THE ATLANTIC GEOSCIENCE SOCIETY (AGS)
LA SOCIÉTÉ GÉOSCIENTIFIQUE DE L'ATLANTIQUE

52ND COLLOQUIUM AND ANNUAL MEETING

Special Sessions
S1: Ongoing developments in coastal and marine geoscience in Atlantic Canada
S2: Sedimentological and paleontological applications in advancing a sustainable energy future
S3: Advances in Appalachian tectonics: insights from field and laboratory studies
S4: Educational outreach
S5: Terrestrial and marine surface processes in Atlantic and Arctic Canada
S6: Advancing critical mineral development in Atlantic Canada

General Sessions
G1: Geoscience research developments

6-7 February 2026

We acknowledge that the Atlantic Geoscience Society is on the traditional and unceded territories of the Mi'kmaq, Wolastoqey, Peskotomuhkati, Innu, Inuit and Beothuk. These nations have been present on these lands since time immemorial: from their ancient stories that share important geological knowledge like fossil localities, gem and mineral sites and more, to John Basque, the first Indigenous Mi'kmaw person to work for the Geological Survey of Canada at its inception in 1843. Indigenous people have always been integral to the study of geology. The knowledge keepers, earth keepers and land defenders continue to do important geological work across these lands. The Atlantic Geoscience Society recognizes that we are all Treaty People and therefore supports honouring the treaties signed with all levels of government in this region.

PROGRAM

SPONSORS

The Atlantic Geoscience Society Colloquium is where students, industry professionals, government leaders, and academics come together to learn, share research, and collaborate on advancing geoscience.

This event would not be possible without the incredible support of our sponsors from the local geoscience community.

A heartfelt THANK YOU to these organizations for their commitment to fostering innovation and driving geoscience forward in Atlantic Canada. Your investment in knowledge and collaboration makes a lasting impact!

Welcome to Truro, Nova Scotia! This will be the 52nd time that the Atlantic Geoscience Society has met for an Annual Meeting, although the first Colloquium did not begin until a few years later. We hope you will find something that interests you and generates discussion with friends and colleagues, old and new alike. The excellent program is a testament to this great conference and the attraction this annual highlight holds for all of us. AGS members are clearly pushing the boundaries of geoscience in all its branches! It is very encouraging to see that 51 of the 103 submissions are from students. We will be hosting three simultaneous sessions Friday night and all day on Saturday. Be sure to take in the poster session and don't miss the awards banquet and get together on Saturday night at 7.00 p.m. Special thanks to the chairs of the Special Sessions for proposing, organizing, and hosting their sessions. We hope you will be able to use the weekend to renew old acquaintances, make new ones, and support the Atlantic Geoscience Society.

Jared Butler, Lynn Dafoe, Maureen Matthew, Michael Parsons, Rob Raeside, Deanne van Rooyen, Carla Skinner

PROGRAM SUMMARY

FRIDAY – 6TH FEBRUARY 2026

12:00 – 8:00 pm	Registration	*Lobby*
1:00 – 4:00 pm	Poster Set Up	*Elm*
8:00 – 5:00 pm	Workshop 1: QAQC Methods	*Birch*
8:00 – 5:00 pm	Workshop 2: Mineral exploration in glaciated terrain	*Maple*
1:00 – 5:00 pm	Workshop 3: Building community within the geosciences	*Aspen*
2:30 – 4:00 pm	Products and Publications Committees	*Hemlock*
4:00 – 6:00 pm	Atlantic Geoscience Editors Meeting	*Hemlock*
4:00 – 6:00 pm	Poster Session	*Elm*
6:00 – 8:00 pm	Session 1: Ongoing development in coastal and marine geoscience in Atlantic Canada	*Maple*
6:00 – 8:40 pm	Session 5: Terrestrial and marine surface processes in Atlantic and Arctic Canada	*Aspen*
6:00 – 8:40 pm	Session 3: Advances in Appalachian tectonics: insights from field and laboratory studies	*Birch*
8:00 – 10:00 pm	Poster Session	*Elm*
8:40 – 10:00 pm	Ice Breaker	*Elm*

SATURDAY – 7TH FEBRUARY 2026

8:00 – 10:00 am	Registration	*Lobby*
9:00 – 4:00 pm	Poster Session	*Elm*
8:20 – 10:00 am	Session 6: Advancing critical mineral development in Atlantic Canada	*Maple*
	Session 4: Educational outreach	*Aspen*
8:00 – 10:00 am	Session 3: Advances in Appalachian tectonics: insights from field and laboratory studies	*Birch*
10:00 – 10:20 am	Coffee Break & Poster Session	*Lobby*
10:20 – 12:00 pm	Session 6: Advancing critical mineral development in Atlantic Canada	*Maple*
	Session 3: Advances in Appalachian tectonics: insights from field and laboratory studies	*Birch*
10:20 – 11:20 am	Session 4: Educational outreach	*Aspen*
12:00 – 2:00 pm	AGS Luncheon & Annual General Meeting	*Oak*
2:00 – 3:40 pm	Session 6: Advancing critical mineral development in Atlantic Canada	*Maple*
	Session 2: Sedimentological and paleontological applications in advancing a sustainable energy future	*Aspen*
	General: Geoscience research developments	*Birch*
3:40 – 4:00 pm	Coffee Break & Poster Session	*Lobby*
4:00 – 6:00 pm	Session 6: Advancing critical mineral development in Atlantic Canada	*Maple*
	Session 2: Sedimentological and paleontological applications in advancing a sustainable energy future	*Aspen*
4:00 – 6:20 pm	General: Geoscience research developments	*Birch*
6:00 – 6:40 pm	Judges meeting	*Maple*
7:00 – 9:00 pm	Banquet and awards gala	*Oak / Elm*

PROGRAM AT A GLANCE

	Maple	Aspen	Birch
Friday 4:00 – 6:00 pm & 8:00 – 10:00 pm Saturday 9:00 – 5:00 pm	**Poster Session** *Elm*		
Friday 6:00 – 8:20 pm	**Session 5** (6:00 – 8:40)	**Session 5** (6:00 – 8:40)	**Session 3** (6:00 – 8:40)
Friday 8:40 – 10:00 pm	**Ice Breaker** *Elm*		
Saturday 8:20 – 10:00 am	**Session 4** (8:20 – 10:00)	**Session 4** (8:20 – 10:00)	**Session 3** (8:00 – 10:00)
Saturday 10:00 – 10:20 am	**Coffee Break & Poster Session** *Elm*		
Saturday 10:20 – 12:00 pm	**Session 4** (10:20 – 11:20)	**Session 4** (10:20 – 11:20)	**Session 3** (10:20 – 12:00)
Saturday 12:00 – 2:00 pm	**AGS Luncheon & Annual General Meeting** *Oak*		
Saturday 2:00 – 3:40 pm	**Session 2** (2:00 – 3:40)	**Session 2** (2:00 – 3:40)	**General** (2:00 – 3:40)
Saturday 3:40 – 4:00 pm	**Coffee Break & Poster Session** *Elm*		
Saturday 4:00 – 6:20 pm	**Session 2** (4:00 – 6:00)	**Session 2** (4:00 – 6:00)	**General** (4:00 – 6:20)
Saturday 7:00 – 9:00 pm	**Banquet & Awards Gala** *Oak & Elm*		

POSTERS AT A GLANCE

Set Up: Friday February 6th: 1:00 – 4:00 pm. Poster boards are 4 x 8 ft (120 x 240 cm) and push pin friendly.
Sessions: Friday February 6th: 4:00 – 6:00 pm and 8:20 – 10:00 pm. Saturday February 7th: 9:00 – 4:00 pm.
Student Awards: All student presenters are eligible for the best poster award. Students are evaluated on their abstract, clear purpose and conclusions/summary, layout, and merit.
* = Undergraduate student ** = Graduate student

General: Geoscience research developments

Eric Bechard*, Jacob Hanley, Delaney Carter, Katie Cottreau-Robins
A blast furnace from the past: using Renaissance-period smelting techniques and ore sources to assess stable copper isotope fractionation for contact period L'nu artifact provenance studies

Aaron L. Bustard, Amirabbas Karbalaeiramezanali, Dustin R.L Dahn, Ayalew Gebru
Geochronology and petrogenesis of granitoids and related critical mineral systems in New Brunswick

Jiawen Jiang, Haijun Yu, David Lentz, Wen-Chang Li**
Gold enrichment in porphyry Cu-Au systems: insights from LMCE behavior in the Late Triassic Zhongdian arc, Sanjiang region, SW China

Jessica MacIsaac*, Edward J. Matheson, Jason Loxton, Mo E. Snyder
Context matters: examining soft-sediment deformation structure terminology with insights from the Pomquet Formation

Graydon MacIsaac*, Jason Loxton, Edward (Ted) Matheson
Can free software produce high-quality Virtual Outcrop Models?

Alex MacKay
Research opportunities in Nova Scotia geoscience: hyperspectral and RGB drill core imaging for advanced research

Bailey Malay, Lucy L Smith, Matthew R Stimson, Robert A Gastaldo, Brian L Hebert, Margaret L Scott, Duncan McLean, R. Andrew MacRae, John H Calder, Steven J Hinds, Adrian F Park, Page Quinton, Michael Rygel, Tetsuto Miyashita, Hillary Maddin
The oldest known dipluran associated with a new diverse assemblage of invertebrate body fossils preserved in a lycopod stump from the Carboniferous (Moscovian) Clifton Formation of New Brunswick, Canada

Kayla Youngchief*, Graydon MacIsaac, Zailynne Durant, Edward (Ted) Matheson
Seeing inside basal Windsor Group microbial reefs: serial-slab-based 3D reconstruction

Lauren T. O'Reilly, Brett D. Walker, Owen A. Sherwood**
Dissolved inorganic carbon stable and radiocarbon isotope distributions in slope waters of Nova Scotia and Southern Newfoundland

Eve Pole*, Ian Spooner, Sarah Hines, Nelson O'Driscoll
Arsenic accumulation in alder trees at a legacy gold mine tailings impoundment in southwest Nova Scotia: implications for environmental risk

Jodie Stephens*, Jacob Hanley, Catherine Cottreau-Robins, Tim Fedak
Strengthening geochemical provenance studies of pre-contact L'nu artifacts through the chemical homogeneity of natural copper samples at Cape d'Or Nova Scotia using laser ablation-inductively coupled plasma-mass spectrometry

Emma M. Wehbe*, Matthew R. Stimson, Coady C. Roach, Lauren E. Wheaton, Emily Theben, Dave Keighley, Paul Olsen, Steven J. Hinds, Adrian Park, Grant D. Wach
On the discovery of Triassic aged invertebrate and vertebrate ichnofossils from Melvin Beach, New Brunswick

Coady Roach, Emma Wehbe, Emily Theben, Lauren Wheaton, Dave Keighley, Grant Wach
Fundy Basin reservoir characterization for geological carbon storage

Sana Salehi, Lauren Wheaton, Grant Wach
Carbon sequestration and geological storage: Atlantic Canada's route to net-zero

Session 1: Ongoing developments in coastal and marine geoscience in Atlantic Canada
Chairs: Cameron Greaves, Victoria Watson

Ethan Geraci, Ian Spooner, Mark Mallory**
Antifouling paint particles as a source of metal and microplastic pollution in harbour sediments: Chester Back Harbour, Nova Scotia

Brette Harris, Eric Hutton, Noah Slaney, Jaimee Hodgson, Simone Booker, Erin Adlakha, David Lowe, Hilary Corlett

Preliminary petrographic and micro XRF insights into the origin and diagenetic evolution of siderite in the Ben Nevis Formation, Jeanne d'Arc Basin, offshore Newfoundland

Cliff Stanley, Anna Kiefte

Nova Scotia hurricanes leave no Peggy's Cove stones un-turned

Session 2: Sedimentological and paleontological applications in advancing a sustainable energy future

Chairs: Lynn Dafoe, Vânia Correia, Jade Atkins

Kasia Chmiel**

Analysis of reef island building, sediment Production and Island Elevation, Utila, Honduras

Session 3: Advances in Appalachian tectonics: insights from field and laboratory studies

Chairs: Deanne van Rooyen, Sandra Barr, Chris White

Sandra M. Barr, Deanne van Rooyen, Chris E. White, Michael A. Hamilton, Susan C. Johnson, Adrian F. Park, James L. Crowley

Toward understanding geological relations in southern New Brunswick, Canada, one U-Pb zircon date at a time

Leslie Boateng-Dwomoh, Deanne van Rooyen, Chris E. White**

Lithology, geochronology, and tectonic setting of the Rockville Notch Group in the western Meguma terrane

Kiersty M Malay, Donnelly B Archibald, James Conliffe, James L Crowley**

Age and petrogenesis of Devonian peraluminous plutons in southwestern Newfoundland

Session 4: Educational outreach

Chair: Tracy Webb

Tim Fedak

Results of the Geoheritage Summer Institute and Geodiversity Day in the Cliffs of Fundy UNESCO Global Geopark

Session 5: Terrestrial and marine surface processes in Atlantic and Arctic Canada

Chairs: John Gosse, Roger Paulen

Emma McCarron*, John Gosse

Evaluating the cosmogenic nuclide catchment erosion rate method on the Margaree River, Cape Breton, NS

Session 6: Advancing critical mineral development in Atlantic Canada

Chairs: Fazilat Yousefi, Niyayesh Khorshidi, Jacob Hanley, Michael Parsons, Jared Butler

Marcela Barrera-Cortes, David R. Lentz, Kathleen G. Thorne**

Lithogeochemical discrimination of tungsten-associated intrusive rocks using pXRF, southwestern and central New Brunswick, Canada

Chloe Oxner*, Jacob Hanley, Sarah Speight, Geena Morse

Characterizing the evolution and magmatic endowment of the Mount Douglas and McDougall Brook granite suites, southwestern New Brunswick

ZaneAldeen Rahabi, David Lentz, Tania Martins, Lee Groat**

Metasomatic alteration around pegmatites in the Cat Lake-Winnipeg River pegmatite field, southeastern Manitoba: insights from exocontact cesium enrichment

Laura Riendeau*, Donnelly Archibald, Jesse McNichol

Exploring the influence of rock geochemistry on biofilm composition in a lithium pegmatite system using metabarcoding

Manju Sati, Tania Martins, Christopher R.M. McFarlane, David Lentz, Pura Alfonso

Distribution and form of gold-silver in the Paleoproterozoic Lalor VMS deposit, Manitoba: preliminary analysis of precious-metal enrichment processes

ORAL PRESENTATIONS AT A GLANCE

Set Up & Delivery: Presentations should be prepared using wide-screen format, and we recommend .pps or .ppsx to ensure symbols and graphics transfer appropriately. Please arrive to your session room 15 minutes early (before all sessions in that block start) to load presentation onto laptop. Presentation slots are 20 minutes: 15 minutes to present and 5 minutes for questions. Session chairs are reminded to keep speakers on schedule using provided time indicators and to accommodate judging of student speakers.

Student Awards: All student presenters are eligible for the best presenter award. Students are evaluated on their abstract, presentation (introduction, flow, conclusions, timing, speaking), slides, and merit.

* = Undergraduate student ** = Graduate student

FRIDAY FEBRUARY 6TH

Session 1: Ongoing developments in coastal and marine geoscience in Atlantic Canada

Chairs: Cameron Greaves, Victoria Watson *Maple*

6:00 pm **Jade Chung, Victor Weber, Maeve Story, Diane Baxter**
Understanding of geohazards and constraints for development of Nova Scotia's designated offshore Wind Energy Areas

6:20 pm **Anna Ryan**
Evolving shorelines: update on Nova Scotia's coastal monitoring program

6:40 pm **Cameron Greaves**, Jordan B.R. Eamer, Vittorio Maselli**
Evidence for widespread barrier overstepping in coarse-clastic paraglacial coastlines: insights from Chedabucto Bay, Nova Scotia

7:00 pm **Brette Harris, Kelly Rozanitis, Jeffrey Kavanaugh, Murray Gingras**
Spatial Distributions of Surface Textures, Sedimentary Structures, and Neoichnological Traces in the Bay of Fundy, Canada

7:20 pm **Alexis Gauvin*, Unyime Umoh, G. Todd Ventura**
Resolving the effects of circulation structures on microbial diversity in the North Atlantic

7:40 pm **David J.W. Piper**
Interpreting coastal landscapes for the Cliffs of Fundy Geopark: new geoscience insights

Session 5: Terrestrial and marine surface processes in Atlantic and Arctic Canada

Chairs: John Gosse, Roger Paulen *Aspen*

6:00 pm **Lauren MacLellan**, John Gosse, Alan Hidy**
Quaternary erosion of the Canadian Shield from a 250-m 36Cl depth profile in the Sudbury Igneous Complex

6:20 pm **Bailey R. Grondin**, Alexandre Chiasson, Alejandro Alvarez, Steven V. Kokelj, Duane G. Froese**
Surficial geology and permafrost conditions within the involuted terrain near Tuktoyaktuk, Northwest Territories, Canada

6:40 pm **Kynan Hughson**
The diverse morphology and internal structure of North American pingos reveals complex ice growth and loss

7:00 pm **Shannon Hegger*, Kynan Hughson, Gilles Ngoran**
Characterizing the geomorphology and dynamics of potential rock glaciers in parc national de la Gaspésie using LiDAR, thermal imaging, and GPR

7:20 pm **Syed Bukhari**, Nick Eyles, Roger Paulen, Lavanecha Chandran, Denise Brushett**
Mapping of glacial erratic boulders for mineral exploration in southwestern Nova Scotia using ultra-high resolution LiDAR

7:40 pm **Rowan Norrad*, Shannon Sterling, Ian Spooner**
Assessing the impacts of river-based carbon sequestration: effects of river alkalinity enhancement on dissolved metal concentrations in the West River, Nova Scotia

8:00 pm **Melissa S. Schwab, Claudia I. Czimczik, Shawn A. Pedron, Jeffrey M. Welker**
Are we digging deep enough to get permafrost carbon?

Session 3: Advances in Appalachian tectonics: insights from field and laboratory studies

Chairs: Deanne van Rooyen, Sandra Barr, Chris White *Birch*

6:00 pm **J. Brendan Murphy, Rob A Strachan, William J Collins, Donnelly B Archibald, Jacob Hanley, Geena M Morse**
Post-accretionary emplacement of Meguma terrane granitoid plutons: transition from dextral transpression to transtension?

6:20 pm **Karen Brookman*, Deanne van Rooyen, Chris White**
Timing and kinematics of deformation relative to contact and regional metamorphism in the Tor Bay area, Nova Scotia, Canada

6:40 pm **Lauren DiPietro*, Richard Cox**
Chlorite compositions, prograde metamorphism, and gold-related trace elements

7:00 pm **Rowan Kennedy*, Deanne van Rooyen, Chris E. White**
Deformation and metamorphism in the southernmost Chebogue Point shear zone of the Meguma terrane, Nova Scotia, Canada

7:20 pm **Jared P. Butler, Antoine Godet, Jamie A. Cutts, Dawn A. Kellett**
Turning up the heat: garnet chemistry and phase equilibria constraints on high-temperature, low-pressure metamorphism in the southwestern Meguma terrane

7:40 pm **Jillian Kendrick, Charbel Abou-Khalil**
Preliminary investigation of the metamorphic gradient in the southwestern Meguma terrane, Nova Scotia

8:00 pm **Rebecca Jamieson, Sandra Barr, Chris White, Deanne van Rooyen, Donnelly Archibald**
What's REALLY under the Meguma terrane? A fresh look at xenoliths from the Eastern Shore dykes

8:20 pm **Cees van Staal, Sandra Barr, Chris White, Deanne van Rooyen, John Waldron**
Provenance and tectonic evolution of the Meguma terrane, northern Appalachian orogen

ICE BREAKER & POSTER SESSION 8:40 – 10:00 pm *Elm*

SATURDAY FEBRUARY 7TH

Session 6: Advancing critical mineral development in Atlantic Canada

Chairs: Fazilat Yousefi, Niyayesh Khorshidi, Jacob Hanley, Michael Parsons, Jared Butler *Maple*

8:20 am **Tania Martins**
Minerals and metals critical for the energy transition in Canada
Please note this is a double-slot talk and will end at 9:00 am

9:00 am **Michael B. Parsons, Duane C. Petts, Jeanne B. Percival, Terry C. Cheng, Julie Deriaz**
Critical mineral distribution and resource potential in tailings from the abandoned Stirling Zn-Pb-Cu-Au-Ag Mine, Nova Scotia

9:20 am **Niyayesh Khorshidi**, Michael B. Parsons, David R. Lentz**
Critical mineral potential of historical antimony tailings in Atlantic Canada: a case study from the Lake George mine, New Brunswick

9:40 am **Peter Rogers, Robert Stewart**
Nova Scotia critical minerals opportunity

Session 4: Educational outreach

Chair: Tracy Webb *Aspen*

8:20 am **Dirk Werle, Guy Aubé, Jonathan Lajoie, Dalia Laoubi, Janin Huard**
Sharing Earth observation satellite technology and Indigenous mapping knowledge: recent Canadian Space Agency training activities in Atlantic Canada

8:40 am **Jason Loxton**
Who takes a natural disasters class? (And where does it take them?)

9:00 am **Scott Preston, Katie McDonough**
Designing a geoscience strategy board game

9:20 am **Alex MacKay**
The human element: why emotion leads geoscience communication

9:40 am **Louise Leslie, Aaron C. Elser**
Rocks in the classroom: insights from teacher workshops and school visits

Session 3: Advances in Appalachian tectonics: insights from field and laboratory studies
Chairs: Deanne van Rooyen, Sandra Barr, Chris White *Birch*

8:00 am **Gabriel Santos,** Ivan Yip, Hamish Sandeman
Subduction initiation within the Penobscot back-arc basin: evidence from the Great Bend Complex, central Newfoundland

8:20 am **Connor Steele*, Shawna White, Keaton Markham, Sebastian Kommescher**
Provenance of metasedimentary units in the Laurentian Long Range Inlier, west Newfoundland: Evidence of a shared history with the peri-Laurentian Dashwoods block

8:40 am **Noah Slaney**, David Lowe, Nicolas Gomez**
The Cambrian Hawke Bay Event of the Eastern Laurentian Margin in Western Newfoundland

9:00 am **Keaton Markham**, Shawna White, Mo Snyder, Sebastian Kommescher**
Deciphering the post-Grenvillian geological history in the Long Range Inlier, West Newfoundland: implications on gold mineralization

9:20 am **Dylan J. McKeen**, Deanne van Rooyen, Sandra M. Barr, Chris E. White, Robert P. Raeside**
Age and tectonic evolution of the Clyburn Brook Formation, Nova Scotia, Canada

9:40 am **Chunzeng Wang, Amber Whittaker, Robert Marvinney**
The re-established Lochkovian Seboomook Group and the onset of Acadian arc volcanism in the northern Maine Appalachians

COFFEE BREAK & POSTER SESSION 10:00 – 10:20 am *Lobby*

Session 6: Advancing critical mineral development in Atlantic Canada
Chairs: Fazilat Yousefi, Niyayesh Khorshidi, Jacob Hanley, Michael Parsons, Jared Butler *Maple*

10:20 am **Fazilat Yousefi, David R. Lentz, Kathleen G. Thorne**
Petrogenesis and Geochemical Evolution of Late Devonian Peralkaline A-Type Granites in Southwestern New Brunswick: insights from the Welsford, Parks Brook, and the Jake Lee Alkali Granites

10:40 am **Adrian F. Park, Steven J. Hinds, Susan C. Johnson, Steven L. E. Rossiter, Aylalew Gebru**
Tectonic framework for MIAC (IOCG) mineralization systems in southern New Brunswick

11:00 am **Jenna Rees*, David Lentz, Fazi Yousefi**
Petrogenetic analysis of Neoproterozoic NYF pegmatites found in Perch Falls quarry, South-central New Brunswick: insight from petrology, lithogeochemical signatures, and zircon analysis

11:20 am **Jacob Hanley, Geena Morse, Anna Terekhova, Brendan Murphy**
Mafic-ultramafic melt inclusions in early magmatic apatite record low degrees of partial melting of a critical metal-enriched, suspected Neoproterozoic basement, Mersey Point, Nova Scotia

11:40 am **Rick Horne, Daniel Kontak**
The East Kemptville Sn(-Ag-Cu-Zn) Domain: a potential world class Sn-In-Li-Rb district

Session 4: Educational Outreach
Chair: Tracy Webb *Aspen*

10:20 am **Hilary Corlett**
Lived experience navigating the geosciences and field-based research with a physical disability: the good, the bad, and the things that drive me mad

10:40 am **Lea M.A. St John, Catrina E. Russell**
A history mystery: "who the heck is Carl Steinhammer?!"

11:00 am **Maureen Matthew, Natasha MacAdam, Maylia Parker**
Your path to professional geoscience: education, licensure, and careers

Session 3: Advances in Appalachian tectonics: insights from field and laboratory studies
Chairs: Deanne van Rooyen, Sandra Barr, Chris White *Birch*

10:20 am **John Waldron, Sandra Barr, Chris White, Deanne van Rooyen, Phil McCausland, Chunzeng Wang**
Deconstructing the "Iapetus suture": diachronous accretion of terrane assemblages in the Appalachian-Caledonide collage

10:40 am **Susan Johnson, Ayalew Gebru, Adrian Park, Steven Rossiter**
A provisional stratigraphic revision of the Neoproterozoic–Cambrian succession in the Caledonian Highlands, southeastern New Brunswick

11:00 am **Alex M. Welles*, Joseph White, Steven Hinds, Chris McFarlane, Adrian Park**
Microscale deformation and metamorphism of Neoproterozoic granitoids in northern Caledonia Highlands, Stuart Mountain

11:20 am **Tiernan Davies*, Sandra Barr, Chris White, Deanne van Rooyen**
Distinguishing Tonian and Ediacaran rocks in the northern Cobequid Highlands, Nova Scotia, Canada

11:40 am **Dana Šilerová**, Dawn Kellett, Shawna E. White, Catherine Mottram, Kyle P. Larson**
Geochronological and microstructural analysis of the Cobequid-Chedabucto deformation corridor

AGS LUNCHEON & ANNUAL GENERAL MEETING 12:00 – 2:00 pm *Oak*

Session 6: Advancing critical mineral development in Atlantic Canada
Chairs: Fazilat Yousefi, Niyayesh Khorshidi, Jacob Hanley, Michael Parsons, Jared Butler *Maple*

2:00 pm **Anna Terekhova**, Jacob J. Hanley, Jim Crowley**
Zircon geochronology and geochemistry in variably endowed subphases of the Davis Lake Pluton, South Mountain Batholith, Nova Scotia

2:20 pm **Geena Morse*, Anna Terekhova, Jacob Hanley, James Crowley, Brendan Murphy**
Zircon chemistry-geochronology and melt inclusion constraints on the origin and critical metal endowment of late Devonian granitoid in the Port Mouton Pluton, Meguma Lithotectonic Zone, Nova Scotia, Canadian Appalachians

2:40 pm **Michael Powell**, James Brenan**
Mineralogical and geochemical zonation of the South Mountain Batholith, NS, with applications to mineral resource prospectivity by cosine similarity mapping

3:00 pm **Daniel J. Kontak**
Feldspars as monitors of fluid-mediated ore processes in magmatic-hydrothermal critical-metal deposits: theory and application

3:20 pm **Claude Nambaje, Christopher R.M. McFarlane, Tania Martins, Max Kaczmer, Lee A. Groat**
Using apatite chemistry to distinguish Li-Cs-Ta-fertile and barren pegmatites

Session 2: Sedimentological and paleontological applications in advancing a sustainable energy future
Chairs: Lynn Dafoe, Vânia Correia, Jade Atkins *Aspen*

2:00 pm **Bill Richards, Fraser Keppie, Helen Cen, Grant Wach**
Quantitative assessment and risk analysis of Geologic Carbon Storage potential in the Triassic-Jurassic Fundy Subbasin

2:20 pm **Hilary Corlett**
Evaluating subsurface carbonate reservoirs for CO_2 storage

2:40 pm **John Carey, Paul Durling, Peter Giles, Zelia Pereira, Marcia Mendes, Vania Correia, Rob Fensome**
Lithology and thickness variations in Lower Pennsylvanian rocks of the southern Maritimes Basin

3:00 pm **Bill Richards, Fraser Keppie, Helen Cen, Grant Wach**
3D geocellular modeling linking sedimentary, structural and diapiric architecture to geothermal potential: Cumberland Basin and Sable Subbasin, Nova Scotia

3:20 pm **Sydney Thompson*, Lexie Arnott, Jade Atkins**
A Late Carboniferous myriapod from the Joggins Fossil Cliffs UNESCO World Heritage Site

General: Geoscience research developments *Birch*

2:00 pm **Margaret Scott**, Matt Stimson, Bailey Malay, Brian Herbert, Olivia King, Lynn Dafoe, Robert Gastaldo, John Calder, Mike Rygel, Page Quinton, Lucy Smith, Kayla Gerard, Luke Allen, Keenan Richard, Spencer Lucas, Hilary Maddin**
Ichnofaunal diversity of the Pennsylvanian-aged Clifton Formation, including the first documented trace fossil assemblage from within a hollowed lycopod stump, Clifton, New Brunswick, Canada

2:20 pm **Luke Allen*, Rowan Norrad, Matthew Stimson, Olivia King, Dave Keighley, Steven Hinds, Adrian Park, Bailey Malay**
Ichnology and sedimentology of the middle Pennsylvanian Minto Formation at Robertson Point, central New Brunswick: implications for paleobiodiveristy, provenance and paleoenvironmental settings

2:40 pm **Kayla Gerard*, Margaret Scott, Matt Stimson, Bailey Malay, Steven Hinds, Adrian Park, Lynn Dafoe**
On the discovery of a large Taenidium burrow from the Clifton Formation in New Brunswick

3:00 pm **Zailynne Durant*, Ted Matheson**
Cryptic microbial carbonates of the basal Windsor Group: a sedimentologic and petrographic reappraisal of the Macbeth Brook Formation, Cape Breton

3:20 pm **Emanuel de Gante Carrillo, Karl Butler, Kerry MacQuarrie**
Separating advective from conductive heat transport signatures in Distributed Temperature Sensing (DTS) data for dam seepage monitoring

COFFEE BREAK & POSTER SESSION 3:40 – 4:00 pm *Lobby*

Session 6: Advancing critical mineral development in Atlantic Canada
Chairs: Fazilat Yousefi, Niyayesh Khorshidi, Jacob Hanley, Michael Parsons, Jared Butler *Maple*

4:00 pm **Roger Paulen, Beth McClenaghan, Chris Beckett-Brown, Denise Brushett, Jessey Rice**
Glacial dispersal from the Brazil Lake lithium-cesium-tantalum pegmatites, southwest Nova Scotia

4:20 pm **Joshua Jackman**, Daniel J. Kontak, Jacob J. Hanley, Robert A. Creaser, Jonathon Toma**
A >360 Myr history of polymetallic vein formation at Cobalt-Gowganda (Ontario) and relevance to Nova Scotia

4:40 pm **Chunzeng Wang, David Lentz, Amber Whittaker, Robert Marvinney**
Significance of the first documented Devonian sedimentary manganese mineralization in the Lower Seboomook Group in northern Maine

5:00 pm **Marcos Zentilli, Jacob Hanley, Juan Valdés-Edwards**
First intrusion-related Mo-Bi-Te-Au polymetallic system recognized in Chilean Patagonia

5:20 pm **Peter Rogers**
Looking for a deeply buried new Walton deposit:across Iapetus and into the Carboniferous Basins of Eastern North America

5:40 pm **Sahroz Khan, Yana Fedortchouk**
Rare earth and Nb enrichment in Kimberlite Perovskite: insights from the Lac de Gras Kimberlites, Canada

Session 2: Sedimentological and paleontological applications in advancing a sustainable energy future
Chairs: Lynn Dafoe, Vânia Correia, Jade Atkins *Aspen*

4:00 pm **Steven Hinds, Adrian Park, Matt Stimson, Andrew MacRae, Olivia King**
Revised structural and stratigraphic correlation of the Boyd Creek tuff of the eastern Moncton Subbasin, southeastern New Brunswick

4:20 pm **Ricardo L. Silva**
Integrating coastal environments into our understanding of major Mesozoic carbon cycle perturbations

4:40 pm **Stephaniie Erhunmwunsee**, Todd Ventura, Andrew MacRae**
Organic geochemical analysis of potential intra-salt E. Jurassic oil shows of the Scotian Basin

5:00 pm **David Lowe, Noah Slaney, Hodgson Jaimee, Eric Hutton, Brette Harris, Hilary Corlett**
A review of carbonate cementation in the syn-rift strata of the Jeanne d'Arc Basin: challenges, models, and the potential for scalability using hyperspectral data

5:20 pm **Vânia Correia, Robert A. Fensome, Lynn T. Dafoe, R. Andrew Macrae, Graham L. Williams, Carla Skinner, John Carey, Ricardo L. Silva**
Early Cretaceous palynoevent scheme for the Scotian Margin: application to offshore geological carbon storage and other energy transition studies

5:40 pm **Lynn T. Dafoe, Mark E. Deptuck, Robert A. Fensome, D. Calvin Campbell, Chris E. White, Jordan B.R. Eamer, Stéphanie Larmagnat, Vânia Correia, Qingmou Li, Kevin MacKillop, Zélia Pereira, Sean Kelly**
Bedrock occurrences tied to Nova Scotia offshore wind energy areas: linking seabed samples to subsurface and onshore geology

General: Geoscience research developments *Birch*

4:00 pm **Emily Theben*, Richard Cox, James Brenan, Mattea McRaa**
Defining the Geminid Deposit: investigating mineral assemblages, textures, and Ni distribution

4:20 pm **Cliff Stanley**
Closure in concentration data can be measured in relative terms

4:40 pm **Kari Osfolk*, Richard Cox**
Recording peak metamorphic conditions in garnet-rich schists from the Dalradian highlands of Scotland

5:00 pm **Brook Penner*, Zhenhao Zhou**
Depth controls on metamorphic decarbonation: insights from metacarbonate rocks from the Sierra Nevada arc, California

5:20 pm **Charbel Abou-Khalil*, Jillian Kendrick**
Apatite for knowledge: what can we learn about the Archean Eon from inclusions found in zircon?

