Curriculum Vitae

Personal Information

Name: Austin Gion
Address: Department of Earth Sciences, University of Oxford
Email: austin.gion@earth.ox.ac.uk
ORCID: 0000-0001-9124-039X
Personal Website: www.austingion.com

Education

06/30/20	Ph.D. in Geology, University of Maryland (39 hours completed)
12/19/17	M.S. in Geology, University of Maryland (31 hours completed)
12/11/15	B.S. in Geology, Wichita State University (126 hours completed)
12/23/14	International Study, University of Sydney (13 hours completed)

Professional and Work Experience

12/04/23 to Present	Postdoctoral Research Assistant, Department of Earth Sciences, University of Oxford, South Parks Road, Oxford, UK. Supervisor: Jon Blundy.
01/08/21 to 11/24/23	Post-Doctoral Researcher, Institut des Sciences de la Terre d'Orléans (ISTO), Université d'Orléans, 1A Rue de la Férollerie Orléans, France 45071. Supervisor: Fabrice Gaillard.
09/11/20 to 12/31/20	Post-Doctoral Researcher, Earth and Planets Laboratory, Carnegie Institution for Science, 5241 Broad Branch Road, N.W., Washington, DC 20015. Supervisor: Yingwei Fei.
07/13/20 to 09/11/20	Student Researcher, Earth and Planets Laboratory, Carnegie Institution for Science, 5241 Broad Branch Road, N.W., Washington, DC 20015. Supervisor: Yingwei Fei.
05/16/19 to 07/10/20	Pre-doctoral Visiting Investigator, Earth and Planets Laboratory, Carnegie Institution for Science, 5241 Broad Branch Road, N.W., Washington, DC 20015. Supervisor: Yingwei Fei.
01/10/16 to 07/10/20	Lab Manager, Laboratory for Mineral Deposits Research, University of Maryland, 8000 Regents Dr., College Park, Maryland 20742. Supervisor: Philip M. Piccoli and Philip A. Candela

01/10/16 to 07/10/20	Research and Teaching Assistant, University of Maryland, 8000 Regents Dr., College Park, Maryland 20742. Supervisor: Philip M. Piccoli and Philip A. Candela
06/06/15 to 12/16/15	Geotech for David Barker (Independent Exploration Geologist), 212 North Market Suite 320, Wichita, Kansas 67202. Supervisor David Barker.
08/4/14 to 09/04/14	Centre for Research on Ecological Impacts on Coastal Cities, Edgeworth David Building, University of Sydney, NSW 2006, Australia. Supervisor: Ross Coleman.
04/29/13 to 12/10/15	Geological Data Integrator, Kansas Geological Foundation, 212 North Market Suite 100 Wichita, Kansas 67202. Supervisor: Ted Jochems.

Publications in Refereed Journals

1. Rajič, K., Raimbourg, H., **Gion, A.M.**, Lerouge, C., Erdmann, S. (2023) Fluid Circulation in Subducted Sediments at the Base of the Seismogenic Zone: Closed vs. Open System Behavior. Chemical Geology [under review]

2. **Gion, A.M.**, Gaillard, F., Freslon, N., Erdmann, S. and Di Carlo, I. (2022) A Method for the Analysis of Magmatic-Hydrothermal Fluids Recovered from High-Pressure, High-Temperature Experiments. Chemical Geology 609, 121061, doi:10.1016/j.chemgeo.2022.121061.

3. **Gion, A.M.**, Piccoli, P.M. and Candela, P.A. (2022) Characterization of biotite and amphibole compositions in granites. Contributions to Mineralogy and Petrology 177, 43, doi:10.1007/s00410-022-01908-7.

4. **Gion, A.M.**, Piccoli, P.M., Fei, Y., Candela, P.A. and Ash, R.D. (2021) Experimental Constraints on the Formation of Pegmatite-forming Melts by Anatexis of Amphibolite: A Case Study from Evje-Iveland, Norway. Lithos, doi:10.1016/j.lithos.2021.106342.

