Niihau that took five years to finish!

Having gone to grad school at UC Santa Barbara, I went on lots of field trips to Arizona and California – to the desert in winter and to the Sierra Nevada in summer. I had a chance to do some field work around Long Valley Caldera in 1992 and in 1993, looking at the mafic to intermediate lavas rather than the "sexy" high-silica rhyolites and ignimbrites that were already well-studied. This was the stepping stone to the start of a 28-year long study of continental arc volcanism in the southwestern US that pre-dates the modern Cascade Arc. Bill Wise and Art Sylvester from UCSB got me started working around Lake Tahoe, giving me copies of their brand-new geology maps from the north side of the lake. Then in 2000, I met Chris Henry of the Nevada Bureau of Mines and Geology at a NAGT conference in Blairsden, California. Since that lucky introduction, Chris and I, along with students from Carleton, have slowly progressed eastwards from the Lake Tahoe region east across the Cenozoic volcanic arc exposed in northern Nevada. This has been the most satisfying part of my research career, where we combined detailed mapping, Ar-Ar and U-Pb dating, and whole-rock geochemistry and radiogenic isotope analysis to evaluate the petrogenesis of lava flow complexes and caldera ignimbrites, lavas and intrusions that range in age from Eocene to late Pliocene. Unlike the modern Cascade Arc, the older continental arc derives mafic magmas from metasomatized lithospheric mantle during Farallon slab rollback, something that was totally unexpected at the outset of the project. Our last bit of field work was in May 2023, and if our isotope clean lab renovation ever comes to an end I can run the last rocks to tidy up the story.

None of this could have happened without enthusiastic students at Carleton, like Ann Timmermans, who have done superb work. Julie Prytulak, one of my first undergrad students who took on a BSc thesis study around Lake Tahoe, has just taken up a CRC position at UBC which means I may get to see her more often. Over the last few years, I have co-supervised a number of grad students with Richard Ernst and have enjoyed being part of his LIPs research group. I have also been lucky to have some terrific Visiting Scientists, such as Nadia Mohammadi, who came to Carleton to learn all they could about radiogenic isotopes in our facilities. I have loved having students and researchers visit Carleton to do their own chemistry and learn the ins and outs of mass spectrometry.

Last but not least, thanks to my wife Caroline and my daughter Kristen for both tolerating my love of volcanoes and geology and for sometimes participating in it! Now I hope that I can get my grandkids to see why Grampy loves what he does.

Brian Cousens
Carleton University

Ph.D. Award, Dr. Rebecca Morris, University of Victoria

Nomination Letter

I am hereby writing in support of Rebecca Morris for the GAC VIP Gelinas Gold Medal. I have known Rebecca for five years as supervisor of her PhD, which she successfully defended and completed in December 2023. Originally from Red Deer, Alberta, Rebecca came to Victoria in 2018 from a MSc at Western Washington University and a BSc from University of Calgary.

Rebecca is an igneous petrologist with interests and passions that concern arcs, arc magmas and tectonics. To address her interests, she undertook a thesis at the interface of petrology and the topic of the long-term geologic record of climate warming. Her PhD thesis is directed at a controversial proposal (from isotopic studies of volcanic gases), that a significant amount of CO_2 released at modern volcanoes may be 'upper plate/crustal carbonate' in origin, and not sourced in the mantle. If true, this greatly impacts a common dogma about the long-term solid earth C cycle and the role of CO_2 release from volcanic arcs and warm climates over geologic time. Rebecca addressed this research problem by studying in detail some examples of magmacarbonate reactions in the subsurface of an arc. To do this, she examined the interaction of plutons and dikes (magma channels) with carbonate wallrock to create CO_2-rich fluid (and related skarn mineralization) in an exhumed arc crustal section here on Vancouver Island. She initially visited many sites but eventually focussed on the Merry Widow site – a former Fe mine with a well-exposed stratigraphy of the upper 6 km of 197 Ma Jurassic island arc crust. Rebecca performed detailed field mapping, and collected over 250 samples to examine how the composition, geometry or duration of intrusions (dikes vs. plutons), impact carbonate-magma interactions and CO_2 release. Rebecca gathered isotopes and geochemistry of plutons and dikes from two detailed settings, and with detailed fieldwork and archived data from several mineral exploration drill cores, assembled a spatially comprehensive picture of field relationships and carbonate-magma interactions. She used geochemical and geological data in parallel with petrologic models she developed using MELTS software. Rebecca thus admirably combined fieldwork, modelling, mineral and rock chemistry into a comprehensive examination of reaction progress, mixing and assimilation processes during carbonate-magma interactions beneath an arc. Based on this work, just finished in Dec 2023, Rebecca has already published two first rate papers in major high-impact journals:

