

Michelle Muth

Smithsonian Institution
National Museum of Natural History
Department of Mineral Sciences
100 Madison Ave., Washington DC 20560
Phone: 215 206 3605 Email: muthm@si.edu

EDUCATION

- 2021 *Ph.D. Earth Science*, University of Oregon, Eugene, OR
Research advisor: Paul Wallace
Dissertation: Sulfur Cycling in the Southern Cascade Arc: Implications for the Sulfur Content, Metal Content, and Oxidation State of Arc Magmas
- 2015 *B.S. Earth Science*, Rice University, Houston, TX
Research advisor: Rajdeep Dasgupta
Distinction in Research and Creative Work
Thesis: The effect of variable Na/K on CO₂ solubility in slab-derived rhyolitic melts

PROFESSIONAL EXPERIENCE

- 2021- present *Peter Buck Postdoctoral Fellow*, Smithsonian National Museum of Natural History
- 2016- 2021 *Graduate Researcher*, University of Oregon
- 2020 *GRIP Fellow*, Smithsonian National Museum of Natural History
- 2019 *Lead Instructor*, Sternberg Museum of Natural History Science
- 2015- 2016 *Geoscientist*, AECOM Philadelphia Area Remediation Services Group
- 2013- 2015 *Undergraduate Researcher*, Rice University Experimental Petrology Group
- 2013 *NSF-REU Intern*, University of Minnesota Institute for Rock Magnetism

PUBLICATIONS

- In Preparation **Muth, M.J.**, Wallace, P.J. The influence of slab-derived sulfur on the metal contents of magmas in the southern Cascade arc. *Journal of Petrology*.
- In Preparation **Muth, M.J.**, Rasumussen, D.J., Wallace, P.J., Andrys, J., Plank, T., Cottrell, E.. Best practices for measuring sulfur in silicate glasses via EPMA. *American Mineralogist*.

- In Review **Muth, M.J.**, Wallace, P.J. Sulfur recycling in subduction zones and the oxygen fugacity of mafic arc magmas. *Earth and Planetary Science Letters*.
- 2021 Lerner, A.H., **Muth, M.J.**, Wallace, P.J., Lanzirotti, A., Newville, M., Gaetani, G. A., Chowdhury, P., Dasgupta, R. Improving the reliability of Fe- and S-XANES measurements in silicate glasses: correcting beam damage and identifying Fe-oxide nanolites in hydrous and anhydrous melt inclusions. *Chemical Geology*, 586, 120610.
- 2021 **Muth, M.J.**, Wallace, P. J. Slab-derived sulfate generates oxidized basaltic magmas in the southern Cascade arc (California, USA). *Geology*, 49, 1177-1181.
- 2021 Rose-Koga, E.F., Bouvier, A.-S., Gaetani, G.A., Wallace, P.J., Allison, C.M., Andrys, J.A., Angeles de la Torre, C.A., Barth, A., Bodnar, R.J., Bracco Gartner, A.J.J., Butters, D., Castillejo, A., Chilson-Parks, B., Choudhary, B.R., Cluzel, N., Cole, M., Cottrell, E., Daly, A., Danyushevsky, L.V., DeVitre, C.L., Drignon, M.J., France, L., Gaborieau, M., Garcia, M.O., Gatti, E., Genske, F.S., Hartley, M.E., Hughes, E.C., Iveson, A.A., Johnson, E.R., Jones, M., Kagoshima, T., Katzir, Y., Kawaguchi, M., Kawamoto, T., Kelley, K.A., Koornneef, J.M., Kurz, M.D., Laubier, M., Layne, G.D., Lerner, A., Lin, K.-Y., Liu, P.-P., Lorenzo-Merino, A., Luciani, N., Magalhães, N., Marschall, H.R., Michael, P.J., Monteleone, B.D., Moore, L.R., Moussallam, Y., **Muth, M.**, Myers, M.L., Narváez, D.F., Navon, O., Newcombe, M.E., Nichols, A.R.L., Nielsen, R.L., Pamukcu, A., Plank, T., Rasmussen, D.J., Roberge, J., Schiavi, F., Schwartz D., Shimizu, K., Shimizu, K., Shimizu, N., Thomas, J.B., Thompson, G.T., Tucker, J.M., Ustunisik, G., Waelkens, C., Zhang, Y., Zhou, T. Silicate melt inclusions in the new millennium: A review of recommended practices for preparation, analysis, and data presentation. *Chemical Geology*, 570, 120145.
- 2020 **Muth, M.**, Duncan M.S., Dasgupta, R. The Effect of Variable Na/K on CO₂ Solubility in Slab-Derived Rhyolitic Melts. *Carbon in Earth's Interior AGU Monograph*, 195-208.
- 2014 Frahm, E., Feinberg, J. M., Schmidt-Magee, B.A., Wilkinson, K., Gasparyan, B., Yeritsyan, B., Karapetian, S., Meliksetian, K., **Muth, M.**, and Adler D.S. Sourcing geochemically identical obsidian: multiscalar magnetic variations in the Gutansar volcanic complex and implications for Palaeolithic research in Armenia, *Journal of Archaeological Science*, 47, 164-178.