5:40 pm **Isaac Bahler*, Shannon Sterling**
Hydraulic controls on pCO_2 damping across river steps and cascades under baseline and alkalinity-dosed conditions

6:00 pm **Georgia Pe-Piper, David J.W. Piper, Brian Hebert, Angeliki Papoutsa**
Mineralogy and origin of Bay of Fundy agate, Nova Scotia

JUDGES MEETING 6:00 – 6:40 pm *Maple*

BANQUET & AWARDS GALA 7:00 – 9:00 pm *Oak & Elm*

Speaker: Tracy Webb

Geoscience education through the decades – a look back to look forward

Tracy is a long-time member of the AGS Education Committee and has been chair for the past several years. She retired from a career as a high-school science teacher (including Geology) in Horton High School, near Wolfville, and now spends more time on general education matters for the AGS when she is not motorbiking across Canada.

2026 SPECIAL SESSIONS

General: Geoscience research developments

This is a general geoscience session for talks and posters that were not submitted for a special session. This session invites studies spanning regional geology, geophysics, geochemistry, geomorphology, hydrogeology, and environmental geoscience. Contributions may include field observations, subsurface and offshore studies, analytical advances, and modeling approaches that enhance understanding of the region's geological evolution and resources. Interdisciplinary and applied studies are encouraged. The session provides a platform for sharing insights that contribute to the broader understanding of Atlantic Canada's dynamic geoscientific landscape.

Session 1: Ongoing developments in coastal and marine geoscience in Atlantic Canada

Chairs: Cameron Greaves, Victoria Watson

There is a growing need for research on Atlantic Canada's coastlines due to rising sea levels, coastal erosion, and severe weather events, all of which have been exacerbated by anthropogenic climate change. Additionally, recent proposals for offshore renewable energy developments throughout Atlantic Canada's continental shelves have garnered interest in geological and geotechnical data that characterize these vast regions. By integrating research on both onshore and offshore geomorphology, sediment dynamics, and paleoenvironmental change, geoscientists can provide insight for stakeholders that improves plannability for offshore energy infrastructure corridors while also informing environmental conservation strategies to protect Atlantic Canada's unique coastal and marine ecosystems. This session seeks research on Atlantic Canada's coastlines and continental shelves that has broad applicability to the above issues.

Session 2: Sedimentological and paleontological applications in advancing a sustainable energy future

Chairs: Lynn Dafoe, Vânia Correia, Jade Atkins

The stratigraphic record plays an ongoing critical role in Canada's energy future. As the energy industry and economy transition away from a hydrocarbon-dominated system into new fields such as geothermal, carbon storage, lithium in brines, renewable energy, energy storage, and hydrogen power, the fields of sedimentology and paleontology are adapting to support changing research directions. The study of stratigraphic successions continues to provide valuable framework geoscience information on the nature of rock units, their age, and paleoenvironments of deposition. We invite presentations in the fields of stratigraphy, sedimentology and paleontology that illustrate relevance to evolving energy geoscience and storage solutions.

Session 3: Advances in Appalachian tectonics: insights from field and laboratory studies

Chairs: Deanne van Rooyen, Sandra Barr, Chris White

This session welcomes contribution focused on the tectonic evolution of the Appalachian-Caledonide orogenic system.

Session 4: Educational outreach

Chair: Tracy Webb

Over the years this special education outreach session has evolved into a mix of presentations showcasing projects, new programs for outreach, and EdGEO ideas, to lively geological discussions among the participants. With the demands on the earth's resources, it is increasingly important to encourage and support earth science education at all levels. Please feel free to join us, and if you have a presentation you'd like to share, we'd welcome the opportunity to learn about it!

Session 5: Terrestrial and marine surface processes in Atlantic and Arctic Canada

Chairs: John Gosse, Roger Paulen

Knowledge of rates, style, and frequency of surface processes on land and sea floor are critical for predicting the impact of landslides tsunami hazards, and flooding, or evaluation of the suitability of onshore and offshore infrastructures needed for wind energy and nuclear waste management. We seek oral and poster presentations on surface processes research relevant to climate and environmental change, regional geology, natural hazards, and energy or mineral sectors in Atlantic or Arctic Canada.

Session 6: Advancing critical mineral development in Atlantic Canada

Chairs: Fazilat Yousefi, Niyayesh Khorshidi, Jacob Hanley, Michael Parsons, Jared Butler

Atlantic Canada contains a broad range of critical mineral resources that are essential for supporting Canada's transition to a low-carbon and digital economy. This session will showcase research from the Atlantic provinces and beyond on conventional as well as new, emerging, or unconventional sources (e.g. brines, evaporites, tailings) of the 34 minerals and metals on Canada's critical minerals list. We invite presentations on the geology of mineral deposits, especially granite-

related magmatic systems that are commonly enriched in critical minerals (e.g. Li, Sn, W, Mo, Nb, Ta, REEs) and represent some of the most prospective mining targets in the Atlantic region. We also encourage submissions describing novel exploration tools, field and laboratory method development, and studies of mine wastes as a potential source of valuable critical minerals. The goal of this session is to inspire new ideas about critical mineral systems and to discuss innovative solutions for reducing the environmental impacts of mining.

2026 WORKSHOPS

Workshop 1: QAQC Methods in geochemical research and mineral exploration, with a focus on gold assay quality control

Friday, February 6th, 2026 - Birch Room, Inn on Prince, Truro *8:30am – 5:00pm*

Cliff Stanley, Ph.D., P.Geo., Professor of Applied Geochemistry in Department of Earth & Environmental Sciences at Acadia University

This short course presents both the theory behind quality assurance/quality control (QA/QC) methods used by geoscientists to ensure data quality to a clear description of the design, implementation, and evaluation of such methods. Emphasis will be placed on the use of QA/QC methods to assess data quality, and strategies that will reduce ambiguities impeding the interpretation of geochemical results in geological research, mineral exploration, and resource estimation. Topics covered range from why errors are introduced during initial sampling, digestion, and analysis, to how errors introduced by these methods impact data quality. In addition, foundational material involving qualitative and quantitative data, types of errors, accuracy and precision assessment methods, and strategies to reduce errors will also be presented. Lastly, several practical exercises will be undertaken during this workshop that allow participants to develop confidence in plotting and assessing real.

Workshop 2: Mineral exploration in glaciated terrain: principles, applications, and techniques

Friday, February 6th, 2026 - Maple Room, Inn on Prince, Truro *8:30am – 5:00pm*

Roger Paulen, PhD, Research Scientist, Geological Survey of Canada

Dave Sacco, SLR Consulting

This one-day short course will focus on a range of basic drift prospecting topics and applied exploration techniques to increase exploration success in glaciated terrain. The short course will include lecturers from government, academia, and industry. The course will be presented at an introductory level, suitable for prospectors, exploration geologists, and students. Presentations will highlight on the importance of glacial sediment identification, identifying past ice flow movements, till sampling program design and methods, data sources available in Nova Scotia and New Brunswick, a case studies from Nova Scotia and New Brunswick, mineral chemistry applications, and the applicability of LiDAR. Expected participants include exploration geologists, prospectors, and geology students.-world QA/QC data.

Workshop 3: Building community within the geosciences

Friday, February 6th, 2026 - Aspen Room, Inn on Prince, Truro *1:00 – 5:00 pm*

Jade Atkins, Curator, Director of Science & Research, Joggins Fossil Cliffs

Lexie Arnott, Senior Instructor, Dalhousie University

Mo Snyder, Associate Professor, Acadia University

Danielle Serratos, Director, Fundy Geological Museum

Carla Skinner, Geomodeller, Geological Survey of Canada - Atlantic

Building community is an important practice that helps to leverage diverse perspectives, challenges biases, and builds interdisciplinary teams of scientists that can better tackle challenging problems. “Crafternoons,” where individuals come together to craft and socialize are a great way to engage with art to reduce stress, improve health, and build community. This practice is especially common in Indigenous communities across Turtle Island. Building on this practice, many cultural and academic institutions have started offering regular crafternoons to help community members meet and socialize with diverse individuals. For example, at Dalhousie University, Dr. Lexie Arnott has been offering a regular crafternoon program for students, staff, and faculty in the Earth and Environment Sciences program. Now, crafternoon is coming to the Atlantic Geosciences Society’s annual colloquium. Please join us for an afternoon of crafting and building community. All are welcome, but we especially encourage students to attend. Bring your own craft or start one provided by the IJADE committee (e.g., colouring, crochet/knitting). Use this time to craft, meet a conference buddy, and chat about your studies and ongoing research projects.

ABSTRACTS

* = Undergraduate student submission ** = Graduate student submission ^ = Poster presentation

Apatite for knowledge: what can we learn about the Archean Eon from inclusions found in zircon?

*Charbel Abou-Khalil, Jillian Kendrick
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One of the most widely debated topics in geology is crustal evolution in the Archean Eon, a time that is poorly understood due to limited preserved crust. There are, however, examples of well-preserved Archean crust, which are largely composed of tonalite-trondhjemite-granodiorites suites (TTGs). TTGs represent some of the earliest continental crust that can be dated back to the Archean, and their chemical compositions are typically linked to the depth and tectonic setting of their source. However, the complexity of their magmatic evolution is increasingly being recognized and unravelling this could provide new insights into their origin. Magmatic zircon in felsic igneous rocks has been shown to contain a record of melt evolution in the form of mineral and melt inclusions, and this approach has not yet been widely applied to TTGs. In this study, we investigate the magmatic evolution of the original melt that formed Mesoarchean to Neoarchean TTGs and related felsic rocks within the Kapuskasing Uplift in the Superior Province, Canada, by examining inclusions in zircon separates. We found that the mineral inclusions are consistent with the observed mineral assemblages in the rocks and confirm that epidote in the TTGs is magmatic in origin, providing constraints on P-T conditions of crystallization. The F and Cl content of apatite inclusions varies systematically with the age of the sample, and may indicate a shift toward F-bearing, Cl-poor sources over time, which has implications for halogen cycling in the region near the end of the Archean Eon.

Ichnology and sedimentology of the middle Pennsylvanian Minto Formation at Robertson Point, central New Brunswick: implications for paleobiodiversity, provenance and paleoenvironmental settings

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Robertson Point, situated along the southern shoreline of Grand Lake New Brunswick (NB), is a prolific fossil locality that continues to yield a diverse array of tetrapod and invertebrate trace fossils from the mid-Pennsylvanian Minto Formation. The Minto Formation was deposited within the Marysville Subbasin of the Maritimes Basin and is historically thought to represent a tidally influenced peat-forming wetland within back-barrier or delta front depositional settings. New stratigraphic data and interpretations suggest that the stratigraphy at Robertson Point represents fluvial, low sinuosity channel and overbank deposits of large tributary rivers that drained to the northeast, flowing from the crystalline highlands that bordered the southeastern subbasin margin. These tributaries likely fed into a central flowing axial river system that existed in the center of the basin, resembling a paleoenvironmental setting analogous to the modern-day St. Lawrence River Valley. The tetrapod ichnofaunal assemblage is dominated by the ichnogenera, *Batrachichnus salamandriodes*, *Characichnos* sp., *Limnopus heterodactylus*, *Matthewichnus* sp., *Notalacerta missouriensis*, cf. *Psuedobradypus* sp., and an unidentified, potentially new morphology that resembles both *Notalacerta* and *Dromopus*. Tetrapod trackways provide ichnological evidence as a proxy for biodiversity of terrestrial amphibians (temnospondyls, microsaurs, stem tetrapods, anthracosaurs) and early amniotes (reptiles and/or synapsids). Equally diverse is the invertebrate ichnofaunal assemblage of surface trails (*Gordia*, *Helminthoidichnites*, *Helminthopsis*), infaunal burrows

(*Taenidium*, *Planolites*), and walking traces (*Stiaria*, *Diplichnites*, *Kouphichnium*). *Kouphichnium* is one of the few invertebrate traces that is confidently assigned to a limulid or eurypterid trace maker. The presences of this trace could be interpreted as evidence of a distal connection to open water and is thought to represent an upriver excursion to reproduce inland. The ichnofaunal assemblage at Roberston Point is interpreted to have been preserved in a moderately to well drained floodplain paleoenvironment.

Hydraulic controls on pCO_2 damping across river steps and cascades under baseline and alkalinity-dosed conditions

*Isaac Bahler, Shannon Sterling

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Anthropogenic climate change is amplifying carbon-cycle perturbations across aquatic and terrestrial systems, increasing the need for accurate greenhouse-gas accounting. Rivers, though limited in global surface area, exert outsized influence on the carbon, alkalinity balance through coupled weathering and gas-exchange processes and are estimated to emit ~1.8 Pg C/yr as CO_2. A key unresolved challenge is the absence of a systematic, scalable approach to quantify CO_2 evasion from short, high-energy lotic segments—hydraulic "hotspots" where dissolved CO_2 and exchange rates change sharply over space and time. Discrete features such as steps, cascades, and waterfalls can dominate reach-scale CO_2 evasion despite occupying negligible surface area, yet prevailing monitoring approaches rarely resolve step-specific contributions, often miss local dynamics occurring over seconds to minutes, and do not yield low-cost proxies suitable for widespread deployment. This knowledge gap is especially consequential for River Alkalinity Enhancement (RAE), a carbon dioxide removal (CDR) strategy in which alkaline minerals, such as calcite, are added to raise alkalinity and dissolved inorganic carbon, lower aqueous pCO_2, and promote conversion of atmospheric CO_2 to bicarbonate for long-term ocean storage. If dosed waters traverse high-energy steps during equilibration, turbulence-driven gas exchange may provide a mechanism for improving removal efficiency and CDR credibility by reversing the gradient of CO_2 invasion. This research presents the ongoing development of an approach to quantify step-resolved CO_2 evasion by measuring pCO_2 "damping" across discrete hydraulic steps, with avenues to examine other factors influencing simulated reach evasion. Controlled mesocosm experiments systematically vary hydraulic conditions while collecting high-frequency dissolved CO_2 observations under baseline and calcite-dosed scenarios, enabling empirical constraints that support scalable hotspot accounting, improved RAE siting and design.

^Toward understanding geological relations in southern New Brunswick, Canada, one U-Pb zircon date at a time

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Southern New Brunswick is a collage of fault-bounded Neoproterozoic and lower Paleozoic belts/terranes with few original stratigraphic relationships or fossils preserved. Hence ages provided by U-Pb dating of zircon via chemical abrasion-isotope dilution-thermal ionization mass spectrometry (CA-ID-TIMS) and laser ablation-inductively coupled plasma-mass spectrometry are essential for constraining geological relationships. The New River belt contains felsic volcanic rocks and porphyry with ages of ca. 551 Ma, the same as similar rocks in the Avalonian Caledonia belt. Both belts contain Cambrian sedimentary rocks that have been assigned to the Saint John Group, but the New River belt also includes different Cambrian rocks that include rhyolite dated at 515.96 ± 0.50 Ma (CA-ID-TIMS). The New River belt also includes both younger (550–530 Ma) and older (630–625 Ma) granitoid plutonic rocks that differ from plutons in the Caledonia

terrane. Pre-Mesozoic rocks of Grand Manan Island in the Bay of Fundy have been correlated with the New River belt based on age and rock types, including quartzite units in which the principal zircon age modes are ca. 2.0, 2.5, and 2.75 Ga with no grains younger than Mesoproterozoic. These rocks indicate a large old cratonic source for Ganderia that differs from that for quartzite sources in Avalonia. The Avalonian Caledonia terrane includes continental margin volcanic-plutonic arcs with ages of ca. 690–680 Ma and ca. 620–615 Ma, and voluminous extensional or plume-related magmatism at 551.5–549.5 Ma (Coldbrook Group and related plutons). Overlying Cambrian sedimentary rocks (Saint John Group) have a maximum depositional age of ca. 534 Ma. southwest of Saint John, the Burchill Wind Project has revealed rock units that may be part of the Carboniferous Partridge Island block, a tectonically emplaced assemblage of Devonian and Carboniferous metasedimentary, sedimentary, and igneous rocks with associated iron oxide-copper-gold (IOCG) mineralization.

^Lithogeochemical discrimination of tungsten-associated intrusive rocks using pXRF, southwestern and central New Brunswick, Canada

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In situ portable X-ray fluorescence (pXRF) analyses of immobile elements provide a robust geochemical framework to minimize the effects of hydrothermal alteration (greisenization) and to assess lithogeochemical differences among intrusive rocks associated with tungsten (W) occurrences at Lake George (LG), Flume Ridge (FR), Foster Lake (FL), Wildcat (WC), Kedron (KD), and Burnt Hill (BH) in southern and central New Brunswick. Measurements were conducted directly on rock slabs, using the average of three analyses per sample to reduce small-scale heterogeneity, and data were calibrated using certified reference materials. Scatterplots of Nb/Ti and Y/Ti versus Zr/Ti reveal systematic compositional contrasts among the intrusions. KD and WC samples are characterized by elevated Nb, Y, and Zr concentrations relative to LG and FL, indicating highly differentiated felsic magmas for the former, and less evolved, intermediate to felsic compositions for the latter. BH samples are comparatively sparse and scattered, suggesting a heterogeneous and overall intermediate compositional character. The Ti versus Zr diagram highlights distinct fractionation trends, suggesting the involvement of at least two magmatic precursors: a dacitic affinity with moderately high Ti values for FL, LG, and some BH samples, and a rhyolitic affinity with lower Ti contents, encompassing WC, KD, and most BH samples. Additionally, Nb versus Ti relationships indicate contrasting magma source affinities. Granites from WC, FL, LG, and part of BH plot within the syn-collisional granite (syn-COLG) field, whereas KD and most BH samples exhibit higher Nb and Y contents, plotting predominantly within the within-plate granite (WPG) field and the upper ocean-ridge granite (ORG) field, suggesting partial hotspot-influenced magmatic contributions. Overall, these immobile-element relationships indicate that W-associated intrusions along the Central and Southern Plutonic Belt of New Brunswick record contributions from distinct magmatic sources and variable degrees of fractionation, rather than a single homogeneous magma.

^A blast furnace from the past: using Renaissance-period smelting techniques and ore sources to assess stable copper isotope fractionation for contact period L'nu artifact provenance studies

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Heavy metal stable isotope systems (e.g., Pb, Sn, Cu, Fe) are applied in fields like archaeometallurgy to evaluate geologically distinct sources of ore as it relates to the provenance of metallic artefacts and stratigraphic source of ore in historically mined ore systems. However, compared to Pb, Cu isotope systematics have received much less attention. The objective of this study is to elucidate the natural variations in stable Cu isotopes in relevant historical Cu ores (16^{th}–17^{th} C) and suspected compositionally linked artifacts from sites of L'nu trade, habitation and burial in the Maritimes Basin that

date to the same period. Fourteen samples of ore were measured for δ^{65}Cu across 5 Renaissance mining districts in Sweden, Norway, and Germany with a focus on Falun, Sweden, considered to be the most important copper source during this period. Fourteen samples of artifact copper metal previously characterized for stable Pb isotopes were assessed for δ^{65}Cu, including 7 L'nu artifacts and 7 Renaissance Swedish coins. Five samples of matte were also produced from experiments designed from historical accounts of Renaissance smelting techniques at Falun during its peak production period to quantify Cu isotope fractionation during ore roasting, pulverization, and smelting. All artifacts yielded δ^{65}Cu values ranging from 0.16 to 0.60‰ (mean = 0.49‰) This is consistent with the ore samples at Falun (mean = 0.39‰). Excluding two outliers at –0.13‰ and 1.3‰ these fit within expected error (± 0.08‰,2s). Other historically important mining districts show consistent isotopic signatures given historical context and geology, except for Garpenberg which ranges from 0.02‰ and 3.83‰. Significant outliers in Falun and Garpenberg potentially indicate natural fractionation due to oxidation and weathering of the ore minerals along alteration zones or different ore mineralization. Future work includes characterization of stratigraphic δ^{65}Cu fractionation in the natural Falun system to resolve this issue.

^Lithology, geochronology, and tectonic setting of the Rockville Notch Group in the western Meguma terrane

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The Silurian to early Devonian Rockville Notch Group (RNG) consists of sedimentary and volcanic rocks that unconformably overlie the Halifax Group of the Meguma terrane. The RNG occurs north of the Chebogue Point Shear Zone and in the Annapolis Valley area. It consists of, from youngest to oldest, the White Rock, Kentville, and Torbrook/New Canaan formations. In the Torbrook and Wolfville areas, the lowermost White Rock Formation overlies either the Elderkin Brook, Hellsgate Falls, or Lumsden Dam formations of the Halifax Group. The metamorphic grade of the Halifax Group rocks ranges from sub-greenschist facies in the Wolfville area, to greenschist facies in the Torbrook area. Detailed field mapping and petrographic studies reveal lithological variations in stratigraphy of the RNG. In Fales River, the White Rock Formation consists of a basal rhyolite flow and crystal to crystal lithic tuff overlain by sandstone beds. In the Wolfville area, the base of the White Rock Formation is marked by interbedded sandstone and siltstone. Ironstone occurs in lenses throughout the White Rock Formation. The Kentville Formation in Fales River consists of black slate with abundant graptolite fossils overlain by laminated siltstone with limestone nodules. A complete section of the Torbrook Formation in the Spinney Brook area comprises sandstone and siltstone at both the base and the top of the formation. The middle of the Torbrook Formation includes minor mafic tuff, ironstone, and interlayers of black slate and limestone. These units are contact metamorphosed by the South Mountain Batholith and related plutons which produced a narrow contact aureole with cordierite porphyroblasts preserved at the highest grade. New U-Pb dating of rocks throughout the Rockville Notch Group will yield the maximum depositional ages of the formations, determine how the provenance of the Rockville Notch Group changes throughout its history, and constrain its tectonic affinity.

Timing and kinematics of deformation relative to contact and regional metamorphism in the Tor Bay area, Nova Scotia, Canada

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The eastern Meguma terrane consists of Cambrian to Ordovician metasedimentary rocks of the Goldenville and Halifax groups. These units are intruded by Devonian granitoid plutons which have well-developed contact aureoles that overprint regional metamorphic assemblages. In the Tor Bay area, the Goldenville Group comprises the Taylors Head and overlying Beaver Bank Formations. The younger Halifax Group consists of the Cunard Formation and the laterally equivalent Cole Harbour Formation. All rocks have a strong near-vertical, E-W striking, composite foliation, axial planar to regional upright, gently east and west plunging, folds. In the Mn-rich Beaver Bank Formation, greenschist-facies rocks are characterized by muscovite + garnet (spessartine) + quartz + ilmenite + chlorite ± plagioclase and grade into lower-amphibolite facies

characterized by cordierite + ilmenite ± biotite. In the pelitic Cole Harbour Formation, greenschist-facies rocks are characterized by muscovite + quartz + ilmenite + chlorite ± garnet and grade into lower-amphibolite-facies rocks characterized by muscovite + biotite + andalusite ± garnet. In the sulphide-rich Cunard Formation, greenschist-facies rocks are characterized by muscovite + chlorite + graphite + quartz + pyrite and lower-amphibolite-facies rocks are characterized by andalusite + cordierite ± biotite. All assemblages show a retrograde metamorphic overprint (sericite + chlorite). Porphyroblasts and overprinting relationships indicate that spessartine garnet was the first major porphyroblast to grow during M_1 regional metamorphism closely associated with D_1/S_1 regional deformation. Cordierite and andalusite porphyroblasts are interpreted as M_2 associated with high heat flow in contact aureoles because they overgrow $D_1/S_1/M_1$ mineral assemblages and related textures. The S_2/D_2 structures define the dominant E-W-striking regional foliation in which kinematic indicators show both flattening and shear deformation. This S_2/D_2 deformation happened during cooling, because the high-grade assemblages are overprinted by chlorite and sericite (interpreted as M_3 retrograde assemblages) occurring in pressure shadows, boudin necks, and as mantles around porphyroblasts.

Mapping of glacial erratic boulders for mineral exploration in southwestern Nova Scotia using ultra-high resolution LiDAR

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Mineral exploration in glaciated terrains is dependent on a thorough understanding of the history and mode of flow of Pleistocene mid-latitude ice sheets to successfully identify potential mineralized targets in bedrock partially or completely covered by glacial sediments. Mapping of glaciated terrains and exploration using boulder trains and mineralized dispersal trains on the glaciated crystalline shields of Canada and Fennoscandia is challenged by vegetative covers and remote sensing data of inadequate resolution. New generation LiDAR data and mapping techniques provide an excellent solution by allowing the removal of vegetation to generate bare earth digital elevation models and identify glacial erratic boulders. Targeted drone-based LiDAR mapping was carried out at an area of known lithium and tin mineralisation obscured by thick forest cover in Nova Scotia, which has been affected by several Pleistocene glaciations, most recently by the Appalachian Glacier Complex some 20,000 years ago. The methodology developed herein permitted successful mapping of erratic boulders and their spatial density. This approach can now be scaled up for regional mineral exploration projects and for geomorphic mapping of modern and ancient glaciated terrains to determine former ice flow trajectories and landform evolution in Atlantic Canada.

Turning up the heat: garnet chemistry and phase equilibria constraints on high-temperature, low-pressure metamorphism in the southwestern Meguma terrane

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Staurolite-grade metapelites in southwestern Nova Scotia record high-temperature, low-pressure metamorphism associated with Devonian orogenesis. However, quantitative constraints on the timing and conditions of this metamorphism are lacking, limiting our ability to relate it to the broader tectonic and metallogenic evolution of the Meguma terrane. We present preliminary results from a petrological and geochronological study designed to address this gap, focusing on the pressure-temperature evolution of metapelites from the Yarmouth area.

Petrographic observations show that M_1 metamorphism produced syn- to post-tectonic garnet ± staurolite ± andalusite assemblages. Overprinting fabrics and chlorite strain fringes on M_1 porphyroblasts represent later D_2/M_2 deformation and

metamorphism. M_1 garnet preserves prograde major element zoning with rimward decreasing spessartine and increasing almandine, relatively constant pyrope and grossular contents, and narrow, higher-grossular outer rims. Concentric trace element zoning in garnet is superimposed on patchy, matrix-inherited patterns, suggesting limited post-growth element mobility. Elevated REE concentrations associated with higher-grossular outer rims imply growth during prograde breakdown of allanite or other Ca- and REE-bearing phases. Phase equilibria modeling in the MnNCKFMASHTO system using Theriak Domino indicates garnet core growth at ~3.0–3.5 kbar/525–540°C followed by an increase in P-T conditions to ~4.5–5.5 kbar/550–615°C, with outer rims recording somewhat higher conditions. Efforts are underway to constrain the timing of metamorphism by garnet Lu-Hf and U-Pb monazite geochronology.

Comparable high-temperature, low-pressure metamorphism has been documented elsewhere in the Meguma terrane. Although some occurrences are spatially associated with late Devonian plutons, textural evidence and field relations suggest that these are not contact metamorphic rocks but instead record a regionally elevated geothermal gradient (~40°C/km) that preceded pluton emplacement. Such conditions are difficult to reconcile with crustal thickening alone, implying that other processes, such as lithospheric thinning or delamination, played an important role in Devonian orogenesis in the Meguma terrane.

Lithology and thickness variations in Lower Pennsylvanian rocks of the southern Maritimes Basin

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The Hastings Uplift is an uplifted basement block in northern Nova Scotia and southeastern New Brunswick, southeast of the Sackville Basin, north of the Athol syncline and across the Northumberland Strait from Prince Edward Island. Understanding of the stratigraphy of the Hastings Uplift and its relationship to other parts of the Maritimes Basin has been hampered by limited outcrop and biostratigraphic data. New palynological data from the Hastings No. 1 well and a nearby borehole provide insights to the thickness and facies patterns in the lower Pennsylvanian rocks. In the Hastings well, the Mississippian Mabou Group is overlain by a sand-dominated succession with interbedded grey siltstones approximately 1650 m thick most of which belongs to the *Raistrickia fulva* zone (late Bashkirian). These rocks resemble but are largely younger than the Boss Point Formation in the well-studied stratigraphic succession at Joggins in the Athol syncline; there, the *R. fulva* zone comprises a red and grey clastic succession with intercalated coal-bearing strata. The Hastings succession more closely resembles that in the Sackville Basin where the Boss Point Formation is estimated to be up to 2400 m thick, spans the *R. saetosa* (early Bashkirian) and *R. fulva* zones, and coal measures are absent. The Bashkirian succession in western Cape Breton is also thick (~2200 m) and broadly resembles that of the Athol syncline. In contrast, Bashkirian rocks in Prince Edward Island are comparatively thin (< 1000 m thick), which may also be the case in the Tatamagouche syncline southeast of the Hastings Uplift. These results suggest that Bashkirian strata are thicker proximal to ancestral basement than nearer the basin center, possibly due to greater erosion or a longer hiatus in late Bashkirian time. The observed lithology and thickness variations have important implications for potential carbon sequestration in rocks of this age.

^Analysis of reef island building, sediment production and island elevation, Utila, Honduras

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Coral reef islands are amongst the most diverse yet vulnerable ecosystems on Earth. They yield important ecosystem services, providing habitat for both animals, including endemic and threatened species, and humans. In some cases, they house entire nations, supporting the livelihoods of billions of people globally. As these landforms are typically below 5m above MSL, they are under threat from inundation due to SLR and increasing storm events. Reef island dynamics are highly understudied, particularly within the Caribbean region, highlighting the need for a deeper understanding of potential responses to global warming induced oceanographic changes. Reef island longevity is a function of its 3D profile; thus, this

thesis assesses the relationship between sediment production rates and elevation of three reef islands in the Caribbean Sea off the coast of Utila, Honduras. Sediment transport dynamics are identified as driving process behind island geomorphology therefore transport processes including currents and waves are investigated. To calculate sediment production rates, sediment budget surveys in three zones around each island, seagrass, patch reef and reef crest, are the main data collection method. Current and wave data are retrieved, in addition to elevation data by topographic surveys of each island. Results revealed no significant relationship between sediment production rates and island elevation. MC had the highest production yet was the smallest island while WC exhibited the lowest production rates yet was the largest island. Oceanic data suggest transportation of island grade material away from MC north-westerly towards SWC. WC revealed extensive patches of dead coral, possibly causing rapid influxes of sediment grade material to the island. Additionally, significant anthropogenic disturbances and manmade sediment trapping features were observed at WC. The energy transition will reduce the pressures of global warming and SLR on future carbonate production and sedimentological regimes, allowing reef island accretion to keep pace with SLR.

Understanding of geohazards and constraints for development of Nova Scotia's designated offshore Wind Energy Areas

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The Cathie Group have collaborated with BGC Engineering to complete a regional desktop study of Nova Scotia's designated offshore Wind Energy Areas (WEAs). Located on the continental shelf, three WEAs form part of Land Tenure Process NS25-1R launched in October 2025 by the Canada Nova Scotia Offshore Energy Regulator: Sydney Bight, Middle Bank and French Bank. This study uses public datasets to assess geological, geospatial and anthropogenic conditions, then provides preliminary development recommendations from global offshore wind experience. The study includes: a regional geological data review to understand depositional history; a compilation of specific site conditions including bathymetry, seabed morphology, and seabed conditions; an identification of potential geohazards; and a preliminary assessment of anthropogenic features and metocean parameters that may influence site suitability. These data are then used to develop geoscience recommendations for additional geotechnical and geophysical surveys to reduce uncertainty in site understanding, to support the development of ground models for effective risk mitigation, and to identify applicable complementary studies (e.g., sediment mobility, cable burial risk). The study also identifies preliminary development considerations such as the suitability of the seabed and subsurface for industry-specific foundations, and anchors and cables, as well as anticipated challenges for engineering design and construction. Screening of bathymetry data across the WEAs indicates that water depths would be consistent with the development of either bottom-fixed (e.g., Middle Bank) or anchored floating technologies (e.g., French Bank). Geoscience data review suggests that area-wide survey strategies should aim to collect additional primarily coarse seabed sediments at the Sydney Bight to reduce risk for foundation design. Soil investigations within the French Bank will be required to reduce uncertainty as highly variable subsurface conditions are interpreted with potential for bedrock outcropping. Last, the Middle Bank has potential for scour depressions and large ripples that a high-resolution geophysical dataset would assist understanding of.

Evaluating subsurface carbonate reservoirs for CO_2 storage

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Meeting our global targets for reduction of greenhouse gases requires us to cut back on emissions through shifting to different energy sources, but also to store CO_2 that is produced through our current production. Canada runs four of the largest seven subsurface geological CO_2 storage operations in the world in Alberta and Saskatchewan. Three of the four involve injection of liquid CO_2 into carbonate reservoirs. There are many things that can make carbonate reservoirs ideal candidates for CO_2 storage, but there are considerations to take into account when evaluating permeability, porosity, and reactivity in carbonates. In this talk, I will review the projects that currently operate in western Canada and discuss an

integrated approach to the evaluation of carbonate reservoirs for CO_2 storage using various analytical methods. Examples of carbonate reservoirs and analogues will be included from the Western Canada Sedimentary Basin and closer to home in the offshore Newfoundland Jeanne D'Arc Basin. Evaluation of the petrophysical properties of carbonates requires knowledge of the changes in biota on the carbonate platform through geological time that result in variable carbonate environments and therefore, complex textures. Assessment of the complex diagenetic history of highly reactive carbonate sediments from the time they are deposited to present day is also critical in understanding the physical properties of the rocks, their potential reactivity, and possible fluid flow and plume migration pathways linked to prior tectonism and diagenesis.