Morris, R.A., Canil, D., Spence, J. 2023 Magma-carbonate interactions drive CO_2 production and metal enrichment in shallow dikes and sills at volcanic arcs. Geology, doi.org/10.1130/G51439.1

Morris, R.A., Canil, D. 2022 CO_2 transport at shallow depths in arc magmas: Evidence from unique orbicular dikes in the Jurassic Bonanza arc, Vancouver Island, Canada. Contributions to Mineralogy and Petrology 1776 doi.org/10.1007/s00410-021-01852-y

Two more papers are in the works. Some major impacts of her research are : (1) though smaller in size, dikes and sills maximize carbonate wallrock assimilation, and actually produce more CO_2 per unit area than plutons, (2) plutons are larger heat sources, but very little of the magma volume 'sees' wallrock carbonate, (3) magma-carbonate reactions can create ephemeral and bizarre Ca-rich liquids with unique chemical and physical properties, (4) CO_2 produced from the wallrock (in limestone) greatly exceeds the flux of any magmatically produced CO_2. Her research showed the 'upper plate carbonate' contributions to high CO_2 fluxes and warm climates in the geological record has been grossly overestimated, and on weak grounds. Though not the focus of the thesis, her research also has implications for metal transfer and mineral deposits forming at magma-carbonate contacts.

Rebecca is a bright, enthusiastic, diligent self-starter, and always made herself new opportunities – including interfacing with private companies that showed interest in her research, approaching them for unique samples and highly confidential drill core. Her thesis was carried out at a critical time through the covid pandemic, but she is independent and weathered it like a champ. Rebecca views herself as a petrologist, but her research touching on the solid earth CO_2 cycle, forced her to bridge many disciplines - volcanology, economic geology, climate science - and be cognizant of an interesting interface between the world of igneous petrology and the environment. Rebecca has a passion for petrology and shows even greater future potential. She has a special commitment as to the training of the next generation of geoscientists, and is great a role model for younger women in science. In summary, I give Rebecca an overwhelmingly strong recommendation for this award.

Sincerely,
Dante Canil

Acceptance letter

I am truly humbled to be the recipient of the 2024 Léopold Gélinas Gold Medal award. Thank you to Dante Canil for the nomination, and to the Volcanology and Igneous Petrology Division of the Geological Association of Canada for selecting my dissertation.

This work would not have been possible without the support and mentorship from Dante, who over the better part of 5+ years was a source of new curiosities and questions that led to unique research directions and discoveries. Dante's flexibility during my dissertation also allowed me to teach and work on other related Canadian Cordilleran topics, which brought balance and enjoyment throughout this degree.

I am grateful to the many other colleagues, students, friends and family who contributed ongoing encouragement and support during this dissertation – especially to Jody Spence for his analytical patience and expertise in the lab. I also thank my husband Simon, who has been a pillar of support over the years, and (truly) the best field assistant and camp cook there is.

Thank you to the University of Victoria, NSERC, the Mineralogical Association of Canada, and Geoscience BC for the financial support that made this work possible.

Lastly, it is somewhat fitting in that the first project within my dissertation focused on unique orbicules in basaltic dikes, which upon some of my early literature searches for spherical textures in mafic rocks led me to Gélinas work on variolites in Archean basalts. Although my orbicules are vastly different from Gélinas variolites in nearly all aspects (genesis, processes, age, tectonic setting), his work was unique and interesting, and I feel privileged to receive an award in his name.

Thank you again GAC-VIP for this recognition,

Rebecca Morris

M.Sc. Award
Carlos Guerra Braga
Carleton University

Nomination Letter

We are pleased to nominate Mr. Carlos Guerra Braga to receive the 2024 Silver Gélinas Medal for his successfully defended M.Sc. thesis (defense on January 11) "Geological history of the Atira Mons large shield volcano, Beta Regio, Venus". The thesis was enthusiastically accepted by the defense committee with no required changes, and the committee nominated him for a Carleton University Senate Medal. During his defense Mr. Braga demonstrated total command of the topic, remarkable for someone at the M.Sc. stage and more consistent with a successful Ph.D. defense.

Atira Mons is a huge Hawaiian-style shield volcano that extends over an area of 300,000 km², equivalent to nearly a third of the size of Ontario, and with individual flows up to 700 km long. His mapping was 10 times more detailed than previous regional mapping on Venus and is the most detailed ever attempted for a large Venusian volcano. His success in providing a detailed flow history for this volcano (53 volcanic units grouped into 6 stages) was the first to demonstrate that such a sophisticated flow history can be developed for large Venusian volcanoes using the currently best available data, from the Magellan mission: radar images at 75 m/ pixel and radar altimetry at 50-100 m vertical and +/-10 km horizontal resolution.

