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THE
UNIVERSITY OF
BRITISH
COLUMBIA

RESEARCH INTERESTS

My current research interests are centered around the use of radiogenic and stable isotopes in Hawaiian lavas to explore, define, and characterize the mantle sources and processes that contribute to changing the long-term chemical composition of the Hawaiian mantle plume. This research has fundamental implications for deep mantle chemistry and has shown that the distribution of heterogeneities in the Hawaiian source is incredibly dynamic. Moving forward, I am interested in applying these concepts and geochemical tools to other fields in isotope geochemistry, volcanology, and planetary sciences.

LANGUAGES

English (Fluent Oral and Written)
French (Fluent Oral and Written)

EDUCATION

University of British Columbia, Ph.D. Candidate in Geological Sciences **2015-present**

Supervisors: Dr. Dominique Weis and Dr. James Scoates

Title: Geochemistry of Kaua'i shield basalt: Exploring the emergence of the Hawaiian trends and the chemical evolution of the Hawaiian mantle plume

Carleton University, M.Sc. Earth Sciences with distinction **2010-2013**

Supervisors: Dr. Brian Cousens and Dr. Alexandre Zagorevski

Title: Physical Volcanology and Geochemistry of the Neoproterozoic Natkusiak Formation Flood Basalts of the Franklin Magmatic Event, Victoria Island, NWT, Canada

University of Ottawa, B.Sc. Honours Geology **2006-2010**

Supervisor: Dr. Mark Hannington

Title: Occurrence and Genesis of Hydrothermal Barite along the Endeavour Segment, Juan de Fuca Ridge

AWARDS

UBC Egil H. Lorntzen Scholarship (\$15 000) **2019 to 2020**

UBC Thomas and Marguerite MacKay Memorial Scholarship (\$12 625) **2018 to 2019**

UBC Graduate Scholarship W.H. Matthews Award (\$10 000) **2017 to 2018**

Multidisciplinary Applied Geochemistry Network Research Award (\$4 372) **2016**

Multidisciplinary Applied Geochemistry Network Program (NSERC CREATE, \$10 000/year) **2015 to 2018**

UBC graduate tuition award (\$7 450/year for 4 years) **2015 to 2019**

Carleton University Graduate Scholarship (\$900) **2012**

Carleton University Graduate Scholarship (\$900) **2011**

Geological Survey of Canada Research Affiliate Program Bursary (\$17 500/year) **2010 to 2013**

Awarded participation in Canadian Society of Petroleum Geologists Student-Industry **2010**

Field Trip (SIFT)

3rd place award for best undergraduate poster, Advances in Earth Science Research Conference **2010**

Dr. Donald Hogarth Bursary (\$1 500) **2009**

University of Ottawa Entrance Scholarship (\$2 500) **2006**

EMPLOYMENT/RESEARCH HISTORY

Pacific Centre for Isotopic and Geochemical Research, Digital Outreach **May 2019 - Present**

Manage and update social media accounts (Twitter, LinkedIn), website, and digital outreach TV.

- Argon Geochronology Laboratory, Oregon State University**, Visiting Researcher **July 2018**
Whole-rock Ar-Ar analyses on tholeiitic basalts from Kaua'i, Hawai'i.
- Lorax Environmental Inc.**, Intern **June - Sept. 2018**
Effects of climate change on mine waste geochemistry (literature review, summary report, and presentation).
- MAGIC laboratory facility, Imperial College London**, Visiting Researcher **December 2017**
Chemical and analytical methods for purifying and analyzing stable thallium isotopes. Method subsequently adapted to Hawaiian basalts, set up, and implemented at the PCIGR lab, UBC.
- Electron Microprobe Facility, University of Hawai'i at Mānoa**, Visiting Researcher **February 2017**
Olivine compositions on tholeiitic basalts from Kaua'i, Hawai'i.
- Borealis GeoPower Inc.**, Intern **Aug. 2015 - Apr. 2016**
Geothermal exploration, resource development, and building business models.
- Golder Associates Ltd.**, Junior Consultant (Mining Geochemistry Division) **June 2013 - Dec. 2014**
Mine waste geochemical characterization programs, environmental geochemistry, aqueous geochemistry, toxicity test data. Knowledge gained on provincial, national, and international water, sediment, and waste quality guidelines.
- Aurora Geosciences, Yellowknife**, Junior Geologist **August 2011**
Various tasks related to staking claims and field work planning.
- Geological Survey of Canada GEM Victoria Island Project**, Field Assistant **Summer 2010 & 2011**
Remote field work: traverse mapping and geochemical sampling in Neoproterozoic sedimentary and igneous rocks, experience with helicopters, and experience with wildlife (muskox, wolves, and bears).
- Department of Earth Science, University of Ottawa**, Research Assistant **Summer 2009**
Research assistant to Dr. Mark Hannington: petrography and laboratory work in a marine geology laboratory.
- Cosmogenic Nuclide Exposure Dating Facility, Dalhousie University** **Summer 2007**
Laboratory Technician: Technician for Dr. John Gosse: Handling of large volumes of potent acids (HF, HCL, HNO₃), and physical and chemical sample preparation for cosmogenic nuclide geochronology. Now the "Dalhousie Geochronology Centre".