5. Hoover, W.F., Penniston-Dorland, S.C., Baumgartner, L.P., Bouvier, A.-S., Baker, D., Dragovic, B. and **Gion, A**. (2021) A Method for SIMS Measurement of Lithium Isotopes in Garnet: The Utility of Glass Reference Materials. Geostandards and Geoanalytical Research, doi:10.1111/ggr.12383.

6. Kaushal, S.S., Wood, K.L., Galella, J.G., **Gion, A.M.**, Haq, S., Goodling, P.J., Haviland, K.A., Reimer, J.E., Morel, C.J., Wessel, B., Nguyen, W., Hollingsworth, J.W., Mei, K., Leal, J., Widmer, J., Sharif, R., Mayer, P.M., Newcomer Johnson, T.A., Newcomb, K.D., Smith, E. and Belt, K.T. (2020) Making 'chemical cocktails' – Evolution of urban geochemical processes across the periodic table of elements. Applied Geochemistry 119.

7. **Gion, A. M.**, Piccoli, P. M., and Candela, P. A., 2019, Constraints on the Formation of Granite-Related Indium Deposits: Economic Geology, v. 114, no. 5, p. 993-1003, doi:10.5382/econgeo.4668.

8. **Gion, A. M.**, Piccoli, P. M., and Candela, P. A., 2018, Partitioning of indium between ferromagnesian minerals and a silicate melt: Chemical Geology, v. 500, p. 30-45, doi:10.1016/j.chemgeo.2018.08.020.

9. **Gion, A. M.**, Williams, S. E., and Muller, R. D., 2017, A reconstruction of the Eurekan Orogeny incorporating deformation constraints: Tectonics, v. 36, doi:10.1002/2015TC004094.

Abstracts and Presented Works

1. Peterson, L.D., Newcombe, M.E., Piccoli, P., **Gion, A.**, Nielsen, S. G., Gaetani, G. A., and Sarafian, A. R. (2023) Relieving the Pressure: Low Pressure (30-100 MPa) Olivine/Melt Partitioning of H_2O. American Geophysical Union Fall Meeting, San Francisco, California, USA.

2. **Gion, A.M.** and Gaillard, F (2023) A Mass Action Model for the Determining the Composition of Magmatic-Hydrothermal Fluids. Goldschmidt, Lyon, France.

3. Horányi, B., **Gion, A.M.**, Gaillard, F., Plunder, A., Gloaguen, E., Melleton, J., Moradell-Casellas, A., Garde, J. (2023) Partial Melting of Hyperaluminous Metasediments: the Origin of Rare-Metal Granites and Pegmatites?. Goldschmidt, Lyon, France.

4. **Gion, A.M.** and Gaillard, F (2023) Experimental Constraints on the Exchange of Metals Between Supercritical Fluids and Silicate Melts. EMPG, Milan, Italy.

5. **Gion, A.M.**, Gaillard, F., Scaillet, B., Freslon, N., Erdmann, S. and Di Carlo, I. (2022) The Exchange of Metals Between Low-Salinity Vapors and Felsic Melts. Goldschmidt, Honolulu, Hawaii, USA.

6. **Gion, A.M.**, Gaillard, F., Scaillet, B., Freslon, N., Erdmann, S. and Di Carlo, I. (2022) The Exchange of Metals Between Low-Salinity Vapors and Felsic Melts. Magma & Fluids workshop in celebration of the career of Michel Pichavant, Orléans, France.

7. **Gion, A.M.**, Gaillard, F., Scaillet, B., Freslon, N., Erdmann, S. and Di Carlo, I. (2022) The Exchange of Metals Between Low-Salinity Vapors and Felsic Melts. TRANSFAIR Workshop, Commentry, France.

8. **Gion, A.M.**, Piccoli, P.M., Fei, Y., Candela, P.A. and Ash, R.D. (2021) Experimental Constraints on the Formation of Pegmatite-forming Melts by Anatexis of Amphibolite: A Case Study from Evje-Iveland, Norway. Goldschmidt, Lyon, France.

