Corliss Kin I Sio Updated 5/15/2020

Lawrence Livermore National Laboratory
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Livermore, CA 94550
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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: Nicolas Dauphas

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

EMPLOYMENT

Research Scientist (career-indefinite; 2019-present)
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

SKILLS

MC-ICPMS (Neptune and Nu-Plasma)
TIMS (Triton)
ICPMS (Element)
Column chemistry for purifying Mg, Fe, Rb-Sr, and Sm-Nd
Laser ablation (New Wave and Photon Machines)
Electron beam techniques (EMPA, SEM, EBSD)
Gas mixing furnace
Piston cylinder press

AWARDS AND HONORS

Research featured on the book cover of *Reviews in Mineralogy and Geochemistry: Non-traditional stable isotopes* (2017)

LLNL Research Slam finalist (2018)
Carnegie Postdoctoral Research Fellowship (2014)
Lunar and Planetary Institute Career Development Award (2014)
NASA Earth and Space Science Fellowship (2013)
Goldschmidt Travel Grant, NSF and GS (2013)
AGU Outstanding Student Paper Award [Oral presentation, MRP] (2012)
Chateaubriand Fellowship (2011)
UCLA Clem Nelson Award, Academic Excellence in Geology (2008)
Meritus College Fund Scholarship (2004-2008)
Maisin Scholar Award (2004-2008)
Lowell Alumni Scholarship (2004)
Chinese American Citizens Alliance Scholarship (2004)
Governor's Scholars Award (2002)

PATENT

"Additive Manufacturing of Microanalytical Standard Reference Materials (SRMs)"
U.S. provisional patent application #61/881830 filed on 8/1/2019. Inventors: **Sio, C.K.,** Parsons-Davis, T., Lee, E., Kuntz, J., Pascall, A., Kevins, R., Bandong, B., Shusterman, J.

FUNDING

Proposals in review:
- LDRD-Labwide: "Earth's leaky core: identifying signatures of core materials in the lithosphere" ($524,000; PI)
- LDRD-Feasibility Study: "Revolutionizing thermal ionization mass spectrometry with PIE (porous ion emitters)" ($145,000; PI)
- TechBase: "Enabling high precision and spatially resolved isotopic analyses in Physical Life Sciences (PLS) [at LLNL]" ($54,000; PI)

Proposals funded:
- Co-I on LDRD and NASA proposals totaling $9m (2019-2022)
- Carnegie Postdoctoral Fellowship ($136,000; 2014-2016)
- NASA Earth and Space Science Fellowship ($35,000; 2013-2014)
- Chateaubriand Fellowship ($10,000; 2011)

SOFTWARE

IsoSpeed – Thermal and crystallization histories from Monte-Carlo inversion of isotopic profiles in minerals, in development with J.D.P. Moore

TEACHING ASSISTANT-SHIPS

Department of Geophysical Sciences, University of Chicago (2008-2013)
- GEOS 13400: Global Warming
- GEOS 21000: Introduction to Mineralogy
- GEOS 21100: Introduction to Petrology
- GEOS 21300: Origin and Evolution of the Solar System
- GEOS 21900: Introduction to Structural Geology
- NTSC 10100: Evolution of the Solar System and the Earth

VISITING SCHOLAR POSITIONS

- Isotope Geochemistry Laboratory, University of Washington (2013)
- UMET, Université de Lille 1, France (2010, 2012, 2013)
- CRPG, Nancy, France (2012, 2013)
- Isotope Laboratory, University of Arkansas (2011)
- Laboratoire Magmas et Volcans, Clermont-Ferrand, France (2010)

SERVICE

- Reviewer for: *American Mineralogist*, *Earth and Planetary Science Letters*, *Geochemical Perspectives Letters*, *Geochimica et Cosmochimica Acta*, *Geology*, and *Rapid Communications in Mass Spectrometry* (2014-present)
- LLNL PLS Workforce & Communications Committee (2020-present)
- Goldschmidt Conference session convener and chair (2018) "Geochemical and geodynamical constraints on the origin and evolution of planetary bodies"
- AGU Fall Meeting OSPA judge (2016; 2017; 2018)
- Meritus College Fund scholarship judge (2018; 2019)
- LPSC Dwornik Award judge (2018)
- DC STEM Fair Science judge (2015)