His mapping and geological interpretation are a template for future detailed mapping programs on Venus. He is already influencing the planetary research community with a presentation on January 18 for the International Venus Research Group (IRVG), and a manuscript submitted for the international journal, Planetary and Space Science.

A couple of weeks ago the journal reviews were received; they recommended acceptance after only minor revision. Within a week the revised manuscript was sent back to the journal, and we are expecting formal acceptance shortly. We attach both the accepted thesis and the revised version of the journal manuscript. Additional letters of support for this nomination are being submitted separately.

In summary, Mr. Braga has produced a MSc thesis of exceptional quality and scientific impact.

Sincerely,

Dr. Richard Ernst and Dr. Hafida El Bilali (co-supervisors)

II am writing in support of the nomination of Mr. Carlos Guerra Braga, Carleton University, for the prestigious Geological Association of Canada Volcanology and Igneous Petrology Division 2024 Silver Léopold Gélinas Medal, for his successfully defended (1-1-24) M.Sc. thesis, "Geological history of the Atira Mons large shield volcano, Beta Regio, Venus".

By way of introduction, I have been on the geoscience faculty at Brown University since 1973. My major research focus has been the theoretical modeling of the generation, ascent anderuption of magma on Earth and planets, and geological mapping and assessment of volcanicdeposits on planetary surfaces to test and improve the models, and understand the thermal evolution of the Earth and planets (https://scholar.google.com/citations?user=GgICCQIAAAAJ&hl=en). During this time I have been primary advisor for ~50 PhD and >55 MSc degree recipients. I have known Mr. Braga through participation, with his principal advisors at Carleton University (Dr. Richard Ernst and Dr. Hafida El Bilali),in the International Venus Research Group (IVRG),a group we co-chair, and which is designed to encourage and train young people across the world in the geological mapping and interpretation of the Earth-like planet Venus, in preparation for the international armada of missions (United States, European Space Agency, India, Russia, China) scheduled to arrive at Venus in the coming decade.

The GAC-VIP Silver Medal is named for Léopold Gélinas, whose pioneering and detailed work in Canadian Archean volcanic and metavolcanic rocks of the Abitibi Greenstone Belt has provided fundamental insights into the nature of this important record, and its relation to other Archean deposits and history. It is thus totally appropriate that the criteria for the Medal require demonstration of "originality, validity of concepts, organization and presentation of data, understanding of volcanology & petrology, and depth of research". On the basis of my personal knowledge of Mr. Carlos Braga and his Carleton University Master's thesis, I believe that his thesis has not just met, but excelled, in all of these categories.

Originality: Mr. Braga chose an area to map for his thesis project that is incredibly complex, but clearly had the potential, with hard work and countless hours of detailed mapping and remapping, to provide major insight into the origin and evolution of a major large shield volcano on Venus.

Validity of concepts: Geological mapping using remote sensing data, particular radar, is a very difficult endeavor, but Mr. Braga enthusiastically researched and learned these principles and their application to Venus from previously published work and constant interaction with his advisors. Thus, his unit definition and characterization criteria were based on a firm foundation and his application of these to the "dissection" of the volcano (stratigraphic relation, structural interactions, and subsequent assessments of phases and implications) were very firmly based on a solid foundation.

Organization and presentation of data: On the basis of the initial presentation of background and context, unit definition and characterization, and then the systematic assessment of the volcanological and chronological sequence of lava flow emplacement and interaction with evolving topography, structure and other geological units in the area, the thesis is a prime example of how the clearly documented organization and presentation of data are essential to making a strong and convincing interpretation of thevolcanological history of Atiri Mons, a major Venus shield volcano. More succinctly, it serves as a foundational example of how to do

this type of volcanology analysis for international participants in the present and future analysis of Venus data.

Understanding of volcanology & petrology: The thesis is clearly a critical contribution in this area. Without 'ground truth' and in situ outcrop investigations, planetary scientists must use the type of careful geological mapping demonstrated in Carlos Braga's thesis to infer key volcanological aspects of the individual lava flows (inferring composition, viscosity, flow effusion rates, flow cooling rates, etc.). Carlos Braga's thesis illustrates both the strengths (excellent documentation of examples), and limitations (being clear in not overinterpreting the data) of this necessary approach.

Depth of research: This is clearly demonstrated by the fundamental documentation of individual lava flows, their phases, their collective patterns and sources, and how these changed during the overall history of the volcano. In addition, careful documentation of these patterns (source regions, caldera location and size, evidence for uplift and/or subsidence, evidence for radial dike emplacement and its timing and length) are all key to understanding the relationship of the volcano to mantle convection patterns and vigor (e.g., minor upwelling, plume head, plume tail, large igneous province (LIP), thin or thick lithosphere, etc.). Carlos Braga's thesis serves as a critical resource for geologists and geophysicists who are studying the volcanological, geological and geodynamical history of the enigmatic Earth-like planet Venus.

