

# Michelle Muth

Smithsonian Institution  
National Museum of Natural History  
Department of Mineral Sciences  
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## EDUCATION

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- 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 CO<sub>2</sub> Solubility in Slab-Derived Rhyolitic Melts

## PROFESSIONAL EXPERIENCE

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- 2021- present      *Peter Buck Postdoctoral Fellow*, Smithsonian National Museum of Natural History
- 2016- 2021      *Graduate Researcher*, University of Oregon
- 2020      *Predoctoral Fellow*, Smithsonian National Museum of Natural History
- 2019      *Lead Instructor*, Sternberg Museum of Natural History
- 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

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- 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*.

Submitted	<b>Muth, M.J.</b> , Wallace, P.J. Sulfur recycling in subduction zones and the oxygen fugacity of mafic arc magmas. <i>Earth and Planetary Science Letters</i> .
2021	Lerner, A.H., <b>Muth, M.J.</b> , 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. <i>Chemical Geology</i> , 586, 120610.
2021	<b>Muth, M.J.</b> , Wallace, P. J. Slab-derived sulfate generates oxidized basaltic magmas in the southern Cascade arc (California, USA). <i>Geology</i> , 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., <b>Muth, M.</b> , 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. <i>Chemical Geology</i> , 570, 120145.
2020	<b>Muth, M.</b> , Duncan, M.S., Dasgupta, R. The Effect of Variable Na/K on CO <sub>2</sub> Solubility in Slab-Derived Rhyolitic Melts. <i>Carbon in Earth's Interior AGU Monograph</i> , 195-208.
2014	Frahm, E., Feinberg, J. M., Schmidt-Magee, B.A., Wilkinson, K., Gasparyan, B., Yeritsyan, B., Karapetian, S., Meliksetian, K., <b>Muth, M.</b> , and Adler D.S. Sourcing geochemically identical obsidian: multiscalar magnetic variations in the Gutansar volcanic complex and implications for Palaeolithic research in Armenia, <i>Journal of Archaeological Science</i> , 47, 164-178.

## GRANTS AND FELLOWSHIPS

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2021	User Beamtime Award, <i>Argonne National Laboratory</i>
2020	Graduate Research Intern Program Award, <i>National Science Foundation</i>
2019	User Beamtime Award, <i>Argonne National Laboratory</i>

2018	Graduate Research Fellowship, <i>National Science Foundation</i>
2016	First Year Graduate Student Fellowship, <i>University of Oregon</i>

## HONORS

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

## INVITED SEMINAR PRESENTATIONS

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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 ( <i>Collaborative Virtual Seminar Series</i> )

## CONFERENCE PRESENTATIONS

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2021	<b>Muth, M.</b> , Wallace, P.J. The Influence of Slab-Derived Sulfur on the Metal Contents of Arc Magmas in the Southern Cascades. <i>AGU 2021 Fall Meeting, New Orleans, LA, 13-17 December.</i>
2021	<b>Muth, M.</b> , Wallace, P.J. Slab-Derived Sulfate and Oxidized Magmas in the Southern Cascade Arc. <i>AGU 2021 Fall Meeting, New Orleans, LA, 13-17 December.</i>
2020	<b>Muth, M.</b> , Wallace, P.J. Insights into global sulfur cycling from the melt inclusion record. <i>AGU 2020 Fall Meeting, Virtual, 1-17 December. (invited).</i>
2020	<b>Muth, M.</b> , Wallace, P.J. The influence of slab-derived sulfur on the sulfur content and oxidation state of arc magmas in the Southern Cascades. <i>AGU 2020 Fall Meeting, Virtual, 1-17 December.</i>
2020	Lerner, A., <b>Muth, M.</b> , 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 CO<sub>2</sub> solubility in slab-derived rhyolitic melts- An experimental study. *AGU 2014 Fall Meeting, San Francisco, CA, 15-19 December.*

## FIELD EXPERIENCE

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- 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 Santorini and deformation structures associated with the neotectonics of the surrounding region.

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| 2017 | <i>Lassen Volcanic Area, CA</i><br>Sample collection of tephra deposits at selected cinder cones, targeting deposits likely to contain rapidly quenched primitive melt inclusions. |
| 2017 | <i>Long Valley Caldera, CA</i><br>Sample collection of inter-layered ignimbrite and fall deposits.   |

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## TEACHING EXPERIENCE

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

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## RESEARCH TECHNIQUES

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Fourier Transform Infrared Spectroscopy (FTIR)  
 Electron Microprobe Micro-Analysis (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

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## PROFESSIONAL ACTIVITIES

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| 2019 | GeoPrisms Synthesis and Integration Theoretical and Experimental Institute<br><i>San Antonio, TX</i> |
| 2018 | Thermodynamic modeling with alphaMELTS and other MELTS software<br>Workshop<br><i>Caltech, CA</i>    |
| 2018 | Annual Workshop in Secondary Ion Mass Spectrometry<br><i>University of Arizona, AZ</i>               |
| 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

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- 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

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- 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*