

Angela N. Seligman

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Research Interests

isotope geochemistry, isotope tracers, nuclear waste storage, geochemistry, water, paleoclimatology, mass spectrometry, volcanic degassing, stable isotope analysis, analytical technique and method development, igneous petrology, geothermal energy, natural hazards, data analysis, large-volume silicic eruptions, secondary hydration of volcanic glass, paleotectonic reconstructions, aqueous geochemistry, environmental geochemistry

Education

Ph.D. candidate, University of Oregon (*expected graduation – June 2016*)

Department of Geological Sciences

Advisor: Dr. Ilya Bindeman

Areas of Study: geochemistry, volcanology

Thesis: Oxygen and hydrogen investigation of volcanic rocks: Petrogenesis to paleoclimate

M.Sc., University of Utah, 2012

Department of Geology and Geophysics

Thesis: Generation of low $\delta^{18}\text{O}$ silicic magmas, Bruneau-Jarbridge volcanic center, Yellowstone hotspot: Evidence from zircons, including oxygen isotopes, U-Th-Pb dating, and melt inclusions.

Advisor: Dr. Barbara Nash

B.Sc., Northern Arizona University, 2008

School of Earth Sciences and Environmental Sustainability

Thesis: Origin of rafted material on the SP Crater lava flow and implications for eruptive history of a “simple” cinder cone.

Advisor: Dr. Nancy Riggs

Professional Experience

Graduate Teaching Fellow, September 2011–Present

Department of Geological Sciences, University of Oregon

Geologist, May 2011–July 2011

Utah Geological Survey

Teaching Assistant, August 2009–May 2011

Department of Geology and Geophysics, University of Utah

Geotechnician, May 2010–July 2010
Utah Geological Survey

Lab Manager, June 2008–December 2008
School of Earth Sciences and Environmental Sustainability, Northern Arizona University

Field Technician, June 2008–September 2008
Speedie and Associates

Seismic Analyst, May 2007–August 2007
Washington University in Saint Louis

Analytical Equipment Experience

- Thermo Finnigan TC/EA used to determine hydrogen and oxygen isotope ratios of waters extracted from hydrous minerals and volcanic glass
- Thermo-Nicolet Nexus 670 FTIR spectrometer used to determine speciation of water in KBr pellets of volcanic glass
- Thermo Finnigan MAT 253 mass spectrometer used to determine oxygen isotope ratios of silicate minerals
- Secondary Ion Mass Spectrometer (CAMECA IMS-1270, CAMECA IMS-1280, CAMECA IMS 6f) used for in situ U-Pb geochronology, oxygen isotope ratios of zircons, and depth profiling
- Sensitive High Resolution Ion Microprobe with Reverse Geometry (SHRIMP-RG) used for in situ U-Pb geochronology and trace element analyses of zircons
- Agilent 7500ce ICP-MS used for Sr and Ca analyses of teeth
- Titan 80-300 Transmission Electron Microscope (TEM) used to image volcanic glass to check for microscopic clay particles
- Nano Secondary Ion Mass Spectrometer (CAMECA Ametek NanoSIMS 50L) used during the Arizona State University SIMS Workshop
- Qualitative Evaluation of Minerals by SCANNing electron microscopy (QEMSCAN) used during an Analytical Methods course at the University of Utah
- X-Ray Diffractometer (Panalytical X'Pert XRD) used during an Analytical Methods course at the University of Utah
- Time of Flight Secondary Ion Mass Spectrometer (TRIFT I TOF SIMS) used during the Arizona State University SIMS Workshop
- Electron Microscopes (CAMECA SX-50 and CAMECA SX-100) used for major and trace element analyses of melt inclusions and volcanic minerals
- FEI Quanta 200 SEM microscope used for high resolution imaging of volcanic tephra and ion microprobe spot analyses
- Jaw crusher, roller mill, dry sieve, Rogers water table, and Frantz magnetic separator used for zircon extraction from rocks
- Petrographic microscopes for transmitted and reflected light of rock and mineral thin section characterizations, and mineral picking