In summary, I believe that Mr. Carlos Braga's Carleton University Master's thesis has not just met, but excelled, in all of these categories. On the basis of my personal knowledge of the thesis, and my experience in advising and mentoring in the last 50 years, I unequivocally recommend Mr. Carlos Braga's Carleton University M.Sc. thesis, "Geological history of the Atira Mons large shield volcano, Beta Regio, Venus", for the prestigious Geological Association of Canada Volcanology and Igneous Petrology Division 2024 Silver Léopold Gélinas Medal.

Sincerely,
James W. Head, III

I had the great fortune of being asked to serve on the thesis examination committee for Carlos Braga in the Department of Earth Sciences. Mr. Braga had completed a study of the geology of the Atira Mons volcano on Venus, using radar imagery collected by the Magellan orbiter in the early 1990's. This dataset is still the best that exists for Venus, even though it suffers from limitations in terms of altimetry and resolution of geological features on the Venusian surface.

The thesis was superbly written, including an excellent description of the Magellan data collection techniques, the advantages and limitations of the Magellan dataset, and the approach taken to the study of the Atira Mons volcano. The amount of work that goes into interpreting the geology of Venus as recorded in the Magellan data is arduous, but Mr. Braga was able to convincingly discriminate numerous volcanic episodes based on cross-cutting relationships. He was able to demonstrate that earlier volcanic episodes were of greater volume that later volcanic events on the volcano. Mr. Braga produced a geological map of Atira Mons volcano that is truly astounding in its detail. It is on par with geological maps of volcanoes on Earth for which we far better access. He also produced a table that outlined the geological history of the volcano over time, although there is no stringent control on the total time that it took to construct this edifice. Mr. Braga showed expertise in the use of geographical information software that allowed him to model the volume and vertical extent of Atira Mons volcano over the basement rocks of the region, a very difficult feat.

The thesis itself deserves a medal. But I was blown away by Mr. Braga's thorough understanding of the Magellan dataset, of previous studies of the geology of Venus, and what the impact of his work was to understanding the volcanic history of Earth's sister planet. His defense was, without a doubt, the very best that I have had the honour to sit through in my 31 years at Carleton.

Sincerely,
Brian L. Cousens
Carleton University

It is my pleasure to offer these comments in support of the nomination of Mr. Carlos Braga's M.Sc. Dissertation for the Silver Gélinas Medal of GAC, in recognition of superior achievement in research, presentation, and defense of his work.

Mr. Braga's thesis is an impressive body of work on an internationally important project to map and understand the surface of Venus. His research contributes to the understanding of one of largest

expressions of volcanism on the planet and the relationships between magmatism and planetary geodynamics. The examining committee unanimously agreed that the scope and breadth of enquiry, encompassing structural geology, volcanology, and geophysics were unprecedented for research at this level.

The findings are presented in a very well organized and comprehensive document – a major achievement considering the complexity of the volcanic system and the demands of remote predictive mapping in our solar system. The thesis presents a sophisticated state-of-the-art analytical approach that had to be developed to unravel the complex geologic history of the erupted materials. The seamless combination of geology, geomorphology, and geophysics far exceeds what is normally expected at this level. While the whole document is a pleasure to read, the final geological map is an original creation of singular merit. It takes a great deal of discipline to build a robust geological legend for a planet that has never been mapped at this scale before and then to interpret those results according to a strict set of structural and stratigraphic rules. This work will be a major contribution to the ongoing international effort to map Venus in its entirety. The significance of Mr. Braga's contribution was evident from the deluge of congratulations from leaders in this field throughout North America and Europe – clear evidence of the impact of his work.

Sincerely,
Prof. Mark Hannington
Department of Earth and Environmental Sciences
University of Ottawa

Acceptance letter

I am very thankful to the Volcanology and Igneous Petrology Division for awarding my MSc thesis the Léopold Gélinas Silver Medal. It is very rewarding to have our work recognized by the Geological Association of Canada.

That said, I would like to thank my supervisors, Richard Ernst and Hafida El Bilali, for taking me in as their MSc student at Carleton University and nominating this work for this award. This collaboration introduced me to Planetary Science, allowed us to publish many abstracts, finish this thesis and publish a paper at Planetary and Space Science. More importantly, it introduced me to wonderful coauthors, namely Ekaterina Antropova, James Head, and Ken Buchan who always offered invaluable input that led this work to its final form.

I would like to extend my gratitude to the other nominators for the VIP-GAC award: Mark Hannington, James Head, and Brian Cousens. Besides offering continuous support and guidance during my studies, they introduced me to different and exciting faces of Geology, helping me clear the fog and define the next steps in my career.

