Corliss Kin I Sio Updated 07/18/2023

Assistant Professor
University of Toronto
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EMPLOYMENT

Assistant Professor (2021-present)
Department of Earth Sciences
University of Toronto

Staff Scientist (permanent position; 2019-2021)
Postdoctoral Research Staff Member (2016-2019)
Nuclear and Chemical Sciences Division
Lawrence Livermore National Laboratory (LLNL)

Postdoctoral Fellow (2014-2016)
Geophysical Laboratory
Carnegie Institution of Washington

EDUCATION

Ph.D. in Geophysical Sciences, 2014
The University of Chicago
Dissertation title: Cooling and crystallization histories of magmatic bodies from *in-situ* Mg-Fe isotopic analyses in zoned olivines
Thesis advisor: Dr. Nicolas Dauphas

B.S. in Geology, 2008
University of California, Los Angeles (UCLA)

AWARDS

University of Toronto Connaught New Research Award (2023)
LLNL DDS&T Excellence in Publication Award (2020)
Lunar and Planetary Institute Career Development Award (2014)
Goldschmidt Travel Grant (2013)
AGU Outstanding Student Paper Award [Oral presentation, MRP] (2012)
UCLA Clem Nelson Award, Academic Excellence in Geology (2008)
Meritus College Fund Scholarship (2004-2008)
Maisin Scholar Award (2004-2008)

FUNDING (Sole PI)

Duration	Total	Source	Proposal title
2021-2026	$175,000	NSERC Discovery	Igneous petrology through the lens of non-traditional stable isotopes
2021-2026	$120,000	NSERC Accelerator	
2021-2026	$12,500	NSERC Launch	
2022	$31,431	University of Toronto	Micro-sampling for spatially resolved high-precision isotopic analyses
2020-2022	$524,000	LLNL LDRD Labwide	Earth's leaky core: identifying signatures of core materials in the lithosphere
2014-2016	$136,000	Carnegie Postdoc Fellowship	Experiments on olivine growth
2013-2014	$35,000	NASA ESS Fellowship	Thermal histories of Martian nakhlites and Alexo komatiites, the terrestrial analogue?
2011	$10,000	Chateaubriand Fellowship	Application of iron isotopes for petrologic studies

FUNDING (lead PI)

Duration	Total	Source	Proposal title
2022-2027	$560,000	CFI-JELF	Constraining source compositions and timescales of mass transport using femtosecond LA-MC-ICPMS
2022-2027	$560,000	ORF	
2022-2027	$168,000	CFI-IOF	

BEAMLINE PROPOSAL

- Cross-calibrating NRIXS and equilibration experiments for determining iron isotope fractionation factors (12 shifts granted at beamline 3-ID-B, APS, Chicago, for 03/2023)

PATENT

- Additive Manufacturing of Microanalytical Reference Materials
  U.S. patent application No. 16/902,076 filed on 6/15/2020.
  Inventors: **Sio, C.K.,** Parsons-Davis, T., Lee, E., Kuntz, J., Pascall, A., Kevins, R., Bandong, B., Shusterman, J.

TEACHING

- ESS 322 Igneous petrology
- ESS 425 Analytical methods for the geosciences
- ESS 2708 Characterization of geological materials (grad version of ESS 425)
- ESS 2704 Isotope geochemistry (guest lecturer)

TRAINEES

- Bruna da Silva Ricardo (PhD student; 2021-present)
- Sarah Mount (PhD student; 2023-present)
- Shannon Murtonen (MSc student; 2023-present)
- Alexandre Guillerez (BSc student; 2022-present)
- Katherine Bormann (BSc student; 2022-present)
- Jessica Verschoor (MSc student co-supervised with Dr. Neil Bennett; 2023-2023)
- Winnie Xuefei Fan (MSc student co-supervised with Dr. Xu Chu; 2021-2023)
- Jan Render (LLNL postdoctoral scholar; 2020-2021)
- Sarah Hansen (LLNL post-college appointee; 2020-2021)
- Teresa Baumer (LLNL postdoctoral scholar; 2020-2021)

INVITED TALKS

- Carleton University, Canada (11/2/2023)
- Queen's University, Canada (3/24/2023)
- Ruhr-Universität Bochum, Germany (virtual; 1/27/2022)
- University of Toronto, Canada (virtual; 4/28/2020 and 4/29/2020)
- University of Nevada, Las Vegas, USA (10/9/2019)
- University of British Columbia, Canada (10/3/2019 and 10/4/2019)
- University of California, Los Angeles, USA (10/25/2018)
- 2nd International Mars Sample Return Conference, Germany (4/26/2018; **keynote**)
- University of Florida, USA (2/8/2018 and 2/9/2018)
- University of California, Santa Cruz, USA (10/31/2017)
- Lawrence Livermore National Laboratory, USA (12/16/2015)
- Carnegie Neighborhood Lecture Series, USA (10/15/2015)
- University of Maryland, USA (3/4/2015)