9. Kaushal, S., Wood, K. L., Galella, J. G., Haq, S., Haviland, K., Wessel, B., Morel, C.,

Reimer, J., Nguyen, W. D., Hollingsworth, J., Mei, K., Widmer, J. M., Sharif, R., Mayer, P. M., Johnson, T. A. N., **Gion, A. M**., Newcomb, K. D., and Belt, K., 2019, Watershed 'Chemical Cocktails' – Evolving Urban Biogeochemical Processes: American Geophysical Union Fall Meeting, San Francisco, CA.

10. **Gion, A. M.**, Piccoli, P. M. Candela, P. A, 2018, An Experimental Study on the Formation of Scandium-Rich Rocks: American Geophysical Union Fall Meeting, Washington, D.C.

11. Sullivan, G., **Gion, A. M.**, Piccoli, P. M. Candela, P. A., and Ash R. D., 2018, Modeling Indium Enrichment in the Mount Pleasant Ore: American Geophysical Union Fall Meeting, Washington, D.C.

12. **Gion, A. M.**, Candela, P. A., and Piccoli, P. M., 2017, Experimental Geochemistry and Modeling as an Aide to Exploration: An Indium Case Study: Geological Society of America Abstracts with Programs, Seattle, Washington, v. 49, no. 6, doi:10.1130/abs/2017AM-306392

13. **Gion, A. M.**, Williams, S. E., and Muller, R. D., 2017, Modelling and visualizing distributed compressional plate deformation using GPlates2.0: The Arctic Eurekan Orogeny: EGU General Assembly, Vienna, Austria.

14. **Gion, A. M.**, Piccoli, P. M., and Candela, P. A., 2017, From Lab to Lode: Applications of Experimental Geochemistry to Mineral Exploration with Reference to Indium: Student Mineral Colloquium, Prospectors and Developers Association of Canada, Toronto, Canada.

15. **Gion, A. M.**, Piccoli, P. M., Candela, P. A., and Nance, J. R., 2016, Indium in Ferromagnesian Minerals: An Experimental Study: Geological Society of America Abstracts with Programs, v. 48, no. 7, doi:10.1130/abs/2016AM-286546

16. **Gion, A. M.**, Piccoli, P. M., Candela, P. A., and Nance, J. R., 2016, Partitioning of Indium Between Biotite and Felsic Melts: Pan-American Current Research on Fluid Inclusions Conference, Columbia, Missouri.

17. **Gion, A. M.**, Williams, S. E., and Muller, R. D., 2015, The Wegener Fault revisited: Building a deforming plate model for the Eurekan Orogeny: GeoBerlin Dynamic Earth – from Alfred Wegener to today and beyond, Berlin, Germany.

Experimental Skillset

- **Internally Heated Pressure Vessel:** Operation of an internally heated pressure vessel, that is capable of performing experiments at conditions of ~1000° C and up to 400 MPa at Institut des Sciences de la Terre d'Orléans (ISTO).
- **Cold-seal pressure vessel techniques:** Proficient in the use of MHC (Molybdenum-

Hafnium-Carbide) and René 41 cold-seal pressure vessels and rapid quench systems. Experiments were routinely performed up to 100 MPa and 1000° C. I was also responsible for the routine and long-term maintenance of the experimental apparatuses in the Laboratory for Mineral Deposits Research at the University of Maryland.

- **Piston-cylinder apparatus:** Operation of a Boyd-England style end-loaded piston cylinder apparatus at conditions of up to 500 MPa and 1000° C at the Earth and Planet Laboratory, Carnegie Institution for Science.
- **Multi-anvil press:** Experience in the operation of split-sphere, multi-anvil press at conditions of up to 6 GPa and 1500° C at the Earth and Planet Laboratory, Carnegie Institution for Science.
- **Sealed-silica tubes:** Experience in the construction of sealed silica tubes for synthesis of minerals used in high pressure, high temperature experimentation at the University of Maryland.

