

Nicole Williamson, Ph.D. Candidate (she, her, hers)
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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

President's Academic Excellence Award (\$739) **2020 to 2022**

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)

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, Analytical Facility User** **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, Analytical Facility Visit** **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, Analytical Facility User** **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 acids (HF, HCL, HNO₃), and physical and chemical sample preparation for cosmogenic nuclide geochronology. Now the "Dalhousie Geochronology Centre".

TEACHING & LEARNING

| Years | Role | Course/Opportunity | Level |
|---------------------------------------|---------------------------|--|-------------------------------------|
| <i>General</i> | | | |
| 2021 | Participant | NASA InSight Science Team Meeting | NA |
| 2021 | Participant | Unlearning Racism in Geoscience (URGE, https://urgeoscience.org/) | NA |
| <i>University of British Columbia</i> | | | |
| 2016-2019, 2022 | Teaching assistant (head) | EOSC 333: Elemental and Isotopic Geochemistry | Undergraduate: 3 rd year |
| 2018, 2022 | Guest lecturer | EOSC 333: Elemental and Isotopic Geochemistry | Undergraduate: 3 rd year |
| 2020 & 2021 | Guest lecturer | EOSC 523: Isotope Geology | Graduate |
| 2020 & 2021 | Teaching assistant | EOSC 523: Isotope Geology | Graduate |

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|-----------|---------------------------|--|-------------------------------------|
| 2020 | Participant | EOAS TA Training Course | Graduate |
| 2019 | Guest lecturer | EOSC 321: Igneous Petrology | Undergraduate: 3 rd year |
| 2018 | Facilitator | MAGNET Field course, Hawai'i, USA | Graduate |
| 2018 | Facilitator | Creation of a geochemistry course for the University of Central Asia | Undergraduate: 4 th year |
| 2015-2019 | Teaching assistant (head) | EOSC 220: Introductory Mineralogy | Undergraduate: 2 nd year |
| 2016 | Facilitator | MAGNET Field course, Yellowstone, USA | Graduate |
| 2015 | Teaching assistant | EOSC 221: Introductory Petrology | Undergraduate: 2 nd year |
| 2015 | Participant | EOSC 516: Teaching and Learning in Earth, Ocean and Atmospheric Sciences | Graduate |

Carleton University

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|-----------|--------------------|--|-------------------------------------|
| 2012 | Teaching assistant | ERTH 2104: Igneous Systems, Geochemistry and Processes | Undergraduate: 2 nd year |
| 2011-2012 | Teaching assistant | ERTH 3204: Mineral Deposits | Undergraduate: 3 rd year |
| 2011 | Teaching assistant | ERTH 3205: Hydrogeology | Undergraduate: 3 rd year |
| 2010-2011 | Teaching assistant | ERTH 1006: Introductory Geology | Undergraduate: 1 st year |

ADVISING/MENTORING

| Student Name | Program | Year | Topic |
|-----------------|--|--------------|--|
| Serena Formenti | UBC-M.Sc. | 2021-present | Geochemistry of basalts along the Northwest Hawaiian Ridge |
| Holly Pelletier | UBC-B.Sc. | 2018 | High-precision geochemistry of the Wai'anae Volcano, O'ahu, Hawai'i |
| Rhys O'Connor | UBC-B.Sc. | 2017 | Tracing contributions to Cascade Arc magmatism using thallium isotopes |
| NA | Prince of Wales Mini School Mentorship Program | 2017 | Mentored two high school students as they completed a geology-themed research activity over the course of 5 weeks. 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: D8 Advance XRD, Element2 High Resolution ICP-MS, Nu Instruments MC-ICP-MS, TritonTIMS, NuTIMS, JEOL Hyperprobe, reflected and transmitted light optical microscopy

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

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

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

British Columbia Geological Survey **2020**

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

Skype a Scientist, École des deux mondes, Campbell River, BC **2021**

Interviewee for SCIE 101 course, UBC **2020**

Southlands Therapeutic Riding Society **2016 to present**

Carleton University Earth Sciences Outreach Team **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**

MEMBERSHIPS

Geochemical Society

International Association of Volcanology and Chemistry of the Earth's Interior

American Geophysical Union

CERTIFICATIONS

Possession and Acquisition Firearms License

UBC Chemical Safety Training Course

WHMIS for Workers

DELAYS IN ACADEMIC DEGREES AND DISEMINATED RESEARCH

Surgery **2020**

In January 2020 I had surgery to repair damage to a lower limb as the result of the accident noted below. This caused a delay of at least 6 months towards the ongoing completion of my Ph.D.

Accident **2011**

I was involved in a serious accident in August 2011 that left me with multiple severe injuries. This caused a delay of at least 6 months during the completion of my M.Sc.

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

2022, **Williamson, N.M.B.**, Weis, D., Scoates, Garcia, M.O. $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology of basalts from Kaua'i, Hawai'i: Implications for shield-stage evolution of Hawaiian volcanoes. Submitted to Bulletin of Volcanology.

2021, **Williamson, N.M.B.**, Weis, D., and Prytulak, J. Thallium isotopic compositions in Hawaiian Lavas: Evidence for recycled materials on the Kea side of the Hawaiian mantle plume. *Geochemistry, Geophysics, Geosystems* 22(9), e2021GC009765, doi: 10.1029/2021GC009765

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* 21(11), e2020GC009292, 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(9): 4354-4369, doi: 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

2022, **Williamson, N.M.B.**, Weis, D., Scoates, J., Garcia, M.O., How atypical is Kaua'i's Loa-Kea geochemical trend? 2022 Goldschmidt Conference [Oral presentation and abstract]

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]