VISITING SCIENTIST

- Lawrence Livermore National Laboratory, USA (2021-present)
- Leibniz Universität Hannover, Germany (2022)
- Isotope Geochemistry Laboratory, University of Washington, USA (2013)
- UMET, Université de Lille 1, France (2010, 2012, 2013)
- CRPG, Nancy, France (2012, 2013)
- Isotope Laboratory, University of Arkansas, USA (2011)
- Laboratoire Magmas et Volcans, Clermont-Ferrand, France (2010)

SERVICE

- Journal reviewer:
  - *American Mineralogist*
  - *Elements*
  - *Earth and Planetary Science Letters*
  - *Geochemical Perspectives Letters*
  - *Geochimica et Cosmochimica Acta*
  - *Geology*
  - *Meteoritics and Planetary Science*
  - *Nature Astronomy*
  - *Nature Communications*
  - *Rapid Communications in Mass Spectrometry*
- Proposal reviewer:
  - NASA postdoctoral fellowships (2022)
  - NASA FINESST graduate student fellowships (2020)
- Conference session convener:
  - Understanding the formation and evolution of Earth's mantle and core: Insights from elemental and stable isotope studies of natural samples, experiments, and theory. Goldschmidt Conference (2022)
  - Beyond equilibrium: Kinetic isotope fractionation in high-T environments. AGU Fall Meeting (2021)
  - Geochemical and geodynamical constraints on the origin and evolution of planetary bodies. Goldschmidt Conference (2018)
- University of Toronto Department of Earth Sciences seminar organizer (2022-present)
- University of Toronto Distinguished Lectureship committee (2021-2022)
- University of Toronto Roger Deane Postdoctoral Fellowship committee (2021-2022)
- LLNL PLS Workforce & Communications Committee (2020-2021)
- Meritus College Fund scholarship judge (2018-2019)
- AGU Fall Meeting OSPA judge (2016-2018)
- LPSC Dwornik Award judge (2018)
- DC STEM Fair Science judge (2015)

PUBLICATIONS

_ indicates supervised student or postdoc

In preparation

1. Fan, X., Chu, X., **Sio, C.K.** Matrix effect during *in-situ* Li isotope analyses using ns-LA-Q-ICP-MS (in revision with Rapid Communications in Mass Spectrometry)
2. Bennett, N., Verschoor, J., Wimpenny, J., **Sio, C.K.** The effects of phosphorus on Fe-isotope fractionation during planetesimal core formation (first draft completed)
3. **Sio, C.K.**, Wimpenny, J., Borg, L.E. Iron isotope fractionation during lunar differentiation (first draft in progress)
4. Ricardo, B., Oeser, M., Lynn, K., Weyer, S., Chu, X., **Sio, C.K.** Diffusion-limited growth of olivine crystals: evidence from Mg isotope analyses by fs-LA-MC-ICPMS (first draft in progress)
5. **Sio, C.K.**, Render, J., Lesher, C., Brenan, J., Wimpenny, J., Bennett, N. Fe-Ni isotope fractionations in FeNi±S alloys during thermodiffusion (first draft in progress)

Published

1. Bennett, N.[%], **Sio, C.K.**[%], Schauble E., Edwards, P., Lesher, C., Wimpenny J., Shahar, A. (2022). Iron isotope evidence of an impact origin for main-group pallasites. *Geochemical Perspectives Letters*, 23, 6-10. [%]dual first-author
2. Wimpenny, J., Borg L., **Sio, C.K.** (2022). The gallium isotopic composition of the Moon. *Earth and Planetary Science Letters*, 117318.

3. **Sio, C.K.,** Baumer, T., Cahill, J., Hansen S., Harris S., Wimpenny J., Lindvall R., Du Frane, W., Kuntz J. (2022). Determination of impurities in cubic boron nitride (cBN) by inductively coupled plasma mass spectrometry (ICPMS). *Diamond and Related Materials*, 108726.

4. Shollenberger, Q. R., Kmak, K. N., **Sio, C. K.**, Despotopulos, J. D., Kim, G. B., Borg, L. E. (2022). Chemical separation of ^{146}Sm for half-life determination. *Journal of Radioanalytical and Nuclear Chemistry*, 1-7.