Analytical Skillset

- **Electron microprobe analyzer:** Proficient in the operation of a JEOL JXA 8900R electron microprobe and use of a JEOL 8530F and Cameca SXFive electron microprobe. Skills include qualitative energy dispersive spectroscopy; quantitative wavelength dispersive spectroscopy of major, minor, and trace element analyses; x-ray mapping; as well as backscatter electron and secondary electron imaging.
- **Mass Spectrometer:** Experience in the use of a ThermoFisher Element2 inductively coupled plasma mass spectrometer for solution analysis, as well as a UP213 Nd:YAG and RESOlution-SE 193 nm Ar-F excimer laser ablation system for laser ablation analyses of solid materials.
- **Petrographic Microscope:** Proficient in the use of a petrographic microscope for use in analyzing rocks and minerals in thin section.

Computational Skillset

Experience with MELTS
Experience in MATLAB
Familiarity with programs such as Geochemists Workbench
Familiarity with JMP
Exposure to C# and HTML
Proficiency in Microsoft Office

Research Projects

Metal Partitioning Between Vapor and Melt in Magmatic Hydrothermal Systems

The goal of this research is to characterize the partitioning of metals between fluids exsolved from a melt and the coexisting melt. Experiments are being performed in internally heated pressure vessels at Institut des Sciences de la Terre d'Orléans (ISTO) at a temperature of 800°C and a pressure of 200 MPa. In addition, modeling of speciation of metals in the vapor phase is being performed. The magmatic systems that are being investigated range from fluorine-poor to

fluorine-rich systems and the coexisting fluid has a variable chlorine content. This research will elucidate how the chlorine and fluorine content of a fluid affects the partitioning behavior of metals in magmatic systems. Such information can be used to further understand the formation of ore deposits related to rare element granites, as well as rare-element granitic pegmatites. The results of this research are expected to produce several publications on metal partitioning and the exchange of fluorine and chlorine between a vapor and melt.

The Behavior of Scandium During Fractional Crystallization and Implications for Ore Formation

The goal of this research is to characterize the behavior of scandium during fractional crystallization in a series of genetically related melts that range in composition from basaltic to rhyolitic. Experiments in these systems were performed in cold-seal pressure vessels at temperatures of 800° to 965° C, at a pressure of 100 MPa, and oxygen fugacities ranging from fayalite-magnetite-quartz to nickel-nickel oxide +1.3. Partition coefficients for scandium between olivine, pyroxene, biotite, plagioclase, spinel, and apatite and a coexisting silicate melt were determined. This research has led to a significant increase in the understanding of the behavior of scandium in magmatic systems and how scandium-bearing ores may form. This knowledge will increase the ability to find scandium-bearing deposits where scandium can be mined for use in the production of high-strength, lightweight alloys. This research is ongoing and is expected to result in several publications, which will detail the results of these experiments and include trace element modeling for scandium in magmatic-hydrothermal systems.

Formation of Rare Metal Pegmatites

Scandium-bearing Pegmatites: The goal of this research was to understand the petrogenesis of the Evje-Iveland pegmatite field in Norway. This pegmatite field is renowned for hosting minerals wherein scandium is a primary constituent. It has been proposed that these pegmatites were formed as the result of partial melting of an amphibolite host rock and the scandium that is now hosted in the pegmatites was also sourced from the amphibolite. In order to test this hypothesis, piston-cylinder experiments were performed at 500 MPa and between 700 and 950° C to characterize the phase relations and trace element partitioning during partial melting of an amphibolite. The results of this project have been published in “Lithos”.

LCT Pegmatites: The goal of this work is to characterize the formation of LCT pegmatites. This work is being-performed by PhD student Bence Horányi who is conducting experiments in both a piston-cylinder apparatus and internally-heated pressure vessel. These experiments are aimed at characterizing the partial melts of lithium-rich metasediments and characterizing the partitioning behavior of lithium in granitic systems.