Honors and Awards

2016: Arizona State University Travel Stipend for Secondary Ion Mass Spectrometry Workshop
2015: Good Citizen Award, University of Oregon
2015: Johnston Grant, University of Oregon
2015: Kleinman Grant for Volcano Research, United States Geological Survey
2014: On to the Future Award, Geological Society of America
2014: Smith Scholarship, University of Oregon
2014: Geological Society of America Grant
2014: Evolving Earth Foundation Grant
2014: University of Oregon Staples Scholarship
2013: Good Citizen Award, University of Oregon
2008: Outstanding Undergraduate Women in Geology Award, Northern Arizona University
2007: Tom and Rose Bedwell Earth Physics Grant

Presentations

2016: Environmental Protection Agency, Ada, Oklahoma (invited talk)
2015: American Geophysical Union Fall Meeting, San Francisco, California (poster)
2015: Portland State University, Portland, Oregon (invited talk)
2014: American Geophysical Union Fall Meeting, San Francisco, California (poster)
2014: Geological Society of America Annual Meeting, Vancouver, Canada (talk)
2014: Geological Society of America Annual Meeting, Vancouver, Canada (poster)
2013: Pima County Community College Archaeology Field School (invited lecture)
2013: American Geophysical Union Fall Meeting, San Francisco, California (poster)
2012: American Geophysical Union Fall Meeting, San Francisco, California (poster)
2011: JKASP Meeting, Petropavlovsk-Kamchatsky, Russia (talk)

Journal Publications

Seligman, A.N., Bindeman, I.N., McClaughry, J., Stern, R.A., and Fisher, C., 2014, The earliest low and high $\delta^{18}\text{O}$ caldera-forming eruptions of the Yellowstone plume: Implications for the 30–40 Ma Oregon calderas and speculations on plume-triggered delaminations: *Frontiers in Earth Science*, v. 2, p. 1–9.

Seligman, A.N., Bindeman, I.N., Jicha, B., Ellis, B., Ponomareva, V., Leonov, V., 2014, Multi-cyclic and isotopically-diverse silicic magma generation in an arc volcano: Gorely eruptive center, Kamchatka, Russia: *Journal of Petrology*, v. 55, p. 1561–1594.

Manuscripts in Review

Seligman, A.N., Bindeman, I.N., Watkins, J.M., Ross, A.M., *in review*, Water in volcanic glass: From volcanic degassing to secondary hydration: *Geochimica et Cosmochimica Acta*.

Martin, E., Bindeman, I.N., Balan, E., Palandri, J., **Seligman, A.N.**, Villemant, B., *in review*, D/H by TCEA technique in application to volcanic glass as a window into secondary hydration, *Chemical Geology*.

Manuscripts in Preparation

Seligman, A.N., Bindeman, I.N., *in preparation*, $\delta^{18}\text{O}$ analyses of hydrous volcanic glass using the TCEA: New standards and methodology, *to be submitted spring 2016*.

Seligman, A.N., Bindeman, I.N., Van Eaton, A.R., Hoblitt, R.P., *in preparation*, Isotopic insights into the degassing and secondary hydration rates of volcanic glass from the 1980 eruptions of Mount St. Helens, *to be submitted Summer 2016*.

Published Abstracts

Martin, E., Bindeman, I.N., Balan, E., Palandri, J.L., **Seligman, A.N.**, Villemant, B., 2016, Water content, speciation and isotopic composition in volcanic glass: an open window on magma degassing processes or paleoclimate? European Geosciences Union General Assembly, abstract #EGU2016-7403.

Seligman, A.N., Bindeman, I.N., Palandri, J.L., Watkins, J.M., Ross, A.M., 2015, Water in volcanic glass: From volcanic degassing to secondary hydration. American Geophysical Union, Fall Meeting 2015, abstract #V51F-3103.