I am also grateful to the financial support provided by the Canadian NSERC Discovery Grant, iMAGE-CREATE, the GAC-MAC Graduate Scholarship in Earth Sciences, the Collins Endowment, and the Donald R. Wiles Prize for Laboratory Demonstrators.

Lastly, I would like to thank the members of the VIP-GAC committee once more for deeming this work deserving of such an award.

Carlos Braga

B.Sc. Award
Mia Morson
Lakehead University

Nomination Letter

Please find the attached HBSc thesis written by Ms. Mia Morson for consideration of the 2024 Léopold Gélinas Bronze medal. I supervised Mia over this past academic year on her thesis, entitled “Quartz trace element chemistry as a pathfinder technique: exploring the link between a fertile parental granite and a mineralized pegmatite”.

She worked diligently throughout the year with this important research. She’s been an absolute pleasure to supervise, and her abstract has been accepted for presentation at the Institute on Lake Superior Geology (ILSG) annual meeting in Houghton, Michigan this coming May.

Please let me know if anything else is required at this time. Thanks for your consideration of this HBSc thesis.

All the best,
Shannon Zurevinski
Dept. of Geology
Lakehead University

Acceptance letter

I am deeply thankful to be receiving the Gelinas Bronze Medal for my undergraduate thesis research this year. I would like to extend my gratitude to the Volcanology and Igneous Petrology Division of the Geological Association of Canada for this huge honour in recognizing my work for this award. I would also like to thank my thesis advisor, Dr. Shannon Zurevinski, from the Lakehead Geology Department for her guidance and advice throughout the writing process, for this would not be possible without her continued support. I am very grateful to have been surrounded by constant encouragement from my family and my peers in the Lakehead Geology Department, which helped maintained my enthusiasm throughout the school year.

Mia Morson

The 2024 International Ni-Cu Symposium

The 2024 International Ni-Cu Symposium was held on the Thunder Bay campus of Lakehead University from August 6-8th, 2024 and featured a diverse range of technical sessions that highlighted the latest research on a wide range of topics related to Ni-Cu-PGE mineral systems. With 125 attendees from 10 countries the conference brought together a diverse group from academia, industry and government including 25 students. Fantastic keynote presentations covered diverse topics including non-traditional settings for Ni-Cu deposits, the role of lithospheric structures in forming deposits, magmatism in the Midcontinent Rift, new ideas for the formation of the J-M Reef and the future of research directions for Ni-sulfides and were peppered through three days of great talks (you can find the abstracts at https://digitalcollections.lakeheadu.ca/items/show/10613). The talks were complimented by some great posters and a core shack with displays of core from deposits around the region. Thanks to some hard work by our judging panel (Rebecca Sproule, Ville Virtanen and Michel Houlé) we were able to reward the hard work of our student attendees with Henri Höytiä and Dustin Peters sharing the prize for best talk, Dominic Raisch the runner up and Killian Millier for the best poster.

Before and after the conference we ran field trips to see some local deposits with the geological team at Impala Canada's Lac des Iles mine hosting a tour of the deposit, Dave Good and Al MacTavish leading a trip to the 1.1 Ga Coldwell Complex with a stop at the Generation Mining core shack (see companion article by Fazilat Yousefi). After the meeting Jim Miller led a trip through the Duluth complex, with a chance to view core from New Range Cu-Ni's Northmet and Mesaba deposits and Twin Metal's

Maturi deposit as well as the Tamarack deposit and Dean Rossell took a group through the Baraga basin with one highlight being the core shack of the Eagle Mine.

All in all, it was an amazing conference none of which would have been possible without the help of our amazing sponsors: Clean Air Metals Inc., the CEDC Tourism Development Fund, Generation PGM, Actlabs, Big Rock Exploration, Talon Metals Corp., Agat Laboratories, the Centre of Excellence for Sustainable Mining and Exploration, AGC Geoconsulting, Teck, the Society for Geology Applied to Mineral Deposits and Explore Geosolutions. Thanks to our sponsors, all participants and the amazing organising committee whose hard work made the conference the success it was. See you in two years time in Perth-Whadjuk for the International Symposium on Mafic-Ultramafic Mineral Systems.

Pete Hollings and the organizing committee

Visiting Cu-PGE deposits of the Coldwell Complex (Caldera), Ontario: Field trip related to International Ni-Cu Symposium, Thunder Bay, 2024

This two-day pre-meeting field trip in northern Ontario occurred on August 4th and 5th. It was organized by Dr. David Good and Mr. Allan MacTavish. Participants included geoscientists from around the world. On the first day, we visited 6 key outcrop sites. During the day, we spent time at each outcrop to learn about features that were significant to understanding the Coldwell Complex as a large volcanic caldera (Figure 1). The caldera origin of the Coldwell Complex has been proposed by a few workers (e.g., Walker et al. 1993).