5. Kim, G. B., Borg, L. E., Boyd, S. T. P., Cantor, R. H., Despotopulos, J. D., Drury, O. B., Friedrich, S., Gallant, A., Hines, N. R., Jacobs, A., Jovanovic, I., Kmak, K. N., Kavner, A. R. L., Kim, Y. H., Kunz, P., Kwiatkowski, A., Kwon, D. H., Lee, D., Murbock, T., Scielzo, N. D., Shollenberger, Q. R., **Sio, C. K.**, Thomas, K. J., Wooddy, T., Wall, C. (2022) Absolute decay counting of ^{146}Sm and ^{147}Sm for Early Solar System Chronology. *Journal of Low Temperature Physics*.

6. Nie, N.X., Dauphas, N., Alp, E.E., Zeng, H., **Sio, C.K.**, Hu, J.Y., Aarons, S.M., Zhang, Z., Tian, H.C., Prissel, K.B., Greer, J., Bi, W., Hu, M.Y., Zhao, J., Shahar, A., Roskosz, M., Teng, F.-Z., Krawczynski, M.J., Heck, P.R., Spear, F.S. (2021). Iron, magnesium, and titanium isotopic fractionations between garnet, ilmenite, fayalite, biotite, and tourmaline: results from NRIXS, ab initio, and study of mineral separates from the Moosilauke metapelite. *Geochimica et Cosmochimica Acta*, 302, 18-45.

7. Cahill, J.T., Du Frane, W.L., Sio, C.K., Kig, G.C.S., Soderlind, J.C., Lu, Worsley, M.A., Kuntz, J.D. (2020). Transformation of boron nitride from cubic to hexagonal under 1-atm helium. *Diamond and Related Materials*, *109*, 108078.

8. Kruijer, T.S., Borg, L.E., Wimpenny, J. **Sio, C.K.** (2020). Onset of magma ocean solidification of Mars inferred from Mn-Cr chronometry. *Earth and Planetary Science Letters*, 116315.

9. **Sio, C.K.**, Borg, L.E., Cassata, W.S. (2020). The timing of lunar solidification and mantle overturn recorded in ferroan anorthosite 62237. *Earth and Planetary Science Letters*, *538*, 116219.

10. **Sio, C.K.,** Parsons-Davis, T., Lee, E., Wimpenny, J., Kuntz, J.D., Pascall, A.J. Bennett, N. (2020). Additive manufacturing of platinum group element (PGE) reference materials with a silica matrix. *Rapid Communications in Mass Spectrometry*, *34*(7), e8627.

11. Borg, L.E., Gaffney, A.M., Kruijer, T.S., Marks, N.A., **Sio, C.K.**, Wimpenny, J. (2019) Isotopic evidence for a young lunar magma ocean. *Earth and Planetary Science Letters*, *523*, 115706.

12. Elardo, S.M., Shahar, A., Mock, T. D., **Sio, C.K.** (2019). The effect of core composition on iron isotope fractionation between planetary cores and mantles. *Earth and Planetary Science Letters*, *513*, 124-134.

13. **Sio, C.K.**, Roskosz, M., Dauphas, N., Bennett, N., Mock, T., Shahar, A. (2018) The isotope effect for Mg-Fe interdiffusion in olivine and its dependence on crystal orientation, composition and temperature. *Geochimica et Cosmochimica Acta*, *239*, 463-480.

14. **Sio, C.K.**, Dauphas N. (2017) Thermal and Crystallization histories of magmatic bodies by Monte Carlo inversion of Mg-Fe isotopic profiles in olivine. *Geology*, *45*(1), 47-70.

15. **Sio, C.K.** (2016) Dissecting a volcano. *American Mineralogist*, *101*(5), 1023-1024.