Lived experience navigating the geosciences and field-based research with a physical disability: the good, the bad, and the things that drive me mad

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The first reaction I had to telling my family that I was going to go into geology was "oh, big surprise", but the first reaction I had to telling my university advisors was "you cannot be in geology if you cannot participate in field work". The reaction from my family is because I come from a family that is oddly filled with geologists and they knew how much I loved being outdoors and trying to understand the natural environment. The reaction from my university was because I told them I had a physical disability that can limit some of my mobility. I had not told them I could not do fieldwork, but rather that I would need to figure out my own way to do it. What they told me was a difficult thing to hear, but my aunt, who was one of the first female geology professors in the country told me to persevere, and that she was sure I would be able to succeed. In this talk, I would like to share some of my experiences from over 20 years in the geosciences. I will also present some of the amazing adaptations that are being developed by various groups in the geosciences to promote inclusion in the field and the lab for people with differing abilities.

Early Cretaceous palynoevent scheme for the Scotian Margin: application to offshore geological carbon storage and other energy transition studies

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Organic-walled microfossils (palynomorphs), including dinoflagellate, spores, and pollen, are extensively recovered from subsurface wells and boreholes, often when other fossil groups are scarce or difficult to extract from limited sample material; they are a standard biostratigraphic tool for relative age control. The Scotian Margin, located off Atlantic Canada, has been studied biostratigraphically over the past 50 years, and palynoevents (e.g., inceptions, extinctions, and acmes of species) have been critical to understanding the geological history of this area and associated petroleum systems. However, the Late Triassic-Early Cretaceous interval lacks a detailed event-stratigraphic framework. With the urgent need to globally shift to more environmentally sustainable energy and Canada's current aim to achieve net-zero emissions by 2050, geological studies to support the development of renewable energy, such as offshore geological carbon storage (GCS) and offshore wind, are being actively advanced on the Scotian Margin. Assessing the potential of GCS requires a comprehensive knowledge of the subsurface geology, including age constraints and assessment of depositional paleoenvironments. We carried out palynological analyses of 115 samples from the Lower Cretaceous conventional cores of Panuke B-90, comprising the Upper Member of the Missisauga Formation and the Logan Canyon Formation, a key interval for ongoing GCS investigations. We have identified several palynoevents from four lithological intervals reflecting changes in the paleoenvironmental setting. Additionally, we have tied our results to selected palynoevents from previous

biostratigraphic studies, resulting in a high-resolution Mesozoic palynoevent scheme for the Scotian Margin. These palynoevents are further integrated with other analyses in an ongoing event-stratigraphic framework. Palynology, combined with other disciplines, is effective in providing age-control refinements for the Scotian Margin, which is essential for establishing regional correlations, and for paleoenvironmental interpretations that help understand the nature of reservoir bodies in GCS studies.

Bedrock occurrences tied to Nova Scotia offshore wind energy areas: linking seabed samples to subsurface and onshore geology

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Wind energy development in offshore Nova Scotia requires an understanding of seabed conditions and seabed geology to guide infrastructure design, with exposed and shallowly-buried bedrock posing a challenge for conventional foundations. Three recently designated wind energy areas overlie varied bedrock: a Mesozoic-Cenozoic Scotian Basin passive margin succession below Middle Bank, Carboniferous Sydney Basin strata below Sydney Bight, and Meguma terrane rocks beneath French Bank. Our study focusses on archival and recent dredge and grab samples of bedrock and subcrop geology within these areas, with assessment of lithology, lithostratigraphy, age, paleoenvironments, geochemistry, and key petrophysical and mechanical properties. Where possible, samples are integrated with multibeam bathymetry, shallow seismic, potential fields, borehole data, and onshore bedrock geology. Adjacent to Middle Bank, two sample stations predominantly record bedded and bioturbated sandstones representing possible fluvial, estuarine, shoreface, and inner shelf settings, with rare shelfal limestones. Subcrop mapping from industry seismic and borehole information shows the sandstone samples are likely Logan Canyon Formation. Similar lithologies in the nearby Dover A-43 well confirms this, with rare limestones likely correlating to the overlying Petrel Member of the Dawson Canyon Formation. In the Sydney Bight area, Permian-Carboniferous samples include red, grey and greenish sandstones and siltstones with current ripples, planar lamination, cross bedding and/or mottling representing fluvial channel, crevasse splay and floodplain paleoenvironments. Extrapolation of onshore structure and geology combined with borehole data indicates a possible shallow subcrop transition between the Morien and Pictou groups in northeast plunging folds. In the French Bank area, bedrock is imaged in multibeam data and samples confirm the presence of laminated metasandstones consistent with Goldenville Group rocks in tight east-west oriented folds. Bedrock subcrop mapping and seabed samples thus provide key insights into occurrences impacting future offshore wind development, both within designated wind energy areas and the broader continental shelf.

Distinguishing Tonian and Ediacaran rocks in the northern Cobequid Highlands, Nova Scotia, Canada

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The Cobequid Highlands in northern mainland Nova Scotia remains one of the most enigmatic components of Avalonia in the northern Appalachian orogen. The highlands are divided by faults into the Bass River, Mount Ephraim, and Jeffers blocks, all of which contain small areas of Neoproterozoic rocks with uncertain relations both to one another and to other

parts of Avalonia. Although initially interpreted to be mainly Ediacaran, recent U-Pb zircon dating has shown that both Tonian and Ediacaran volcanic and plutonic rocks are present. However, because they formed in similar volcanic arc settings, establishing criteria to distinguish rocks of the two ages without U-Pb zircon dating at every outcrop is challenging. Tonian ages of 755 Ma to 725 Ma are well established for volcanic rocks of the Dalhousie Mountain Formation and Mount Ephraim Plutonic Suite in the Mount Ephraim block in the eastern highlands. Recent studies of the central Jeffers block reveal that it consists mainly of tuffaceous volcanic rocks intruded by two granodioritic plutons, one Tonian (Bulmer Brook pluton, ca. 740 Ma) and the other Ediacaran (Lily Pond pluton, ca. 626 Ma). Although trace element characteristics enable these two dated plutons to be distinguished, subdividing the host volcanic rocks, all currently assigned to the Ediacaran Jeffers Group, is difficult. U-Pb dating and chemical characteristics of three tuffaceous rocks in the Central New Annan area support the interpretation that the northern part of the central block of the Jeffers Group is Tonian and related to the Dalhousie Mountain Formation in the Mount Ephrain block, whereas the southern part may be Ediacaran and related to dated volcanic and plutonic rocks of that age in the western part of the Jeffers block.

Separating advective from conductive heat transport signatures in Distributed Temperature Sensing (DTS) data for dam seepage monitoring

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Fibre Optic Distributed Temperature Sensing (DTS) systems have been installed in water-retaining dams throughout the world to measure temperature and detect leaks or concentrated seepage. Where concentrated water seepage occurs temperature anomalies will be transported into the dam structure by advection, distorting the normal temperature pattern. This study developed a suite of data processing and visualization techniques designed to identify temperature anomalies suggestive of anomalous seepage within more than a decade of Distributed Temperature Sensing (DTS) data collected at the Mactaquac Dam. The dataset is dominated by strong seasonal signals arising from conductive heat exchange with air- and reservoir-exposed surfaces, which obscure subtler advective signatures.

Two complementary approaches are demonstrated to enhance anomaly detection. The first computes the temperature gradient along the DTS cable and applies median filtering to reduce systematic noise, effectively highlighting short-wavelength thermal variations. The second, more advanced method introduces the DBM (deGante-Butler-MacQuarrie) algorithm, which employs a modified Karhunen-Loève transform adapted from seismic data processing. Conceptually similar to Principal Component Analysis, this approach estimates and subtracts depth-dependent conductively transported temperature variations, enabling the extraction of more subtle thermal patterns associated with potential seepage. In addition, novel visualization strategies are presented, including offset temperature-depth and gradient-depth displays inspired by seismic trace plotting, as well as a new method for visualizing time series as a function of depth. Together, these techniques significantly improve the interpretation of seasonal behavior and the identification of subtle anomalies within long-term DTS data sets which are becoming increasingly common in dam seepage/leakage monitoring and other hydrological applications.

Chlorite compositions, prograde metamorphism, and gold-related trace elements

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This project will focus on volatile-metalloid (VM) element (S, Se, Te, Sb, Bi, Hg, As, etc.) behavior during progressive metamorphism of pelitic rocks from the West Highlands of Scotland. The metamorphism is represented by chlorite-mica schists to garnet-muscovite schists, with at least two stages of deformation and variable retrograde reactions present. VM-elements are commonly related to orogenic gold mobilization, and the compositions of sheet silicates have been used as indicators of gold deposition. In polymetamorphic terranes, different deformation events may be responsible for the reactions releasing volatile and metalloid elements. Microstructures preserved by sheet silicates are widely used to

examine P-T conditions and deformation. This project will investigate P-T conditions and trace-element variations during multistage deformation in samples from the West Highlands which were mapped and collected in May of this year. The research will involve, (i) SEM and petrographic analysis of chlorite-schists and chlorite-altered retrograde garnets with identification of chlorite growth zoning during varying metamorphic conditions (ii) X-ray mapping and analyses of major elements in the sheet silicates to produce P-T-d maps, and in the future, (iii) trace-element analysis using LA-ICP-MS to determine which deformation event(s) released volatile, gold-related elements, and finally, (iv) determining the grades of metamorphism that release the majority of volatile elements.

Cryptic microbial carbonates of the basal Windsor Group: a sedimentologic and petrographic reappraisal of the Macbeth Brook Formation, Cape Breton

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The Macbeth Brook Formation of the Sydney Basin is a laterally extensive and understudied component of the basal Windsor Group. Existing interpretations are based primarily on core observations, with limited detailed outcrop analysis and petrography. As a result, the stratigraphic and paleoenvironmental relationships between the Macbeth Brook Formation and coeval microbial reef complexes of the geographically proximal and laterally equivalent Gays River Formation, as well as the more widely known Macumber Formation laminated limestone, remain incompletely understood. The Macbeth Brook Formation has been previously described as variable siliciclastics in bedded limestones that are stromatolitic or thickly bedded to massive with relatively sparse fossil content. Here we re-evaluate key outcrops of the Macbeth Brook Formation in the Coxheath Hills, along East Bay, and at the northern end of the Boisdale Hills, together with Gays River Formation outcrops near the transition between units. Petrographic analysis reveals that the Macbeth Brook Formation is dominated by microscopic microbial fabrics, including laminated, oncolitic, cryptic, and irregular textures that are difficult to recognize at outcrop scale. Fossil material is more common than previously reported, though largely present as thin-section-scale components intergrown with microbial fabrics, dominated by molluscs and poorly preserved enigmatic and problematica forms. These textures indicate *in situ* carbonate accumulation, rather than extensive allochthonous redeposition, with growth of significant microbial material coating individual fossil grains providing novel insight in fluctuating conditions between those supportive of metazoan vs. microbial communities. Comparison with nearby Gays River reefal successions indicates a closer paleoenvironmental association than previously recognized in a spectrum of shallow-marine, microbially influenced carbonate environments. This work further highlights the need for re-evaluation of paleogeographic and relative water depth interpretations of the onshore Sydney Basin Windsor Sea.

Organic geochemical analysis of potential intra-salt E. Jurassic oil shows of the Scotian Basin

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Well-completion reports document numerous putative oil shows in salt-bearing units and associated carbonates within the Early Jurassic, Argo Formation of the Scotian Margin in the Orpheus Graben. These oil shows were, however, inferred from odour, fluorescence, and visual staining during drilling operations and require definitive confirmation by geochemical analysis of core plugs, sidewall cores, and cuttings. Unfortunately, these materials are often compromised by contamination from hydrocarbon in drilling fluids. This study evaluates whether oil-stained lithologies and salt-hosted fluid inclusions preserved in contaminated cuttings can be extracted and geochemically fingerprinted to distinguish indigenous in situ or migrated hydrocarbons from drilling-fluid contaminants. Eleven Early Jurassic carbonate-, siliciclastic-, and halite-dominated cuttings samples, along with two sidewall cores from the Argo F-38 well, were analyzed. Due to extensive drill-mud contamination, an experimental series of sequential solvent washes was applied before sample powdering and extraction. Hydrocarbon recoveries decreased exponentially with successive washes, indicating

progressive removal of contaminant hydrocarbons. Apolar fractions were analyzed using comprehensive two-dimensional gas chromatography with flame ionization detection (GC×GC-FID). Subtracted chromatograms were used to characterize drilling-fluid hydrocarbon signatures and isolate potential native hydrocarbon fingerprints. The results will assess whether indigenous hydrocarbons are present and, where confirmed, constrain their origin and maturity, providing new geochemical constraints on possible hydrocarbon generation within the Scotian Margin.

^Results of the Geoheritage Summer Institute and Geodiversity Day in the Cliffs of Fundy UNESCO Global Geopark

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Three one-hour online seminars were delivered for the 2025 Geoheritage Summer Institute (GSI) at noon on Fridays, June 6, July 4, and August 1. Fifty multidisciplinary participants were invited, representing geoscience, humanities, tourism, and economics, from universities, government, industry, and community members within the Cliffs of Fundy UNESCO Global Geopark. Thirty individuals (60%) registered through Zoom.

The 2025 GSI was designed to strengthen engagement with geoheritage and geodiversity by fostering dialogue between academic and community stakeholders in the Cliffs of Fundy UNESCO Global Geopark (http://fundygeopark.ca). Each seminar provided a concise overview of a focused topic, followed by structured discussion. Participants were invited to complete a pre-session survey to assess interests and experience. Attendance varied by session, ranging from 7 to 11 participants.

Across the three seminars, participants considered definitions of geoheritage and geoconservation, the UNESCO Sustainable Development Goals, and shared perspectives on interdisciplinary and community-based collaboration. The final seminar explored the development of a potential geoheritage course syllabus intended for both university students and community members, reflecting sustained interest in formal educational offerings.

Building on the GSI discussions, organizers developed a plan to celebrate International Geodiversity Day (October 6) within the Geopark. A full-day itinerary, spanning sunrise to sunset was implemented, beginning at Spencers Island, moving to the Fundy Discover Site, and concluding at Five Islands Provincial Park. Outcomes from this event were documented in the *Geologists' Association Magazine* and featured on the International Geodiversity Day website (http://geodiversityday.org).

The 2025 GSI pilot was successful. The small cohort size supported meaningful discussion, relationship building and collaboration. Continued interest in developing a geoheritage course, together with the international visibility generated by the Geodiversity Day celebration, highlights the program's value to the Geopark and the region. Funding was provided by the Canadian Geological Foundation and the Atlantic Geoscience Society Products and Grants Committee.

Integrating coastal environments into our understanding of major Mesozoic carbon cycle perturbations

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The Mesozoic witnessed several major carbon cycle perturbations associated with the deposition of organic-rich sediments in many locations worldwide. These episodes of environmental upheaval are commonly known as oceanic anoxic events (OAEs), often explained by drastic changes in carbon storage in the marine realm. However, there is a wide knowledge gap regarding the responses of terrestrial and coastal areas to the environmental drivers of OAEs and the impact of changing fluxes of carbon in and out of these depositional environments on the global carbon cycle.

This presentation discusses the potential implications of terrestrial and coastal environments on global organic matter storage and atmospheric carbon feedback during the Mesozoic. The integration of our findings from both sides of the Atlantic margins with current modelling efforts will allow us to clarify the impact of coastal environments on climate,

carbon-cycle perturbations, and OAEs, and to provide a Deep Time perspective on the factors contributing to present-day issues of coastal anoxia expansion and tidal wetland loss.

Resolving the effects of circulation structures on microbial diversity in the North Atlantic

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Compared to other areas of the ocean, the North Atlantic is rich in photosynthetic activity, responsible for roughly one-third of the world's net carbon dioxide uptake. The primary driver of this activity is thought to be a disruption of ocean stratification by turbulent interactions of strong warm- and cold-water currents, which are projected to weaken due to anthropogenic warming of seawater. How the microbial communities that sustain this productivity are responding to such a shift is thus far poorly understood. Last summer, the One Ocean Expedition's transatlantic cruise brought together scientists from around the world to measure ocean productivity markers and compare them to satellite data. From this cruise, our group collected a total of 26 surface water and water column filtrate samples from 10 stations along a transect between Iceland and Spain. We are currently using lipids—extracted from the filtrate samples using a modified Bligh-Dyer technique and measured using ultra high-pressure liquid chromatography coupled to a quadrupole time-of-flight mass spectrometer—as cellular proxies to resolve the identity and relative abundance of various microorganism types throughout the transect. Particular focus is placed on recording the occurrence of chlorophyll and its derivative pheophytin, indicators of photosynthetic communities, as well as the occurrence of archaeol and GDGT-class lipids, indicative of heterotrophic archaeal communities. This dataset, combined with other geochemical (nitrate, ammonia, TOC) and geophysical (remote sensing) datasets taken from the cruise, should provide a clear snapshot of how microbial communities are stratified along our transect, which can then be related to known current structures in the North Atlantic to resolve the impact of changing circulation patterns.

^Geochronology and petrogenesis of granitoids and related critical mineral systems in New Brunswick

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New Brunswick is host to diverse critical mineral systems associated with felsic magmatism. Though the timing of several of these systems are well constrained, many of the critical mineral systems in New Brunswick need additional geochronological work. This two-year project, supported in part by a federal grant through the Critical Minerals Geoscience and Data (CMDG) Initiative, aims to address knowledge gaps in the timing of critical mineral systems associated with granitoid intrusions in New Brunswick that are favorable for hosting critical minerals, and to investigate their petrological origins. Four types of system will be investigated: 1) greisen/quartz stockwork quartz vein-related systems, including Burnthill (W-Mo-Sn), Flume Ridge (W), and Foster Lake (W); 2) intrusion-related polymetallic vein systems including Pokiok (Ag-Cu-Zn-Pb-Au), Zealand Station (Be-Mo-W), Lake George (W-Mo), Popelogan - South Zone (Cu-Zn), Malachite (Cu-Co), Keymet (Cu-Pb-Ag-Zn), and Nigadoo (Cu-Pb-Ag-Zn); 3) LCT pegmatite systems, including in the Splan Pond (Li), Tower Hill (Li), and Kedron (Li) areas; and 4) W-Cu-Sn-Mo systems including Basswood Ridge (Sn-W-Li), Tower Hill (Sn-Mo-Cu-Zn-Au), Sorrel Ridge (Sn-Mo), Pleasant Ridge (Cu-Zn-Li-Mo-Pb), Kedron (W-Sn-Li-Be-Pb-Y-Zn-In-Cu-Au), Beech Hill (Mo-Sn-Zn), True Hill (Bi-Mo-Sn-W), Whittier Ridge; Wildcat Brook Granite (Mo-W-Pb-Zn), Benjamin River South (Cu-Mo), and Nicholas Denys (Cu-Mo).

The geochronological approach will begin with *in situ* dating of muscovite using the Rb-Sr method and will be followed up with the ^{40}Ar-^{39}Ar method on selected samples. Zircon mineral separates will be analysed using laser ablation U-Pb geochronology. Zircon crystals yielding the youngest ages from laser ablation will subsequently be dated using high-precision thermal ionization mass spectrometry techniques. Lu-Hf isotopic analysis will be conducted on the same zircon crystals used for geochronology. Re-Os dating of arsenopyrite and molybdenite will be completed for systems where other

isotopic systems are not feasible. Additional work will include whole-rock lithogeochemistry and complementary isotopic work.

^Antifouling paint particles as a source of metal and microplastic pollution in harbour sediments: Chester Back Harbour, Nova Scotia

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In recent years, antifouling paints have been identified as a significant source of microplastic and heavy metal pollution in marine environments. Most modern antifouling paints contain copper (I) oxide as a primary biocide in addition to booster biocides such as zinc oxide, zinc pyrithione, and copper pyrithione. When released from a vessel, antifouling paint particles (APPs) will continue to leach biocides per their original design, posing an environmental risk to sediment dwelling organisms. Our research focussed on determining the concentration of heavy metals associated with modern and historic marine paints (Cu, Zn, and Pb) and the concentration of APPs in the sediments of Nova Scotia's small harbours. Sediment gravity cores were collected in Autumn 2025 from Chester Back Harbour and two reference sites in Mahone Bay with limited boating traffic. Metal analysis was performed using an Epsilon 1 X-Ray Fluorescence Spectrometer. Results from the Chester Harbour sample show concentrations of Cu and Pb ($mg \cdot kg^{-1}$) in the core's surface sediments that exceed the interim sediment quality guidelines (ISQGs) for Cu (18.7 $mg \cdot kg^{-1}$) and Pb (30.2 $mg \cdot kg^{-1}$) in marine sediments. In the case of Cu, concentrations in the top 2 cm of sediment exceeded the probable effect levels (PELs) for copper in marine sediments (108 $mg \cdot kg^{-1}$). Results from both reference sites showed concentrations of Cu and Pb that did not exceed the ISQGs. Results for Zn from all three sites also did not exceed the ISQGs (<124 $mg \cdot kg^{-1}$). Future work will include the isolation of suspected APPs along with the application of FTIR and Raman spectroscopy for polymer analysis.

On the discovery of a large Taenidium burrow from the Clifton Formation in New Brunswick

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The Moscovian-aged Clifton Formation crops out in northern New Brunswick (NB) along the shores of the Bay du Chaleur. The formation is well known for its well-preserved plant fossils and lycopod trees preserved in life position. Trace fossils from the Clifton Formation have sparsely been reported in literature with only a cameo-appearance of an amphibian track and an invertebrate trackway reported amidst a detailed description of the sequence stratigraphy of the formation and sedimentary lithofacies. We report here the first systematic description of a large *Taenidium* burrow discovered near the township of Stonehaven NB. The burrow was preserved within a grey-green fine-grained sandstone from floodplain deposits. The fossil is relatively large (5 cm diameter and 50 cm in length) compared to other examples that have been reported from the Paleozoic of Atlantic Canada. However, large examples of *Taenidium* are known. *Taenidium* is characterized as an unbranched, unlined, subhorizontal burrow with evenly spaced meniscate backfill. A unique morphological feature includes the presence of 3–5 mm scale grey mud intraclasts within the meniscate backfill. This unique feature has not been recorded for *Taenidium* burrows previously, and may represent a new ichnospecies, and thus would expand the ichnogenus concept to include a heterogenous infill including intraformational mudclasts with a similar burrow infill as the parent rocks matrix. The *Taenidium* burrow presented here is interpreted to having been produced by a tetrapod, ma it one of the rare examples of Carboniferous tetrapod burrow in the fossil record.

Evidence for widespread barrier overstepping in coarse-clastic paraglacial coastlines: insights from Chedabucto Bay, Nova Scotia

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Key insights on how coastlines will evolve with future sea-level rise can be obtained by examining past coastal systems that formed during post-glacial relative sea-level (RSL) rise. In Atlantic Canada, coastlines are dominantly paraglacial, meaning that their geomorphology and morphodynamics are largely governed by the presence of glacigenic deposits from successive glaciations. Recent detailed mapping of uniquely preserved drowned (overstepped) barrier beach deposits in Chedabucto Bay, Nova Scotia has revealed not only the ubiquity of these features but also that barrier overstep may play a more dominant role in shoreline retreat than once thought. Many studies investigating barrier retreat through overstepping primarily focus on sandy systems while coarse-clastic systems remain understudied. Here, we investigate coarse-clastic paraglacial barrier systems by comparing the geophysical characteristics of modern barrier features surveyed through ground penetrating radar and LiDAR, with those now drowned offshore, imaged by multibeam bathymetry and seismic reflection data. We aim to investigate the environmental conditions that have led to their formation and preservation and to understand the differences observed in modern systems. Our mapping in Chedabucto Bay has revealed 62 individual relict paraglacial barriers, with glacio-isostatic RSL models suggesting systems formed between ca. 9,500 and 5,500 yrs BP in a similar coastal configuration to that observed today, with recent radiocarbon ages supporting this regional model. From this catalogue of barrier features there is a greater prevalence of drift-aligned relict barriers, which we attribute to a sedimentological preservation bias from longshore transport dynamics along northern coast of the bay. From these findings we suggest that barrier overstepping plays an extremely important role in coastal dynamics for coarse-clastic paraglacial systems. This mechanism of coastal retreat must be considered by researchers who attempt to model long-term sediment budgets and shoreline retreat for these systems, especially during periods of high rates of RSL rise.

Surficial geology and permafrost conditions within the involuted terrain near Tuktoyaktuk, Northwest Territories, Canada

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The Arctic coastal community of Tuktoyaktuk, Northwest Territories, faces severe coastal erosion and permafrost thaw hazards driven by its location on ice-rich terrain. Near Tuktoyaktuk, the involuted terrain is characterized by clusters of ice-cored hills (involuted hills) with ridge forms along their tops separated by thermokarst basins and lakes. The origin of the involuted terrain is not well-understood, but a general model suggests that these ice-rich deposits formed in front of the retreating Laurentide Ice Sheet along the Tuktoyaktuk coastlands through a combination of segregation and intrusive ice growth during the Late Pleistocene. The last regional surficial geology mapping (1:500,000) was completed more than 30 years ago, prior to the availability of LiDAR, high resolution satellite imagery, modern glaciogenic concepts, and before the current rapid climate-driven landscape change began. Since ground ice content is the primary driver of permafrost thaw sensitivity, mapping the distribution, and understanding the development and degradation of involuted hills is crucial. In 2025, we undertook initial fieldwork, and developed the first high-resolution surficial geology and geohazard assessment of the involuted terrain, including: 1) producing 1:10,000 and 1:50,000 scale surficial geology and permafrost feature maps (1:5,000); 2) establishing relations between geology and ground ice by correlating electrical resistivity tomography surveys, headwall mapping of thaw slumps, and shallow drilling with ground ice observations; 3) examining areas of recent landscape change by analyzing multi-temporal LiDAR (2011–2024) to quantify recent thermokarst features,

and classify geohazards. The ultimate goal of this work will be to establish surficial geology-ground ice relations to improve our understanding of ongoing climate-driven landscape change and provide baseline information for infrastructure planning in the region.

Mafic-ultramafic melt inclusions in early magmatic apatite record low degrees of partial melting of a critical metal-enriched, suspected Neoproterozoic basement, Mersey Point, Nova Scotia

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The Mersey Point gabbronorite intrusion is one of several very small Late Devonian mafic intrusions coeval with granitoids that host intrusion-related Sn-W-Mo deposits in NS. The gabbronorite is an olivine (>Fo80)-plagioclase mesocumulate with poikilitic orthopyroxene, clinopyroxene, and phlogopite. Apatite, spinel, and sulfides (Fe-Ni-Co-Cu-S) are present as accessory phases. Early apatite phenocrysts contain primary, high-alkaline silicate melt inclusions (SMI) of picrobasaltic/basanitic (in primocrysts) to trachytic composition. Apatite trace element compositions (LA-ICP-MS) indicate growth from plagioclase-saturated mafic-ultramafic magma and show strong crustal contamination. Compatible major/trace elements in the SMI show behaviors consistent with differentiation. However, incompatible LILE/HFSE show no enrichment with differentiation and, instead, reach extremely high concentrations in the most primitive melt inclusions. Notably, concentrations of critical metals W and Mo are 1–3 orders higher than in MORB and arc basalts; Sn concentrations are unremarkable. The compositional characteristics of the apatite and associated SMI provide the first direct evidence for the onset of partial melting of protolith lower crustal rocks by mafic end-member magmas within the Meguma Lithotectonic Zone. Strong enrichment in W relative to Sn indicate very low degrees of partial melting of a phyllosilicate-rich crustal protolith, suggesting that in areas where larger volumes of such mafic magmas interacted with lower crust, higher degrees of partial melting may have produced Sn- and W-rich melts, a likely prerequisite for intrusion-related deposits in coeval granitoids.

^Preliminary petrographic and micro XRF insights into the origin and diagenetic evolution of siderite in the Ben Nevis Formation, Jeanne d'Arc Basin, offshore Newfoundland

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Early diagenetic and burial siderite can provide new constraints on the paragenesis of cementation in marginal to shallow-marine reservoir successions. Building on previous research that uses siderite chemistry and morphology to track basin fluid evolution in Mesozoic clastic systems of the Scotian Basin, this study focuses on the Aptian-Albian Ben Nevis Formation of the Jeanne d'Arc Basin, offshore Newfoundland. Here we use hyperspectral and petrographic analysis, scanning electron microscope (SEM) microscopy, and micro-X-ray fluorescence (μXRF) elemental mapping to characterize siderite paragenesis and textural relationships to host sediments. Preliminary observations document multiple siderite habits, including nodules and pore-filling to grain-binding cements, that vary with diagenetic facies and burial depth. Variations in Fe, Mg, Mn, and Ca, suggest progressive compositional evolution linked to changes in diagenetic fluid composition and redox conditions. Textural criteria, including laminae deflection around siderite-cemented domains, contrasts between sutured and open grain contacts, and cross-cutting relationships between diagenetic phases provisionally distinguish eodiagenetic concretions and cements from mesodiagenetic replacement and pore-filling phases. These preliminary results support a diagenetic model in which multiple generations of siderite cements and nodules occur with distinct chemical signatures and textures. Ongoing work integrating systematic petrography, SEM-EDS, quantitative geochemistry, and high-resolution μXRF guided by hyperspectral analysis of core will refine the paragenetic framework and assess how siderite morphology in the Ben Nevis Formation can be used as a proxy for fluid pathways, redox evolution, and reservoir quality in this key Atlantic Canadian petroleum system.

Spatial Distributions of surface textures, sedimentary structures, and neoichnological traces in the Bay of Fundy, Canada

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Intertidal environments are shaped by complex interactions between physicochemical processes and biological activity. These interactions influence sedimentary structures and surface textures crucial for interpreting modern and ancient siliciclastic tidal systems. This study integrates high-resolution unmanned aerial vehicle (UAV) imagery, sedimentological analyses, and neoichnological observations to investigate the spatial distribution of surface features and modern organism traces in macrotidal intertidal flats. This project focuses on the mud-dominated inner estuary and fluvial-tidal transition zones within the Salmon and Petitcodiac River estuaries (Bay of Fundy, Canada). Surface features were mapped and classified, quantifying the affinity of trace types to specific sedimentary surfaces using spatial statistics, specifically affinity factor analysis and Markov chain analyses with Monte Carlo simulation. Grain size distributions from sediment cores complement the spatial dataset. Results reveal distinct spatial relationships between sedimentary facies and biogenic structures, establishing quantitative baselines for sediment-biota relationships in macrotidal estuaries. We demonstrate that certain organism tracemaking activity exhibits strong environmental control, clustering predictably on specific depositional surfaces. This integrated UAV-based neoichnological approach provides a novel framework for interpreting trace fossil assemblages in analogous ancient siliciclastic deposits and advances methodologies for high-resolution sedimentary investigations in coastal environments. The quantitative baselines established here offer a valuable reference for paleoenvironmental reconstruction and prediction of organism-sediment interactions across tidal systems.

Characterizing the geomorphology and dynamics of potential rock glaciers in Parc National de la Gaspésie using LiDAR, thermal imaging, and GPR

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Three potential rock glaciers were visited in Parc National de la Gaspésie in summer of 2025, with the goal of contributing to the understanding of permafrost and periglacial processes in Eastern Canada. The presence of rock glaciers, along side their structures and activity, in eastern Canada has been fairly under documented and under characterized in recent decades. With the recent rise of global temperatures, it is more important than ever to study these features and document their climate sensitivity. Remote sensing surveys were conducted with a small remotely piloted aircraft system to collect photogrammetry, LiDAR, and thermal infrared data to produce high-resolution terrain models and multispectral orthophotos. These data were used in the following ways: high resolution imaging (orthophotos), mapping surface temperature anomalies (thermal imaging), identifying and mapping geomorphic facies (LiDAR), and examining internal reflectors, such as ice- and water-rich zones (GPR). Analysis conducted thus far includes mapping of geomorphological features based on orthophotos and LiDAR data and inferring relative chronostratigraphy. Additional analysis using thermal images have identified zones of surface temperature variation associated with geomorphological structures. Radargrams are currently undergoing examination for internal reflectors in order to map locations of potential ice- and water-rich zones to later cross-reference with temperature anomalies and geomorphological features.

Revised structural and stratigraphic correlation of the Boyd Creek tuff of the eastern Moncton Subbasin, southeastern New Brunswick

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The Boyd Creek tuff was recently radiometrically dated by U-Pb Laser Ablation method to be 337.4 ± 1.5 million years old (Visean–Holkerian). This date is significant as there are very few units which provide a radiometric age to constrain the timing of stratigraphic deposition and tectonic events throughout the Devonian Carboniferous sedimentary sequences of New Brunswick. Historically, age determinations for the Devonian-Carboniferous sediments are reliant on the study of micro and macro paleontology of spores and plants. The Boyd Creek tuff was logged in some early 1900s boreholes and very sporadic outcrops within the Stoney Creek to Gautreau area. During the 1940s exploration phase by Shell Oil, this tuff was interpreted to have been deposited within the Hillsborough Formation before being re-assigned to the Late Tournaisian during the early 2000s. Hence, the scarcity of outcrops of the Boyd Creek tuff and the uncertain age of the stratigraphy has complicated surface to subsurface geological correlations within the Berryton to Gautreau Village area of southeastern New Brunswick. The new age is consistent with a recent biostratigraphic study in the Gautreau-Weldon area and the Boyd Creek tuff is correlative with other Visean volcanic episodes across the southern portion of the onshore Maritimes Basin in New Brunswick. Very recently, a new outcrop of the Boyd Creek tuff was discovered along the Hiram Brook within the Stoney Creek Station area. This outcrop, along with new fieldwork, borehole and seismic interpretations in adjacent areas reveals the Boyd Creek tuff is part of a doubly plunging syncline extending from the Berryton to Gautreau Village areas. The southern portion of this syncline near Baltimore is truncated by the Clover Hill Fault, which explains the absence of the Boyd Creek tuff in nearby boreholes.