TEACHING EXPERIENCE

Field-based instruction

2018: Created and facilitated a field-based activity on geothermal energy resources of Hawai'i, USA, as part of a MAGNET workshop. Activity took place on the East Rift Zone of Kilauea volcano, Hawai'i.

2016: Created and facilitated a field-based activity on the volcanology of Yellowstone, Montana, USA, as part of a MAGNET workshop. Activity took place in various locations in Yellowstone National Park.

Course-based instruction

Mantle geodynamics and radiogenic isotopes (2020): Guest lecturer, 'Isotope Geology' (UBC).

Hawaiian volcanism and geochemistry (2019): Guest lecturer, 'Igneous Petrology' (UBC).

Trace element geochemistry (2018): Guest lecturer, 'Elemental and Isotopic Geochemistry' (UBC).

Courses/lectures created

Geochemistry course for the University of Central Asia (2018): UBC is collaborating with UCA to create an Earth and Environmental Sciences undergraduate degree program. As part of this initiative, I facilitated the development of a senior geochemistry course.

Reflected light microscopy laboratory (2012): Created a laboratory on reflected light microscopy for an undergraduate mineral deposits course.

Courses taken

Earth, Ocean and Atmospheric Sciences TA training course (UBC, 2020): A new, comprehensive training course for teaching assistants offered by the EOAS department at UBC. Among others, this 10-module course includes topics on facilitated learning, equity and inclusion, methods for approaching classroom challenges, and teaching in a virtual environment.

Teaching and Learning in Earth, Ocean and Atmospheric Sciences (UBC, 2015): Course designed as a semester version of the UBC Centre for Teaching, Learning and Technology Instructional Skills Workshop (ISW). This course aimed to develop and enhance instructional skills and emphasized participatory-based learning methods.

Teaching assistantships

University of British Columbia (2015 to present): Isotope Geology, Head TA (EOSC 523); Elemental and Isotopic Geochemistry, Head TA (EOSC 333); Introductory Mineralogy, Head TA (EOSC 220); Introductory Petrology (EOSC 221)

Carleton University (2010 to 2012): Introductory Geology (ERTH 1006); Igneous Systems, Geochemistry and Processes (ERTH 2104); Hydrogeology (ERTH 3205); Mineral Deposits (ERTH 3204)

ADVISING/MENTORING

Co-advising

B.Sc. thesis (2017-2018): "High-precision geochemistry of the Wai'anae Volcano, O'ahu, Hawai'i" by Holly Pelletier

B.Sc. directed study (2017): "Tracing contributions to Cascade Arc magmatism using thallium isotopes" by Rhys O'Connor

Mentored and co-advised the above students in their sample preparation, analytical chemistry, data collection, data synthesis, written dissertations, and posters for presentation. Data from both projects are published or being published in scientific journals.

Mentorship

2017 (5 weeks): Guided two high school students as they completed a geology-themed research activity. The activity involved physical preparation, mounting, XRD analysis, and data analysis of a paleosol to determine major minerals present.