GRANTS AND FELLOWSHIPS

- 2021 User Beamtime Award, *Argonne National Laboratory*
- 2020 Graduate Research Intern Program Award, *National Science Foundation*
- 2019 User Beamtime Award, *Argonne National Laboratory*

- 2018 Graduate Research Fellowship, *National Science Foundation*
2016 First Year Graduate Student Fellowship, *University of Oregon*

HONORS

- 2021 Research Recognition Award, *University of Oregon*
2021 Smith Scholarship, *University of Oregon*
2019 Warren DuPre Smith Research Award, *University of Oregon*
2018 Geology Emeritus Research Award, *University of Oregon*
2015 Torkild Rieber Award in Earth Science, *Rice University*
2013 Eugen Merten Memorial Prize in Geology and Geophysics, *Rice University*
2013 Chevron Earth Science Minority Scholarship, *Rice University*

INVITED SEMINAR PRESENTATIONS

- 2022 USGS Volcano Science Center
2021 University of Pittsburgh
2020 Carnegie Science Earth and Planets Laboratory
2020 Smithsonian National Museum of Natural History, Dept. of Mineral Sciences
2020 International Volcanology Seminar (*Collaborative Virtual Seminar Series*)

CONFERENCE PRESENTATIONS

- 2021 **Muth, M.**, Wallace, P.J. The Influence of Slab-Derived Sulfur on the Metal Contents of Arc Magmas in the Southern Cascades. *AGU 2021 Fall Meeting, New Orleans, LA, 13-17 December.*
- 2021 **Muth, M.**, Wallace, P.J. Slab-Derived Sulfate and Oxidized Magmas in the Southern Cascade Arc. *AGU 2021 Fall Meeting, New Orleans, LA, 13-17 December.*
- 2020 **Muth, M.**, Wallace, P.J. Insights into global sulfur cycling from the melt inclusion record. *AGU 2020 Fall Meeting, Virtual, 1-17 December. (invited).*
- 2020 **Muth, M.**, Wallace, P.J. The influence of slab-derived sulfur on the sulfur content and oxidation state of arc magmas in the Southern Cascades. *AGU 2020 Fall Meeting, Virtual, 1-17 December.*

- 2020 Lerner, A., **Muth, M.**, Wallace, P.J., Lanzirotti A., Newville, M., Gaetani, G., Chowdhury, P., Dasgupta, R. Correcting Fe- and S-XANES Beam Damage and Recognizing Rapid Redox Equilibration of Olivine-Hosted Melt Inclusions. *Goldschmidt Conference, Virtual, 21-26 June.*
- 2020 **Muth, M.**, Wallace, P.J. Tracking Slab-Derived Sulfur and its Effect on Magma Oxidation State in the Southern Cascades. *Goldschmidt Conference, Virtual, 21-26 June.*
- 2019 **Muth, M.**, Wallace, P.J., Gaetani, G.A. Drawing connections between slab-derived sulfur, mantle melting, and arc magma oxidation state: A case study in the southern Cascades. *AGU 2019 Fall Meeting, San Francisco, CA, 9-13 December.*
- 2019 **Muth, M.**, Wallace, P.J. How does slab-derived sulfur affect magma redox in the southern Cascades? Insights from the melt inclusion record. *GSA Cordilleran Section-115th Annual Meeting, Portland, OR, 15-17 May.*
- 2018 **Muth, M.**, Wallace, P.J. Insights into Arc Magma Volatile Cycling and Oxidation State from Global Sulfur Trends. *AGU 2018 Fall Meeting, Washington, DC, 10-14 December.*
- 2017 **Muth, M.**, Wallace, P.J., Walowski, K.J. The Role of Hydrous Slab Melts in the Sulfur Content, Metal Content, and Oxidation State of Primitive Arc Magmas in the Southern Cascades. *AGU 2017 Fall Meeting, New Orleans, LA, 11-15 December.*
- 2017 Harvey, K.M., Perry-Houts J., Domino J., **Muth M.**, Carruthers S., Kotowski A.J., DeGrandpre K., Faul, U., Kent, A.J., Abers, G.A., Krawczynski, M. The ins and outs of mélange diapirs: a multidisciplinary approach to formation, ascent, and observation. *AGU 2017 Fall Meeting, New Orleans, LA, 11-15 December.*
- 2014 **Muth, M.**, Duncan, M. S., Dasgupta, R. Effect of variable Na/K ratio on CO₂ solubility in slab-derived rhyolitic melts- An experimental study. *AGU 2014 Fall Meeting, San Francisco, CA, 15-19 December.*

FIELD EXPERIENCE

- 2019 *Lassen Volcanic Area, CA*
Field sampling of tephra deposits with high school students during a two-week volcanology field course.
- 2018 *Trinity Ophiolite, CA*
Field trip with the University of Delaware Mantle Processes group for 3 days in the Trinity Ophiolite.