The East Kemptville Sn(-Ag-Cu-Zn) Domain: a potential world class Sn-In-Li-Rb district

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The ongoing quest for critical metals to support the green transition includes a long and expanding list of metals that includes Sn. The demand for domestic sources of critical metals is important and exemplified by Sn for which there is no current primary production in North America. The former producing East Kemptville Sn mine and surrounding area define a northeast-trending "Sn domain" of 100 km that extends from the Dominique prospect south of Yarmouth eastwards to the Caledonia occurrence and thus represents Nova Scotia's premiere critical metal target. This domain hosts numerous occurrences of Sn and related metals (W, Zn, Cu, In, Ag) within both the parental granite and host Meguma Supergroup metasediments. Tin occurrences include all the classic Sn deposit types, including quartz vein-greisen zones within host granite and quartz veins and skarn in host metasediments. Although the East Kemptville Sn mine is the only currently defined economic resource, several significant occurrences in the area suggest further resources are likely to be defined through systematic exploration based on the fact that all well-defined Sn domains globally host several or more deposits (e.g., Cornwall, Bolivia, Australia). In addition to Sn, mineralization includes potential Cu-Zn-In-Rb-Li resources as byproducts, with Cu (chalcopyrite) and Zn (sphalerite) both byproducts of historical mining, in addition to Ag and W, and with In concentrated in sphalerite having the potential for recovery at the smelting stage. Li and Rb are enriched in micas, including zinnwaldite, trilithionite, muscovite and biotite, but are decoupled from Sn on a local scale and thus may require selective mining and processing streams, however, as they occur in the same general area they thus benefit from common infrastructure.

The diverse morphology and internal structure of North American pingos reveals complex ice growth and loss

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Pingos are distinct ice-rich hills found in permafrost regions that serve as critical indicators of ground ice conditions and possess morphological analogs on planetary bodies like Mars and Ceres. Despite their cultural and scientific significance, the relationship between pingo surface morphology and internal cryostratigraphy remains poorly constrained, often relying on classical models of monolithic ice cores. This study provides novel geophysical constraints on pingo internal structure by analyzing four pingos near Prudhoe Bay, Alaska, and nine within Pingo Canadian Landmark, near the Hamlet of Tuktoyaktuk in the Northwest Territories. We integrated high-resolution digital elevation models with ground penetrating radar and capacitively-coupled electrical resistivity surveys to resolve subsurface architecture and ground ice distribution.

Our results challenge the prevalence of the idealized hydrostatic pingo model. Of the thirteen investigated sites only two, including the massive Ibyuk pingo, displayed geophysical characteristics supporting a large, monolithic massive ice core. Instead, we observed significant structural diversity; many morphologically “mature” pingos lacked discrete central cores, exhibiting instead scattered lenticular ice bodies and complex layering. Observations of "young" pingos indicate that growth likely initiates through ice segregation, transitioning to a mixed-mode of segregation and intrusive processes as the pingo matures and the overburden undergoes brittle failure.

We identify a positive correlation between morphological maturity and internal cryostratigraphic complexity yet find that topographic prominence alone is a poor predictor of subsurface heterogeneity. Furthermore, structural patterns such as slope-parallel resistive anomalies support a thin elastic plate model for pingo formation, where intrusive ice is emplaced along flank failure surfaces rather than exclusively via basal accretion. These findings suggest that monolithic ice cores represent a rare endmember, and that a distributed segregation-injection framework better explains pingo evolution on Earth and analogous planetary environments.

A >360 Myr history of polymetallic vein formation at Cobalt-Gowganda (Ontario) and relevance to Nova Scotia

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The world-class “five-element” vein systems of Cobalt-Gowganda (Ontario) are among the highest-grade deposits of Ag and Co (15.5 billion g Ag, 20.5 million kg Co) globally. Their proximity to a regional mafic sill complex (Nipissing diabase) spurred the assumption that the vein mineralization was coincident with and genetically related to the intrusive event at ca. 2.22 Ga. Results from Re-Os analysis of pre- and syn-ore-stage sulfarsenide phases from several polymetallic vein settings indicate a greatly protracted history for mineralization spanning >360 Myr which precedes the Nipissing diabase by >245 Myr. These results require alternate model(s) that invoke both an extended time frame and various events to explain the polymetallic mineralization. These findings are perhaps relevant to polymetallic vein systems in Nova Scotia (e.g., Nictaux Falls Dam, Lansdowne, Cape Saint Mary’s) as they share some similarities to those of Cobalt-Gowganda in metallogeny (e.g., Co, Ni, Ag, Sb, Pb), and peculiar mineralogy (e.g., Sb-, Ag-sulfosalts, native Ag, Sb, cobaltite). The latter geological best assumption for deposit genesis at Cobalt-Gowganda informed exploration, with production ceasing when deposits could no longer be found near the favoured setting of diabase and country rock contact. Whereas the documentation of this protracted history of mineralization does not preclude a role for the diabase intrusion for some deposits, it suggests that mineralization also occurred before and after, due to other processes which may also include other undiscovered locations. Similarly, the polymetallic vein deposits of Nova Scotia are considered in isolation, and with emphasis on their host formations. Instead, these deposits may represent an extended, more complicated system of events.

What’s REALLY under the Meguma terrane? A fresh look at xenoliths from the Eastern Shore dykes

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Xenoliths hosted by the late Devonian Eastern Shore lamprophyre dyke swarm are the only samples of what lay beneath the Meguma terrane when the dykes were intruded (ca. 370 Ma). The xenoliths represent a wide variety of lithologies and mineral assemblages and have been the focus of several studies since their discovery 40 years ago. Nevertheless, some long-standing interpretations deserve further scrutiny, including suggestions that: (i) pelitic lithologies are not potential source rocks for peraluminous magmatism; (ii) mafic granulites are an important component of the xenolith suite; and (iii) their geochemical and isotopic characteristics indicate that the Meguma terrane is underlain by Avalonian lower crust. We report preliminary results from a re-examination of these important samples undertaken to document their characteristics further and to test existing hypotheses concerning their origin and significance. Most xenolith samples are pelites or pelitic migmatites with complex polymetamorphic histories. An early kyanite + garnet + biotite-bearing assemblage is strongly overprinted by sillimanite associated with corundum + spinel and sapphirine-bearing leucosome. The observations are consistent with high-temperature biotite dehydration melting; preserved melt pockets are clearly peraluminous and quartz-poor. Later retrogression produced distinctive spinel + gedrite coronas around garnet. Mafic xenoliths display pristine igneous textures involving pyroxene + plagioclase ± amphibole but lacking either garnet or olivine. They are interpreted as gabbro and diorite; samples resembling metamorphic mafic granulite have not yet been recognised. Based on these observations we question some previous interpretations regarding the nature and significance of the pelitic and mafic xenoliths. Work is in progress to determine the petrogenetic affinity of the mafic igneous rocks and P-T conditions for melting of the pelitic rocks.

^Gold enrichment in porphyry Cu-Au systems: insights from LMCE behavior in the Late Triassic Zhongdian arc, Sanjiang region, SW China

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Gold is efficiently concentrated in subduction-related porphyry copper-gold systems (PCDs), which are estimated to host nearly 20% of the world's gold resources. While subduction and its duration are fundamental drivers of magma fertility in PCDs, the specific mechanisms responsible for Au enrichment—particularly the role of low-melting chalcophile elements (LMCEs) and nanoscale formation pathways remain poorly understood. This study focuses on the giant Late Triassic Pulang and Lannitang porphyry Cu-Au deposits, located in the Zhongdian terrane, Sanjiang region, SW China, which are interpreted to have formed in an island-arc-related subduction setting, but preserve contrasting structural levels and thermal histories.

Through a comparative multi-analytical approach—integrating reflected light microscopy, scanning electron microscopy (SEM), electron probe microanalysis (EPMA), laser ablation-inductively coupled plasma time-of-flight mass spectrometry (LA-ICP-TOF-MS), and high-resolution transmission electron microscopy (HRTEM)—we demonstrate that Au enrichment at Pulang was efficiently scavenged during the early magmatic-hydrothermal stage associated with Bi-Te-As mineralization, when its LMCE phases formed under high-temperature and oxidized conditions and promoted nanoscale gold nucleation. These gold nanoparticles were subsequently preserved within arsenopyrite and rooseveltite during progressive cooling and oxidation. In contrast, the structurally shallower Lannitang system, characterized by a thicker wall-rock, records extensive late-stage hydrothermal overprinting, in which earlier LMCE-mediated Au reservoirs were largely re-equilibrated or destroyed, resulting in dominantly free native gold precipitation during argillic alteration. These contrasting features reflect differences in structural level and thermal state rather than distinct metallogenic processes.

We therefore propose that subduction-related settings create the essential thermo-chemical window—marked by high oxidation states, delayed sulfide saturation, and elevated temperatures—that promotes the enrichment and saturation of LMCEs. These LMCEs act as highly efficient gold scavengers, representing a primary control on gold endowment in PCDs. This LMCE-driven mechanism offers a new mechanistic and nanoscale framework for exploration targeting.

A provisional stratigraphic revision of the Neoproterozoic–Cambrian succession in the Caledonian Highlands, southeastern New Brunswick

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The Caledonian Highlands encompass an area 30 km wide by 130 km long bordering the northern Bay of Fundy from Saint John to Alma. Neoproterozoic and Cambrian rocks of the Caledonian Highlands represent one of several Avalonian terranes in the northeastern Appalachians, along with northern Nova Scotia and southern Cape Breton Island, southeastern Newfoundland, and southeastern New England, USA. Since the last bedrock mapping was conducted in the late 1980s–early 1990s, a wealth of new data has been published, however no attempt has been made to reconcile this data with the published set of bedrock geology maps. Towards this aim, a multi-year bedrock mapping project was initiated by the New Brunswick Geological Surveys Branch in 2015.

The Neoproterozoic succession in the highlands was previously divided into two groups of Ediacaran age: an older Broad River Group (ca. 620-615 Ma) and younger Coldbrook Group (ca. 550 Ma). The more recent recognition of a suite of ca. 690 Ma felsic intrusions that were emplaced into metavolcanic and volcaniclastic rocks assigned to the Broad River Group has led to significant stratigraphic revisions and the delineation of a new Cryogenian-aged succession we have named Lumsden Group. This new group hosts the Lumsden base-metal deposit, which is similar in age and metallogeny to the Stirling deposit on Cape Breton Island (Mira terrane). Some other major revisions include reducing the rank of several stratigraphic formations in the Coldbrook Group to members, thereby decreasing the number of formations in the group from twelve to five. In the structurally complex eastern highlands, we have expanded the distribution of the Coldbrook Group and re-assigned the clastic metasedimentary rocks of the Goose River Formation (formerly Broad River Group) to the Cambrian Saint John Group, indicating that the Avalonian overstep sequence is more extensive in the eastern highlands than previously thought.

Preliminary investigation of the metamorphic gradient in the southwestern Meguma terrane, Nova Scotia

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The Meguma terrane in southwestern Nova Scotia exhibits a low-pressure metamorphic gradient, locally reaching suprasolidus conditions near the Devonian-aged Barrington Passage Pluton. Excellent exposure, particularly along the coast, allows sedimentary units of the Goldenville and Halifax Groups to be traced across metamorphic isograds. This region therefore provides an opportunity to study fundamental aspects of the metamorphic evolution of metasedimentary sequences, including 1) the influence of variable bulk compositions on pelite phase equilibria, and 2) the mobilization of trace metals through metamorphic reactions. Here, we present preliminary field and petrographic observations from coastal exposures near Villagedale and Sandy Point in Shelburne County, NS. Migmatite outcrops near Villagedale are foliated with patchy leucosome and abundant muscovite porphyroblasts, which appear to be retrograde after the peak assemblage of sillimanite + biotite + feldspar + quartz + magnetite ± garnet. Rare tourmaline is also texturally late. Near Sandy Point, the influence of changing pressure-temperature (P-T) conditions and bulk composition is apparent. Metamorphic grade decreases moving southeast along the coast, indicated by staurolite disappearing from the assemblage and the garnet distribution becoming sporadic in pelitic layers. However, this sequence is interrupted by a package of green metasiltstones containing biotite and chlorite. Future work will focus on high-resolution mapping of shoreline exposures in this region, with documentation of variations in bulk composition. Geochronology of multiple

minerals in the migmatite (zircon, monazite, etc.) will be used to constrain the timing of partial melting and melt crystallization, potentially providing a clearer link between magmatism and metamorphism in the region.

Deformation and metamorphism in the southernmost Chebogue Point shear zone of the Meguma terrane, Nova Scotia, Canada

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The Chebogue Point shear zone (CPSZ) is a major intra-terrane high-strain zone in the Meguma terrane in southwest Nova Scotia. It juxtaposes Cambrian to Ordovician rocks of the metasedimentary Goldenville Group (Green Harbour, Government Point and Moshers Island formations) and Halifax Group (Cunard Formation) with Silurian and younger metavolcanic and metasedimentary rocks of the Rockville Notch Group (White Rock Formation and associated suites of mafic sills and dykes) that only occur northwest of the shear zone. At a costal section at Chebogue Point the stratigraphy is well-exposed and units young towards the NW. At the base of the section the Green Harbour Formation consists of massive metasandstone and grades upwards to the Government Point Formation which consists of cross-bedded siltstone with minor sandstone layers. The overlying high-Mn Moshers Island Formation consists of siltstone with spessartine-rich nodules and lenses. The Cunard Formation consists of black, sulphide-rich chloritic slate with rare sandstone layers. The White Rock Formation in this section is represented by interlayered siltstone, tuff, and amphibolite. The section shows a pronounced deformation gradient increasing in intensity towards the NW. From the base of the section to the top, S_0 and S_1/D_1 spaced cleavage defined by weakly foliated muscovite and chlorite become increasingly overprinted by a S_2/D_2 foliation that folds and rotates the S_0/S_1 structures into a composite transposition foliation and vertical and rootless isocline folds defining the CPSZ. Based on the presence of chlorite and muscovite in the S_2 structures (foliation, pressure shadows around diagenetic pyrite, axial planar cleavage in folds, and mineral lineations) it is clear that the S_2/D_2 shearing took place at lower greenschist facies conditions, in contrast to amphibolite-facies shearing recorded further inland along strike. Kinematic indicators show local SE-directed motion overprinted by the main NW-directed oblique sinistral motion that defines the CPSZ.

Rare earth and Nb enrichment in kimberlite perovskite: insights from the Lac de Gras Kimberlites, Canada

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Kimberlites are mantle-derived igneous rocks known for their diamond content, but they also host significant rare earth elements (REEs) and critical metals (e.g., Ni, Co, and Nb) in primary and secondary REE mineral hosts. Perovskite and apatite are the primary REE-bearing minerals; however, perovskite is generally the dominant REE host, with crystallisation sequence exerting a strong control on REE distribution. This study presents an investigation of different lithological facies from six Lac de Gras (LDG) kimberlites, with a focus on perovskite, and compares it with kimberlite data from other global localities. The samples were examined using petrographic, scanning electron microscopes (SEM), and electron microprobe (EMP) to characterise mineral textures and compositions. In hypabyssal kimberlites (Grizzly and Leslie), perovskite occurs as euhedral to subhedral crystals with sharp grain boundaries and compositional zoning. In contrast, perovskite in the volcaniclastic kimberlites (Beartooth, Koala, Misery, and Panda) displays irregular, embayed, and fragmented morphologies, consistent with resorption and fragmentation. The highest REE and Nb concentrations are found in the few perovskites from the Leslie, wherein abundant groundmass apatite often contains Ce-La and REE-rich apatite inclusions. In Grizzly, the abundant perovskite is the primary REE host and exhibits Nb-rich rims of up to 5 µm thickness. Perovskite from Panda and Koala shows REE and Nb concentrations comparable to the core of perovskite from Grizzly. Perovskite in samples from Misery and Beartooth has lower REE and Nb concentrations. In Beartooth, REE-rich apatite occurs in association with groundmass carbonate, and monazite occurs as overgrowth on ilmenite. REE minerals, including monazite and ancylite, occur sporadically in both hypabyssal and volcaniclastic kimberlites. Compared with other African and

Canadian kimberlites, LDG perovskite has a higher REE concentration and shows Nb enrichment. The variation in the perovskite composition between the LDG kimberlites and worldwide localities reflects variation in melt composition and emplacement mechanism.

Critical mineral potential of historical antimony tailings in Atlantic Canada: a case study from the Lake George Mine, New Brunswick

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Between 1998 and 2023, Canada ranked as the ninth-largest producer of primary antimony (Sb); however, Canadian Sb deposits now contribute minimally to global supply. Atlantic Canada hosts three Sb deposits (Clarence Stream and Jones Brook, NB; and Beaver Brook, Central Zone, NL), six past producers (including the Beaver Brook (NL), Lake George (NB), and West Gore (NS) mines), and 35 significant Sb occurrences, indicating strong potential for future exploration. Historical mine tailings across the region represent an underexplored secondary source of critical minerals and a potential resource for both recovery and reclamation at former mine sites.

This study examines the distribution of Sb deposits, occurrences, and Sb-bearing tailings in Atlantic Canada, with particular attention to abandoned Sb mines that may retain economically relevant concentrations of Sb and associated critical minerals. Among these, the Lake George Sb mine in New Brunswick—formerly the largest Sb producer in North America—stands out due to its notable content of Sb and gold (Au).

Mineralogical analyses of the Lake George tailings identified primary Sb minerals such as stibnite (Sb_2S_3) and berthierite ($FeSb_2S_4$), along with secondary weathering products including Sb oxides and Sb-Fe oxides. Although Au occurs in microscopic or invisible forms, bulk geochemical analyses reveal elevated Au concentrations in the tailings (mean 415 ppb) and substantial residual Sb (mean 3,015 ppm), indicating incomplete historical recovery and highlighting the potential for modern reprocessing.

The results of this study show that a detailed understanding of the mineral hosts, spatial distribution, and geochemical behaviour of critical minerals is essential for identifying tailings zones with the highest recovery potential and for assessing associated environmental risks. Evaluating the critical mineral content of mine waste at abandoned mines in the Atlantic Provinces can support targeted exploration, strengthen secondary resource development, and contribute to Canada's broader strategy of securing domestic critical mineral supplies.

Feldspars as monitors of fluid-mediated ore processes in magmatic-hydrothermal critical-metal deposits: theory and application

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The alkali feldspars (AFs), here simply albite (Ab) and K-feldspar (Kfs), and quartz dominate the modal mineralogy of host rock granites and pegmatites for many critical metal (CM) ore deposit settings (i.e., Sn, W, Ta, Nb, Li, REEs), in many cases forming >90–95% of the mode. Whereas quartz is relatively robust in regard to fluid-rock interaction, which involves heated variably saline alkali-chloride solutions, the AFs are highly reactive with coupled dissolution precipitation (CDP) reactions producing textural and chemical changes that provide the means to monitor fluid interaction. Here, the theory relevant to these changes in the AFs is first reviewed followed by its application to a variety of CM settings to illustrate its pragmatic application. A key textural feature noted is formation of perthite textures in Kfs (e.g., film, flame, bleb) commensurate with a change from sanidine to orthoclase with development of pitted textures due to the presence of fluid inclusions (FIs) in newly precipitated Kfs via CDP processes. Textural modification of Ab via CDP also occurs with FIs preserved along with growth of secondary apatite in P-rich settings. Synchronous with these textural changes is the

progressive transition from magmatic to metasomatic chemistry of the AFs, thus Or_{70} to $Or_{95–100}$, and $Ab_{85–90}$ to Ab_{100}. An important aspect of these latter changes is that primary magmatic textures are preserved, thus formation of metasomatic rocks that texturally look igneous as X-ray maps presented will demonstrate. Using this foundation, examination of several ore deposit settings reveals a strong correlation between CM mineralization and pervasive development of the textural and chemical features noted above. In fact, the CDP process is often so efficient that the host metasomatic rocks have and continue to be erroneously referred to as magmatic in nature.

Rocks in the classroom: insights from teacher workshops and school visits

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A comprehensive rock kit was designed for rock identification activities and used at two teacher workshops and seven school visits. Fifteen kits were assembled with rock samples donated by the Nova Scotia Department of Natural Resources and Renewables and materials that were purchased with grants from the Nova Scotia Mineral Resources Development Fund and the Canadian Geological Foundation. Each kit contains rock samples representing all rock types, materials for rock identification activities, and individual student materials, including a hand lens, ruler, reference guide and worksheets. Insights from the first teacher workshop led to redesigning the kit with a smaller number of rock samples that had textures that were more easily identifiable and increasing the number of kits used in the classroom to accommodate up to five groups of four to six students. Teachers at the second workshop experienced more hands-on time and activities that engaged them in greater depth than the first workshop using a similar format. School visits included: four different grade 4 classes, one day-long visit with several small groups of mixed primary to grade 6 students, one grade 7 class and one Geology 12 class. Insights from these visits led to minor changes in the kit's content, improvements in the demonstrations and the creation of detailed lesson plans redesigned into three modules consisting of a knowledge review, learning observational skills and naming rocks. The kit has proven to be an invaluable resource for teachers that engages students with learning rock identification skills and is applicable for several grade levels, starting at elementary and up to high school level.

A review of carbonate cementation in the syn-rift strata of the Jeanne d'Arc Basin: challenges, models, and the potential for scalability using hyperspectral data

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The Jeanne d'Arc Basin on the Grand Banks contains significant potential for subsurface CO_2 storage within syn-rift marginal to shallow-marine Jurassic and Cretaceous sandstone reservoirs. However, uncertainties remain related to reservoir heterogeneity and reactivity to injected CO_2, particularly concerning the distribution of carbonate cements. Carbonate cementation reduces reservoir capacity and connectivity, and may dissolve or reprecipitate during CO_2 injection, altering reservoir properties. Previous studies have identified multiple generations of carbonate cements in the Jeanne d'Arc Basin formed before and after burial compaction. Cements precipitated under near-surface conditions reflect strong paleoenvironmental controls. In the fluvio-deltaic Hibernia Formation, dolomite cementation is linked to seawater retention during sea-level regression, whereas calcite cementation corresponds to transgression and increased marine fluid flux into marginal-marine sediments. Similarly, in the storm-dominated Ben Nevis Formation, early calcite cements are associated with bioclast dissolution and early diagenetic fluid migration during marine transgression. Subsequent dissolution of early cements and precipitation of late ferroan calcite in both formations likely occurred during migration of basinal brines and/or meteoric fluids along faults. Despite this detailed reservoir-scale understanding, extrapolating carbonate cement distribution to the basin scale remains challenging due to limitations in identifying and mapping carbonate cements using conventional core, petrophysical, or seismic datasets. Hyperspectral imaging provides a promising basin-scale approach, as calcite and dolomite exhibit diagnostic absorption features in the short-wave (2325–2345 nm), mid-wave (3920–3960 nm), and long-wave (11,140–11,300 nm) infrared ranges. We have acquired

hyperspectral data from over 7,000 m of drill core spanning all cored clastic reservoir intervals in the Jeanne d'Arc Basin, with the goal of developing supervised and unsupervised classification workflows to map carbonate cement phases, calibrated against detailed sedimentological, petrographic, and geochemical analyses. This integrated approach aims to constrain carbonate cement paragenesis and evaluate the controls on cement precipitation and dissolution across the basin.

Who takes a natural disasters class? (And where does it take them?)

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Like many institutions, Cape Breton University offers an introductory natural disasters course designed to serve as both a recruitment tool for geology and a general introduction to science for Arts students. Over the past five years, students enrolled in this course have completed a pre-course survey to assess their needs, motivations, and expectations. This presentation discusses data gathered from over 300 students. While some general trends emerge, e.g., enrollment was predominantly domestic and female-identifying, there was significant diversity in academic major, year of study, comfort level with science, and academic background. Participants generally fell into three subpopulations: upper-level science students seeking an engaging elective, general-interest students, and Arts or pre-Education students fulfilling a science requirement. Each of these groups reported unique needs and expectations upon entering the class. These are discussed, along with course changes implemented based upon these responses. End of course comments and teaching evaluations frequently highlighted an increased interest in science after taking our natural disasters class. Between 2021–2025, nearly 50% of the students enrolled in our two introductory courses had also taken our disasters course, demonstrating its effectiveness as a recruitment tool.

^Can free software produce high-quality Virtual Outcrop Models?

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The use of Structure from Motion (SfM) photogrammetry has grown in the geoscience community over the past decade as drones have become affordable to the average consumer. Structure from Motion is a remote sensing technique that works by inputting overlapping photographs from different angles and using algorithms to triangulate the images. The technology enables geoscientists to create high-resolution 3D models of outcrops that can be annotated and interpreted from a remote location. The Cape Breton Sedimentology Research Group is in the process of creating a virtual library of 3D outcrop models from across Cape Breton. This poster documents our benchmarking process to determine photogrammetric best practices for in-house model creation. Complete results will be shared with the broader geoscience community to advance best practices and enhance accessibility of 3D SfM modelling. Our project required user-friendly software that generated high-resolution textures and meshes. We considered nine potential photogrammetry software packages. Two were chosen for detailed testing: Agisoft Metashape, the current industry standard for photogrammetric processing, and RealityScan, a free software not widely mentioned in remote sensing literature. We conducted standardized tests using an HP Z2 G9 PC with a GeForce RTX 4060 graphics card and 32 GB of RAM. Tests included model processing time, point cloud density, mesh and texture quality, and software functionality. RealityScan is more versatile than the standard edition of Metashape, due to the shorter model generation time, reduced hardware requirements, lower cost, greater functionality, and higher-quality textures and meshes. However, Metashape is more compatible with some visualization software, as it less frequently requires model decimation to upload to 3D libraries. This research demonstrates that RealityScan is a viable low-cost alternative to Metashape that could facilitate more widespread adoption of SfM in geoscience research and education.

^Context matters: examining soft-sediment deformation structure terminology with insights from the Pomquet Formation

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Classification of soft sediment deformation structures (SSDS) can be difficult, as descriptive, diagnostic, and interpretive terminology and criteria vary widely among authors. This is particularly true when examining purported seismites, sedimentary deformation caused by earthquakes. Definitions of specific SSDS are inconsistently applied in the literature, reflecting differences in regional geology, scale of observation, and outcrop perspective/exposure, the possible trigger mechanisms for deformation inferred to be at play. This study examines pseudonodules and dish structures in the Pomquet Formation (Mabou Group) at Creignish, Cape Breton using detailed outcrop observation, ground- and drone-based photo analysis, and comparison to published global SSDS examples. The evidence suggests that classification and description of SSDS is strongly dependent on bed composition and architecture, the scale of features, and viewing orientation (e.g., plan-view vs. cross-section). These contextual controls are rarely emphasized in existing classification schemes, yet they strongly influence description and when compared with other reports of these SSDS, differences in scale and context are clear. These differences can make it difficult to determine how to classify the Pomquet Formation SSDS, because the pseudonodules and dish structures analyzed by other geologists are not exactly the same as those at the Creignish section. These observations demonstrate that broadly defined SSDS categories may encompass structures with different origins and that generalized descriptive criteria should not be used in isolation to support specific genetic interpretations. Superficially similar SSDS may not share the same formative processes. As such, this study emphasizes the importance of context-driven descriptions of SSDS through careful analysis and side-by-side comparison of global SSDS to those closer to home, the latter of which illustrates the liquidization that was occurring in the Maritimes Basin, into the deposition of the Mabou Group.

^Research opportunities in Nova Scotia geoscience: hyperspectral and RGB drill core imaging for advanced research

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In 2023, a hyperspectral drill core scanning pilot project was completed at the Stellarton Drill Core Library. The work, carried out by Scient Analytics and funded through the Mineral Resource Development Fund, scanned 30 drill holes from diverse geological settings across Nova Scotia. Using Short-Wave Infrared (SWIR), Near-Wave Infrared (NWIR), and high-resolution RGB imaging, the project captured detailed mineralogical and textural information. The hyperspectral data has been processed into ENVI-compatible files, creating a robust dataset ready for advanced interpretation. This resource offers significant opportunities for collaborative research—from undergraduate honors projects to Ph.D. studies—focused on mineral mapping, alteration characterization, and assessing the applicability of hyperspectral techniques across different geological environments, to name a few. The poster will list all scanned drill holes, including West Gore, Coxheath Hills, New Ross, East Kemptville, Walton, Brazil Lake, and others. We invite researchers to engage with this dataset to identify where hyperspectral and RGB imaging provide the greatest geological insight and where limitations exist, fostering innovation in mineral exploration and geoscience applications.

The Human Element: why emotion leads geoscience communication

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Public resistance to mining contrasts sharply with society's dependence on mined materials. Traditional outreach—explaining where minerals come from or calling out hypocrisy—has failed to connect. *The Human Element* display, developed in partnership with Geologize Inc., takes a different path: it begins with feeling, not facts. This presentation explores how evidence-based communication principles make geology relatable and meaningful. The exhibit starts with familiar human experiences: a grandmother hears ocean waves again thanks to rare earth elements in her hearing aids; a father fights an invisible hazard—radon gas—in his basement to protect his family; a community finds hope after a deadly stretch of highway is rebuilt with local aggregate and steel; and a senior traces family history through gypsum walls that have stood for generations. These narratives, told in Nova Scotians' own tone and cadence, reveal how geology quietly underpins health, safety, and heritage—without promoting industry, but by highlighting relevance. By framing geoscience as part of everyday life, this approach transforms outreach into an empathetic dialogue, bridging the gap between science and society.

Quaternary erosion of the Canadian Shield from a 250-m 36Cl depth profile in the Sudbury Igneous Complex

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Quantifying crustal erosion rates over million-year timescales in cratons remains challenging because tectonic stability, resistant lithologies, and low relief result in slow time-averaged erosion and poor preservation of erosional landforms. Low-temperature thermochronology, while powerful in tectonically active regions, typically models pre-Quaternary cooling histories in cratons and integrates exhumation over Phanerozoic timescales. Limited constraints on Late Cenozoic erosion in stable cratons leave a temporal gap between short-term (millennial) erosion methods and longer-term thermochronological exhumation estimates. Here, we present preliminary results from a novel approach being developed at CRISDal Laboratory that uses the depth-dependent patterns of rare isotopes produced in minerals by cosmic ray interactions to determine a Quaternary erosion rate for the Canadian Shield. *In situ* ^{36}Cl concentrations were measured in feldspar separates from seventeen samples collected along a 250 m-deep drill core through compositionally homogeneous granophyre in the Sudbury Igneous Complex. At these depths, ^{36}Cl production transitions from neutron-dominated interactions near the surface to muon-dominated production, reducing sensitivity to short-lived surface effects such as ice sheet history and transient shielding owing to ephemeral lakes or sediment cover. Measured depth-dependent ^{36}Cl concentrations were compared with predicted profiles calculated from semi-empirical formulas under varying erosion-rate scenarios, allowing Quaternary erosion rates to be estimated from the best-fitting models. Proximity to SNOLAB enables future integration of measured muon fluxes with physics-informed codes (e.g., MUTE and GEANT4), while extending the method to additional cosmogenic nuclides with differing half-lives will allow erosion histories to be examined across multiple timescales. This research provides a means to estimate erosion thickness over the next 1 Myr above a proposed underground site in the Canadian Shield currently being evaluated for the long-term storage of Canada's nuclear waste.

^The oldest known dipluran associated with a new diverse assemblage of invertebrate body fossils preserved in a lycopod stump from the Carboniferous (Moscovian) Clifton Formation of New Brunswick, Canada

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A diverse assemblage of invertebrate body fossils has been discovered in the Pennsylvanian-aged Clifton Formation (northern New Brunswick), which is composed exclusively of terrestrial strata. Palynostratigraphy of the formation places these rock in the "*Torispora* Biozone" indicating an upper Moscovian (315–307 Ma) age. Despite previous documentation in the Maritimes Basin of a diverse continental paleontological record, terrestrial invertebrates are rare in the Pennsylvanian. The invertebrate body fossils in the Clifton Formation are entombed in lycopod stumps that were rooted in a mineral paleosol. The taphonomic window is similar to that at the Joggins Fossil Cliffs, Nova Scotia. At Joggins, myriapods (*Xyloliulus*), eurypterid cuticle, and terrestrial gastropods (*Dendropupa*) were first discovered during the 19th century. The Clifton specimens are preserved on, and in, an oxidized mudstone associated with raindrop impressions, vertebrate skeletons, and invertebrate trace fossils. The specimens originate from three lycopsid stumps. One is a complete, 3-dimensionally preserved specimen of a Diplura, a basal hexapod lacking eyes, wings, and external mouthparts. Other invertebrates in the lycopod trees have yet to be described but include: xyloiuloidea myriapods with a compound eye; a terrestrial isopod; a paleocarid shrimp; and scorpion or eurypterid cuticle. To date, the indisputable dipluran record extends back only to the Cretaceous Period. A single, purported specimen is reported from Mazon Creek, Illinois, USA, but the interpretation is contentious. Hence, the Clifton dipluran is the oldest unequivocal example of the group and extends its fossil record back to the Pennsylvanian. These new invertebrate body fossils offer insight into the Carboniferous fauna of the Maritimes Basin in New Brunswick before a period of significant paleoenvironmental change that witnessed the onset of the Kazimovian rainforest collapse and aridification of the Maritimes Basin.

^Age and petrogenesis of Devonian peraluminous plutons in southwestern Newfoundland

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The Couteau Brook and Peter Snout plutons in southern Newfoundland are a complex composite intrusion of biotite-muscovite granite that formed from multiple magmatic pulses and possible remelting events. The plutons are tourmaline- and garnet-bearing and crop out over an area of approximately 10 km^2. LA-ICP-MS and CA-ID-TIMS dating of three samples from the Peter Snout pluton yielded ages between 419 ± 10 and 392 ± 10 Ma. Two samples of Couteau Brook pluton yielded ages between 397.49 ± 0.17 and 396 ± 9 Ma. Geochemical data show that both plutons are strongly peraluminous and show a negative REE slope with a negative Eu anomaly. Trace element patterns for both plutons show a slightly negative trend with elevated concentrations of elements such as Cs, Rb, and Ta. Tourmaline and mica compositions show Peter Snout is more geochemically evolved than Couteau Brook. Tectonic classification diagrams show that both plutons are syn-collisional and Nd-Sr isotopic data reflect a derivation from a continental crust source. Based on these data, Couteau Brook and Peter Snout are likely part of the same magmatic system, with some parts of the Peter Snout pluton representing a remelted version of older intrusions. Taken together, these plutons provide better age and tectonic constraints of this region of Ganderia in the Devonian.