FIELD EXPERIENCE

Hawaii (2018): One-week field workshop on Hawaiian igneous geochemistry, volcanology, geothermal resources, soil chemistry, archaeology, and groundwater chemistry (1 week)

Ontario, Canada (2017): Two-day field workshop in surficial water sampling and lake sediment coring (gravity and freeze cores)

Montana and Wyoming, US (2016): Two-week field workshop on Stillwater Complex and Yellowstone

Kauai, Hawaii (2015): Three-week sampling by traverse for igneous geochemistry

Ontario, Canada (2013 & 2014): Archaeological surveys, well monitoring programs (water sampling, packer testing, pumping tests), geophysical surveys (vertical seismic profile and multichannel analysis of surface waves)

Canadian Arctic (2010 & 2011): Seven weeks of mapping and sampling by traverse on Victoria Island

Nevada and California, US (2011): Three-week field school on modern volcanism and tectonics

Iceland (2009): Three-week field course on Icelandic volcanism ("advanced igneous petrogenesis")

Ontario, Canada (2008): Three-week field course in the Abitibi Greenstone belt

Québec, Canada (2007): Three-week field course on the geology of eastern Québec

TECHNICAL SKILLS

Analytical method setup: Stable thallium isotope geochemistry and analyses

Instrumentation: Experience using a D8 Advance XRD, Element2 High Resolution ICP-MS, Nu Instruments MC-ICP-MS, TritonTIMS, NuTIMS, JEOL Hyperprobe, reflected and transmitted light optical microscopy

Physical sample preparation: hydraulic crusher, jaw crusher, disk mill, wilfley table, heavy liquid separation

Wet chemistry: Acid leaching and digestion (HCl, HNO₃, HF), ion exchange chromatography (Pb, Sr, Hf, Nd, Tl), fusion digestion

Field work: Mapping (planning/completing traverses, ArcMap, ArcGIS) and sampling of volcanic and sedimentary rocks

Computer programs: Microsoft office suite, Adobe Illustrator and Photoshop, IgPet, Excel (including managing large databases), PHREEQ-C

Other: Geotechnical core logging, technical report writing

ACADEMIC/UNIVERSITY SERVICE

Article reviews

Nature Reviews Earth & Environment

2020

University service

Grader/examiner for B.Sc. Honours theses, Department of Earth, Ocean and Atmospheric Sciences, UBC

2018-2020

OUTREACH AND VOLUNTEERING

Interviewee for SCIE 101 course, UBC

2020

Southlands Therapeutic Riding Society, weekly volunteer

2016 to present

Carleton University Earth Sciences Outreach with high schools in the Ottawa area

2012

Advances in Earth Science Research Conference (AESRC) Organizing committee

2011

Earth Sciences outreach, NWT community of Ulukhaktok

2010 & 2011

Co- and Vice- President of the Ottawa-Carleton University Society of Economic Geologists, Student Chapter (OCUSEG)

2009 to 2012

Captain of the University of Ottawa Equestrian Team

2007 to 2008

CERTIFICATIONS

UBC Chemical Safety Training Course (completed February 12th 2015)

WHMIS for Workers (Golder Online/E-learning HS-CA-00051-EN, 7 January 2014)

Possession and Acquisition Firearms License (valid to April 27, 2021)

REFERENCES

Dr. Dominique Weis, Professor and Canada Research Chair, Director of the PCIGR, University of British Columbia

Tel: 1-604-822-1697

e-mail: dweis@eos.ubc.ca

Dr. James Scoates, Professor, University of British Columbia

Tel: 1-604-822-3667

e-mail: jscoates@eoas.ubc.ca

PEER-REVIEWED PUBLICATIONS

2020, Weis, D., Harrison, L.N., McMillan, R., and **Williamson, N.M.B.** Fine-scale structure of Earth's deep mantle resolved through statistical analysis of Hawaiian basalt geochemistry. *Geochemistry, Geophysics, Geosystems*, doi: 10.1029/2020GC009292

2019, **Williamson, N.M.B.**, Weis, D., Scoates, J.S., Pelletier, H., Garcia, M.O. Tracking the geochemical transition between the Kea-dominated Northwest Hawaiian Ridge and the bilateral Loa-Kea trends of the Hawaiian Islands. *Geochemistry, Geophysics, Geosystems*, 20:4354-4369, doi.org/10.1029/2019GC008451