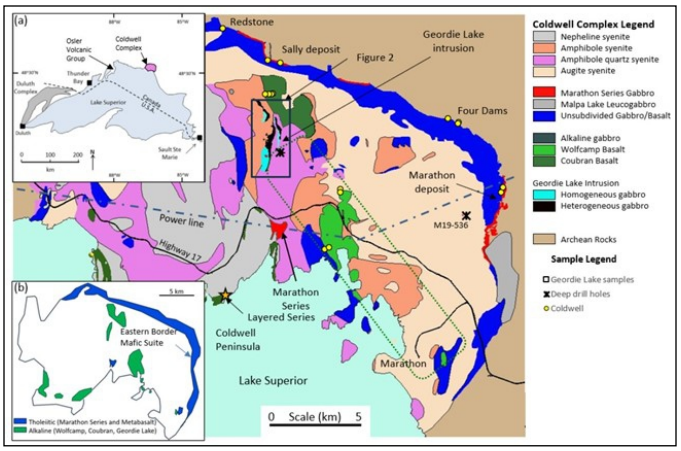

Figure 1: Geology map of the Coldwell Alkaline Complex (Good et al. 2021).

The Proterozoic Coldwell Complex intruded the Archean Schreiber-Hemlo greenstone belt along the northern margin of the North American Midcontinent Rift (Figure 2). At the first stop of the trip, we observed the east-west trending Copper Island dyke swarm, geochemically correlated to the Geordie-Wolfcamp magmatic series in the Coldwell Complex, cutting the Archean basement (Figure 3A), and well-developed boudinage structures in the Archean rocks (Figure 3B). These features provide clear evidence of the deformation history in the area, reflecting significant tectonic activity. The subcircular complex that is the Coldwell Complex, with a diameter of 25 km and a surface area of 580 km², is one of the largest alkaline intrusive complexes in North America. The U-Pb age date for the Coldwell Complex is 1106.5 ± 1.2 Ma (Good et al. 2021). It was emplaced over approximately 2 million years (1107.7 to 1105.3) during the early stage of the Midcontinent Rift magmatism.

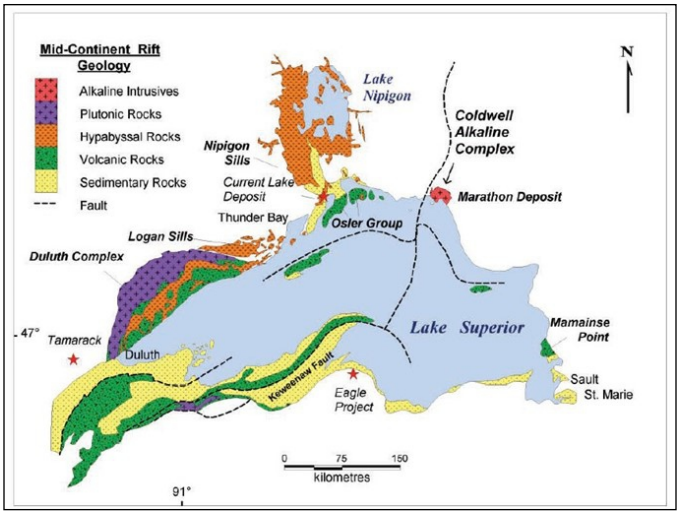

Figure 2: Location of the Coldwell Alkaline Complex within the Midcontinent Rift (after Miller and Nicholson 2013).

Figure 3: A) The east-west trending Copper Island dyke swarm, which is geochemically correlated to the Geordie-Wolfcamp magmatic series in the Coldwell Complex, cutting the Archean basement located west of the complex; B) Boudinage structures observed in Archean rocks.

Another interesting stop during this trip was visiting the syenite units which were contaminated by basalt (Figure 4). Other theories propose that this outcrop

Figure 4: Contamination of syenite by basaltic units.

Another remarkable rock in this field trip was the presence of layered gabbro in the vicinity of syenites. Layered gabbro during crystallization can be due to the process of fractional crystallization and gravitational settling of early-formed minerals. As the magma cools, denser minerals like olivine and pyroxene crystallize first and settle at the bottom of the magma chamber, creating distinct layers, while lighter minerals like plagioclase crystallize later, contributing to the formation of a layered structure. Variations in mineral composition and cooling rates further enhance this layering effect. We also observed a pegmatitic section, adjacent to the layered gabbro assemblage (Figure 5).