Deciphering the post-Grenvillian geological history in the Long Range Inlier, West Newfoundland: implications on gold mineralization

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The geologic history of Appalachian orogenesis in Newfoundland (NL), involving Paleozoic episodic accretion of microcontinents and terranes, is the primary reason for gold occurrences across the province. Although most occurrences occur within central NL Gondwanan terranes, recent exploration has uncovered occurrences within the Mesoproterozoic (ca. 1.0 Ga) Long Range Inlier (LRI) of west NL, a Laurentian massif of crystalline rocks. Gold showings are spatially associated with regional, northwest-trending LiDAR lineaments, which parallel, and merge with, basement faults farther west. This suggests structural control on gold occurrences, demonstrating significant economic potential; however, locating deposits is hindered by a lack of geoscientific research in the LRI. This study therefore combines geological mapping and geochronology to better constrain the inlier's geological history. Results show a metasedimentary sequence, once grouped with Mesoproterozoic rocks, nonconformably overlies crystalline basement. Mafic units intrude metasedimentary rocks sub-parallel to bedding. These rocks, originally correlated with Mesoproterozoic amphibolite, are classified as dioritic-gabbroic, and their extent and textural variability suggests a plutonic suite origin. Preliminary U-Pb dates from LA-ICP-MS analysis of zircon from the gabbro are ca. 425 Ma, similar to the ca. 430 Ma Taylors Brook Gabbro, the only known Silurian mafic rocks in the region. LiDAR lineaments correlate with sinistral faults with pervasive gouge, breccia, and slickensides and mineralized veins and altered host rock are pervasive within the deformation zone. Ongoing K-Ar dating of illite in gouge will constrain the timing of fault motion. This work refines the geological history of the LRI by identifying a Paleozoic stratigraphic succession that is used as a marker horizon to track deformation post 1.0 Ga. A major sinistral fault system offsets these marker beds and clearly focused late mineralizing fluids. Recognition of Silurian magmatism, combined with recently documented Silurian deformation in west NL, implies the Salinian orogeny may be farther reaching than previously thought.

Minerals and metals critical for the energy transition in Canada

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Critical minerals are clearly a current topic of interest and research. The Government of Canada released a list of 34 elements and raw materials considered vital for the sustainable economic success, national security, decarbonization and strategic interests of the country, and its allies. Additionally, Canada has demonstrated to be committed to grow domestic and global value chains for the green and digital economy by creating funding research opportunities and infrastructure investment around critical minerals. This is a trend also observed outside of Canada, with many nations interested in fostering the search for critical minerals and their research, especially giving the importance of the exploration and mining industry to any country's economic development. Of Canada's list, one of the most critical and strategic elements is lithium. This element has important physical and chemical properties that are suited to a wide range of applications including pharmaceuticals, glass and ceramics, and aerospace technologies. Furthermore, lithium is currently considered one of the most important critical metals for the energy transition due to its importance in the lithium-ion battery technology for electric vehicles (EVs), portable electronic devices, electric tools, and energy grid storage applications. Canada is a hard-rock lithium producer from granitic pegmatites and has extensive reserves of this resource, but it also holds significant resources associated with brines. In Nova Scotia, Brazil Lake is the most prospective area for hard-rock lithium with recent resource drilling and new discoveries being made. Other elements are also critical for these same low-carbon technologies such as copper, graphite, nickel and cobalt to name a few. All these critical elements and raw materials occur in a variety of deposits, geological settings, and mineral associations. Canada is well endowed in these types of commodities and well positioned to offer a competitive and reliable supply.

Your path to professional geoscience: education, licensure, and careers

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Geoscience is a regulated profession in most of Canada, with legislative acts restricting the practice of geoscience to individuals and companies registered with self-governing professional associations. In Nova Scotia, this role is fulfilled by Geoscientists Nova Scotia, formally known as the Association of Professional Geoscientists of Nova Scotia (APGNS). In some jurisdictions, like New Brunswick and Newfoundland, geoscience is jointly regulated with engineering practice under APEGNB and PEGNL, respectively; however, all associations share common requirements and mandates set by Geoscientists Canada. APGNS and its counterparts across Canada are responsible for upholding high standards of geoscience practice and education through the regulation of admissions, provision of disciplinary oversight, and protection of the professional title "geoscientist" from misuse by unlicensed practitioners.

For students studying the geosciences, the purpose of professional associations, the academic requirements for licensure, and the path toward professional registration can be difficult to navigate. This presentation will help clarify the role of associations, outline the educational requirements for professional membership, and provide guidance on course selection to support future licensure. Early-career mentoring and experience requirements that precede full professional registration will be highlighted.

In addition to regulatory and academic considerations, the presentation will explore what geoscience careers can look like in practice, drawing on examples from academia, consulting, industry, and the public sector. By linking licensure requirements with real-world career pathways, the session aims to help students better understand how their academic choices translate into professional opportunities. Time will be reserved for open discussion and questions to ensure students leave with a clear understanding of their course requirements and the tools needed to develop individualized plans for a successful early career in the geosciences.

Evaluating the cosmogenic nuclide catchment erosion rate method on the Margaree River, Cape Breton, NS

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Terrestrial cosmogenic nuclides (TCNs) are widely used to establish tributary to mountain range-scale differences in stream catchment erosion owing to tectonic and climatic forcing over millennial timescales. Increasingly, this method is used to establish pre-industrial baseline erosion rates of catchment slopes to evaluate landscape responses to anthropogenic climate change. The catchment-wide average erosion rates (CWAER) can be readily converted to total sediment discharge (bed, suspended, and dissolved load). The approach assumes that catchment slopes have experienced sufficient exposure to cosmic radiation to produce the expected exponential decrease in nuclide concentration with soil depth. However, in recently deglaciated catchments, exposure to TCN irradiation may be too short for this assumption to hold. Insufficient exposure, combined with glacial sediments containing variable inherited TCN concentrations can yield depth profiles with low concentrations that are easily overprinted by inherited signals. Despite this limitation, the validity of CWAER methods under these conditions has not been systematically tested. To address this gap, we will determine CWAERs for the Northeast Margaree River using cosmogenic ^{10}Be in quartz isolated from coarse stream-sand samples from two first-order tributaries, a steep downstream second-order tributary, and the mainstem in Inverness county. Two soil samples - a saprolite exposed on the upland barrens and a till 5 km upstream of the mainstem - will be used to evaluate the inherited nuclide concentrations in slope sediment. Based on catchment slope, area, and stream discharge, we expect the two upper catchments to exhibit relatively low ^{10}Be erosion rates, the third a substantially higher erosion rate owing to steep long slopes, and the mainstem to yield an intermediate erosion rate, reflecting its mixed slope conditions. If successful, this study will provide Nova Scotia's first baseline erosion rates, and suggest that the method can inform investigations of recent climate and anthropogenic impacts on stream bank erosion.

Age and tectonic evolution of the Clyburn Brook Formation, Nova Scotia, Canada

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The Eastern Highlands Shear Zone (EHSZ) in the Cape Breton Highlands juxtaposes the Ganderian Aspy terrane consisting primarily of Ordovician to Silurian metavolcanic and metasedimentary rocks and abundant mid-Paleozoic granitoid plutons with the Ganderian Bras d'Or terrane consisting primarily of Ediacaran metasedimentary rocks and Ediacaran to Cambrian plutons. The Clyburn Brook Formation (CBF) is an assemblage of interlayered, low-grade, bimodal metavolcanic and metasedimentary rocks which straddles the northeastern part of the EHSZ. Based on lithological and geochemical similarities and interpreted age, the CBF has been correlated with Silurian units in the Aspy terrane which are arc related based on chemical characteristics. New maximum depositional ages (MDAs) of ca. 420 Ma from a calcareous-meta-arkose and ca. 410 Ma from a subarkosic metasandstone in the lower and upper epiclastic members, respectively, suggest that the CBF formed as a syn-convergent pull-apart basin that received detrital material from Silurian arc-related igneous activity that post-dated initial convergence along the EHSZ. Silurian volcanic activity at 430 to 420 Ma is well-documented in the Sarach Brook, Calumruadh Brook, and Money Point formations of the adjacent Aspy terrane. Based on the MDAs reported here the CBF may be correlative with the upper parts of those units. The CBF was intruded by largely undeformed Cameron Brook granodiorite (CBG) dated at 402 ± 3 Ma, suggesting that terrane juxtaposition was accompanied by Devonian syn-collisional magmatism. This interpretation is supported by a new igneous crystallization age of 395.8 ± 2.2 Ma from felsic metatuff in the middle volcanic member interpreted as the volcanic equivalent of the CBG, suggesting that the CBF mostly post-dates the initial collision between terranes interpreted to have begun between 430 and 420 Ma. The CBF records syn-convergent deformation and folding, as well as post-collisional brittle deformation, resulting from transpressional deformation during protracted convergence of the Aspy and Bras d'Or terranes.

Zircon chemistry-geochronology and melt inclusion constraints on the origin and critical metal endowment of late Devonian granitoid in the Port Mouton Pluton, Meguma Lithotectonic Zone, Nova Scotia, Canadian Appalachians

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Late Devonian satellite plutons (Shelburne, Barrington Passage, Port Mouton "PMP") in southwest NS, coeval with the much larger South Mountain Batholith, show felsic magma interaction with coeval mafic magmas. In the PMP, field and petrographic observations, bulk rock geochemistry, and EPMA characterized mafic "enclaves" to constrain the conditions during interaction of mafic magmas with coeval felsic magmas, and influence on the critical metal endowment of late Devonian granitoid magmas. Oxythermobarometry data from peritectic amphibole (after pyroxene) indicate that values of fO_2 in the mafic magmas shifted from FMQ+4 to FMQ+1 over a cooling window from ~850–700°C during this interaction, at pressures of up to ~390 MPa (~14.7 km), much deeper than that of final magma emplacement. LA-ICP-MS zircon geochemistry and U-Pb dating show that PMP zircon populations shift in predominant age populations across lithologies. Zircons from mafic lithologies (rounded, corroded, inherited or xenocrystic) at Forbes Point returned exclusively Neoproterozoic ages (ca. 550 Ma), whereas early granodiorites show predominantly Neoproterozoic ages (ca. 560–620 Ma) and rare late-Devonian (ca. 390 Ma) ages (consistent with PMP emplacement), with the balance shifting almost entirely to 370–390 Ma zircons in late-stage granodiorites and hybrid tonalites (formed by mixing of mafic and felsic magmas). PMP-coeval zircon from the felsic-intermediate rocks yield: (i) REE-HFSE ratios that diverge from typical magma fractionation trends, and (ii) values of fO_2 are widely variable in PMP-coeval zircon ranging from FMQ+1 to FMQ-5, decreasing with progressive fractionation. These findings suggest re-equilibration and thermal disturbance of small volumes of crystallizing felsic magmas by mafic magmas and strongly reducing wall-rock lithologies during deep magma gestation. Melt inclusions in zircon in the tonalite have low granophile critical metal (Sn, W, Mo) concentrations, comparable to average upper crust. The dominant Neoproterozoic ages in mafic rocks and early granodiorites in the PMP sparks new questions about the timing and source of mafic endmember magmas.

Post-accretionary emplacement of Meguma terrane granitoid plutons: transition from dextral transpression to transtension?

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Continental crust forms primarily where processes associated with subduction transfer mass and heat from the mantle to the base of the crust. These processes are encapsulated in the concept of trans-crustal magmatic systems (TCMS), in which mafic underplating along the base of the crust energizes a deep crustal hot zone (DCHZ), from which buoyant silicic magma rises to form a vertically interconnected network of reservoirs.

We provide a synthesis of recent studies on the origin and emplacement of the voluminous peraluminous granitoid magmas in the Meguma terrane. Magma genesis began at ca. 400 Ma in the DCHZ and gestated for 25–30 million years before emplacement in the middle-to-upper crust in discrete episodes. Protracted magmatism in the lower crust was the product of ongoing subduction, coeval with regional metamorphism and dextral transpressional polyphase deformation of upper crustal rocks.

Ascent of granitoid magma through the crust, beginning at ca. 380 Ma and continuing until ca. 370 Ma, occurred during the transition from transpression to dextral transtension, distributed strain to focused strain, and the development of through-going shear zones. These shear zones were a combination of Reidel and P-shears which produced an interconnected network of conduits that facilitated the magma ascent and emplacement at depths ranging from 10–20 km. Granitoid magmas created rheological barriers, impeding the ascent of coeval mafic magmas except along the shear zones. Field relationships, age data, and geochemistry of these volumetrically subordinate mafic intrusions are evidence

of mafic underplating and imply coeval emplacement of mantle-derived magma in a continental arc setting. Clasts of Meguma-derived granitoid rocks in ca. 360 Ma unconformably overlying continental clastic strata of the Horton Group imply ~10 km exhumation of the Meguma terrane between 370 and 360 Ma during protracted regional dextral transtension culminating in the composite Late Devonian-Early Permian Maritimes Basin.

Using apatite chemistry to distinguish Li-Cs-Ta-fertile and barren pegmatites

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Apatite major- and trace-element chemistry offers a powerful tool for assessing the fertility of granitic pegmatites and distinguishing Li-Cs-Ta-bearing systems from barren counterparts. Across representative pegmatites examined in this study—including a case-study suite from the Bird River greenstone belt, Manitoba, Canada—apatite compositions systematically record magmatic differentiation and volatile enrichment processes linked to rare-element mineralization. Apatites from fertile pegmatites are characterized by elevated Mn and higher Mn/Fe ratios, together with enrichment in Li, U, and Th. These are accompanied by lower Eu_N values, subdued total rare-earth-element abundances, pronounced negative Eu anomalies, and subtle but diagnostic REE tetrad effects, reflecting advanced melt evolution. By contrast, apatites from barren pegmatites typically show higher ΣREE, elevated Eu_N values and weaker Eu anomalies, and lower Mn/Fe and Li contents. Integrated compositional thresholds—particularly Mn enrichment, low Eu and ΣREE, and Li-U-Th enrichment—provide a reproducible geochemical fingerprint for fertile pegmatites. These results demonstrate that apatite is an applicable recorder of magmatic-hydrothermal evolution and an effective discriminator of pegmatite fertility, with direct implications for exploration targeting of critical-metal systems.

Assessing the impacts of river-based carbon sequestration: effects of river alkalinity enhancement on dissolved metal concentrations in the West River, Nova Scotia

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Low pH conditions in the West River, Pictou Co, Nova Scotia that are a result of both natural and anthropogenic processes have resulted in elevated metal concentrations which can be toxic to aquatic flora and fauna. River alkalinity enhancement (RAE) is a process that has been applied to the West River in which crushed alkaline minerals are added to the river to has the potential to sequester atmospheric carbon dioxide. RAE also enhances habitat quality by raising river pH which theoretically reduces dissolved metals. In this study, two years (2024-2025) of water chemistry and quality data were collected from three sites along the West River. Sites were selected upstream of the application location, directly downstream of the dosing location, and at the head of tide. Towards the end of winter 2025 (March through May), data was collected while RAE was taking place within the river. Water samples were collected using polyethylene bottles and submitted to the Dalhousie Clean Water Lab where metals were measured using ICP-MS. Temperature, pCO2, pH and conductivity data were also collected using continuous autonomous in-situ monitoring stations. Preliminary comparisons between the application window in the control year (2024) and treatment year (2025) show that concentrations of dissolved Al, Fe, Cu, Mn, and Zn vary greatly. In 2025 only Al concentrations appeared to vary between upstream and downstream sites. Data indicates that the severe drought in 2025 had an impact on dissolved metal concentrations in the West River. However, the lack of significant trends between collection sites may demonstrate that the application of RAE for carbon dioxide removal does not have a pronounced effect on the concentration of dissolved metals. These results have the potential to provide transportable risk assessment guidance for RAE projects. Future work includes the integration of hydrogeological parameters in metal concentration assessment.

^Dissolved inorganic carbon stable and radiocarbon isotope distributions in slope waters of Nova Scotia and Southern Newfoundland

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Marine dissolved inorganic carbon (DIC; ~38,000 GtC) is the largest reservoir of oceanic dissolved carbon. Carbon isotopes ($\delta^{13}C$ and $\Delta^{14}C$) of marine DIC are useful for tracing water mass advection and mixing, residence times, and carbon cycling. Few DIC $\delta^{13}C$ and $\Delta^{14}C$ depth profiles have been published for the Northwest Atlantic off Nova Scotia and southern Newfoundland, which is one of the fastest-warming regions globally. We report slopewater DIC stable ($\delta^{13}C$) and radiocarbon ($\Delta^{14}C$) depth profiles from the Gully Marine Protected Area off Nova Scotia, and a coral conservation area (Division 3O) off the southwest Grand Banks of Newfoundland. The subsurface water masses in these areas comprise Warm Slope Water (WSW: θ=10°C, S=35.2), which is associated with the northward flowing Gulf Stream, and Labrador Slope Water (LSW: θ=6°C, S=34.9), which is formed in part from outflow from the Canadian Arctic Archipelago. We find that these water masses have distinct DIC $\delta^{13}C$ and $\Delta^{14}C$ isotopic signatures, with WSW having higher DIC $\Delta^{14}C$ values and lower DIC $\delta^{13}C$ values than LSW, suggesting a larger contribution of "bomb" ^{14}C and higher anthropogenic carbon inputs to WSW. Lower DIC $\Delta^{14}C$ values in LSW are consistent with dilution effects of deep convection in the Labrador Sea and atmospheric isolation of Arctic halocline waters. These results, when paired with proxy bioarchival data, will better constrain our understanding of water mass circulation, carbon cycling, and AMOC variability in the Northwest Atlantic.

Recording peak metamorphic conditions in garnet-rich schists from the Dalradian highlands of Scotland

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Determining the timing of metamorphism is key to understanding the relationship between deformation, mineral growth, and crustal evolution during mountain building. This study investigates peak-metamorphic assemblages within the garnet zone of the Dalradian Supergroup in the West Highlands of Scotland. Samples were mapped and collected from Rubha Cladaich (Loch Leven Schist) and Cononish Glen (Ben Lui Schist), two areas that record distinct deformation histories. Garnet growth occurred syn-D_2 at Rubha Cladaich and post-D_1 to pre-D_2 at Cononish Glen, providing an opportunity to examine how metamorphism and deformation were linked during different stages of the Caledonian Orogeny. Petrographic and microstructural analyses are being used to characterize garnet textures, inclusion trails, and mineral assemblages in order to interpret pressure-temperature conditions and the timing of metamorphic events. Planned analytical work includes trace-element mapping of garnet (REE and Y zoning), garnet end-member determination, and thermobarometric analysis, including application of the garnet-biotite and garnet-muscovite thermometers to estimate peak temperatures. By comparing metamorphic features between these two Dalradian localities, this research aims to identify variations in metamorphic timing and intensity across the region. The results will help clarify how garnet growth relates to deformation phases and crustal thickening during the Caledonian Orogeny. Ultimately, this work contributes to a better understanding of the metamorphic history and tectonic development of the Scottish Highlands.

^Characterizing the evolution and magmatic endowment of the Mount Douglas and McDougall Brook granite suites, southwestern New Brunswick

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Polymetallic (Sn-W-Mo-In-Zn-Bi) deposits occur in the Mount Pleasant Granites (MPG) within the Mount Pleasant Caldera Complex, on the northern margin of the Saint George Batholith (SGB) in southwestern New Brunswick. Polymetallic (Sn-W-Mo) mineral occurrences are also hosted in the Mount Douglas Granite (MDG), a granitic suite in the SGB. The intracaldera McDougall Brook Granites (MBG) represent barren, precursor intrusions to the MPG and are genetically related to the mineralized MPG based on similarities in textures, geochemistry, crystallization ages, and mineralized assemblages. The MDG may be a parental magma source for the MBG, and coeval with mineralization in the MPG, although relationships remain unresolved. Zircon from the MDG is likely overprinted and reworked, commonly seen in "cold" granites, and inherited zircon cores result in an overlap in reported age ranges for emplacement and crystallization of the MDG and MBG. To address these uncertainties, this study integrates petrography, whole rock geochemistry, oxythermobarometry, and halogen systematics from accessory mineral chemistry (apatite, titanite, zircon) to constrain the crystallization and emplacement P-T conditions, degassing history, and oxygen fugacity of these granitic magmas. The overall objective is to resolve and characterize processes that influenced the variable magmatic mineralization potential of these granitoids. Results from petrographic analysis document multiple processes relevant to the metal endowment in the MDG, including magma mixing, volatile saturation, sulphide saturation, and late magmatic oxidation. As well, preliminary whole rock geochemical results show pronounced depletions in Eu, Sr, Ba, and Ti in MDG samples, indicating that magmas experienced extensive melt fractionation with significant crystal accumulation prior to emplacement, a key process for metal enrichment.

Tectonic framework for MIAC (IOCG) mineralization systems in southern New Brunswick

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MIAC (Metasomatic Iron Alkali-Calcic) systems are large-scale hydrothermal alteration systems related to mineralization involving many critical elements. Within MIAC systems IOCG (Iron Oxide Copper Gold) deposits can also host important reserves of Cu, U, Th and REEs, and Five Element vein deposits can host important reserves of Cu, Co, Ni, Ag and Bi. A thermal model for MIAC systems posits a series of deposit types from high to low temperature related to various "alteration facies". The challenge of mapping out the geometry of these facies is only compounded when deformation has occurred during and after MIAC systems form. Southern New Brunswick illustrates an example of how deformation related to major strike-slip faults reorganizes (fragments) the products of a MIAC system(s). The same faults provide the fluid pathways necessary for this crustal-scale hydrothermal activity. Positive flower structures (transpressive), especially when transtensional relaxation follows their formation, are related to several examples of MIAC alteration. In southern New Brunswick the Bellisle, Kennebecasis and offshore Cobequid-Chedabucto faults are the principal structures involved, with associated flower structures recognized from the Mascarene Peninsula to Quaco Head. In eastern Caledonia large flower structures have been modified by strike-slip fault overprinting and extensive salt movement. Extensive quartz-mylonite zones derived from granitoid and felsic volcanic protoliths show evidence of silica flooding and Fe, K, Ca, and Na depletion, while massive specular hematite, siderite and magnetite mineralization with associated Cu and Au in shear zones and brecciated zones represent the mineralization. Five Element veins are also represented. Stratabound redox boundary deposits represent later fluids channeled by faults, derived from dewatering in the Cumberland Basin. Geochronological constraints suggest the systems have been operative from the early Devonian to mid-Permian. Positive flower structures with evidence of late transtensional relaxation from Tournaisian to late Permian age are potentially the most prospective areas.

Critical mineral distribution and resource potential in tailings from the abandoned Stirling Zn-Pb-Cu-Au-Ag Mine, Nova Scotia

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Increasing global demand for critical minerals and lengthening timelines for permitting new mines have led to strong interest in reprocessing legacy mine wastes. There are more than six billion tonnes of tailings at active and abandoned metal mines across Canada; however, many questions remain concerning the economics, technical feasibility, and regulations associated with reprocessing. The goal of this study is to evaluate the critical metal content and mineralogy of tailings at the former Stirling Mine in Cape Breton, the spatial distribution and recoverability of critical metals, and the potential for reprocessing to help reduce environmental risks. The Stirling Mine operated from 1927–1931, 1935–1938, and 1951–1956, extracting Zn, Pb, Cu, Au, and Ag from a volcanogenic massive sulphide deposit and generating approximately 930,000 tonnes of tailings. In 2023 and 2024, we collected tailings from hand-dug pits to investigate the effects of weathering in near-surface tailings. In June 2024, we drilled 33 boreholes through the tailings, recovering samples for geochemical, mineralogical, particle size, and metallurgical testing. Geochemical analyses of the tailings using ICP-ES/MS following 4-acid digestion (and fire assay for Au) show the following median metal concentrations (n=152): 1.19 wt. % Zn, 0.35 wt. % Pb, 0.18 wt. % Cu, 0.50 g/t Au, and 21 g/t Ag. A subset of tailings was analyzed using ICP-ES/MS following sodium peroxide fusion, revealing the following median concentrations of potential by-product critical elements (n=51): 6.6 mg/kg Ga, 1.1 mg/kg Ge, and 0.80 mg/kg In. Critical minerals in the tailings are hosted by sulphide, sulphosalt, and silicate minerals including sphalerite, chalcopyrite, galena, tennantite, chlorite, muscovite, and talc. Metal-bearing, weathering-related secondary phases are present in the near-surface oxidized tailings. Results from this study are being used to assess the viability of reprocessing historical base metal tailings to recover valuable elements and reduce risks to local ecosystems and surrounding communities.

Glacial dispersal from the Brazil Lake lithium-cesium-tantalum pegmatites, southwest Nova Scotia

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The Brazil Lake lithium-cesium-tantalum (LCT)-type pegmatites (North, South, and Army Road) in southwestern Nova Scotia were the focus of a detailed till study to document glacial dispersal through several documented phases of glaciation. A total of 84 bulk (7–20 kg) till samples, from mostly subglacial traction till, were collected from 77 sites near and down ice of the three pegmatites. Glacial dispersal of indicator minerals from the pegmatites is best defined by spodumene (the primary Li ore mineral) in the 0.25–0.5 mm fraction of the 2.8–3.2 specific gravity till concentrates, and its presence in the local till (100s to 1000s of grains per sample) confirms the existence of nearby LCT pegmatites. Results indicate that spodumene dispersal is the product of multiple ice-flow events with varying trajectories, and formed a broad, fan-shaped footprint extending at least 12 km down ice that is considerably larger than the pegmatite subcrop areas. Other useful LCT pegmatite indicator minerals identified during this study include apatite and tourmaline (10 to 100s of grains), and lesser amounts of columbite-tantalite, cassiterite, and scheelite (1s to 10s of grains), although their spatial distribution in till is limited compared to spodumene. Geochemical analyses of three till size fractions was completed including coarse sand (1.0–2.0 mm), silt + clay (<0.063 mm), and clay (<0.002 mm) using various digestion and fusion methods to identify best methods to detect LCT pegmatites. Lithium dispersal from the Brazil Lake pegmatites is best defined by the coarse fraction (Na-peroxide fusion), which contains up to 531 ppm Li and forms narrow, ribbon-shaped dispersal train extending 4 km down ice. The results presented here demonstrate that drift prospecting methods are effective tools for Li exploration in southwestern Nova Scotia, as well as in other prospective glaciated regions in Canada.

Depth controls on metamorphic decarbonation: insights from metacarbonate rocks from the Sierra Nevada Arc, California

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Metamorphic decarbonation has been recently regarded as a source of carbon that may contribute to the global carbon cycle. This is attributed in part to the temporal coincidence between fluctuations in total length of continental arcs and climate intervals throughout geological history. Most field-based studies to date focus on metacarbonate rocks from shallow depths (<2 kbar equivalent), because thermodynamic modelling reveals that decarbonation reactions are suppressed at high pressures. However, this potential depth effect has not been revealed using natural samples. My research examines this gap by investigating metacarbonate rocks near the Sierra Nevada Batholith (SNB) in California, USA. The SNB intruded carbonate platforms at a range of depths causing metamorphism of the carbonate protolith from 2 kbar to at least 8 kbar. I hypothesize that a carbonate protolith at mid-crustal levels experiences less decarbonation than its shallower equivalents, and that decarbonation reactions at different pressures occur under distinct physiochemical conditions. This hypothesis is being tested using petrography, bulk-rock chemistry, mass balance analysis and thermodynamic modelling. Preliminary results show that a sample formed at >8 kbar consists almost entirely of carbonates, whereas a sample formed at 2 kbar preserves only 10 vol. % carbonate minerals. This suggests that higher pressure suppresses the extent of decarbonation. Observed assemblages correspond to model conditions at 5 kbar and 2.5 kbar, with the higher-pressure assemblage indicating higher temperature and lower X_{CO2} (i.e., more water-rich fluid). This suggests with increasing pressure, decarbonation reactions require higher temperatures and greater water availability to be triggered. These results and the ongoing mass balance work will provide new constraints on how pressure, temperature, and fluid availability regulate metamorphic decarbonation. Comparing the loss of carbon with that from other modern tectonic settings will enhance our understanding of how metamorphic decarbonation contributes to the global carbon cycle.

Mineralogy and origin of Bay of Fundy agate, Nova Scotia

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This study investigates the distinctive agates in the latest Triassic North Mountain Basalt and proposes a model for their formation. Ten representative agate samples were investigated by petrographic microscope, scanning electron microscope with energy dispersive spectroscopy analysis of mineral inclusions, and Raman spectroscopy analysis of silica and iron minerals. Agate veins typically show three zones: 1) an outer zone of microgranular quartz and irregular goethite flames; 2) banded chalcedony; and 3) a central zone of coarse-grained polycrystalline quartz. Similar zonation is reported from many hydrothermal vein agates elsewhere, interpreted as forming in situ from an initial impure amorphous silica sol, by processes of self-organization and Ostwald ripening. The North Mountain Basalt in the Fundy Basin comprises >150 m thick lower and upper inflated flow units and a middle unit of multiple thinner flows. The base of the lava pile is saucer shaped. Hydrothermal circulation driven by the lower flow unit dissolved halite from the underlying Blomidon Formation and was hot enough (>300°C) to dissolve silica, copper and iron. The resulting silica sol migrated up dip to the southern margin of the basalt, where actively deforming faults along the Minas Fault Zone provided pathways and accommodation. The thinner flows of the middle unit created smaller hydrothermal systems that altered the underlying basalt and led to hydrothermal zeolite precipitation. The thick upper flow unit re-activated hydrothermal flow through the Blomidon Formation and mixed with zeolite-rich fluids, producing agate with an outer rim of zeolite, in some cases reactivating or fragmenting earlier agate veins. Reactivated veins and deformed goethite flames demonstrate syn-emplacement tectonism. Oxidizing groundwater following Early Cretaceous inversion of the Fundy Basin led to alteration of original magnetite and hematite flames to goethite. The beauty and variety of Fundy agate were created by the specific details of the volcanic hydrothermal system.

Interpreting coastal landscapes for the Cliffs of Fundy Geopark: new geoscience insights

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Interpretation of coastal landscapes and their impact on human activities is important for public outreach in the Cliffs of Fundy unesco Global Geopark. Landscapes are influenced by bedrock distribution, glaciation and post-glacial sea-level changes and many previous workers have evaluated their impacts. This contribution proposes new interpretations of some landscape features and attempts a coherent synthesis. Before the opening of the basalt barrier between Cape Split and Cape d'Or in the earlier Quaternary, first allowing marine transgression into Minas Basin, the meandering dry valley occupied by Highway 2 west of Lower Five Islands was cut by a west-flowing river that entered the Bay of Fundy near Port Greville. Only after the sea entered Minas Basin did the rivers draining the Cobequid Highlands have a direct southward route to the sea. Once breached, the basalt barrier was widened and deepened by glacial erosion. Ice-streaming through Minas Passage is recorded in the roche moutonnee form of Partridge Island and Cape d'Or. Farther inland, slot canyons and incised meanders in south-flowing rivers were cut subglacially, not proglacially. Ice retreat to the present coastline at 16 ka allowed raised beaches, wave-cut platforms, sea stacks and fluvioglacial terraces to form, up to 40 m above present sea level. Relative sea level fell progressively until the at −30 m lowstand at 8 ka, when Minas Basin was a river plain with incised river talwegs leading to a delta located in Minas Passage. During the subsequent rise in relative sea level, the old delta was reworked into a barrier beach that blocked Minas Passage. A fresh or brackish lake occupied Minas Basin. At ~3400 BP, the barrier beach was breached in a storm and macrotidal marine waters first entered Minas Basin. The gravel remnants of the beach are found at Diligent River and Black Rock.

^Arsenic accumulation in alder trees at a legacy gold mine tailings impoundment in southwest Nova Scotia: implications for environmental risk

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Legacy gold mine tailings contaminated with arsenic pose significant ecological risks, particularly through bioaccumulation in terrestrial food webs. This study investigated patterns of arsenic accumulation in alder trees (*Alnus* spp.) growing on legacy gold mine tailings in southwestern Nova Scotia. Alder was selected as the target species due to its ecological importance as a food source, tolerance to disturbed environments, and to better understand their potential role in the phytostabilization of arsenic. Field sampling involved collecting alder tissues, such as leaves, catkins, and branches, as well as associated soil and water samples. Metal concentrations were analyzed using X-ray fluorescence (XRF) and inductively coupled plasma spectrometry (ICP-MS). Arsenic levels in tailings soil (430–3200 ppm) and associated groundwater (350–5600 ppb) exceeded baseline values and CCME guidelines. Arsenic levels in alder growing on tailings greatly exceed concentrations in non-tailings alder samples. Catkins on the tailings exhibited the highest arsenic concentrations (mean 1300 ppb; maximum 2140 ppb) and branches the lowest (mean 290 ppb; maximum 420 ppb). Relatively low concentrations in leaves and branches compared to tailings sediments and groundwater suggest that alder may contribute to arsenic phytostabilization at contaminated sites. Though alder is not considered to be an arsenic hyperaccumulator, our data indicates that elevated arsenic concentrations in catkins may pose a potential arsenic bioaccumulation risk for birds and other wildlife that consume reproductive tissues.