2016, **Williamson, N.M.B.**, Ootes, L., Rainbird, R.H., Bédard, J.H., and Cousens, B. Initiation and early evolution of the Franklin magmatic event preserved in the 720 Ma Natkusiak Formation, Victoria Island, Canadian Arctic. *Bulletin of Volcanology* 78(3):1-19

2016, Jamieson, J., Hannington, M.D., Tivey, M.K., Hansteen, T., **Williamson, N.**, Stewart, M., Fietzke, J., Butterfield, D.A., Frische, M., Allen, L., and Cousens, B., Langer, J. Precipitation and growth of barite within hydrothermal vents deposits from the Endeavour Segment, Juan de Fuca Ridge. *Geochimica et Cosmochimica Acta* 173:64-85

INTERNALLY REVIEWED PUBLICATIONS

2016, Bédard, J.H., Hayes, B., Hryciuk, M., Beard, C., **Williamson, N.**, Dell’Oro, T.A., Rainbird, R.H, Prince, J., Baragar, W.R.A., Nabelek, P.I. , Weis, D., Wing, B., Scoates, J., Naslund, H.R., Cousens, B., Williamson, M.-C., Hulbert, L.J., Montjoie, R., Girard, É., Ernst, R., and Lissenberg, C.J.; Geochemical database of Franklin sills, Natkusiak Basalts and Shaler Supergroup rocks, Victoria Island, Northwest Territories, and correlatives from Nunavut and the mainland; Geological Survey of Canada, Open File 8009, 1 .zip file. doi:10.4095/297842

2013, Rainbird, R.H., Bédard, J.H., and **Williamson, N.** Geology, Takiyuaqattak, Victoria Island, Northwest Territories. Geological Survey of Canada, Canadian Geoscience Map 104 (preliminary), scale 1:50 000, doi:10.4095/293344

2013, **Williamson, N.**, Bedard, J., Ootes, L., Rainbird, R., Cousens, B., and Zagorevski, A. Volcanostratigraphy and significance of the southern lobe Natkusiak Formation flood basalts, Victoria Island, Northwest Territories. Geological Survey of Canada, Current Research 2013-16, 13 p.

CONFERENCE ABSTRACTS

2020, Williamson, N.M.B., Weis, D., Scoates, J., Volcanic evolution of the Kaua’i shield, Northern Hawaiian Islands. 2020 Goldschmidt Conference [Virtual presentation and abstract]

2020, Weis, D., **Williamson, N.M.B.**, Harrison, L.N., Bilenker, L.D., Loa-Kea Hawai’i Geochemical Trends: Recent Findings and Future Directions. 2020 Goldschmidt Conference [Virtual presentation and abstract]

2020, Bilenker, L.D., Weis, D., **Williamson, N.M.B.**, Gordon, K., Whole-rock Fe isotope compositions as a tool for exploring the origin and alteration of Hawaiian shield-stage lavas. 2020 Goldschmidt Conference [Virtual presentation and abstract]

2019, **Williamson, N.M.B.**, Weis, D., Scoates, J.S., Garcia, M.O., Pelletier, H., Time-progressive changes in Hawaiian mantle plume composition between the Northwest Hawaiian Ridge and Moloka’i from 7 to 2 Ma. 2019 AGU Conference [Poster and abstract]

2019, **Williamson, N.M.B.**, Weis, D., Prytulak, J., Origin of enriched Hawaiian mantle signatures: insight from the thallium isotopic compositions of shield lavas. 2019 Goldschmidt Conference [Flash talk, poster, and abstract]

2019, Weis, D., Harrison, L.N., **Williamson, N.M.B.**, The different stories told by Hawaiian shield, post-shield, and rejuvenated lavas. 2019 Goldschmidt Conference [Oral presentation and abstract]

2018, Weis, D., Harrison, L.N., **Williamson, N.M.B.**, What makes Hawai'i a unique mantle plume? 2018 Goldschmidt Conference [Invited speaker: oral presentation and abstract]

2018, **Williamson, N.M.B.**, Weis, D., Scoates, J.S., Garcia, M.O., Pelletier, H. Assembling the Hawaiian geochemical puzzle: insight from high-precision Pb isotopes from the Kaua'i shield. 2018 Resources for Future Generations Conference [Oral presentation and abstract]