Ross, A.M., **Seligman, A.N.**, Bindeman, I.N., 2015, Analysis of hydrogen isotopic exchange: Lava Creek Tuff ash and isotopically labeled water. American Geophysical Union, Fall Meeting 2015, abstract #PP11B-2221.

Seligman, A.N., Bindeman, I.N., 2014, The relative rates of secondary hydration in basalt and rhyolite, and the use of δD as a paleoclimate indicator: Implications for paleoenvironmental and volcanic degassing studies. American Geophysical Union, Fall Meeting 2014, abstract #V31C-4768.

Seligman, A.N., Bindeman, I.N., McClaughry, J.D., Stern, R.A., Fisher, C., 2014, Plume-triggered delamination and the earliest low $\delta^{18}\text{O}$ caldera-forming eruptions of the Yellowstone plume: Implications for large 30–40 Ma Oregon calderas. Geological Society of America, Fall Meeting 2014.

Seligman, A.N., Bindeman, I.N., 2014, Testing the use of $\delta^{18}\text{O}$ in extracted water from volcanic ash, kaolinite, and mica as a tool for paleoclimate and paleoaltimetry studies: The search for new standards and methodology. Geological Society of America, Fall Meeting 2014.

Seligman, A.N., Bindeman, I.N., 2013, Volcanic degassing and secondary hydration of volcanic ash and scoria: Implications for paleoaltimetry and paleoclimate studies. American Geophysical Union, Fall Meeting, abstract #V31B-2695.

Bindeman, I.N., **Seligman, A.N.**, Nolan, G., Lundstrom, C., Martin, E., Lowenstern, J., Palandri, J., 2013, The role of residual (undegassed) and environmental waters in pyroclastic volcanic glass in nature and experiments. American Geophysical Union, Fall Meeting 2013, abstract #V24C-08.

Seligman, A.N., Bindeman, I.N., Ellis, B., Ponomareva, V., Leonov, V., 2012, Recognizing evidence for silicic magma derivation from petrochemically-similar arc crust: Isotopic and chemical evidence for the bimodal volcanic series of Gorely volcanic center, Kamchatka, Russia. American Geophysical Union, Fall Meeting 2012, abstract #V31C-2802.

Bindeman, I.N., Lundstrom, C., Schmitt, A., Simakin, A., **Seligman, A.N.**, Drew, D., 2012, Very fast silicic magma genesis in caldera and rift environments based on isotope zoning in zircons, experiments, and thermal modeling. Goldschmidt Conference 2012, Montreal, Canada.

Cathey, H., Nash, B., **Seligman, A.N.**, Valley, J., Kito, N., Allen, C., Campbell, I., Vazquez, J., Wooden, J., 2011, Low $\delta^{18}\text{O}$ zircons from the Bruneau-Jarbidge eruptive center: A key to crustal anatexis along the track of the Yellowstone hotspot. American Geophysical Union, Fall Meeting 2011, abstract #V11A-2510.

Seligman, A.N., Nash, B., Cathey, H., Valley, J., Vazquez, J., Wooden, J., 2011, Oxygen isotopes and U-Th-Pb dating of zircons from post-Cougar Point Tuff lavas of the Bruneau-Jarbidge eruptive center of the Yellowstone hotspot: 7th Biennial JKASP, Petropavlovsk-Kamchatsky, Russia.

Weikart, J., **Seligman, A.N.**, Riggs, N., 2008, Origin of agglutinate material on the SP Crater lava flow and implication for eruptive history of a “simple” cinder cone, San Francisco Field, Northern Arizona. Geological Society of America, Fall Meeting 2008.