Mineralogical and geochemical zonation of the South Mountain Batholith, NS, with applications to mineral resource prospectivity by cosine similarity mapping

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Recent market conditions, coupled with government investment and regulatory relief, have led to an exploration rush in Nova Scotia. Among the desirable units for exploration in Nova Scotia is the South Mountain Batholith (SMB), the largest extant granitic intrusion of the Appalachian orogen. However, despite the presence of a previously operating Sn mine and dozens of known mineralizations for critical mineral resources (Li, W, U, etc.), there have been no advanced operations developed in the SMB for over 30 years. To promote the discovery of new resources, we develop a mineral prospectivity map of the SMB using a rasterized cosine similarity approach. This approach leverages our newly determined mineral proportions and oxide trace element geochemical data, combined with previous measurements of whole rock geochemistry and biotite trace elements, to reveal the mineralogical and geochemical zonation of the SMB. Geochemical and mineralogical data are interpolated at both the batholith and pluton scale using an inverse distance weighting. Interpolated values at known mineralizations are used to calculate an average multivariate geochemical vector representing target pixels which are most likely to bear mineralization. Cosine similarity between this target vector and the interpolated vector at any given pixel quantifies their directional similarity in multivariate geochemical space, with the angular separation indicating (dis)similarity. The resulting prospectivity map highlights regions whose geochemical signatures closely resemble, or strongly contrast with, those of known mineralizations, thereby identifying areas that are highly prospective for new resources. Results are framed in the context of a cooling granitic magma experiencing fractional crystallization as the dominant differentiation mechanism.

Designing a geoscience strategy board game

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Step into 19th Century Saint John and become a founding member of the Steinhammer Club. Play as ambitious young citizen-scientists curious to unravel the remarkable secrets hidden beneath their city's stony hills and jagged coastline. In this board game, you will acquire knowledge and collect fossils while exploring the world-famous geology of the Bay of Fundy and venture to other locales across the Maritime Provinces. Race to collect sets of cards to give public lectures and

publish scientific papers before your opponents. Befriend renowned scientists, and help the museum build a collection of the fossil record from the Precambrian to the Quaternary. Steinhammer: Dawn of Geoscience on Canada's East Coast is a board game being developed by Resolve, the University of New Brunswick's applied game design research group led by Dr. Scott Preston. Resolve designs games that educate and inform. Since 2021, fifteen different students have participated. This project began in Fall 2024, after Dr. Preston met with Catrina Russell to discuss collaborating on a new science-focused game. Those early meetings identified the need for a light-strategy game aimed at older teens and young adults focused on geoscience literacy, preferably something that highlighted the incredible geology of the Saint John area. The story of the real-life Steinhammer Club (a group of young citizen-scientists based in the city in the 19th century) became the game's hook early on and the project took shape as not only a science-based game, but also, as the scope of the game changed to include NS and PEI, a game about the beginnings of geology and paleontology in Eastern Canada. Dr. Preston and Katie McDonough would be thrilled to bring a prototype of Steinhammer to AGS this winter, present a talk about the game, and provide gameplay opportunities for those in attendance.

^Metasomatic alteration around pegmatites in the Cat Lake-Winnipeg River pegmatite field, southeastern Manitoba: insights from exocontact cesium enrichment

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The Cat Lake-Winnipeg River pegmatite field in southeastern Manitoba is prospective for many metals considered critical including Li, Cs, Ta, and Sn. Outside of known occurrences at the Tanco pegmatite and High-Grade dyke, recent exploration shows that pegmatites in this region do not contain significant Cs mineralization. However, core assay data show that ortho-amphibolite and mica-cordierite schist wallrock intervals around these Cs-poor pegmatites locally contain Cs concentrations up to 5100 ppm, and calibrated pXRF measurements on samples from these intervals yield Cs concentrations up to 2.3 wt. %. Detailed petrography reveals three wallrock alteration assemblages, from proximal to distal: 1) tourmaline + muscovite + apatite ± Li-Mn-Fe phosphates, 2) biotite ± holmquistite, and 3) epidote + chlorite ± calcite ± titanite ± holmquistite. A comparison of pXRF results and petrography shows a correlation between Cs concentrations and biotite modal abundance, with values for both peaking 20 cm away from the pegmatite-wallrock contact and decreasing to below detection limits beyond 60 cm. Micro-XRF analysis confirms that wallrock Cs is mainly contained within biotite. Alteration assemblages around the studied pegmatites strongly resemble those described by previous workers at the nearby Tanco pegmatite, which include B (± Li) tourmalinization, K-Rb-Cs-F (± Li) biotitization, and propylitic alteration (Hbl + Pl → Ep + Chl + Ttn + Cal + clay). Previous interpretations of these assemblages at Tanco suggest that they are caused by B- and F-rich fluids released during late pegmatite crystallization and enriched in Cs and other alkalis by sericitization of K-feldspar. Similar processes could therefore be responsible for Cs enrichment around these studied pegmatites, even in the absence of pegmatite Cs mineralization. However, the observed distribution and association between tourmaline, muscovite, apatite, and Li-Mn-Fe phosphates suggests that Li, P, K, and Rb behaved differently in these pegmatites than in the Tanco pegmatite system.

Petrogenetic analysis of Neoproterozoic NYF pegmatites found in Perch Falls Quarry, south-central New Brunswick: insight from petrology, lithogeochemical signatures, and zircon analysis

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In the Perch Falls area of south-central New Brunswick, eight steeply dipping pegmatitic dykes that strike NE–E intruded the Neoproterozoic Perch Falls Granodiorite. These pegmatites represent a late-stage igneous event composed of quartz, plagioclase, K-feldspar, accessory phases, and locally quartz-rich cores. The presence of magmatic epidote and rare allanite

in these calc-alkaline granitic dykes suggests crystallization near the wet solidus at moderate crustal pressures (>300 MPa) consistent with low normative quartz, with minor late-stage hydrothermal alteration. Whole-rock geochemistry shows the pegmatites have silica-rich compositions (SiO_2 = 71.1–77.6 wt. %), moderate Al_2O_3 (12.3–15.6 wt. %), and elevated alkalis (Na_2O = 2.65–4.12 wt. %; K_2O = 3.01–5.62 wt. %), with elevated Nb-Y contents consistent with a NYF affinity, but show variable Zr concentrations (23 to 420 ppm), reflecting low crystallization T (<650°C). Normative quartz calculations further support considerable magmatic fractionation. Overall geochemical signatures and normative values closely overlap those of the nearby Prince of Wales Granite, meaning these dykes likely were derived from it. Micro-XRF reveals a few larger zircons (100–600 μm) present in the pegmatitic dykes. SEM-BSE analysis reveals these zircons are predominantly subhedral and weakly zoned to unzoned. These zircons locally exhibited metamictization and these zircons host micron-scale Th-rich inclusions (thorite, 5-10 μm), based on SEM-EDS. SEM-BSE imaging showed that zircons are present in the adjacent Prince of Wales Granite. Unlike the pegmatitic dykes, the zircons in the Prince of Wales Granite lacks thorite inclusions, are notably zoned, subhedral shaped, and are small-sized (5–100 μm). However, in both granitic units, these zircons preferentially occur within feldspar-rich domains. Previous regional geochronology constrains these units to the Late Neoproterozoic, interpreted as the youngest magmatic event. The combined petrological, geochemical, and zircon textural evidence indicates magmatic fractionation with incompatible-element enrichment, and minor magmatic-hydrothermal modification within weakly evolved NYF-type pegmatites.

Quantitative assessment and risk analysis of Geologic Carbon Storage potential in the Triassic-Jurassic Fundy Subbasin

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Carbon storage potential in the Fundy Basin was addressed qualitatively in 2010 and 2015 based on legacy 2D seismic mapping and two offshore wells that penetrated saline aquifers near onshore emissions sites. In this presentation, we provide quantitative assessment of multiple scenarios in the Fundy Subbasin: range ~25Mt-3Gt, with storage efficiencies of 0.5%–5%. We provide risk analyses of probability against confidence for each play element: capacity, injectivity, containment and pressure-space. The Fundy Basin comprises three contiguous subbasins formed during the rifting of Pangea. The Fundy Subbasin is a half-graben with three components: a crestally-faulted rollover anticline above the Grand Manan-Headlands listric growth-fault, a synclinal basin and a southeastern flank that rises to onshore outcrops. To the northeast, the Chignecto Subbasin is transitional to the Minas Subbasin, which is flanked by the Cobequid-Chedabucto strike-slip system. To assess capacity, we built a geocellular model from published maps incorporating four formations. Triassic Wolfville and Blomidon alluvial-fluvial-aeolian-playa deposits are separated stratigraphically from similar Scots Bay clastics by Jurassic North Mountain basalts. Aquifer porosities were populated from sonic logs with multiple realisations dependent on lithofacies/diagenetic models. Mud-weights from drilling records and onshore aquifer studies indicate long-term pressure equilibration facilitated by extensive fracturing, particularly in basalts, which raises containment risk if 10,000 years sequestration is stipulated. Conversely, uncertainty in primary aquifer continuity leads to uncertainty in short-term injectivity and pressure-space, with risk of unacceptable pressure build-up and project shut-down. Furthermore, if suitable aquifers are confined to basin margins by basinward development of fine-grained playa facies and increased cementation with depth, then there are contamination risks to onshore freshwater aquifers and crestal containment risks. Near Cape Spencer O-79, basalts “sea-crop” above sandstones that could leak gaseous CO2 transitioning from supercritical phase. Interpreted shallow faults near Chinampas N-37 risk similar cross-fault leakage of high-buoyancy gas to the seabed.

3D geocellular modeling linking sedimentary, structural and diapiric architecture to geothermal potential: Cumberland Basin and Sable Subbasin, Nova Scotia

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We present structural-stratigraphic and geothermal geocellular models of the onshore, Paleozoic, Cumberland Basin and the offshore, Mesozoic, Sable Subbasin. In each basin, we show 3D animations of sedimentary successions above autochthonous and allochthonous salt and relate geothermal power potential to the vertical extent of salt diapirism. The structural-stratigraphic models are constructed from 2D and 3D seismic data and petroleum wells, with outcrop data incorporated at Cumberland. Temperature is modeled using Fourier's Law at Cumberland and populated from wells at Sable. The Cumberland Basin is the highest ranked onshore basin in the province for geothermal energy. We model geothermal gradients as low ~15°C/km where high thermal conductivity Windsor Formation salt diapirs reach surface and dissipate heat, but where there is extensive salt withdrawal, e.g., in the Atholl Syncline, gradients reach over 25°C/km. Drilling costs with these temperature-depth profiles present economic challenges for closed-loop or induced-fracture power generation and it is unlikely that open-loop systems in Carboniferous sandstones are practicable, based on extensive core data and hydrocarbon production that requires fracking. In the Sable Island area, we provide similar animations of Triassic/Jurassic salt (Argo Formation) followed by Late Jurassic/Early Cretaceous successions (MicMac and Missisauga Formations) that were deposited by the Sable Island Delta across the continental shelf and in isolated shelf-margin depocentres above listric growth-faults ("expansion trends"). In this setting, salt diapirs that have pierced the footwalls of listric faults to 4000–5000m subsea have enhanced temperatures in overlying high-quality aquifers with geothermal gradients exceeding 30°C/km. Standalone geothermal production is unlikely, but integration of energy transition opportunities should be considered. Wind power and hydrocarbon exploration are currently being licensed offshore where stranded gas resources of ~2TCF are well-established. Both basins have energy storage potential in salt diapirs. Government funding (~$40 million) for gas, geothermal energy and carbon storage research was announced in 2025.

^Exploring the influence of rock geochemistry on biofilm composition in a lithium pegmatite system using metabarcoding

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Microbes inhabit almost every environment on Earth, and their community compositions are highly dependent on abiotic environmental gradients. These abiotic environments include different rock types that can have very different chemical compositions. The objective of this research is to investigate the influence of rock geochemistry on distributions in microbial communities, with a focus on lithium, an important chemical element for decarbonization. Biological applications to mineral exploration are growing in popularity and will be a valuable tool as the demand for critical minerals increases. Microbial biodiversity is being investigated using metabarcoding of rock surface biofilms on outcrops in the Hayman Hill area located near St. Stephen, New Brunswick. The study area is located in the St. Croix terrane of Ganderia, and the local geology consists of plutonic rocks, including mainly diorite, granodiorite and muscovite-biotite granite, and spodumene pegmatite dykes that intruded metasedimentary rocks. Small (<2 cm diameter and <0.5 cm thick) rock chips were collected from different rock types for 3-domain metabarcoding, a process that generates a total community fingerprint of eukaryotic and prokaryotic rRNA barcodes that can identify organisms down to the species level and determine their relative abundances. Absolute abundances per unit of exposed surface area were determined by normalizing to three internal standards. Preliminary results show a diverse biofilm community of prokaryotic and eukaryotic microbes and success of a novel DNA extraction method from rock chips. Current work is focused on comparing the rock surface metabarcodes to whole-rock geochemical data from the same samples. Taken together, this study uncovers the relationships between rock type, geochemistry, and microbial community composition on rock surfaces in the study area.

Nova Scotia critical minerals opportunity

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Rare Earth Elements (REE) consist of 15 lanthanide elements along with Yttrium and Scandium and generally fall into 2 groups of light rare earths (LREE) or heavy rare earths (HREE). Their end use and largest demand is found in the world's fastest growing markets: clean energy and high technology. The global REE market size is USD 3.74 billion in 2024 and expected to grow to USD 8.14 billion by 2032. Specifically, many REE are expected to be in short supply in the next 15 years, including neodymium, europium, terbium, dysprosium and yttrium.

Globally, Ionic Absorption (IA) REE deposits are the predominant source for heavy REE (HREEs) and yttrium with most exploited deposits confined almost exclusively to areas underlain by granitic rocks in southern China. IA ores are defined when weathered granites contain more than ~50% ion-exchangeable REY (REE + Y), relative to whole-rock REY. Present day ore grades range from 140 to 6,500 ppm REY with the most valuable REE ores having significant HREE enrichment.

For exploration purposes the weathering profile of the deposits can be divided into a REE-leached zone in the upper part of the profile, with a positive Ce anomaly, and a REE accumulation zone with the IA ores in the lower part of the profile that is characterized by a negative Ce anomaly. Within Nova Scotia the area with most REE potential is that of Cape Breton Island which contains several granitic bodies of interest especially in the Aspy Terrane. Recent vegetation sampling has indicated areas of exploration interest for REE that will be discussed as potential economic drivers for development in partnership with local indigenous groups.

Looking for a deeply buried new Walton deposit: across Iapetus and into the Carboniferous Basins of Eastern North America

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Historically, the Maritimes has the greatest number of mines per unit area and Nova Scotia the second greatest mineral production per square kilometer of all provinces. The Lower Carboniferous carbonate-hosted barite/base metal/silver are significant deposits. Discovery of a new Walton Mine (5 M tonnes of Barite and 0.4 M tonnes silver) would have a present-day value in the range of over $1B CDN.

Present day mineral development in the Maritime Lower Carboniferous is roughly equivalent to where Ireland was some 25 years ago. The Navan array of ore bodies ($12B in ground value) was discovered in the early 1970s as a near surface deposit using standard geochemical techniques. The next discovery of a "new Walton" will undoubtedly involve innovative techniques to find buried deposits of "Irish-type" that are often found in clusters along identifiable lineaments at 8 km intervals. To date, sustained activity in Ireland has outlined approximately 10 additional economic deposits with the more recent ones being deeply buried.

The Maritime Lower Carboniferous basins have both a complex structural geology and a deep masking clay overburden with 4 multi-directional glacial events that has prohibited exploration success. Enzyme Leach studies in the Tennycape area reveal an impactful Combination Anomaly of significant size–larger than that of a buried Porphyry Cu deposit in the Atacama Desert of Chile. The Halogen elements define a distinct complete low Cl, Br, Ba, Se, Ge, Ti + Mn zone seen as a 600 m × 400 m feature trending NW to SE. Ba enrichment occurs as a distinct trough–possibly a fault/plumbing trace. The elements As, V, Cu, and Ga define a drill target whereas Pb, Zn, Cd, Co, and Ni occur in the halo. REE anomalies including La and Ce along with Th and U occur as a spatially coherent high in West, possibly representing an intrusive body.

Evolving shorelines: update on Nova Scotia's coastal monitoring program

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Nova Scotia has a dynamic coastline extending over 13,000 km, boasting a wide range of shoreline types from rocky cliffs to sandy beaches. To monitor coastal change across this diverse environment, the Nova Scotia Geological Survey established a Coastal Monitoring Program comprised of over 120 sites that are periodically surveyed using Remotely Piloted Aircraft (RPA) to collect high-resolution LiDAR and photogrammetry data. Comparison of annual surveys enables visualization and quantification of shoreline change, while analysis of historical aerial imagery provides context for longer term coastal evolution. Case studies were conducted for three separate monitoring sites to identify and interpret the relative influence of different factors driving coastal change, including the bedrock and surficial geology, geographic setting, coastal cell dynamics, and anthropogenic influences. Recognizing the complex, site-specific nature of coastal change along Nova Scotia's shoreline is fundamental to inferring future change and guiding shoreline management.

^Fundy Basin reservoir characterization for geological carbon storage

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For a project titled "Basin Evaluation for Offshore Carbon Storage in Atlantic Canada", in association with Memorial University, University of New Brunswick, and University of Waterloo, we have been completing work regarding reservoir characterization of Atlantic sedimentary basins. This study has three major focus areas, delineating the Mesozoic strata for candidate reservoirs for storage of CO_2: macro-characterization of reservoirs in Nova Scotia and New Brunswick, micro-characterization of these reservoirs, and static and dynamic models incorporating the data to estimate parameters such as geobody analysis, porosity, and permeability for long term CO_2 storage. Fieldwork has been completed along the Bay of Fundy, collecting data on potentially suitable formations within the Fundy Basin. Through outcrop, wellbore, and analog analysis, geobody and architectural elements can be deduced for reservoir modelling, 3D reservoir facies can be defined, and lithofacies analysis can be correlated to subsurface formations, incorporating well log and 2D seismic data. Through field and lab work data collection, including measurements from scintillometers, permeameter, and drone mapping, key formations are characterized based on lithology and stratigraphic relationships, gamma ray logs and elemental analysis (XRF, XRD), and permeability. Thin sections from samples collected in the field allow petrographic analyses to define details of reservoir mineralogical composition, texture, and heterogeneity of reservoir strata, while gross depositional environment mapping gives a broader view of the systems of formation. Macro- and micro-characterization will be input into static (stratigraphic) and dynamic (fluid flow) models of the representative storage reservoirs.

^Carbon sequestration and geological storage: Atlantic Canada's route to net-zero

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With federal and provincial emissions reductions goals set for 2030, the due date for progress is quickly approaching, requiring innovation and action to achieve targets and continue on the path to net-zero. Carbon capture and storage (CCS) is one such innovation with potential to reduce future emissions through utilization of existing geological resources in Atlantic Canada. By injecting CO_2 into suitable subsurface geological formations, long term sequestration of emissions can be achieved, reducing atmospheric and climatic impacts. Reservoir characterization projects are now underway to evaluate basin potential to store CO_2 in subsurface formations offshore Atlantic Canada. As potential for CCS grows, federal and provincial regulations must be reviewed and revised to clear the way for successful projects in Atlantic Canada.

Subduction initiation within the Penobscot back-arc basin: evidence from the Great Bend Complex, central Newfoundland

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The Great Bend Complex (GBC) is one of three frequently correlated ophiolitic complexes at the base of the Exploits Subzone, a major tectonic division in central Newfoundland. This presentation describes new whole-rock and mineral chemistry from five representative samples of dunite from the GBC, collected during the 2024 field season. The samples are medium-grained, strongly serpentinized, and consist of olivine, disseminated euhedral to subhedral Cr-spinel grains, and minor interstitial clinopyroxene. Whole-rock proxies are consistent with formation of the dunite via extensive melting of peridotite in the spinel stability field. The compositions of olivine (Fo 90-92, NiO 0.1-0.35 wt. %), clinopyroxene (Mg# ~95, TiO_2 <0.05 wt. %, Al_2O_3 ~1 wt. %) , Cr-spinel (Mg# 12–50, Cr# 60–80), and $(Pt/Ir)_N$ values are all consistent with the formation of dunite via a replacive reaction at low pressures between a depleted peridotite and an exotic percolating boninite melt. Platinum-group element data further corroborate the reactive origin of the GBC dunite. The record of boninitic magmatism, typically preserved in ophiolites formed in forearc settings, is inconsistent with prevailing tectonic models that assume the GBC represents a back-arc basin ophiolite. Our data suggest at least one previously unrecognized episode of basin inversion and subduction initiation within the Penobscot back-arc basin between its formation ca. 494 Ma and ophiolite obduction ca. 476 Ma. An episode of ridge inversion during induced subduction in the Penobscot back-arc basin would be consistent with the absence of a mature intra-oceanic arc and the short timeline between basin formation, inversion, boninite magmatism, and ophiolite obduction.

^Distribution and form of gold-silver in the Paleoproterozoic Lalor VMS deposit, Manitoba: preliminary analysis of precious-metal enrichment processes

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The Lalor base-metal deposit, in the Snow Lake area of the Paleoproterozoic Flin Flon domain, Manitoba, Canada, is a structurally complex, gold-rich volcanogenic massive sulfide (VMS) system. The deposit is comprised of an auriferous Zn-Cu-bearing sulfide lenses, with variable gold-enriched zones, and enveloping hydrothermal alteration zones within amphibolitic host rocks. As the largest of the VMS deposits in the Snow Lake area the host rocks in Lalor are affected by syn-genetic alterations followed by intense polyphase deformation and amphibolite facies metamorphism. As a result, original ore mineral assemblages and individual phases are extensively modified, recrystallized to coarser phases, and partly remobilized, such that syn-genetic gold is remobilized locally leading to differential enrichment of Au-Ag. The lithologies, stratigraphy, and alteration patterns, supported with litho-geochemical analysis, of the Lalor VMS system have been investigated earlier; however, the trace-elements signature of ores and gangue minerals, especially in relation to gold enrichment, remains inadequately constrained. This study aims to systematically characterize trace-element distributions in various ore sulfides and associated gangue minerals from the Lalor VMS deposit to better understand their pre- to post-deformational form, distribution and saturation processes. This detailed approach helps to appreciate the post-ore metamorphic changes using combined analytical methods, i.e., reflected-light petrography, micro-X-Ray fluorescence energy dispersive spectroscopy (μXRF-EDS), and scanning electron microscopy (SEM) coupled with EDS and backscattered electron (BSE) imaging, followed by laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). LA-ICP-MS will quantify major- and trace-element concentrations in minerals from each assemblage, providing constraints on developing an understanding of critical trace element and gold incorporation into these phases, which helps to interpret early (syn-genetic) to late (deformation-related) fluid evolution and physicochemical conditions in this VMS system.

Are we digging deep enough to get permafrost carbon?

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Permafrost soils contain vast carbon reservoirs that emit greenhouse gases upon thaw. Yet current climate projections rely on simplified two-layer models distinguishing only the seasonally thawing "active layer" from underlying permanently frozen ground ("permafrost"). This framework obscures the complex thermal history and vertical structure of Arctic soils, particularly a temperature-sensitive "transition zone" that experiences episodic freezing and thawing over decadal to centennial timescales as active layer thickness adjusts to shifts in climate, vegetation, and surface soil layers. Identifiable by its high suspended ("ataxitic") ice content, this zone likely concentrates organic matter, mineral nutrients, and microbial assemblages percolated through soil water. As a result, the transition zone represents a disproportionately reactive substrate and a potentially important, underrepresented source of greenhouse gas emissions. We propose that applying change point detection to high-resolution radiocarbon measurements of bulk soil resolves five distinct layers—accumulation, mixing, transient, intermediate, and isothermal permafrost—that record thaw history and carbon dynamics within the upper two meters of the landscape. The active layer comprises an accumulation horizon, marked by nuclear bomb-spike carbon, and a homogenized mixing layer shaped by cryoturbation and inputs of modern dissolved organic matter and root exudates. Within the transition zone, the transient layer marks the maximum depth reached by the modern active layer each summer, whereas the intermediate layer stores millennial-aged carbon deposited during Holocene warm intervals. Isothermal permafrost, isolated from the contemporary carbon cycle for millennia, exhibits substantially older radiocarbon ages and a more gradual radiocarbon depth profile. Today, gradual thaw as well as disturbances such as wildfires are causing ground-ice melt and transition zone collapse, exposing much older permafrost carbon to the atmosphere. Therefore, expanding depth-resolved datasets is essential to capture the full vertical structure of the soil-permafrost complex and improve projections of Arctic landscape stability and carbon release.

Ichnofaunal diversity of the Pennsylvanian-aged Clifton Formation, including the first documented trace fossil assemblage from within a hollowed lycopod stump, Clifton, New Brunswick, Canada

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The Maritimes Basin is renowned for its near-complete record of late Paleozoic tetrapod tracks (Early Carboniferous to early Permian). The Moscovian-aged Clifton Formation in northern New Brunswick is well known for its paleobotanical record including *in-situ* lycopod trees. The lycopods are rooted in mineral paleosols, and were once hollowed-out stumps, episodically infilled with layers of sediment. Mud cracks, raindrop impressions, and trace fossils are preserved on a bedding plane between strata that contain vertebrate and invertebrate body fossils.

Preservation of traces within stumps are rare within the Paleozoic, with this report representing the first invertebrate assemblage, and second record of vertebrate ichnofossils, preserved inside a Pennsylvanian-aged lycopod tree. The ichnoassemblage within the tree is diverse and dominated by invertebrate traces that include the ichnogenera *Gordia, Helminthoidichnites*, *Helminthopsis, Circulichnus, Planolites, Cruziana, Striatichnium, Diplopodichnus,* and a single vertebrate attributed trace of cf. *Characichnos,* interpreted as a small tetrapod swim trace. The Clifton Formation also preserves a sparse ichnofaunal assemblage from the flanks of channel bodies/floodplain deposits and within abandoned channel deposits. Invertebrate ichnoassemblages (outside of lycopods) includes: *Diplichnites*, *Stiaria, Hexapodichnus, Cochlichnus, Planolites, Taenidium Gordia,* and *Helminthoidichnites.* The tetrapod track assemblage includes large *Characichnos* (swimming stem tetrapods)*, Batrachichnus, Matthewichnus, Limnopus* (temnospondyls/microsaurs), and *Hylopus* (anthracosaurs/reptiliomorphs). Trace fossils can be compared with body fossils of vertebrates and invertebrates also found preserved in the lycopods of the Clifton Formation; a unique preservational occurrence. Trace fossils inside of a lycopod have implications for microhabitats in tree hollows within the Carboniferous and potentially expand the known paleobiodiversity of this time.

Geochronological and microstructural analysis of the Cobequid-Chedabucto deformation corridor

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The Cobequid-Chedabucto deformation corridor is a complex, crustal-scale structural network exposed in northern mainland Nova Scotia that forms the boundary between Avalonia and Meguma terrane in the Canadian Appalachians. The deformation corridor comprises earlier pervasive ductile fabrics that are overprinted by later brittle faults and mineralization. Previous work places the main period of tectonic activity between ca. 370–300 Ma, but within this period, the spatial and temporal evolution of the deformation zone remains largely unknown. This project aims to identify and characterize distinct deformation events along the Cobequid-Chedabucto deformation corridor though an approach combining fieldwork with detailed microstructural and geochronological analysis of key phases. Several N-S transects were investigated across major geologic units within the deformation corridor, including the mid-Paleozoic Cape Chignecto Pluton and Pleasant Hills Pluton, the Neoproterozoic Economy River orthogneiss, and units of the Neoproterozoic Bass River Block. Along the deformation corridor, ductile fabrics consistently strike NE-SW; however, the style and degree of deformation are strongly influenced by lithology and mineralogy. Microstructural analysis of major rock-forming phases, including quartz, plagioclase and K-feldspar, indicates that simple shear dominates, although variations in quartz crystallographic preferred orientation distributions along the deformation corridor may reflect changes in flow type and/or deformation temperature. Quartz and feldspar microtextures are consistent with deformation temperatures between ~300–450°C. In both mid-Paleozoic plutonic rocks and the Neoproterozoic Economy River orthogneiss, *in situ* U-Pb geochronology of pre-kinematic titanite yields dates within uncertainty of crystallization age, whereas that of pre- to syn-kinematic apatite yields younger dates of ca. 330 Ma. Preliminary *in situ* Rb-Sr geochronology of fabric-forming biotite overlaps the apatite with dates between ca. 330–300 Ma in both mid-Paleozoic and Neoproterozoic units, interpreted to record the timing of ductile fabric development.

The Cambrian Hawke Bay Event of the Eastern Laurentian Margin in western Newfoundland

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The Laurentian Iapetan margin formed from the extension and breakup of the supercontinent Rodinia during the Neoproterozoic and early Paleozoic. Strata deposited during late rifting through the onset of passive-margin sedimentation include the Labrador Group of the Laurentian autochthon in the Humber Domain of western Newfoundland. At the base of the Labrador Group, the Hawke Bay Formation is interpreted to represent a mid-Cambrian (ca. 510–505 Ma) regional clastic regressive event termed the Hawke Bay Event (HBE). However, the tectonostratigraphic significance of this event along the Laurentian margin remains debated. To resolve details of the HBE and examine the effects of inherited rift structures on the tectonostratigraphic evolution of the Laurentian margin, facies and provenance analyses were conducted on the Hawke Bay Formation. Results of the facies analyses support the occurrence of a Cambrian Series 2 to early Miaolingian normal marine regression coinciding with a highstand systems tract followed by a falling-stage systems tract, possibly linked to post-rift isostatic rebound of the Laurentian margin following the opening of the Taconic Seaway. Highstand marine regression coincided with the development of a wave-to-tide-dominated embayed clastic shelf succession, with progressive tidal reworking of quartz sand. This succession is capped by coastal aeolian facies and a deflation lag, comprising the falling-stage systems tract. Detrital zircon provenance suggests cratonic-scale sediment supply, but with a more significant contribution from Grenville sources than the Hawke Bay Formation farther south in western Newfoundland, indicating sediment drainage along two separate sediment routing systems within the St. Lawrence Promontory. These separate routes were likely controlled by antecedent rift structures of a low-angle detachment rift system, which also likely increased tidal amplification along the regressed Laurentian margin.

Closure in concentration data can be measured in relative terms

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Closure poses interpretative challenges when evaluating compositional data as it forces component concentrations to sum to unity. This mathematical dependency contributes spurious variability to concentrations beyond those caused by material transfer. Fortunately, measuring the magnitude of closure's spurious variability is possible using the definition of a concentration: $x = X/S$, where x and X represent a component's concentration and amount in a system, and S represents the size of the system. By taking this equation's derivative, dividing both sides by x, and simplifying the result, we obtain a fundamental equation: $dx/x = dX/X - dS/S$, demonstrating that the relative variability of a component concentration (dx/x) is a function of the relative variability of the component's amounts (dX/X) and system sizes (dS/S). Clearly, dX/X describes the relative amount of material transfer that took place. Thus, dS/S, the relative change in the size of the system, must be the amount of closure affecting the system's concentrations. Substituting a conserved component (Z), where $dZ = 0$, for X in our fundamental equation yields: $dz/z = -dS/S$, so we must conclude that dS/S is a measure of the amount of closure, as Z undergoes no material transfer. Moreover, closure is a function of the relative size of the system, so its effect is the same for every component. Examining concentrations of component (Y) that were affected by material transfer ($dY <> 0$), we can also measure the relative amount of material transfer that took place (dY/Y). Substituting the amount of closure ($dS/S = -dz/z$) into our fundamental equation in Y and simplifying, we obtain: $dY/Y = dy/y - dz/z$ and can now compare the magnitudes of closure and material transfer in compositional systems. Examples comparing the magnitudes of closure and material transfer are presented using lithogeochemical data from several different compositional systems.

Nova Scotia hurricanes leave no Peggy's Cove boulders un-turned

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Nova Scotia Prospectors Association participants on a recent fieldtrip to Peggy's Cove recognized a large, displaced boulder of biotite monzogranite near the lighthouse with a xenolith in a complementary position to a xenolith on a nearby outcrop. The similar lithology, size, orientation, and location of the xenolith on the boulder and outcrop confirmed the displaced boulder's origin. When the boulder moved 15.18 m (rotating 51°), either as a glacial erratic, or via meteorological forces (hurricanes, tropical storms, or "northeasters"), or both, was not clear until "time-bracketing" air photos proved the boulder moved between Jun. 2004 and Mar. 2009, likely during Tropical Storm Ophelia (2005-09-18), Hurricane Noel (2007-11-04), or Hurricane Kyle (2008-09-29).

By fitting an irregular heptagon around the boulder, measuring its side lengths and orientations, and the boulder height at each vertex, the boulder volume was estimated (~128 m^3). Multiplying this by the average biotite monzogranite density (2.70 kg/m^3) yields a mass of ~346 tonnes, equal to a Boeing 777F (freighter) aircraft at take-off, a Union Pacific steam locomotive, an Eocene whale (Perucetus colossus, twice size of a blue whale), a 797B Caterpillar Mine Haul Truck payload, or 10,000 talents of gold (Chronicles 1, 29:7)! Furthermore, the work done by the waves to move the rock was ~3.62 megajoules, and the power expended was 0.52 megawatts, ~1/3 of a typical Nova Scotia windmill that can power 500 homes.

We know precisely when smaller boulders (12.5 m^3, 31.3 tonnes) at Peggy's Cove moved (Aug. 23, 2009,) during Hurricane Bill (between 1416 and 1418) because of time lapse photography. Additionally, high-resolution satellite images track how other boulders south of the lighthouse have moved "to" and "fro" via storms between 2015, 2021, and 2023. The masses of these boulders are stunning, providing ample appreciation for the power of Mother Nature's fury.

Provenance of metasedimentary units in the Laurentian Long Range Inlier, west Newfoundland: evidence of a shared history with the peri-Laurentian Dashwoods block

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The Long Range Inlier (LRI) in the western Newfoundland (NL) Appalachians is a massif of Mesoproterozoic crystalline rocks correlated with the (ca. 1.0 Ga) Grenville Province of eastern Laurentia, uplifted to its current structural position during Devonian Acadian orogenesis. Recent exploration in the southern inlier has resulted in discoveries of high-grade gold occurrences, demonstrating significant economic potential. However, locating a deposit is impeded by lack of detailed geological mapping and geoscientific research within the inlier.