2017, O'Connor, A.R., Prytulak, J., Weis, D., **Williamson, N.** Tracing Contributions to Cascade Magmatism using Thallium Isotopes. 2017 GSA Conference [Poster and abstract]

2017, **Williamson, N.M.B.**, Weis, D., Scoates, J.S. Geochemistry of shield basalts from the island of Kaua'i and the emergence of the Hawaiian geochemical trends. 2017 GAC-MAC Conference [Oral presentation and abstract]

2013, Bédard, J.H., Hayes, B., Hryciuk, M., Wing, B., Beard, C., Dell'Oro, T., Weis, D., Scoates, J.S., **Williamson, N.**, Cousens, B., Naslund, H.R., MacDonald, W., and Nabelek, P. The Neoproterozoic Franklin Large Igneous Province on Victoria Island. 2013 GAC-MAC Conference [Oral presentation and abstract]

2012, **Williamson, N.**, Cousens, B., Ootes, L., Bédard, J., Rainbird, R., Dell'Oro, T. Volcano-stratigraphy and major element geochemistry of the Southern Lobe of the Natkusiak Formation flood basalts of Victoria Island: Insights into the initiation of the Neoproterozoic Franklin magmatic event. 2012 GAC-MAC Conference [Oral presentation and abstract]

2012, Engelbert, M.S., Jamieson, J.W., Cousens, B.L., **Williamson, N.M.B.**, Hannington, M.D. Barite precipitation in submarine hydrothermal vents: insights from Sr-isotope ratios. 2012 Goldschmidt Conference [Oral presentation and abstract]

2011, Bédard, J.H., **Williamson, N.** et al., Emplacement and eruption style in the Franklin Large Igneous Province, Victoria Island, Arctic Canada. 2011 AGU Fall meeting [Oral presentation and abstract]

2011, **Williamson, N.**, Cousens, B., Ootes, L., Zagorevski, A., Rainbird, R., Physical volcanology of the Neoproterozoic Natkusiak Formation Flood Basalts of the Franklin Magmatic Event, Victoria Island, NWT, Canada. 2011 GAC-MAC Conference [Poster presentation and abstract]

2011, **Williamson, N.**, Cousens, B., Ootes, L., Zagorevski, A., Rainbird, R., Physical volcanology of the Neoproterozoic Natkusiak Formation Flood Basalts of the Franklin Magmatic Event, Victoria Island, NWT, Canada. 2011 Advances in Earth Science Research Conference [Oral presentation and abstract]

2011, **Williamson, N.**, Cousens, B., Ootes, L., Zagorevski, A., Rainbird, R., Physical volcanology of the Neoproterozoic Natkusiak Formation Flood Basalts of the Franklin Magmatic Event, Victoria Island, NWT, Canada. PDAC 2011 Ottawa-Carleton Alumni Reception and Minerals Colloquium [Poster presentation and abstract]

2011, Bédard, J.H., **Williamson, N.**, Dell'Oro, T.A., Hayes, B., Hryciuk, M., Winpenny, A., Scoates, J.S., Weis, D.A., Nabelek, P.I., Naslund, H.R., MacDonald W.D. Emplacement and Eruption Style in the Franklin Large Igneous Province, Victoria Island, Arctic Canada, 2011 AGU conference [Oral presentation and abstract]

2010, **Williamson, N.**, Cousens, B., Ootes, L., Zagorevski, A., Rainbird, R., Physical volcanology of the Neoproterozoic Natkusiak Formation Flood Basalts of the Franklin Magmatic Event, Victoria Island, NWT, Canada. 2010 Yellowknife Geoscience Forum [Poster presentation and abstract]

2010, **Williamson, N. M-B.**, Jamieson, J.W., Hannington, M.D., Occurrence and Genesis of Hydrothermal Barite Along The Endeavour Segment, Juan de Fuca Ridge. 2010 Advances in Earth Science Research Conference [Poster presentation and abstract]

2010, **Williamson, N. M-B.**, Jamieson, J.W., Hannington, M.D., Occurrence and Genesis of Hydrothermal Barite Along The Endeavour Segment, Juan de Fuca Ridge. PDAC 2010 Ottawa-Carleton Alumni Reception and Minerals Colloquium [Poster presentation and abstract]