Partitioning of Indium Between Ferromagnesian Minerals and a Silicate Melt

The focus of this research was to characterize the behavior of indium in felsic magmatic-hydrothermal systems and predict the characteristics that may generate indium-rich ore deposits. Experiments were performed in cold-seal pressure vessels at temperatures of 750 and 800°C and a pressure of 100 MPa in order to determine the partition coefficients for indium between biotite and melt, amphibole and melt, and vapor and melt. By understanding the behavior of indium in felsic, magmatic-hydrothermal systems, it is possible to model and predict which types of ore deposits are more likely to contain elevated concentrations of indium. Such predictions will increase the ability to find indium-rich deposits, where indium can be mined for use in products such as touch screens and solar panels. This research was published in two papers one in "Chemical Geology" and one in "Economic Geology".

Characterization of Biotite and Amphibole Compositions in Granites

The goal of this research was to characterize the compositions of ferromagnesian minerals (biotite and amphibole) in S-, I-, and A-type granites. This research was a combination of an extensive literature search and a simple machine-learning model to test if the composition of biotite and amphibole further characterize granitic rocks. The results of this project have been published in "Contributions to Mineralogy and Petrology".

Additional Research Topics

A Novel Technique for Generating Diamond Hosted Inclusion: A technique to generate inclusions hosted in diamonds utilizing a catalytic HP-HT diamond growth method in a multi-anvil press is being developed in collaboration with Dr. Yingwei Fei. Once this technique is fully developed it can be used to study rates of equilibration and unmixing of minerals included in diamonds during exhumation, as well as plastic or brittle deformation of the inclusion and host.

Urban Geochemistry: Collaboration with Dr. Sujay Kaushal on student driven review paper on the geochemistry of urban environments. The emphasis of my contribution to the research was to provide an overview of sulfur in sewer systems and the effect of that sulfur on the corrosion of building materials. This research was published in "Applied Geochemistry".

Lithium in Garnet: Collaboration with Dr. Sarah Pennistson-Dorland and Dr. William Hoover to create lithium in garnet standards for SIMS (secondary ion mass spectrometry) analysis, by the melting of a natural garnet sample, as well as creating synthetic glasses with garnet compositions. The results of this research have been published in "Geostandards and Geoanalytical Research".

Fluid Circulation in Subducted Sediments: Collaboration with Dr. Kristijan Rajič and Dr. Hugues Raimbourg to characterize the budget of fluid-mobile elements and evaluated fluid-rock interaction is metapeltic rocks from Japan

(Shimanto Belts) and The United States (Kodiak Complex, Alaska). The results of this research are under review in "Geochimica et Cosmochimica Acta".

Olivine/Melt Partition of Water: Collaboration with Liam Peterson and Dr. Megan Newcombe to characterize the partition of water between olivine and melt at low pressures. This work is ongoing and part of the PhD research of Liam Peterson.

Grants

LABEX Post-doctorate: This post-doctorate position was obtained by submitting an original proposal to the Institut des Sciences de la Terre d'Orléans to study the fluid/melt partitioning of metals in felsic system. This position is funded under the LABEX label, which was awarded to Institut des Sciences de la Terre d'Orléans and is under direction of Bruno Scaillet. The position came with a yearly gross salary of €32,839 per year for three years plus research costs.

NSF REU (Research Experience for Undergraduates) awarded to Philip Piccoli and Philip Candela as an extension for NSF EAR 1348010 to study the distribution of indium in the Mount Pleasant ore system. Amount awarded: $6,000.

Reviewing Activities

Ore Geology Reviews
Lithos
Encyclopedia of Geology
Canadian Mineralogist
American Mineralogist
European Journal of Mineralogy
Journal of Geochemical Exploration

Service

2022: Co-organizer for the "Magma & Fluids" workshop in celebration of the career of Michel Pichavant
2019: Assisted with visit of 5^{th} – 7^{th} grade students to the Department of Geology (UMD)
2018/2019: Assisted with visit of 3^{rd} grade class to the Department of Geology (UMD)
2018: Liaison between graduate students and faculty during new hire search
2016-2019: Volunteer at Maryland Day (the University of Maryland's yearly open house) and developed a module to inform the public about experimental petrology including a YouTube video on granite melting that garnered over 100k views