This study, part of a larger mapping project aimed at resolving the inlier's geological history, is focused on outcrop analysis and detrital zircon geochronology of metasedimentary units, traditionally grouped with Mesoproterozoic Grenville basement. Field results show metasedimentary units sit nonconformably overtop (and are therefore younger than) 1.0 Ga crystalline basement. U-Pb detrital zircon ages range from Silurian to Paleoarchean and define a max depositional age (MDA) of 705 ± 15 Ma, consistent with field observations. Lithology and age of these rocks point to correlation with the Paleozoic margin exposed throughout the Laurentian realm. Although younger than the MDA, a small Silurian population, with a ca. 428 Ma peak, is inferred as metamorphic due to a correlative, newly dated gabbro, which intrudes the metasedimentary units. Major age peaks occur at ca. 1.0, 1.8, and 2.7 Ga, typical of Laurentian derived units; however, a significant proportion of Tonian (700–900 Ma) and 2.0–2.2 Ga zircons are atypical and generally attributed to Gondwanan sourcing. Although not observed elsewhere in the NL Laurentian realm, these atypical ages are found within inherited and detrital zircons of the peri-Laurentian Dashwood's intrusive and Laurentian margin units respectively. These results not only aid in resolving the geological history of the LRI, but demonstrate a connection between Laurentian massifs and peri-Laurentia during Neoproterozoic to Cambrian margin formation which has implications in paleogeographic reconstructions of Rodinian rifting and Iapetan margin geometry.

^Strengthening geochemical provenance studies of pre-contact L'nu artifacts through the chemical homogeneity of natural copper samples at Cape d'Or Nova Scotia using laser ablation-inductively coupled plasma-mass spectrometry

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For thousands of years before European contact, the Wabanaki peoples, including the L'nu of the Maritimes Basin, used copper for sacred ceremonial gatherings such as the Mawiomi, gift and trade, and personal adornment as well as for functional objects including awls and fishhooks. Previous studies have found that Cape d'Or, Nova Scotia was likely a key source of native (elemental) copper for the Wabanaki peoples. In this study, microscopically-destructive laser ablation inductively coupled plasma-mass spectrometry (LA-ICP-MS) is used to further expand an existing large copper source database by analyzing the composition and homogeneity of native copper samples from the Cape d'Or underground workings at the historically mined Hanway lode, a location previously unstudied, as well as an additional location on Spencers island near Cape d'Or. Analysis of a large number of copper fragments from a large volume of mined rock provides a means to determine how chemically homogeneous this source of copper is, thereby reducing uncertainty in provenance studies that aim to differentiate Bay of Fundy copper sources from other important copper procurement sites in eastern and central North America. Through the work of LA-ICP-MS the goal of this study is to ultimately answer key questions concerning the movement and trade of culturally and spiritually significant pre-contact artifacts of the Wabanaki peoples of the far northeast, thereby further strengthening future provenance knowledge in archaeological studies.

A history mystery: "who the heck is Carl Steinhammer?!"

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The Steinhammer Club of Saint John, New Brunswick, brought together a group of young men fascinated by the region's geological and palaeontological history. Among its members were Charles Frederic Hartt and George Frederick Matthew, both of whom went on to become celebrated geologists. Under the mentorship of John William Dawson, the Steinhammer Club evolved into the Natural History Society of New Brunswick. At this time, the original Steinhammer Club records were sealed, not to be opened again until after the deaths of all founding members. While this evolution expanded the study of New Brunswick's natural history, one question has endured for more than a century - why was the name Steinhammer chosen in the first place? Some have suggested it refers to a geologist's primary tool, the "stone" or "rock" hammer. Others have jokingly proposed a connection to another geological pastime, indulging in steins of beer. Was the German word chosen to reflect respect for scientific scholarship in Germany at the time? Or was there an individual named "Steinhammer" whom the founders intended to honour? Our investigation into this history mystery began when our first author, Lea, discovered an 1863 article published by a "Carl Steinhammer." Assuming him to be an early member of the Steinhammer Club, she shared the reference with Catrina, whose immediate response was, "Who the heck is Carl Steinhammer?!" This talk follows our efforts to uncover the identity of Carl Steinhammer while tracing the origins of the Steinhammer Club's name. Ongoing digitization of archival evidence ultimately led to a decisive breakthrough, and we have been able to reveal a long overlooked connection that demonstrates how a single forgotten name can unlock an entirely new chapter of the Steinhammer Club's story.

Zircon geochronology and geochemistry in variably endowed subphases of the Davis Lake Pluton, South Mountain Batholith, Nova Scotia

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The late Devonian South Mountain Batholith (SMB) consists of 13 plutons distinguished as early, barren Stage 1 or late, mineralized Stage 2 containing intrusion-related Sn-W-Mo-Cu-Zn-In-Li deposits. The Stage 2 Davis Lake Pluton (DLP) outcrops in the southwest part of the SMB and is divided into 4 subplutons: main Davis Lake ("DL" leucomonzogranite),

East Kemptville ("EK" leucogranite, hosting the EK Sn greisen deposit), Dog Lake ("DG" leucogranite) and Solomon Lake ("SL" muscovite-biotite monzogranite). The contrasting critical metal endowment of the subplutons is poorly understood, with the DL and EK subplutons being most prospective. Silicate melt inclusions in zircon show similar metal concentration ranges and extents of melt fractionation in all subplutons. Notably, Rb shows a positive correlation with Sn in melt inclusions from only the DL and EK subplutons, providing direct evidence that magma fractionation led to Sn enrichment. Ongoing characterization of zircon further elucidates the contrasting metal endowment and the evolution of the parental magmas. Through LA-ICPMS analysis of subpluton zircons, combined with U-Pb age dating and detailed zircon petrography, we quantify and compare magma temperature and oxygen fugacity, and zircon trace element and metal concentrations (including REE, HFSE, and Sn-W) which constrain the degree of fractionation and magma metal enrichment. Additionally, we investigate the impact other crystallizing accessory phases have on zircon composition (e.g., titanite, apatite, monazite, etc.) and their relationship to processes controlling metal endowment. Preliminary results show that zircons from productive subplutons (EK and DL) record: (i) higher temperature ranges throughout their cooling history; (ii) lower values of magma fO_2; and (iii) trace element ratios that record a disrupted fractionation trend, attributed to elevated concentrations of fluorine in the magmas that increased zircon and other accessory mineral solubilities preventing them from crystallizing in the later stages of the productive subplutons' evolution.

Defining the Geminid Deposit: investigating mineral assemblages, textures, and Ni distribution

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The Geminid Nickel Deposit was discovered in 2023 approximately 2 km east of the Historic Kerr-Addison Mine, an underground gold mine that produced over 11 M oz of gold from 1938 to 1996. Located in Northeastern Ontario 40 km east of Kirkland Lake, the deposit sits along the Larder Lake - Cadillac Break (LLCB), within the Abitibi Greenstone belt, a region renowned for its mineral endowment. The initial discovery was made during exploration drilling along the LLCB, when the core intersected an approximately 23 m wide section of millerite mineralization with an average grade of 1.9% nickel. Follow-up drilling defined an approximately 300 by 700 m mineralized zone with vertical planar geometry. The Ni-ores are millerite-dominated and are hosted mainly in the ultramafic facies of the Larder Lake group, below the contact with Timiskaming sediments. At present, no comprehensive study has investigated the mineral assemblages, textures, or nickel distribution within the Geminid Deposit, limiting models describing its formation, potential economic value and Ni recovery. The aim of this study is to characterize the magmatic and secondary sulphide mineral phases and textures, evaluating their relationship to nickel distribution. Analytical methods include: 1) detailed petrographic analysis of magmatic and secondary mineral assemblages; 2) XRD analysis to determine mineral phases present; 3) SEM and µXRF for phase mapping and phase distributions at different scales within selected samples, 4) LA-ICP-MS analysis to investigate minor and trace element contents including PGEs. The results will be used to: 1) characterize ore types based on mineral assemblages, textures, and Ni tenor; 2) investigate factors governing nickel mobilization; and 3) develop questions for further investigation. This study will provide a foundation for future genetic interpretations and economic evaluations. Beyond advancing the understanding of the Geminid Deposit, this research addresses a broader gap in knowledge of secondary (altered) sulfide systems and millerite dominated mineralization.

A Late Carboniferous myriapod from the Joggins Fossil Cliffs UNESCO World Heritage Site

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The Joggins Fossil Cliffs is a UNESCO World Heritage Site known for its Late Carboniferous aged fossils. The approximately 15km coastal exposure preserves the fossiliferous 315-310-million-year-old Joggins Formation, which was a tropical

wetland-forest paleoenvironment. Approximately 200 different species have been discovered and identified from the Joggins Formation. Despite the high preservation potential in this formation, animal body fossils are still uncommon, which makes each body fossil an exciting find that allows us to learn more about Late Carboniferous animals. In 2016, a specimen, known as NSM016GF018.006, was discovered along the shoreline at the Joggins Formation. Specimen NSM016GF018.006 is an incomplete myriapod (an arthropod group that includes millipedes and centipedes) body fossil suspected to be a part of the Diplopoda class (millipedes) that is preserved in a concretion. During the mid- to Late Carboniferous Period arthropods were an abundant and diverse terrestrial species due to the many available niches on land, making NSM016GF018.006 an important addition when piecing together the Joggins Formation's paleoecology. The purpose of the present research is to 1) describe NSM016GF018.006's morphology, 2) compare NSM016GF018.006 morphology to other Late Carboniferous aged myriapods, and 3) investigate how NSM016GF018.006 fits into the Joggins Formation's paleoenvironment. To accomplish this, NSM016GF018.006 was µCT-scanned in 2025 at µ-VIS at Southampton University. The resulting 3D model was digitally segmented using Dragonfly's 3D analysis software. By using this non-destructive method, the digital segmentation of NSM016GF018.006 revealed morphological features that were hidden by the concretion's hard and difficult to prepare matrix. These features, such as tergites, diplosegments, and legs, will contribute to our understanding of NSM016GF018.006's morphology. Therefore, this research will also help to create a clearer understanding of myriapods during the Late Carboniferous and the paleoenvironments they inhabited.

Provenance and tectonic evolution of the Meguma terrane, northern Appalachian orogen

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The Meguma terrane represents a piece of the Armorican terrane assemblage transferred to Avalonia during Cambrian to Ordovician rifting and opening of the Rheic Ocean or was accreted to East Avalonia as an isolated terrane or as a Gondwanan promontory following subduction of the Rheic Ocean. Early Devonian dextral translation moved the Meguma terrane opposite West Avalonia. Emsian to Famennian contraction between a cold and stiff promontory on West Avalonia in Nova Scotia and the Meguma terrane produced the Kejimkujik orogeny (D_1). Kejimkujik orogenesis was first induced by a period of flat subduction of the Rheic Ocean beneath the Meguma terrane and composite Laurentia. Flat subduction inhibited formation of Early to Middle Devonian upper plate magmatism and placed the upper plate under compression, which led to folding. Contraction culminated in late D_1 thrusting of the Meguma terrane over West Avalonia during Famennian indentation. Sinistral shear occurred in the northeastern part along ENE to NE-striking shear zones with dextral shear in the present southwestern part of the Meguma terrane and adjacent parts of West Avalonia. Progressive steepening of the Rheic slab in the Late Devonian re-established a metasomatized mantle wedge and formation of hydrous, subduction-related magmas, which assimilated significant amounts of Meguma terrane metasedimentary rocks that led to formation of peraluminous S-type magmas; more anhydrous A-type magmas formed in the distal backarc region where fluxing by hydrous slab-derived fluids was absent. Latest Devonian to Carboniferous translation of the Meguma terrane towards the west using the E-striking Minas Fault zone as a dextral transfer fault culminated in D_2 sinistral oblique reverse slip along mid-Carboniferous (Alleghenian) shear zones, which had progressively rotated anticlockwise into a NE-strike during oroclinal bending. This process led to further underthrusting of composite Laurentia beneath part of the Meguma terrane.

Deconstructing the "Iapetus suture": diachronous accretion of terrane assemblages in the Appalachian-Caledonide collage

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Maps of the Appalachian-Caledonide orogen have traditionally sought to identify a unique Iapetus suture marking either the collision between Laurentian and Gondwanan continental crust, or the closure of the last remnant of the Iapetus Ocean. This seemingly straightforward task is fraught with perils in an orogen that was built by the accretion of multiple fragments over substantial time. Orogen syntheses based in Britain and Ireland typically show the Iapetus suture as Silurian; those based in Newfoundland show a Late Ordovician suture; those in Cape Breton Island have no record of an Iapetus suture, whereas those in southern New England show the Iapetus closing in the Early Ordovician. The provenance and the timing of accretion can be examined using detrital zircon distributions and stratigraphic relationships. For example, the approach of a Ganderian terrane to the Laurentian margin is typically marked by an influx of ~1 Ga zircon from the Grenville orogen. The end of accretion is typically bracketed by an angular unconformity, above which forearc basin sedimentary and volcanic rocks contain both Laurentian and non-Laurentian zircon. This approach allows identification of multiple sutures arranged *en echelon*, ranging in age from Early Ordovician to Devonian. Terranes derived from peri-Gondwanan Ganderia arrived diachronously, such that the Laurentia-Gondwana boundary is marked by sutures of different age along the orogen. Traced along orogen strike, a suture of a given age may separate: 1) two Gondwana-derived terranes; 2) a Laurentia-derived terrane and a Gondwana-derived terrane; or 3) two Laurentia-derived terranes. Naming a single Iapetus suture is further complicated by recent results that show a second suture, of Devonian age, within Britain, and other results that show the Munsungun inlier of northern Maine as Laurentian, not Gondwanan. We therefore argue that efforts to portray and discuss a single Appalachian-Caledonide "Iapetus suture" should be abandoned.

Significance of the first documented Devonian sedimentary manganese mineralization in the Lower Seboomook Group in northern Maine

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The Devonian Lochkovian Seboomook Group, a flysch sequence of turbiditic slate and sandstone, is a major part of the Connecticut Valley-Gaspé Trough in northern-northwestern Maine. Recent mapping shows that the Seboomook rests unconformably on highly mineralized Cambrian-Silurian inliers, with this regional unconformity marking the end of the Salinic orogeny and the onset of Acadian foreland basin development. The lower Seboomook comprises a laterally continuous "trinity" of basal conglomerate, fossiliferous limestone and calcareous sandstone, and maroon-red slate-siltstone. The trinity locally contains multiple basalt flows erupted in a continental-arc setting, recording the onset of Acadian arc volcanism in northern Maine. Units previously mapped as separate or Silurian formations are now dated by conodonts as Lochkovian and assigned to the Seboomook Group; for example, the Frost Pond Formation of red slate northeast of Ripogenus Lake is reassigned to be the maroon-red slate-siltstone unit. This unit of hematitic iron formation is typically 10–15 m thick (locally up to 100 m) and indicates a critical early Devonian marine oxidation event. In 2025, a nearly 2-m-thick manganese-rich interval was discovered within this unit in a borrow pit near Hay Brook, in T7 R9 WELS township. The interval consists of alternating red, pink, and black Fe-Mn laminae of very fine-grained minerals; iron phases are predominantly hematite and minor magnetite and manganiferous phases dominated by Ca-rhodochrosite, with abundant cross-cutting rhodonite veinlets (generally <2 mm) and surficial black manganese-oxide films produced by supergene processes. Whole-rock analyses of two samples yield very high MnO content (45.8 and 47.1 wt. %) and low Fe_2O_{3T} content (3.09 and 2.97 wt. %). Micro-XRF scanning confirms high Mn content. A slightly positive Ce anomaly and a convex-upward PAAS-normalized REY pattern support a hydrogenous origin for manganese mineralization. This occurrence, the "Hay Brook manganese occurrence", represents the first documented Devonian sedimentary manganese mineralization in the Northern Appalachians.

The re-established Lochkovian Seboomook Group and the onset of Acadian arc volcanism in the northern Maine Appalachians

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As a major part of the Connecticut Valley-Gaspé Trough, the Lower Devonian Lochkovian Seboomook Group is widespread in northern-northwestern Maine. It is a flysch sequence of turbiditic slate and sandstone deposited in a foredeep due to advancing Acadian deformation. Recent detailed and reconnaissance mapping around Cambrian to Silurian Munsungun, Winterville, East Branch, Lunksoos Lake-Weeksboro, and Number Nine Mountain inliers demonstrates that the Seboomook rests unconformably on these inliers, with this regional unconformity marking the end of the Salinic orogeny and the inception of Acadian basin development. The lower Seboomook comprises a conformable, laterally continuous "trinity" of basal conglomerate, fossiliferous limestone and calcareous sandstone, and maroon-red slate-siltstone. The latter locally hosts laminated manganese-iron deposits. These units were previously mapped as separate or even Silurian formations but now are constrained by new conodont data to be Lochkovian and to be the lower succession of the Seboomook Group. Within the trinity, multiple basalt flows and minor mafic pyroclastic rocks (including the "West Branch Volcanics" redefined in our study) in the headwaters of the East Branch Penobscot and Aroostook rivers and near Ripogenus Lake provide a key record of early Acadian magmatism. Whole-rock analyses of 14 basalt samples reveal a remarkably homogeneous calc-alkaline geochemical signature characterized by pronounced negative Nb-Ta anomalies, enrichment in LILE and LREE, depletion in HFSE, low Nb/Y (average 0.22), and elevated La/Nb (average 2.58), Th/Nb (average 0.48), and Th/La (average 0.18) ratios, all typical of subduction-related continental-arc basalt. These data indicate that the basalts mark the onset of Acadian arc volcanism in earliest Devonian; this followed the final Salinic submarine mafic arc-like volcanism preserved in the 425–424 Ma Spider Lake and Churchill Ridge formations in the Munsungun inlier, the rapid uplift and erosion of Salinic basement, and the earliest Acadian marine transgression in northern Maine.

^On the discovery of Triassic aged invertebrate and vertebrate ichnofossils from Melvin Beach, New Brunswick

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The Fundy Basin of Atlantic Canada represents an aulacogen that preserves a thick succession of continental clastic fluvial and lacustrine deposits in both the Nova Scotian and New Brunswick coastlines. The basin accommodates sediments deposited between the latest Permian and the early Jurassic period. To date, most paleontological research has been conducted in Nova Scotia, including skeletal remains of Canada's oldest dinosaurs (Prosauropods), and abundant late Triassic and early Jurassic vertebrate ichnofossils, predominantly that of dinosaurs (e.g., *Otozoum, Grallator, Anomoepus*). Here, we present the first discoveries of vertebrate footprints, along with vertebrate and invertebrate burrows from the Echo Cove Formation at Melvin Beach New Brunswick, along the Fundy Trail Provincial Park. These traces represent the first evidence of vertebrate life from the upper Triassic (Carnian stage), and the first known Mesozoic vertebrate burrows in New Brunswick. The vertebrate tracks here are assigned to the ichnogenus *Chirotherium* ichsp, which others interpreted to be made by chirotheriid archosaurs, and to the ichnogenus *Characichnos* ichsp*,* assignable to swimming tetrapods. Here, we describe the first known occurrence of the ichnogenus (*Katarrhedrites*) alongside several additional vertebrate burrows left in open nomenclature from the Triassic and noting the potential trace maker archosauriforms or another Triassic-aged tetrapod. Invertebrate burrows such as *Taendium* were observed within an isolated sandstone bed representing infaunal invertebrate deposit feeders. Trace fossils are here explored as an option to refine age constraints, where other conventional age-diagnostic information such as palynology or radiometric dates are limited or absent. Vertebrate footprint ichnobiochrons can be used based on global records of Triassic ichnofossils. In addition to the systematic description of these new trace fossils, this study uses sedimentological and stratigraphic analyses of the Echo

Cove Formation from data collected at coastal outcrops to better understand its depositional setting, that once supported the vertebrate and invertebrate activity.

Microscale deformation and metamorphism of Neoproterozoic granitoids in northern Caledonia Highlands, Stuart Mountain

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Two suites of granitoid intrusions are emplaced into the Ediacaran volcano-sedimentary succession in the northern Caledonia Highlands, New Brunswick: the Point Wolfe River Suite (625–615 Ma) and Bonnell Brook Suite (555–550 Ma). Both suites have been subjected to deformation commencing shortly after the intrusion of the Point Wolfe River suite and continuing episodically until Carboniferous time. Recently, the New Brunswick Geological Surveys Branch has undertaken re-mapping of this section of the Caledonia Highlands terrane with the aim of expand on the work of Barr and White (1999) using new exposures and U-Pb zircon dating. In aid of the latter, a detailed analysis of newly accessible outcrops in the Kent Hills Wind Farm (45.833297°N, 64.877544°W), currently included as part of the Bonnell Brook Suite, has been undertaken. This component of the project focuses on characterizing the intrusive body and its relationship to regional geology, relating the microstructure, both deformational and metamorphic/retrogressive, to the evolution of the intrusion and U-Pb zircon and Rb-Sr white mica dating. Geochronological determinations are intended to constrain the age of protolith, as well as establish more exact ages of deformation. The granodioritic host rock is characterized by calcic plagioclase, hornblende and quartz. Large relict hornblende grains are crossed by numerous K-feldspar veinlets. Subsequent deformation/metamorphism is exhibited by dynamic recrystallization by mixed-mode chemo-mechanical processes. Progressive deformation is intimately linked to hydration and introduction of potassium and silica-rich fluids, the latter being inferred from K-spar and quartz veinlets, the formation of muscovite-dominated deformation zones and striking rutile to titanite reaction textures. Through these observations this project aims to better understand the hydration and fluid migration occurring in these granitoids as well as the relative and exact timing of subsequent deformation in the area.

Sharing earth observation satellite technology and Indigenous mapping knowledge: recent Canadian Space Agency training activities in Atlantic Canada

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This presentation highlights scope, content and outcome of recent Earth Observation (EO) training and capacity building activities of the Canadian Space Agency (CSA) in Atlantic Canada. Planned for and with Indigenous Peoples, this work was based on guiding principles of Integrity, Reciprocity, Respect and Interaction, involving more than 50 participants on three occasions in 2024 and 2025. Combining presentations, discussions, field trips and ceremonies, we explored aspects of land use, environmental monitoring and issues of coastal and ocean governance through an interdisciplinary approach, with particular attention to Indigenous needs, perspectives and knowledge systems. The value of satellite observations of coastal and marine environments, for example from Canada's RADARSAT Constellation Mission, was recognized as an integral part of the two-eyed-seeing and two-way learning approach. In practical terms, we introduced remote sensing concepts and examples of how optical and radar images can be a resource for participants interested in coastal areas, marine environments, impact of wildfires on land and air quality, mapping flood extent, and monitoring land use and land cover change. Hands-on activities and discussion enhanced the learning experience involving comparisons of detailed air photo series and synoptic satellite imagery. Overall training objectives and expected outcomes included the following: build awareness of the application potential of satellite-based EO; understanding the principles of remote sensing; accessing and applying satellite data; and engaging in respectful dialogue and two-way learning. The presentation includes Indigenous and space-technological perspectives on the-view-from-above with examples and comparisons of traditional geospatial knowledge and space technology. They explore the use of century-old traditional mental maps and recent

satellite imagery for orientation, navigation and spatial awareness building. The presentation also highlights ongoing CSA collaborations and partnerships with Indigenous Peoples and the international Committee on Earth Observation Satellites (CEOS) and its Working Group on Capacity Building and Data Democracy.

^Seeing inside basal Windsor Group microbial reefs: serial-slab-based 3D reconstruction

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In the Glen Morrison area of the southern Sydney Basin, the basal Windsor Group Gays River Formation contains a prolific microbial reef complex up to 30 m thick that extends over >10 km^2. Microbial reefs of similar scale are rare in the Phanerozoic rock record, and their internal architecture and growth mechanisms remain understudied. The exceptional preservation of the Glen Morrison reef complex offers a valuable opportunity to investigate microbial reef growth at the centimetre to decimetre scale, the scale at which reef architecture is constructed. This study presents the development of 3D mesoscale reconstructions using serial-slab-based digital reconstruction techniques. Selected specimens were sectioned with closely spaced cuts using a 24-inch slab saw. Each exposed slice was digitally imaged, processed to distinguish microbial fabrics, cavities, and cement, and imported into the SPIERS (Serial Palaeontological Image Editing and Rendering System) software package for alignment, segmentation, and 3D rendering. Through iterative methods development, the most detailed dataset was created with 26 slices at a spacing of 2.974 mm. While a primary challenge was achieving sufficiently small slice spacing for optimal 3D interpolation in SPIERS, image stacks, blocky 3D models, and downsized slice images enabled meaningful interpretation of microbial growth**.** The data reveal reefs built from irregular, interconnected microbial clots (thrombolites), with discrete growth events locally producing pseudo-layered or stromatolitic textures. Persistent clot growth generated vertically continuous elements with branching, dendritic-like geometries. Coupled with the absence of macroscopic biota, this suggests growth driven by localized sub-cm-scale microbial activity wherever conditions permitted. Persistence over broad areas and long timescales produced reef-scale structures, with early cementation contributing to framework integrity. This suggests a lack of self-sustaining ecological feedbacks characteristic of metazoan (e.g., coral) reefs, which engineer their environment to promote further growth. This indicates that the Glen Morrison reefs represent environmentally constrained, opportunistic accumulations.

Petrogenesis and geochemical evolution of Late Devonian peralkaline A-Type granites in southwestern New Brunswick: insights from the Welsford, Parks Brook, and the Jake Lee alkali granites

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In southwestern New Brunswick, the Early Devonian Welsford (412 ± 1 Ma (formerly 422 ± 1 Ma)), Parks Brook (416 ± 5 Ma), and Jake Lee (418 ± 2.3 Ma) (U-Pb zircon ages) peralkaline granites intrude along a NE-trending paleo-suture zone. They exhibit an A-type affinity with variable degrees of mineralization, and they are composed of quartz (15–20%), alkali feldspar, and plagioclase (40–75%), minor biotite, accessory zircon and apatite, and locally abundant riebeckite (10–20%). The McKeel Lake pegmatite-aplite dike swarm intrude into the Welsford alkali granite and are notable for their Zr-REE-Y-Nb enrichment. The ratio of total alkalis ($Na_2O + K_2O$) to SiO_2, together with major-element compositions (FeOt ≈ 1.5–9.4 wt. %, Al_2O_3 ≈ 10.6–15.0 wt. %, and FeOt/MgO ratio ≈ 3–161) provides insights into parental magma sources, melting depth, tectonic setting, and mineralization potential. Geochemical data, including assessment files and whole-rock analyses, indicate anomalous high field strength elements, and REE enrichment. Rittmann serial ($3.5 < \sigma < 8.8$, and $\sigma \geq 8.8$) and Agpaitic indices (AI >1) indicate that Welsford, Parks Brook, and Jake Lee granites exhibit alkaline features. The A-type within-plate tectonic setting of these intrusions is supported by Y + Nb > 60, Ta + Yb > 6, Zr + Nb + Ce + Y > 450, Zr > 688, Th/U > 5, Th > 20, and Eu/Eu* = 0.26, and Ga/Al > 0.00025. Cerium (> 100 ppm), Nb/Y (~0.2–0.5), Y (~105 ppm), and Nb

(~33.5 ppm) concentrations indicate that the Welsford, Parks Brook, and Jake Lee intrusions formed in intraplate settings via low-degree partial melting of an enriched mantle, followed by fractional crystallization near the fayalite-magnetite-quartz buffer, with possible crustal interaction. The studied samples from these peralkaline granites range from A1-type, formed by highly fractionated mantle-derived melts, to A2-type granites, likely generated by partial melting of crustal material (under higher fO_2 conditions), as indicated by Nb/Y ratios ≤ 0.8.

First intrusion-related Mo-Bi-Te-Au polymetallic system recognized in Chilean Patagonia

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The Trapananda prospect in Rio Soler, in Aysén, Patagonia, Latitude 47°S, Chile, contains quartz-Mo-Bi-Te-Au vein arrays within and near a granite apophysis of the North Patagonian Batholith that intrudes carbonaceous phyllites and schists of pre-Jurassic age. Its mineralogy, comprised of molybdenite, native bismuth, and Bi-Te-S sulphosalts, is unknown in Chile, and not compatible with the original description of the prospect as a porphyry-type Mo deposit. The 143.6 Ma (latest Jurassic) rhenium-osmium date of molybdenite confirms a genetic association with the adjoining batholith. Two-phase fluid inclusions in quartz show no evidence of boiling (phase separation) but are coeval with molybdenite, Bi-Te-S sulphosalt minerals, and trails of Bi-Te-S semi-metal melt inclusions. The fluid inclusions have an average salinity of 13.4 wt. % eq. NaCl and T_h of 210°C and were trapped between ~270 and ~400°C at a minimum pressure of 0.7–2 kbar (min ~2.5–7 km depth). Together with the fluid inclusion systematics, the geochemistry of the igneous rocks, the vein textures, mineralogy and metal association (Mo-Bi-Te-Au) including semi-metal melts (which may have played a role in concentrating Au), and the stable isotope systematics (quartz $\delta^{18}O$ +10 ‰; sulphide-sulphosalt $\delta^{34}S$ –0.1 to –1.0 ‰; host schist $\delta^{13}C$ = –22‰) are most compatible with metasediment-hosted, reduced-intrusion-related Au system (RIRGS). However, some features are not consistent with RIRGS, thus an intrusion-related polymetallic type of mineralization is favoured as a more general classification. The lack of native Au, which is contained in Bi-Te-S sulfosalt minerals as "invisible gold", may explain why the deposit eluded discovery by traditional prospecting (panning) methods in this remote, glaciated region. In Atlantic Canada, despite a different tectonic setting, known intrusion-related Mo-Bi associations are recognized (e.g., Deep Cove and Long Lake, Nova Scotia) where detailed mineralogy and assaying have not been investigated with modern methods, and sulphosalts could hide valuable surprises.

2025-2026 ANNUAL GENERAL MEETING OF THE ATLANTIC GEOSCIENCE SOCIETY

12:30 p.m., Saturday, 7th February, 2026, Inn on Prince, Truro NS

AGENDA

1) Approval of Agenda
2) Approval of minutes of 8th February, 2025, Dartmouth, Nova Scotia
3) Matters Arising from the Minutes
4) Presentation of the Financial Report (P Batson)
5) Appointment of Financial Reviewers for 2026
6) Annual Reports of the 2025 Executive and Committees
    a) Report from the President (C Russell-Dolan)
    b) Report from the Education Committee (T Webb)
    c) Report from the Nova Scotia EdGeo Workshop Group (J Loxton)
    d) Report from the Video Committee (B Grantham)
    e) Report from the Products Committee (R Raeside)
    f) Report from the Awards Committee (K Butler)
    g) Report from the Publications Committee (S Barr)
    h) Report from the *Atlantic Geoscience* editors (S Barr)
    i) Report from the Membership Secretary (A Miller)
    j) Report from the Website and Social Media coordinator (L Dafoe)
    k) Report from CFES representative (S Barr)
    l) Report from Geoheritage Committee (J Loxton)
    m) Report from AGS-Science Atlantic speaker tour coordinator (D van Rooyen)
    n) Report from Travelling Speakers Series (S Watters)
    o) Report from EDI Working Group (L Arnott)
    p) Report from AUGC 2025, St. Francis Xavier University (M Holt)
    q) Report from the Science Atlantic Earth Science Committee (D van Rooyen)
7) Motion to amend bylaws of the Society to remove gender-specific language, remove the term "Executive" as it pertains to the entire Council, including the Geoheritage and IJADE Committees in the list of Standing Committees, where IJADE = Inclusion, Justice, Accessibility, Diversity, Equity. [Proposed revisions are posted separately as a pdf file here or as a Word file here].
8) Motion to approve the Land Recognition Statement (see first page of program)
9) Election of Incoming Executive & Councillors (D van Rooyen)
10) Other Business Arising from Meeting
11) Adjournment

2024-2025 ANNUAL GENERAL MEETING OF THE ATLANTIC GEOSCIENCE SOCIETY

12:30 p.m., Saturday, 8th February, 2025, Delta Hotel, Dartmouth, NS

MINUTES OF MEETING

President Donnelly Archibald called the meeting to order at 12.45 p.m. with approximately 140 members present.

Regrets received: S Barr, K Butler, A Miller.

1) **Approval of Agenda** – D van Rooyen moved, T Webb seconded that the agenda be accepted as distributed. Carried.
2) **Approval of minutes of 3 February, 2024, Moncton, New Brunswick** – D Lentz moved, C Stanley seconded that the minutes be approved as distributed. Carried.
3) **Matters Arising from the Minutes** – no matters arising.
4) **Presentation of the Financial Report 2024** – the financial reports were distributed with the agenda. P Batson moved, H Donohoe seconded, that the Financial Report 2024 be approved. Carried.
5) **Appointment of Financial Reviewers for 2025** – J Gosse (Halifax) and I Spooner (Wolfville) were nominated by D van Rooyen and C White respectively as reviewers for 2025. The reviewers were approved.
6) **Annual Reports of the 2025 Executive and Committees**
    a) **Report from the President** (D Archibald – report circulated with agenda)
    b) **Education Committee** (T Webb – report circulated with agenda)
    c) **Nova Scotia EdGeo Workshop Group** – J Loxton reported that a workshop previously planned for 2024 is now being organized in Cape Breton Island for 2025.
    d) **Video Committee** (B Grantham – report circulated with agenda)
    e) **Products Committee** (R Raeside – report circulated with agenda)
    f) **Awards Committee** (C Russell – report circulated with agenda) Rob Fensome announced the recipient of the Gesner Medal 2025 is Graham Williams. Rob provided a brief summary of Graham's long association with the Society (since its inception) and the medal was presented. Graham responded with thanks and reflections on life with large dogs in Dartmouth.
    g) **Publications Committee** (S Barr – report circulated with agenda)
    h) **Atlantic Geoscience editors** (S Barr – report circulated with agenda)
    i) **Membership Secretary** (A Miller – report circulated with agenda)
    j) **Website and Social Media coordinator** (L Dafoe – report circulated with agenda)
    k) **CFES representative** (S Barr – report circulated with agenda)
    l) **Geoheritage Committee** – J Calder reported that the committee includes himself as chair, T Fedak, and J Loxton, who is assuming the chair in 2025, and spoke on the significance of geoheritage and possible reconsideration of the committee's mandate. The committee's report is appended below.
    m) **AGS-Science Atlantic speaker tour coordinator and Science Atlantic Earth Science Committee** (D van Rooyen – reports circulated with agenda)
    n) **Travelling Speakers Series** (S Watters – report circulated with agenda)
    o) **AUGC 2024, Dalhousie University** (A Jones – report circulated with agenda)
    p) **EDI working group** – J Atkins reported that the group is working on expanding the mandate to include Justice, Equity, Diversity, Inclusion and Accessibility ("JEDIA") and on updating the Society's bylaws. The group is hosting a round table discussion at the 2025 Colloquium.
7) **Election of Incoming Executive and Councillors** (slate circulated with agenda). T Webb reported that a full complement of councillors was provided in the slate. J Atkins nominated from the floor that C Skinner serve on Council. There were no objections to exceeding the stated 22-person maximum in the bylaws for the current year. T Webb moved, G Wach seconded, that the 23 people be approved. Carried.
8) **Adjournment** – D Lentz moved adjournment at 1.45 p.m.