- 2018 *Santorini, Greece*
Field trip focusing on the volcanic deposits on the island of Santorini and deformation structures associated with the neotectonics of the surrounding region.
- 2017 *Lassen Volcanic Area, CA*
Sample collection of tephra deposits at selected cinder cones, targeting deposits likely to contain rapidly quenched primitive melt inclusions.
- 2017 *Long Valley Caldera, CA*
Sample collection of inter-layered ignimbrite and fall deposits.

TEACHING EXPERIENCE

- 2019 *Lead Instructor, Fort Hays State University Museum of Natural History*
Designed the curriculum for a newly introduced two-week field volcanology course for high school based in the Pacific Northwest. Lead instructor for the field course, assisted by an undergraduate student TA.
- 2017-2018 *Teaching Assistant, University of Oregon*
 GEOL 202: Earth Surface and Environment
 Primary responsibilities included facilitating lab section activities, grading lab section homework assignments and quizzes.
 GEOL 331: Mineralogy
 Primary responsibilities included teaching and facilitating lab section, grading, and designing laboratory section midterm and final exams.

RESEARCH TECHNIQUES

Fourier Transform Infrared Spectroscopy (FTIR)
 Electron Microprobe (EPMA)
 X-Ray Absorption Near Edge Structure (XANES)
 Laser Ablation ICP-MS
 Secondary Ion Mass Spectrometry (SIMS)
 End-loaded Piston Cylinder Apparatus
 MATLAB, Python
 Melt inclusion preparation and analysis

PROFESSIONAL ACTIVITIES

- 2019 *GeoPrisms Synthesis and Integration Theoretical and Experimental Institute
San Antonio, TX*
- 2018 *Thermodynamic modeling with alphaMELTS and other MELTS software
Workshop
Caltech, CA*

- 2018 Annual Workshop in Secondary Ion Mass Spectrometry
University of Arizona, AZ
- 2018 Mineral-Hosted Melt Inclusions Workshop
Woods Hole Oceanographic Institution, MA
- 2017 CIDER (Cooperative Institute for Dynamic Earth Research)
University of California Berkeley, CA
Participated in collaborative research effort: “The ins and outs of mélange diapirs: a multidisciplinary approach to formation, ascent, and observation”.
Presented results at 2017 AGU Fall meeting.

OUTREACH ACTIVITIES

- 2022 *Newsletter Feature, Smithsonian National Museum of Natural History*
Wrote a description of mantle xenolith research for the volunteer newsletter for the museum’s Hall of Geology, Gems, and Minerals.
- 2020 *“Expert Is In”, Smithsonian National Museum of Natural History*
Led a 2-hour interactive public discussion on museum floor around the theme “The Many Faces of Sulfur”.
- 2016-2019 *“Mad Duck” Science Outreach Program, University of Oregon*
Organized and lead several 4-hour long science outreach modules for local middle school students through NSF-funded ‘Mad Duck’ program.
Facilitated module design collaborations between Mad Duck and other graduate student organizations. Module design for Oregon paleontology is still in use.

PROFESSIONAL SERVICE

- 2022 *Member, Unlearning Racism in Geoscience (URGE) pod*
Smithsonian National Museum of Natural History
- 2020 *Session Convener, AGU Fall Meeting*
“Constraining Petrological and Geochemical Variations in Magmas to Capture the Evolution of Volcanoes over Space and Time”
- 2019 *Session Convener, Cordilleran Section GSA Annual Meeting*
“Crystal Windows into Igneous Processes”
- 2017-2021 *Board Member, CMiS (Community for Minorities in STEM)*
University of Oregon
UO CMiS is a graduate student organization dedicated to helping minority graduate students in STEM succeed through professional workshops, social and networking events, and community building activities. Elected Social

and Outreach Chair 2017-2018, Seminar Chair 2018-2019 and Vice President 2019-2021.

2018-2021 *Organizing Team, IgDEAS (Inclusivity and Gender Diversity in Earth and Atmospheric Science)*
University of Oregon

The mission of IgDEAS is to provide geoscience-specific professional and social support to women and non-binary researchers and students at the University of Oregon. Co-founded in 2018.

Volunteer Reviewer for manuscript contributions to *Geology, American Mineralogist*