16. Roskosz, M., **Sio, C.K.**, Dauphas, N., Bi, W., Tissot F.L.H., Hu, M., Zhao, J., Alp, E. (2015) Spinel-olivine-pyroxene equilibrium iron isotopic fractionation and applications to natural peridotites. *Geochimica et Cosmochimica Acta*, *169*, 184-199.
17. Blanchard, M., Dauphas, N., Hu, M.Y., Roskosz, M., Alp, E.E., Golden, D.C., **Sio, C.K.**, Tissot, F.L.H., Zhao, J., Gao, L., Morris, R.V., Fornace, M., Floris, A., Lazzeri, M., Balan, E. (2015) Reduced partition function ratios of iron and oxygen in goethite. *Geochimica et Cosmochimica Acta*, *151*, 19-33.
18. Teng, F.-Z., Li, W.Y., Ke, S., Yang, W., Liu, S.-A., Sedaghatpour, F., Wang, S.-J., Huang, K.-J., Hu, Y., Ling, M.-X., Xiao, Y., Liu, X.-M., Li, X.-W., Gu, H.-O., **Sio, C.K.**, Wallace, D.A, Su, B.-X., Zhao, L., Chamberlin, J., Harrington, M., Brewer, A. (2015) Magnesium isotopic compositions of international geological reference materials. *Geostandards and Geoanalytical Research*, *39*(3), 329-339.
19. Dauphas, N., Roskosz, M., Alp, E.E., Neuville, D., Hu, M., **Sio, C.K.**, Tissot, F.L.H., Zhao, J., Tissandier, L., Medard, E., Cordier, C. (2014) Magma redox and structural controls on iron isotope variations in Earth's mantle and crust. *Earth and Planetary Science Letters*, *398*, 127-140.
20. **Sio, C.K.**, Dauphas, N., Teng, F.-Z., Chaussidon, M., Helz, R., Roskosz, M. (2013) Discerning crystal growth from diffusion profiles in zoned olivine by *in-situ* Mg-Fe isotopic analyses. *Geochimica et Cosmochimica Acta*, *123*, 302-321.
21. Dauphas, N., Roskosz, M., Alp, E.E., Golden, D.C., **Sio, C.K.**, Tissot, F.L.H., Hu, M., Zhao, J., Gao, L., Morris, R.V. (2012) A general moment NRIXS approach to the determination of equilibrium Fe isotopic fractionation factors: application to goethite and jarosite. *Geochimica et Cosmochimica Acta*, *94*, 254-275.
22. Wang, K., Moynier, F., Dauphas, N., Barrat, J.A., Craddock, P., **Sio, C.K.** (2012) Iron isotope fractionation in planetary crusts. *Geochimica et Cosmochimica Acta*, *89*, 31-45.

SELECTED CONFERENCE ABSTRACTS

_ indicates supervised student or postdoc

1. Murtonen, S.E., **Sio, C.K.**, Bormann, K., Bennett, N.R., Zhao, J., Alp, E.E., Lavina, B., Hu, M.Y. (2023) Determining the effects of 57Fe enrichment on NRIXS-derived force constants. Goldschmidt Conference. **[Poster]**
2. Render, J., Wimpenny, J., Borg, L.E., **Sio, C.K.** (2023) The nickel isotope composition of the Moon. Goldschmidt Conference. **[Poster]**
3. Bennett, N., Verschoor, J., Wimpenny, J., **Sio, C.K.** (2023) The influence of solid structure and liquid compositions on Fe-isotope fractionation between solid and liquid alloys. Goldschmidt Conference. **[Poster]**
4. **Sio, C.K.**, Bennett, N., Schauble, E., Lesher, C.E., Wimpenny, J., Shahar, A. (2023) Iron isotope evidence of an impact origin for main-group pallasites. Goldschmidt Conference. **[Oral]**
5. Fan, X., **Sio, C.K.**, Jiang, H. (2022) Matrix effect for in situ Li isotope analyses using ns-LA-Q-ICP-MS. GSA Annual Meeting. **[Poster]**
6. **Sio, C.K.**, Render, J., Wimpenny, J., Labidi, J., Vlastelic, I., Rizo, H., Archer, G., Lesher, C., Brenan, J. Bennett, N. (2022) A search for isotopic evidence of thermodiffusion at the core-mantle boundary. Goldschmidt Conference. **[Oral]**
7. Ricardo, B., Lynn, K.J., Xu, C., **Sio, C.K.** (2022) Growth-induced Mg-Fe zoning in a skeletal olivine. Goldschmidt Conference. **[Oral]**
8. Bennett, N.R., Verschoor, J.D., **Sio, C.K.** (2022) Probing the Compositional effects on Fe-isotope fractionation between solid and liquid metal alloys. Goldschmidt Conference.

9. Wimpenny, J., Render, J., **Sio, C.K.**, Borg, L.E., Sanborn, M., Yin, Q-Z., Huyskens, M. (2022) Fractionation of Zn isotopes by post accretion volatile loss from the Moon. Goldschmidt Conference.