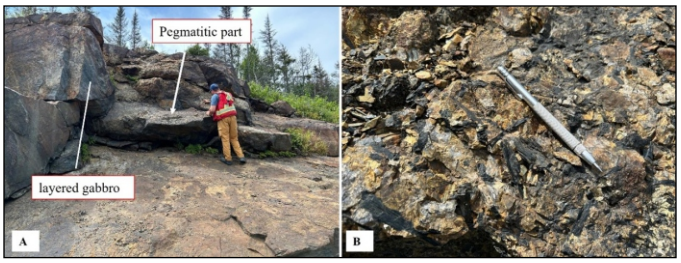

Figure 5: Observation of layered gabbro (A) and tourmaline mineralization in the pegmatite section (B).

On the second day, we focused on mineralization at three very different settings in the Complex highlighted in Figure 1. First, we visited the Generation Mining's core shack in Marathon to examine drill core from the Geordie Lake Cu-PGE deposit and the Four Dams occurrence (Figure 6).

Figure 6: Visiting Generation Mining's core shack in Marathon to examine drill core from the Geordie Lake deposit and the Four Dams occurrence.

Mineralization types included:

1. Pyrrhotite- to bornite-rich assemblages and extreme PGE enrichment at the Marathon deposit (tholeiitic);
2. Bornite-chalcopyrite assemblage associated with skeletal olivine in troctolite breccia at the alkaline Geordie Lake deposit;
3. Chalcopyrite-pyrrhotite assemblage within apatite-olivine-clinopyroxene cumulate rocks at the Four Dams occurrence.

Then we drove up to the Marathon deposit site to examine a total of 4 outcrops: Marathon Main zone including the footwall contact; a small oxide-clinopyroxene-apatite cumulate located in the hanging wall; a troctolite sill overlying the deposit; and the very high-grade PGM mineralized horizon at the south end of the deposit.

Ultramafic Ni-Cu-platinum group element (PGE) deposits linked to the North American Midcontinent

Rift are believed to have formed in magma conduit settings, where PGE concentrations are influenced by various fluid dynamic processes. The Marathon Cu-PGE sulfide deposit, situated within the rift-related Coldwell Alkaline Complex, is categorized as a gabbro-associated contact-type deposit (Figure 7). Magmatic processes have been proposed to explain the significant concentration of PGEs in this deposit (Good et al., 2015), although there is evidence for a late hydrothermal overprint resulting in some loss of Au, Cu and S from the higher-grade samples. The sulfides at Marathon likely formed in a large, deep magma chamber and were transported by magma pulses through a fault-controlled conduit, rather than by in situ sulfur saturation from local country rock interaction.

Figure 7: Gabbroic sample from Marathon Cu-PGE sulfide deposit with bornite (Cu_5FeS_4) and chalcopyrite ($CuFeS_2$).

References

Good, D.J., Linnen, R.L., Meghji, I., Samson, I.M. and McBride, J., 2021. Relationships among the Geordie Lake Cu-Pd deposit, alkaline basalt, and syenites in the Coldwell Complex, Midcontinent Rift, Canada. The Canadian Mineralogist 59(6), pp. 1571-1597.

Good, D.J., Epstein, R., McLean, K., Linnen, R.L. and Samson, I.M., 2015. Evolution of the Main Zone at the Marathon Cu-PGE sulfide deposit, Midcontinent Rift, Canada: spatial relationships in a magma conduit setting. Economic Geology 110(4), pp. 983-1008.

Heaman, L.M., Easton, R.M., Hart, T.R., MacDonald, C.A., Hollings, P. and Smyk, M., 2007. Further refinement to the timing of Mesoproterozoic magmatism, Lake Nipigon region, Ontario. Canadian Journal of Earth Sciences 44(8), pp. 1055-1086.

Miller, J.D., Nicholson, S.W., Easton, R.M., Ripley, E.M. and Feinberg, J.M., 2013. Geology and mineral deposits of the 1.1 Ga Midcontinent Rift in the Lake Superior region—An overview. Field Guide to the Copper-Nickel-Platinum Group Element Deposits of the Lake Superior Region, Duluth, MN, pp. 2013-01.

Walker, E.C., Sutcliff, R.H., Shaw, C.S.J., Shore, G.T. and Penczak, R.S., 1993. Precambrian geology of the Coldwell Alkaline Complex. Ontario Geological Survey Open File Report 5868, 30 p.

Prepared by

Fazilat Yousefi[1] & David Good[2]

[1]University of New Brunswick

[2]The University of Western Ontario

10th International Symposium on Granitic Pegmatites (PEG2024)

Figure 1: PEG2024 group photo in front of the Science building at Brandon University.