Teaching Experience

Volcanology Field Camp, University of Oregon, Summer 2014, 2015

- Assisted in planning for field camp; provided guidance in the field as students mapped their first lavas flows and determined the chronology of the eruptions of the Four Craters in central Oregon; provided guidance for their later project of mapping the John Day and Clarno units in eastern Oregon; assisted in grading final projects

Introduction to Petrology, University of Oregon, Winter 2015, 2016

- Provided instruction for one of the laboratory sections of the course; created weekly lectures and assignments; graded assignments; wrote, proctored, and graded a midterm and final laboratory exam
- Topics covered: petrographic microscopes; igneous and metamorphic mineral and rock identification and associations in hand sample and thin section; igneous and metamorphic textures; igneous phase diagrams; magma differentiation and crystal fractionation; subduction zone, mid-ocean ridge, and hotspot volcanism

Mineralogy, University of Oregon, Fall 2014

- Provided instruction for one of the laboratory sections of the course; created weekly lectures and assignments; graded assignments; wrote, proctored, and graded a midterm and final laboratory exam in addition to periodic mineral identification quizzes
- Topics covered: mineral identification and formulas; crystal forms and habits; mineral systems; miller indices; common occurrences of minerals; introduction to petrographic microscopes; biaxial and uniaxial minerals; plane and polarized light; ternary diagrams

Volcanoes and Earthquakes, University of Oregon, Fall 2011, 2013, 2015 (Lead Assistant)

- Edited class assignments; instructed and graded in-class assignments for a large lecture class; co-led field-trips to Crater Lake National Park and Smith Rock State Park
- Topics covered: natural hazards and risk assessment; mid-ocean ridge spreading; seismic waves; formation of volcanoes; earthquakes; tsunamis; mountain building; rock identification; meteorite impacts

Evolution of the Earth, University of Oregon, Spring 2012, 2013

- Provided instruction for one of the laboratory sections of the course; edited weekly assignments; provided instruction for and graded weekly assignments; proctored and graded laboratory quizzes and the final laboratory exam
- Topics covered: rock identification; paleoclimatology; geologic maps; fossil identification of Paleozoic to Cenozoic marine invertebrates; fossil plants, fish, amphibians, mammals, and reptiles,

Surface and Environmental Geology, University of Oregon, Winter 2012

- Provided instruction for one of the laboratory sections of the course; edited weekly assignments; provided instruction for and graded weekly assignments
- Topics covered: topographic maps; sedimentary rocks and environments; climate change; glaciers; coastal geology; groundwater resources; streams; mass wasting; desert landscapes

Field Experience

- 2015: Two days of sample collection at Mount St. Helens
- 2014: Co-led a three day field trip to Newberry Volcano, Oregon
- 2014: Took a two-week geologic field course in Kyrgyzstan to learn about the structure of the Tian Shan Mountains and surrounding region
- 2013: Field assistant in the Lassen Volcanic Field
- 2013: Ten days of sample collection at three calderas and Mt. Mazama in central and eastern Oregon
- 2012: One week of sample collection at three calderas in central and eastern Oregon
- 2011: One week of sample collection at Gorely volcano in Kamchatka, Russia
- 2011: One week summer international volcanological field school at Tolbachik volcano in Kamchatka, Russia (University of Alaska Fairbanks)
- 2009: One week field course through the Snake River Plain of the Yellowstone hotspot

- 2008: Semester long mapping of the SP Crater lava flow of the San Francisco volcanic field in Northern Arizona
- 2008: Six week field course involving mapping in Sedona, Glenn Canyon, the Verde River Headwaters, and Mesa Butte in Arizona (Northern Arizona University field camp)

Outreach and Involvement

Reviewer for Bulletin of Volcanology (2015)

Graduate Mentor, April 2015–Present

Abigail Ross (faculty mentor: Ilya Bindeman)
Senior Thesis Research, University of Oregon

Oregon Science Olympiad, 2012–2015

Created, administered, and judged the “Fermi” Question event (2012, 2013) and the Geologic Mapping event (2014, 2015); administered and judged the “Awesome Aquifers” event (2012); administered and judged the “Dynamic Planet” event (2013)

Briggs Middle School, 2015

Gave a one hour presentation to ~50 middle school students on volcanic hazards

Prairie Mountain Middle School, 2012

Took four groups of students on field trips to the Willamette River to teach them about river mechanics, and performed a short exercise to determine river velocity

Professional Memberships

American Geophysical Union
Geological Society of America