AGS PRESIDENT'S REPORT 2025-2026

AGS has had a very productive year, highlighted by a successful 2026 Colloquium made possible through the dedication of Rob Raeside, Carla Skinner, and their support team. Engagement continues to grow, with 83 papers and 27 posters being presented this year, reflecting the strength of our Atlantic geoscience community. We also look forward to honouring several outstanding members at this year's banquet, with nominations having been made for all three of our AGS awards.

A few highlights for me this year include significant progress made towards inclusion and community-building through the work of the IJADE Committee. This included introducing inclusive language into the bylaws, developing a fantastic new AGS land acknowledgement, and adopting a Code of Conduct for AGS events. As our membership continues to grow and diversify, it is critical that AGS remains a safe and welcoming space for all.

AGS also continues to do an incredible amount of outreach. This year, we engaged with thousands of people and saw significant AGS book sales at events such as the Sussex Balloon Fiesta, the Parrsboro Gem and Mineral Show, EMP, and Mining Week events. The AGS Travelling Speaker Series reached broad public audiences with a talk presented both in person and virtually by Toon Pronk entitled "*Radon in the Rocks: The geology behind lung cancer risk in Atlantic Canada*" hosted in Fredericton and Halifax. The Fredericton session was held in collaboration with UNB and the Quartermain Earth Science Centre, with Toon being interviewed on CBC in advance of the event.

Congratulations are in order for Sandra Barr and the team behind the "*Maritime Geoscience Map App*" for receiving the inaugural Outstanding Education and Outreach Materials Award from the Association of Earth Science Editors. This App has made information from the NB/PEI Journey Through Time Map, the NS Geological Journey Map, and NS Rocks brochure available through Google Maps and has already been accessed nearly 11,000 times!!

Another major milestone this year is that our now open-access journal, *Atlantic Geoscience,* published its largest-ever volume (Volume 61, 2025), featuring over 20 articles across multiple special series for a total of 616 pages, marking a significant achievement for the journal and its contributors. A huge thank you to everyone involved for the time and effort you have invested into this!

Finally, I want to thank each one of you for your support and dedication. It has been an incredible honour to serve as AGS President this year. I have learned so much and am deeply proud to be part of such a strong and vibrant community of passionate individuals who inspire me every single day.

Respectfully submitted, Catrina Russell, January 26, 2026

ATLANTIC GEOSCIENCE SOCIETY EDUCATION COMMITTEE REPORT 2025-2026

The Education Committee has continued to support educational outreach opportunities, and provide resources for groups and individuals in general.

First, we recognize the loss of one of our longstanding committee members this year, Henrietta Mann, whom most of you knew. She was always passionate about teaching and sharing her vast knowledge and experiences with others, and she is dearly missed.

The NS Mineral and Gems brochure was reprinted in the fall of 2025 - 12 000 copies. Other brochure topics are being considered for future publications. After more discussion, it was finally agreed that there would be no cost to consumers for the brochures. While we rely solely on sponsorships and the rare donation (thank you Grant Wach!), we feel strongly that this is a wonderful outreach opportunity to raise awareness about earth sciences, and our resources. We are also looking into adding a single card format highlighting our brochures and videos available online.

NOTE and reminder from last two years: the wide-ranging interests and abilities of our university earth science students could be promoted as their work may tie in easily with educational outreach – perhaps doing their own brochure as part of a course requirement. We would work with professors/instructors to identify criteria and co-develop a guiding rubric if interested. These brochures would be available to the public online, and downloadable for use. If anyone wants to collaborate, please contact us!

LBY2 images – we continue working on providing access in an online format. If you need access to an image, contact Rob Fensome and he can help out, pending permission from AGS and other copyright holders. The Ed. Committee recently

supported the purchase of a new LBY Photo Guild trophy – we benefit as well from the amazing photographs people capture.

Lynn Dafoe regularly updates the AGS website with informative and educational links. If you have resources to contribute with permission to use, please send along to her. Thank you, Lynn!

Oct. 2025 Association of Science Teachers (AST) Conference: Louise Leslie and Aaron Esler (teacher from CEC) provided a workshop attended by teachers from around the province. Thank you both for providing an excellent Educational Outreach opportunity!

Lastly, I'd wish to recognize and acknowledge the "retirement" of two other longstanding members of the AGS Education and Video committees – Martha and Bob Grantham. I've known Bob since he hired me for my first job in geology back in 1979. In the years since, Bob and Martha have been steadfast supporters and contributors on many levels to both the profession, and in sharing their skills, knowledge and abilities in various other committees and organizations. They will be greatly missed, and we wish them both a long and fulfilling retirement ahead!

Tracy Webb, Chair AGS Education Committee
Respectfully submitted January 12, 2026

REPORT OF THE AGS VIDEO COMMITTEE

As Chair, I am pleased to deliver this report of the AGS Video Committee on behalf of the members: Paul Batson, Howard Donohoe**,** Tim Fedak**,** Rob Fensome**,** Martha Grantham**,** Brian Hebert**,** Jason Loxton**,** Catrina Russell, Matt Stimson, and honourary member, Graham Williams.

The year 2024 was a banner year for production and posting of videos to our YouTube Channel. We did not seek funding for, nor post any new videos since February 2025. However, we have a long list of potential themes and locations for new videos.

Number of views on AGS YouTube Channel

Has Climate Change Driven Human History?	225
The Rockhound of York Redoubt	952
Time Travel at Arisaig	12,295
Joggins Fossil Cliffs	63,712
Explore Canada's (newest) Global Geoparks!	348
Recent Ice Age	1,586
The Cliffs of Fundy, and the Dawn of the Jurassic:	
Episode 1 - *The Story in the Rocks*	17,676
Episode 2 - *Minerals and Gems*	4,478
Episode 3 - *Dinosaurs and More*	3,531
Episode 4 - *Oral Tradition and History*	3,665

The Committee is challenged in its work. Videos to date have been very well received and have had glowing comments made about some of them. However, analytics of our YouTube presence shows that our videos are not reaching the wider audience, and viewings are not meeting our anticipated numbers.

Social media evolution has determined we need to look closely at what products will work and will gain the largest viewership. The Committee is looking into the potential of creating video shorts 1 to 3 minutes in length. Some tips and guidelines have been prepared for producing these short videos.

We will be meeting soon to determine future directions, projects and review of the method of work for the Committee. We invite participation from you. the members, and seek your input, especially the non-grey-haired members. You are the ones most familiar with and who use social media. You can contact me at robert@grantham.com. Yes, I want to hear from you - the member sitting there at this AGM thinking to yourself – I have an idea. Send me an email.

Bob Grantham, Chair, AGS Video Committee, January 20, 2026

PRODUCTS COMMITTEE REPORT – 2025

The Products Committee evaluates proposals for grant- or loan-based funding from the Publications, Education and EdGeo committees, and from those outside the AGS, by vetting the proposals and making recommendations to AGS Council regarding the value of such proposals, whether they should be funded, and how much should be awarded for the project proposed. Loans and/or grants are provided that can be used to help advance the goals of the society, namely the communication of ideas and information about the Earth and earth science to both the professional geoscience community and the general public in Atlantic Canada and beyond.

Funding provided in 2025 totalled nearly $740, comprising:

- $925 contribution to X-Earth Outreach summer camp at St. F.X.
- $800 toward the Canadian Geothermal Student Days, UNB
- $1200 toward the AUGC at St. F.X University
- $4467.50 to Quartermain Earth Science Centre to construct a travelling display on Ediacaran fossils

John Calder, Rob Raeside, Jim Walker AGS Products Committee

REPORT OF THE AGS AWARDS COMMITTEE

There were eleven members of the AGS Awards Committee for 2025–26, including a Chair and ten voting members. The Chair divided the voting members into two sub-committees of five:

- one for the AGS Distinguished Service Award (Laing Ferguson Award) and the AGS Nelly Koziel Award
- a second for the AGS Distinguished Scientist Award (Gesner Medal).

Nominations were solicited by the Chair in an email sent to AGS members on Nov. 23, 2025, with a deadline of Jan. 9, 2026. A reminder was sent on Jan. 2. An open call for judges (i.e. voting members of the committee) was circulated to AGS members on Jan. 9 which yielded a good response, and the majority of our judges. Judges were screened for potential conflicts of interest and asked to confirm they if could impartially adjudicate the nominations. The nominators and seconders were vetted for up-to-date membership in the AGS as required by the rules for submission of a candidate. We had excellent candidates nominated for the awards, with one carried over from last year. We evaluated:

- Two nominations for the AGS Distinguished Scientist Award (Gesner Medal)
- One nomination for the AGS Distinguished Service Award (Laing Ferguson Award)
- One nomination for the AGS Nelly Koziel Award.

The two sub-committees reviewed all the nominations and made their selections in January. The successful recipients of the awards will be announced at the evening banquet during the AGS Colloquium.

Respectfully submitted,
Karl Butler, Vice President,
Chair of the 2026 AGS Awards Committee

2025-26 AGS PUBLICATIONS COMMITTEE REPORT TO AGM

AGS was awarded the inaugural Outstanding Education and Outreach Materials Award by the Association of Earth Science Editors for the "Maritimes Map App". Congratulations to the "map app" team that built the application in Google Earth: Catrina Russell, Gwen Walker, James Morris, Rob Raeside, and Sandra Barr. The award announcement noted "This award is in recognition that this publication is an outstanding example of outreach materials to the general public and promotion of the field of Earth Sciences." We did not request funds to send a representative to the awards banquet in Bloomington, Indiana, but AESE did send a very attractive framed certificate, a scan of which you can view on the AGS website.

The AGS brochures continue to be popular. The NS Minerals brochure and Green Cove brochure were reprinted in 2025 (the latter funded by a donation from Atlantic Geoscience accounts), and the NS Pebbles brochure also needs reprinting. And new ideas for brochures have been proposed. Hence it was recognized that the increasing demand for brochures combined with increased printing costs has made their reprinting unsustainable. The Education Committee has been tasked with designing a rack card for the high-volume outlets instead of actual brochures. The card will be the same size

as the brochures to fit the distribution racks at the Visitor Information Centres but will contain only a listing of the items and a QR code taking visitors to the online versions.

Responsibility for sales of AGS publications continues to be focused in the Department of Earth and Environmental Science at Acadia University managed by the departmental Administrative Assistant. Tanya Kennie, under supervision of AGS Secretary Rob Raeside. Some materials are also maintained in the Department of Department of Energy and Resource Development in Fredericton and at Cape Breton University.

An online store was set up at https://atlantic-geoscience-society.square.site/, linked from the Society's website. All materials distributed and all categories of membership can be purchased there. With the establishment of the *Square* site store, the PayPal arrangement was phased out.

In addition to those sold and distributed from Acadia or online, AGS publications were sold at several events in 2025, including the AGS conference in February, the Parrsboro rock and mineral show in August, the Sussex balloon festival in September, and the Energy, Mines, and Petroleum conference in Fredericton in October. Rob Raeside reported that combined cash sales totaled $2741.80, sales using *Square* were $2305.86, and royalty payments from various sources were $4302.07.

Publications Committee members: Sandra Barr, Rob Fensome, Robert Grantham, Rob Raeside, Erin Smith, Kay Thorne, Chris White, Graham Williams, Reg Wilson.

Submitted by Sandra Barr (Publications Committee Chair)
January 20, 2026

2025-26 *ATLANTIC GEOSCIENCE* EDITORS' ANNUAL REPORT TO AGS AGM

Volume 61 (2025) of *Atlantic Geoscience* was finished in December. It includes four regular papers, one paper for the on-going CAPE special series, thirteen for the on-going Sandra Barr special series, and two for the on-going Net Zero special series. It also contains a Note, an Erratum, a Discussion-Reply, the usual three sets of abstracts, and the acknowledgement of reviewers, for a total of 616 pages, the largest volume that the journal has ever published. The Table of Contents is appended for information. Thank you to everyone involved.

Volume 61 is fully open access on the website maintained by the Centre for Digital Scholarship @ UNB Libraries (http://journals.hil.unb.ca/index.php/AG), as well as through Érudit at https://www.erudit.org/en/journals/ageosci. Érudit is a Quebec-based journal consortium of which we have been a member for many years. Érudit helps to publicize the journal internationally and also gave us a grant to assist with open access. They believe that academic publishing should not be in the control of "for-profit" or "pay-to-publish" publishers, who manipulate researchers with pseudo-quality criteria such as "citation indices". Many journals are moving to an open access publication model, but few are in the position of "Atlantic Geoscience" in being able to do so without requiring publication fees of authors and their host institutions. "Atlantic Geoscience" still gratefully accepts donations to help sustain the journal over the longer term, so thank you to those authors and AGS members for whom that is possible without negative impact on their research funding or personal budgets. In addition to open access, "Atlantic Geoscience" also adopted the Creative Commons License CC BY 4.0. This license allows re-users to distribute, remix, adapt, and build upon the material in any medium or format, even for commercial purposes, provided that due credit is given to the creators. By publishing in the journal, authors agree to this license.

Journal Manager Chris White prepared the annual financial report which is included in the AGS Treasurer's Report. The financial situation for the journal continues to be stable, with a substantial equity. Total assets as of December 31st, 2025, are **$253,457.57** (compared to $226,669.30 at the end of 2024). In spite of the large number of pages, the cost of production of v. 61 (about $13,500) is similar to the income ($14,000) from GIC interest, donations, and the open access support grant from Érudit. Hence the journal management felt able to again subsidize student banquet costs at the colloquium and pay for reprinting of the Green Cove brochure.

Our long-time (20 years!) contact person at the Centre for Digital Scholarship @ UNB Libraries, James Kerr, retired in 2025. He was replaced by Tammy Nichol and the Centre has rebranded as CDS Publishing Services. They continue to assist with managing the journal website as well as maintaining the journal data repository for supplementary data files at UNB Dataverse.

We are grateful to Chris White for his exceptional work as Production and Financial Manager. We also thank the associate editors and other reviewers of manuscripts for their help, without which we would not have a high-quality journal. Reviewers' names are acknowledged annually on the website unless anonymity is requested. Our layout staff (Leann Grosvold and Eugene MacDonald) continue to do excellent work for the journal at reasonable cost. And, of course, we thank the authors who submit manuscripts to the journal for publication – we would not exist without you!

Submitted by: Sandra Barr, Rob Fensome, and David West
Co-editors, Atlantic Geoscience
January 20th, 2025

Atlantic Geoscience
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Regular Articles

159–193 Glaciogenic and volcanic rocks, evaporites and coal in the Maritimes Basin of eastern Canada and variable low-latitude climate during the Late Paleozoic Ice Age
Peter S. Giles

343–454 A tale of two ponds, Newfoundland, Canada
Alison M. Leitch, Jianguang Chen, and Harunur Rashid

393–419 Intrusion-related (ca. 422 Ma), monzogranite-hosted Au-Ag-Sb mineralization at the Yellow Fox zone, eastern Mount Peyton Intrusive Suite, north-central Newfoundland, Canada
Hamish A. I. Sandeman, Ian W. Honsberger, Cody Spurrell, Cameron Peddle, Gregory Dunning, and Alfredo Camacho

487–512 The Missisauga to Logan Canyon formation transition: Early Cretaceous dinoflagellate cyst bioevents from Panuke B-90 well, Scotian Margin (offshore Atlantic Canada)
Vânia Correia, Robert A. Fensome, Lynn T. Dafoe, R. Andrew MacRae, and Graham L. Williams

Special Series: Circum-Arctic palynological event stratigraphy – continued from v. 60

421–486 Cretaceous palynoevents in the circum-Arctic region.
Graham L. Williams, Jonathan P. Bujak, Manuel Bringué, Robert A. Fensome, Jennifer M. Galloway, Henrik Nøhr-Hansen, and Ronald Blakey

Special Series: In recognition of the geological career of Sandra M. Barr – continued from v. 60

001–014 Ordovician magmatism in the Antigonish Highlands, Nova Scotia, Canada: a tectonic model. *J. Brendan Murphy, Donnelly B. Archibald, R. Damian Nance, and John W.F. Waldron*

015–075 Tectonic timing of emplacement of the South Mountain Batholith, southwestern Nova Scotia, Canada
D. Barrie Clarke, Michael A. MacDonald, and Colin B. McKenzie

077–095 Timing and tectonic setting of Ordovician volcanic rocks of the Miramichi terrane in eastern Maine, USA, and southwestern New Brunswick, Canada
Allan Ludman, Amber Whittaker, Paul O'Sullivan, and Christopher McFarlane

097–110 The Big Dig: geological and other outcomes of the 2008–2009 Freshwater Brook sewer replacement project, Halifax, Nova Scotia, Canada
Rebecca A. Jamieson

207–223 Microbial components and metamorphic grade of Miaolingian (Cambrian) black shales from the Burin Peninsula, Newfoundland, Canada
Blanca Martínez-Benítez, Andrea J. Mills, and Javier Álvaro

225–251 New dimensions of Ediacaran Magmatism in the southeastern New England Avalon zone, USA
Margaret D. Thompson, James L. Crowley, and Jahandar Ramezani

253–280 The Eastern Shore spessartite dykes, Nova Scotia, Canada: a glimpse into the subcontinental lithospheric mantle under the Meguma terrane
Shae J. Nickerson, Chris E. White, Sandra M. Barr, and Donnelly B. Archibald

281–304 U-Pb, Lu-Hf and trace element zircon data from plutonic rocks of the New England Avalon terrane, USA
Yvette D. Kuiper, Daniel P. Murray, and James L. Crowley

305–321 Not the Neo-Acadian orogeny: distinguishing Quaboagian deformation in New England from events in Atlantic Canada
John W.F. Waldron, Sandra M. Barr, Chris E. White, and Deanne van Rooyen

527–543 The Dry River Diorite: insights into mantle contributions to the younger White Mountain Magma Series, New Hampshire, USA
Michael J. Dorais, Sean T. Kinney, Francisco E. Apen, and Elizabeth M. Niespolo

545–556 An Ordovician lamprophyre dyke at Machias Seal Island, New Brunswick, Canada
J. Gregory McHone, Sandra M. Barr, and Willis E. Hames

557–576 The Eight Mile Brook Plutonic Suite, Cobequid Highlands, Nova Scotia, Canada: Ordovician alkalic magmatism in Avalonia
Chris E. White, Sandra M. Barr, and Donnelly B. Archibald
577–615 Zircon U–Pb evidence for the extent of the Meguma terrane and late Ediacaran magmatism in offshore Nova Scotia, Canada
Remi Germain, Yvette D. Kuiper, Shawna E. White, and James L. Crowley

Special Series: Geoscience in support of net zero in Atlantic Canada (and beyond) – continued from v. 60
355–374. Multiple forcing mechanisms determine geomorphology of Northumberland Strait, Canada
John Shaw, Carl L. Amos, and Brian Petrie
375–391. Foundations of geological carbon storage modelling and the Atlantic Canada context
Carla Skinner

Note
323–330. Revisions to geological unit names in New Brunswick, Canada, to address culturally offensive or inappropriate nomenclature
Dustin R.L. Dahn, Erin A. Smith, and Philippe Pagé

Erratum
525. Intrusion-related (ca. 422 Ma), monzogranite-hosted Au-Ag-Sb mineralization at the Yellow Fox zone, eastern Mount Peyton Intrusive Suite, north-central Newfoundland, Canada
Hamish A. I. Sandeman, Ian W. Honsberger, Cody Spurrell, Cameron Peddle, Gregory Dunning, and Alfredo Camacho

Discussion and Reply
331–336. Discussion of "Timing and tectonic setting of Ordovician volcanic rocks of the Miramichi terrane in eastern Maine and southwestern New Brunswick" by Allan Ludman, Amber Whittaker, Paul O'Sullivan, and Christopher McFarlane
Cees van Staal and Leslie Fyffe
337–341. Reply to "Discussion of Timing and tectonic setting of Ordovician volcanic rocks of the Miramichi terrane in eastern Maine and southwestern New Brunswick" by Cees van Staal and Leslie Fyffe
Allan Ludman, Amber Whittaker, Paul O'Sullivan, and Christopher McFarlane

Abstracts
111–158. Atlantic Geoscience Society Abstracts: 51st Annual Colloquium and General Meeting, February 7 and 8, 2025
195–205. Geological Association of Canada - Newfoundland and Labrador Section Abstracts: 2025 Technical Meeting, February 27 and 28
513–523. Atlantic Universities Geoscience Conference Abstracts: 76th Annual Conference, October 30 – November 2, 2025

616 List of Reviewers for Volume 61

Complete archives of Atlantic Geology are available online at: http://journals.hil.unb.ca/index.php/ag

AGS MEMBERSHIP REPORT

At year end, AGS had 294 members,185 professionals, 2 Lifetime (LT), 8 Permanent (P), and 99 students. At year beginning (2025) we had 11 members, 2 LT, 4 P, and 5 carry forwards (CFs). I have been working with members to reduce annual double payments (dues and conference registration), and cut down on the number of CFs. Now CFs are members who have pre-paid multiple years ahead by Square or by cheque. Some members have also opted for Permanent membership.

Of the professionals, 54 are academics (including teachers), 57 are government employees (including government and professional organizations) and 35 are employed in industry, and 49 are retired (including the LT and P). The academics are at 16 universities (1 high school), including 2 international. The students are from 12 universities (1 international) and 1 high school. 234 joined via the conference (some members who attend the conference are already on P or carry forward lists), 4 joined via P membership, 43 joined online (with a Square payment) and 2 mailed in cheques; plus the 11 CFs.

Ann Miller, Membership Secretary

ATLANTIC GEOSCIENCE SOCIETY WEBSITE AND SOCIAL MEDIA REPORT 2025

The Atlantic Geoscience Society website remains an important source of information for AGS activities and events, as well as a repository for historical information, awards and recognition of the Society. Members are encouraged to visit the website regularly to view highlighted posts on the main page, including upcoming events, news, and resources (https://atlanticgeosciencesociety.ca/). The website also links to the AGS Square Site (https://atlantic-geoscience-society.square.site/) that continues to support online purchases of publications, membership and to order copies of brochures, as well as the popular Maritime Geoscience Map App (https://sites.google.com/view/maritime-geoscience/home). In addition to Fourwaves, we also continue to updates details regarding the AGS Colloquium on the website, as well as positing of images of the event and award winners.

AGS continues to maintain a presence on social media platforms, particularly on Facebook. Be sure to follow AtlanticGeo on Facebook and join the over 1500 current followers. Our followers are typically 25-44 years of age, with significant numbers in the 45+ range as well. Most followers are Canadians, particularly from Halifax, Dartmouth, Fredericton, Saint John, St. John's and Moncton, with significant numbers of followers from India and the US. The AGS X account (Twitter) has a few hundred followers and is typically used for major events and news. We are always looking for students and members interested in helping with social media platforms to engage a broader audience in the geosciences. The AGS YouTube channel is also linked to the webpage and currently hosts eleven videos, developed by the Video Committee, from the Travelling Speaker Series, as well as others, with hundreds to tens of thousands of views per video, illustrating that it is a solid platform for broadly sharing AGS content and linking back to our website.

The website domain remains valid until July 2030, so there is no action needed there for some time. The website also hosts the subdomains for Halifax 2022, and now the IGCP Project 683. The AGS website had, on average, 300-2000 daily visits each month in 2025, likely including 'bot' visits. Top downloads include: the Nova Scotia Pebbles brochure, the Nova Scotia Minerals and Gems brochure, the Colloquium Program, and past field guides. The main page, "Colloquium", "About", and "Publications" pages are the most visited pages. Most website traffic uses a direct link (i.e., a bookmark), but Google and Bing hits provide the most external links to the website. Website traffic is varied, but is primarily from Canada and the United States, as well as small portions of hits from over 140 other countries.

Please continue to send any content, corrections, or updates for the website to Lynn Dafoe (lynn.dafoe@nrcan-rncan.gc.ca) and content for Facebook to Catrina Russell (Catrina Russell (catrina.russell@unb.ca), or through AGS Executive.

Lynn Dafoe, Rob Raeside, and Catrina Russell

2026 REPORT FROM CANADIAN FEDERATION OF EARTH SCIENCES (CFES) REPRESENTATIVE

CFES is an umbrella organization that represents most Earth Science societies and associations across Canada, including the Atlantic Geoscience Society, and hence represents all of us. CFES aims to provide a coordinated voice nationally and internationally for Canada's Earth Science community to try to ensure that decision makers and the public understand the contributions of Earth Science to Canadian society and economy. Each member organization has a representative on the CFES Council, which annually elects a Board of Directors to manage the day-to-day activities of CFES. Part of the role of the AGS representative is to keep the AGS Executive, Council, and members informed of CFES activities, and also to take any input from AGS back to CFES. The CFES fiscal year runs from April 1 to March 31st, and they normally hold their annual meeting in April or May each year, at which the Board and Officers are elected and the budget approved for the coming year. You can find out more about CFES and their activities on their website (https://www.cfes-fcst.ca/)

The 26th annual general meeting of CFES was held May 23rd-24th at the Canadian Museum of Nature in Ottawa. I attended the entirety of the meeting online via GoToMeeting. The meeting included the annual business and election of the new executive and Board of Directors, which includes President Russell Pysklywec (a geophysicist at the University of Toronto), Past-President Imad Alainachi, and President-Elect Nadia Haider (Vice President, Regulatory Strategy, Innovation & Environment at Conuma Resources). [Note that the presidency of CFES is intended to rotate among government, industry, and academia.] AGS member Lilian Navarro continues in the role of Secretary, and Mitch Maracle (coastal geologist with the NS Department of Natural Resources and Renewables) was elected for the three-year term of Financial Director. Continuing directors are Katherine Boggs (International), Joanna Hodge (Outreach), Fiona D'Arcy (Communications), and Tom Sneddon (External Engagement).

The winner of the CFES Mentorship Medal for 2025 was Jeanne Paquette who since 2008 touched the lives of hundreds of students as the guiding hand managing the undergraduate programs at the Department of Earth & Planetary Sciences at McGill University.

A second meeting of CFES council was held entirely online on December 2 to provide an update to member organizations. The meeting was well attended by representatives of member organizations, including me as the AGS representative. Updates were provided on: (1) the Canada Prize (still hoping to make the first award in 2028 at IGC); (2) the Geoscientists in Residence Program in national parks (very successful in one park in 2025; trying to expand the program to include a second park in 2026); (3) IGC2028 (planning is moving forward under direction of a National Organizing Committee – see www.igc2028Canada.org); (4) the Careers website is now available in English and French https://careers.earthsciencescanada.com/ and https://careers.earthsciencescanada.com/fr/; (5) CFES President-Elect and Communications Director and the 2026 Mentorship medal. CFES is writing a letter of support for a group led by Ricardo da Silva to reinstate Canada's membership in the International Continental Scientific Drilling Program. CFES was asked by the IUGS Commission on Geoethics to provide input and approve a draft document with recommendations on Artificial Intelligence Ethics for the geoscience community. Geoscientists Canada has apparently produced a similar document.

Submitted by Sandra Barr, AGS Representative to CFES (January 20, 2026)

GEOHERITAGE COMMITTEE REPORT FOR AGM 2025-2026

The Geoheritage Committee met infrequently over the past year, but regularly communicated individual updates via group emails. We have agreed to meet bimonthly in the coming year.

General discussion focused on the need to expand membership and for clarification of the committee's mandate. For example, whether it should assume an advocacy/leadership role in regards to geoheritage designations and/or threats to geoheritage.

Members were involved in a large number of geoheritage-related projects and/or brought items to the committee's attention. Highlights include:

- Geodiversity Day celebrations at were held at the Cliffs of Fundy Geopark and an article overview was published online
- A summer geoheritage workshop series was organized by Tim Fedak, which brought together stakeholders to discuss opportunities to protect and promote geoheritage
- Work on a geoheritage-themed board game has commenced
- Several Atlantic Canadian sites were included in the IUGS 200 list (Joggins, Old Wife/Cliffs of Fundy, Mistaken Point, Gros Morne), and Old Wife was cited in an e-pub on Geoconservation in Geoparks
- Fossil discoveries continue to accumulate in PEI, and with it public interest in the island's geology
- The Cliffs of Fundy and Discovery geoparks were successfully revalidated; Stonehammer is currently in the revalidation process, and Matt Stimson is providing information on scientific research that was conducted by the NBM in the Geopark
- Discussion occurred with stakeholders (tourism officials, provincial and federal representatives) on creating a geotourism strategy for Cape Breton, which would leverage the island's geoheritage; discussion also occurred with tourism officials about creating a NS Fossil Trail program to better promote the province's paleontological heritage
- Jason Loxton trialed a 3rd year Geoheritage seminar course at CBU); independently, Dr. Tim Fedak created a syllabus that could be used for similar future courses. Both are available to interested parties.

Jason Loxton, Chair AGS Geoheritage Commitee

AGS TRAVELLING SPEAKER SERIES COMMITTEE REPORT FOR 2025

The AGS Travelling Speaker Series Committee (Catrina Russell-Dolan, Lynn Dafoe and Sheila Watters) reports herein on the 2025 activities of the AGS Travelling Speaker Series. The Series, as presently conceived, provides an annual, free talk

designed for presentation to the general public. Topics have been wide-ranging in showing the relevance of geoscience to people's lives. The Series is now being delivered annually at one or two in-person venues (Ideally rotating among the Atlantic Provinces) and livestreamed via Zoom. Edited versions of some of the recorded talks are posted to the AGS website for later public viewing.

Toon Pronk, retired APEGNB member and popular geoscience speaker, delivered the 2025 AGS Travelling Speaker Series presentation this fall, entitled "**RADON IN THE ROCKS – The geology behind lung cancer risk in Atlantic Canada**". He gave two in-person public talks, one in Fredericton and one in Halifax. The Fredericton venue was Toole Hall auditorium on the UNB campus where Toon's presentation on October 16 was given as part of a combined geoscience event (Earth Science Café) with the UNB Quartermain Geoscience Centre. The Fredericton talk was simultaneously presented by Zoom to a live online audience, and recorded. Prior to the Fredericton event Toon was interviewed on the subject by Saint John CBC Radio One. The Halifax talk was delivered at the Rosaria building at Mount Saint Vincent on November 5th. A total of about 70 people attended the two events in person or virtually and Toon's talk was well received with a good number of questions and discussion, especially at the well-attended Fredericton venue. A number of free, home test kits for radon were given out at each talk thanks to contributions from APEGNB, the NB Research and Productivity Council, and Lung NS/PEI.

Expenses totaling about $945, were mainly travel expenses for the Halifax talk but also includes costs for a speaker gift and for the presentation-room rental at Mount Saint Vincent. Costs are well under the pre-approved annual TSS budget of $2210 set by council in February 2014.

Lynn Dafoe is heartily thanked for her considerable contributions on the TSS committee over the past years, as she steps down due to time constraints.

Input, feedback, and ideas for Travelling Speaker Series talks are welcomed by the committee!

Sheila Watters – Jan 21, 2026

IJADE COMMITTEE REPORT, 2026

The IJADE Committee continues to work hard at making the AGS a safe place for all members to grow and flourish. This year, we were able to accomplish the following meaningful changes:

- We are holding our second annual workshop at the AGS Colloquium, meant to build community within AGS in 2025, we hosted round table discussions on current issues facing geoscientists as a special session. This year, we are hosting a crafternoon session as a pre-conference community-building workshop
- Introduced formal terms and conditions for the IJADE Committee
- Introduced gender neutral language to the AGS by laws and appendices
- Introduced a land acknowledgement and moved that a land acknowledgement be voiced at the beginning of each meeting
- Worked with members to introduce a formal code of conduct that members of the AGS must adhere to when they attend the colloquium
- Working towards clearer terms of references for the annual AGS awards in hopes of creating a larger and more diverse pool of nominees

Over the next year, we hope to be able to introduce to the council and membership new terms of references for the AGS awards as well as continue the equity work and community building efforts we have been doing behind the scenes all year. Please keep an eye on your emails as we will be in touch soon after the colloquium with a survey to help us learn how we can better serve you!

Submitted January 2026 by the IJADE Committee
(Lexie Arnott, Jade Atkins, Carla Skinner & Mo Snyder)

AGS COUNCIL 2026 NOMINATIONS

Executive President – Karl Butler
Past President – Catrina Russell
Vice-President - Tim Fedak
Secretary – Rob Raeside
Treasurer – Paul Batson

Councillors *Returning* Ann Miller
Mo Snyder
Ricardo Silva
Alexis Imperial
Lexie Arnott
Jade Atkins
Dustin Dahn
Jim Walker
Sheila Watters
Simone Booker
Grant Wach
Jason Loxton
Carla Skinner

New Ann Timmermans
Ted Matheson

Departing Michaela Holt and Laura Riendeau (StFX AUGC 2025 Chairs)
Donnelly Archibald
Denise Brushett
Dylan McKeen
Chris White

Graduate Student Rep Kiersty Malay

Undergraduate student rep (UNB AUGC 2026 Chairs) Julianna Piques-Viana
Alita Herrington

Submitted by Donnelly Archibald
January 26, 2026