10. **Sio, C.K.**, Render, J., Wimpenny, J., Lesher, C.E., Brenan, J., Bennett, N. (2021) Nickel isotope fractionation in Fe-Ni and Fe-Ni-S alloys by thermodiffusion. AGU Fall Meeting. **[Oral]**

11. **Sio, C.K.**, Parsons-Davis, T., Lee, E., Wimpenny, J., Pascall, A.J., Kuntz, J.D., Goodell, J.J., Roberts, K.E., Bandong, B.B., Bennett, N.R. (2020) Additive manufacturing of PGE standards with a silica matrix. Goldschmidt Conference. **[Oral]**

12. Harrington A.D., Calaway, M.J., **Sio, C.K.**, McCubbin, F.M. (2020) Considerations for the Mars Sample Return Containment Facility. Committee on Space Research (COSPAR) Scientific Assembly.

13. **Sio, C.K.,** Wimpenny, J., Borg, L.E. (2019) Iron isotope compositions of lunar highland rocks and mare basalts. Goldschmidt Conference. **[Oral]**

14. Gaffney, A.M., Borg, L.E., Wimpenny, J., **Sio, C.K.**, Cassata, W.S., Marks, N.E., Shearer, C.K., Miller, M.L. (2019) Isotope systematics of Mg-suite troctolite 14321,1847. LPSC.

15. **Sio, C.K.**, Moore, J. D. P. (2018) Unlocking the potential of isotopes to constrain thermal histories: Early steps toward a versatile tool for diffusion chronometry using chemical-isotopic profiles in zoned minerals. AGU Fall Meeting. **[Oral]**

16. Borg, L.E., Gaffney, A.M., Kruijer, T.S., **Sio, C.K.** (2018) Long term value of Apollo samples: how fundamental understanding of a body takes decades of study. 2nd International Mars Sample Return Conference. **[Keynote; Oral]**

17. **Sio, C.K.**, Borg, L.E. (2018) Sm-Nd isotopic systematics of ferroan anorthosite (FAN) 62237: Evidence of co-magmatism of FANs at 4.36 Ga. LPSC. **[Oral]**

18. **Sio, C.K.**, Roskosz, M., Dauphas, N., Bennett, N., Mock, T.D., Shahar, A. (2017) Experimentally determined isotope effect during Mg-Fe interdiffusion in olivine. AGU Fall Meeting. **[Oral]**

19. **Sio, C.K.**, Shahar, A. (2017) Cooling rates and metal-olivine iron isotope fractionations in pallasites. MetSoc. **[Oral]**

20. **Sio, C.K.**, Dauphas, N. (2016) Constraining thermal histories by Monte Carlo simulation of Mg-Fe isotopic profiles in olivine. AGU Fall Meeting. **[Oral]**

21. **Sio, C.K.**, Dauphas, N., Roskosz, M., Shahar, A. (2015). An improved geospeedometer using chemical-isotopic profiles in olivines. AGU Fall Meeting. **[Invited; Poster]**

22. **Sio, C.K.**, Chaussidon, M., Dauphas, N., Richter, F.M., Roskosz, M., Sautter, V., Ma, C. (2014). Determining the nature of olivine zoning in nakhlites by *in-situ* Mg and Fe isotopic analyses. LPSC. **[Poster]**

23. **Sio, C.K.**, Roskosz, M., Dauphas, N., Bi, W., Alp, E.E., Tissot, F.L.H., Hu, M.Y., Zhao, J. (2013). Spectroscopic determination of equilibrium Fe isotope fractionation factors for spinels with varying Fe oxidation states. AGU Fall Meeting. **[Poster]**

24. **Sio, C.K.**, Roskosz, M., Chaussidon, M., Dauphas, N., Mendybaev, R., Richter, F., Teng, F.-Z. (2013). Diffusion-driven isotopic fractionations in olivine in laboratory and natural settings. Goldschmidt Conference. **[Oral]**

25. **Sio, C.K.**, Dauphas, N., Teng, F.-Z., Chaussidon, M., Helz, R., Roskosz, M. (2012). Telling zoned from zoned: LA-MC-ICPMS and SIMS iron isotopic measurements of olivine. AGU Fall Meeting. **[Oral]**
26. Roskosz, M., Alexander, C.M.O'D., **Sio, C.K.**, Wang, J., Watson, H.C., Dauphas, N., Mysen, B.O. (2010). Redox-dependent, diffusion-driven fractionation of Fe isotopes in silicate melts and its structural controls. Goldschmidt Conference.
27. **Sio, C.K.**, Dauphas, N., Roskosz, M., (2010). Can core formation in planetesimals fractionate iron isotopes? Clues from a study of metal-silicate assemblages in Disko Basalt, Greenland. LPSC. **[Oral]**