SUPERVISEES

- Sharee Lynae Harris (LLNL; 2019 - present)
- Christopher Dory (LLNL; 2020 - present)

INVITED TALKS

- University of Toronto (virtual; 4/28/2020 and 4/29/2020)
- University of Nevada, Las Vegas (10/9/2019)
- University of British Columbia (10/3/2019 and 10/4/2019)
- University of California, Los Angeles (10/25/2018)
- 2nd International Mars Sample Return Conference (4/26/2018; keynote)
- University of Florida (2/8/2018 and 2/9/2018)
- University of California, Santa Cruz (10/31/2017)
- Lawrence Livermore National Laboratory (12/16/2015)
- Carnegie Neighborhood Lecture Series (10/15/2015)
- University of Maryland (3/4/2015)

PUBLICATIONS *Forthcoming:*

1. **Sio, C.K.**, Wimpenny, J., Borg, L. (in prep). Iron isotope fractionation during lunar differentiation.
2. **Sio, C.K.**, Bennett, N., Schauble E., Edwards, P., Lesher, C., Wimpenny J., Shahar, A. (in prep). An impact origin for main-group pallasites revealed by iron isotopes. *Completed manuscript available upon request.*
3. Cahill, J.T., Du Frane, W.K., Soderlind, J.C., **Sio, C.K.**, Lu, R. Worsley, M.A., Kuntz, J.D. (in revision). Transformation of boron nitride from cubic to hexagonal under 1-atm helium.

Published:

1. 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.
2. **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.
3. **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.
4. 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.
5. 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.
6. **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.
7. **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.
8. **Sio, C.K.** (2016) Dissecting a volcano. *American Mineralogist*, *101*(5), 1023-1024.
9. 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.
10. 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.
11. 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.

12. 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.
13. **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.
14. 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.
15. 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 presenting author***

1. **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.
2. Wimpenny, J., **Sio, C.K.**, Borg, L.E. (2020) Investigating the isotopic composition of the Moon using Zn and Ga isotope systematics. Goldschmidt Conference.
3. 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.
4. **Sio, C.K.*** Wimpenny, J., Borg, L.E. (2019) Iron isotope compositions of lunar highland rocks and mare basalts. Goldschmidt Conference. **[Oral]**
5. Wimpenny, J., Borg, L.E., **Sio, C.K.** (2019) Reassessing gallium isotopic evidence for volatile loss from the Moon. Goldschmidt Conference.
6. 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.
7. **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]**
8. Nie, N.X., Dauphas, N., **Sio, C.K.**, Spear, F.S. (2018) Inter-mineral equilibrium iron isotopic fractionation factors from a special metamorphic rock. Goldschmidt Conference.
9. 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]**
10. **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]**
11. Kruijer, T.S., Borg, L.E., **Sio, C.K.**, Wimpenny, J. (2018) Chromium isotope systematics of martian meteorites: implications for Mars' early differentiation. LPSC.
12. **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]**
13. **Sio, C.K.***, Shahar, A. (2017) Cooling rates and metal-olivine iron isotope fractionations in pallasites. MetSoc. **[Oral]**

14. **Sio, C.K.***, Dauphas, N. (2016) Constraining thermal histories by Monte Carlo simulation of Mg-Fe isotopic profiles in olivine. AGU Fall Meeting. **[Oral]**
15. **Sio, C.K.***, Dauphas, N., Roskosz, M., Shahar, A. (2015). An improved geospeedometry using chemical-isotopic profiles in olivines. AGU Fall Meeting. **[Invited; Poster]**
16. **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]**
17. **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 isotopes fractionation factors for spinels with varying Fe oxidation states. AGU Fall Meeting. **[Poster]**
18. **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]**
19. **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]**
20. Dauphas N., Roskosz, M., Alp, E.E., **Sio, C.K.**, Tissot, F.L.H., Neuville, D., Hu, M., Zhao, J., Tissandier, L., Medard, E. (2012). Controls on iron isotope variations in planetary magmas. LPSC.
21. 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.
22. **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]**