The 10th International Symposium on Granitic Pegmatites (PEG2024) was held in May 2024 in conjunction with the joint Annual Meeting of the Geological Association of Canada (GAC) and the Mineralogical Association of Canada (MAC). PEG2024 was co-chaired by Tania Martins, Encarnacion Roda-Robles, Lee Groat and Alexandre Lima, and was an incredible gathering of geologists and students dedicated to all aspects of pegmatology with field trips and special sessions. Our participants came from across the globe to engage in discussions and hear speakers presenting on active pegmatite studies from North and South America, Asia, Australia, Africa and Europe. PEG2024 was dedicated to the career of Robert F. Martin who gave a plenary talk on 'Sanidine, orthoclase and microcline, all are possible in felsic pegmatites'. PEG2024 also featured keynote speakers focused on 'The magmatic lineage of the Li-rich LCT pegmatites from the Central Iberian Zone: reading the geochemical tracers at bulk-rock and mineral scales' by Encarnacion

Figure 2: Enthusiastic pegmatologists having fun at the Big Whopper pegmatite, Ontario, Canada.

Roda-Robles; 'Reassessing the classification of granitic pegmatites using statistical analysis versus visual inspection of mineral assemblages' by Michael A. Wise; 'Good, bad, or ugly: the unique challenges of geochronology in pegmatite systems' by Chris McFarlane; 'The economic importance of pegmatites in Africa with a focus on lithium' by Judith A. Kinnaird; and 'Looking through lithium tinted retrospectacles: How can the understanding of rare metal pegmatites in research and the minerals industry better inform each other?' by Marcus T. Sweetapple.

Figure 3: Discussions on pegmatite emplacement at the Cat Lake-Winnipeg River pegmatite field in Manitoba.

The field trips included a visit to the Separation Rapids pegmatite district in Ontario, and the Cat Lake-Winnipeg River pegmatite field in Manitoba, including the Tanco pegmatite. Special thanks to all involved in field trip logistics, sample viewing, volunteers, facilitators granting access to sites, drivers, industry, sponsors and particularly to Catriona Breasley, Lot Koopmans and Dr. Claude Nambaje. Everyone's enthusiasm, commitment and interest made PEG2024 a truly memorable event.

Tania Martins

Figure 4: Field trip participants viewing P. Černý,'s Tanco pegmatite sample collection housed at the Robert B. Ferguson Museum of Mineralogy, University of Manitoba.

Late tectonic rare-metal pegmatitic magmatism in the Bancroft area, SW Grenville Province

This 2 day post-meeting field trip (1 nite in Bancroft) would visit the Quadville Be and Rose quartz pegmatites, the Craigmont corundum pegmatite, and the MacDonald REE-Y-Nb-U pegmatite on Day 1, then the Saranac Zr-REE pegmatite, the Princess Sodalite pegmatite, Goulding-Keene pegmatite, and finally the Perthite locality south of Perth. A few pegmatites will also be visited near the Faraday pegmatite (Madawaska Uranium deposit). These iconic localities are very well known for their mineral collecting and former mines, although in recent decades have become less accessible due to changing land ownership. Bancroft (region) is known as the "Mineral Capital of Canada". As with research done decades past even to over 100 years ago, the localities will instigate discussion about their source(s), timing and relative timing, degree of fractionation, role of exsolved volatiles, fractionation history, and structural controls on emplacement. In addition, reaction with host rocks is highly variable and locally seems important in the endogranitic to exogranitic mineralization processes, which have been controversial as well.

Prof. David R Lentz PhD PGeo FGC
Dept of Earth Sciences
University of New Brunswick

Upcoming VIP sessions

GAC-MAC-IAH-CNC 2025, University of Ottawa

Ian Coulson and Fazilat Yousefi are organizing a special session titled "Petrogenesis of Anorogenic Magmatism and Related Mineralization: Decoding Magmatic to Geodynamic Processes – A Session Honoring Joseph Whalen's Contributions".

Phil McCausland; Wouter Bleeker; Mike Hamilton; Richard Ernst; Hafida El Bilali; Joe Hodych; and Henry Halls are organizing a special session titled "Paleogeography and geodynamics of the Earth before Pangea: Celebrating the career accomplishments of Kenneth L. Buchan".

Ben Moulton and James Brenan are organizing a special session titled "The structure and properties of silicate melts and glasses: A celebration of the career of Grant Henderson".

Check out https://cdn.fourwaves.com/ottawa2025/pages for more details.

VIP Award Reminders

The Career Achievement Award - the deadline is **31 January 2025**.
Please send nominations to Donnelly Archibald (darchiba@stfx.ca)

The Gold Gélinas medal for an outstanding PhD thesis in the fields of volcanology and igneous petrology - the deadline is **28 February 2025**.

The Silver Gélinas medal for an outstanding MSc thesis in the fields of volcanology and igneous petrology - the deadline is **28 February 2025**.

The Bronze Gelinas medal for an outstanding Honours thesis in the fields of volcanology and igneous petrology - the deadline is **15 April 2025**.

Please send nominations for the Gélinas medals to Zsuzsanna Magyarosi (zsuzsannamagyarosi@gov.nl.ca).