Awards

Outstanding Graduate Assistant Award ($450)– Spring 2020

University of Maryland Dean's Fellowship ($2,500) – 2019-2020 Academic Year
PDAC Travel Award – PDAC Conference 2017
ESSIC Travel Award – Spring 2016, 2017 and Fall 2016, 2017, 2018
GSA Northeastern Travel Grant – GSA 2016 and GSA 2017
Kansas Geological Foundation Preservation Award – 2016

Professional Organizations Memberships

International Association of Volcanology and Chemistry of the Earth's Interior
Societá Italiana Di Mineralogia E Petrologia

Teaching

GEOL 445: High Temperature Geochemistry Lab

The role of this course is to teach students about Earth and Solar system forming processes. The topics covered include nucleosynthesis, element partitioning, thermodynamics, phase relations, radiogenic isotopes, and geochronology. The laboratory section was concerned with applying these topics to scenarios that students will likely face as they continue with high-level scientific research, such that they might encounter during the course of their Senior Thesis.
Taught Fall 2016, enrollment 6

GEOL 322: Mineralogy Lab

The goal of this course is to introduce students to mineralogy, crystal chemistry and crystallography. The laboratory section involved teaching students how to identify minerals in hand sample, understand crystal symmetry, crystal morphology, and basic mineral chemistry.
Taught Spring 2017, enrollment 21

GEOL 443: Petrology Lab

The purpose of this course is to teach students the principles of igneous and metamorphic petrology. The laboratory section consisted of describing igneous and metamorphic rocks and their significance. Students were required to describe the textures and minerals present in both hand samples and in thin section. In addition to laboratory skills the students practiced identification of rocks in the field.
Taught Spring 2018, 2019, and 2020, enrollment 17, 12, and 13, respectively

GEOL 423: Optical Mineralogy Lab

The goal of this course is to teach students the theory and techniques used in optical mineralogy. The laboratory section consisted of identifying minerals and describing their properties in thin section, as well as grain mounts. This course also included a semester long project, wherein students quantitatively analyzed unknown solid-solution minerals.
Taught Fall 2018 and 2019, enrollment 13 and 11, respectively

Field Camp Prep Course

This course was designed by graduate students to provide guidance to undergraduates who are preparing for field camp. The course consisted of three meetings where students were introduced to the expectations of field camp and were able to practice basic field mapping skills. My role involved co-organizing and teaching. Taught Spring 2016-2019, ~10 Students per year

Advising

PhD Students

Bence Horányi – "Lithium in Rare-Metal Granites and Pegmatites" -presently a 1st year student primarily advised by Fabrice Gaillard (Institut des Sciences de la Terre d'Orléans - ISTO).

Dissertation/Thesis Committee Member

Julien Fort – "Evolution of petrophysical properties during hydrothermal metasomatism: application to the hydrothermal magmatic transition in alkali-boro-silicate systems" mid-PhD report (Institut des Sciences de la Terre d'Orléans - ISTO).

NSF Research Experiences for Undergraduates (REU)

Gwen Sullivan – "Modeling indium enrichment in the Mount Pleasant Ore System" presented at American Geophysical Union Fall Meeting 2018.

Senior Thesis Students

My primary role for the following students was assisting the students and their primary advisor with fieldwork and explanation of related geological concepts.

Ian Harper, Fall 2019 and Spring 2020 – "Classification of I-, S-, and A-type granitic rocks in the eastern United States"

Andrew Houston, Spring and Fall 2019 – "Magmatism at the Mt. Pleasant deposit, New Brunswick, Canada"

Luke Councell, Fall 2016 and Spring 2017– "Hydrothermal Formation of Unakite in the Blue Ridge Mountains, Virginia: A Geochemical Analysis"

Rhobeca Oliveros, Spring 2017– "Fractionation in a dike in the Tuolumne Batholith in California"

Joe Browning, Spring 2017– "Origin of Tourmaline in the Setters Formation, Maryland: Evidence from Major and Trace Element, Boron Isotope, and Rare Earth Element Characteristics"

Undergraduate Honors Projects

Gwen Sullivan, GEOL 322: Spring 2017– "Solid Solution Minerals in North Carolina Eclogites", My role was to oversee geochemical analysis using the electron microprobe.