AMY RENEE SMITH

Marine Chemistry and Geochemistry Cell: (503) 283-0843

Woods Hole Oceanographic Institution Email: asmith@whoi.edu

360 Woods Hole Road, MS #51

Woods Hole, MA 02543

RESEARCH INTERESTS

* Microbial ecology and metabolism in igneous environments
* Biosignatures in igneous rocks and minerals
* Early evolution of life and extraterrestrial analogues

PEER-REVIEWED PUBLICATIONS

***Smith, A.R.****,* R. Mueller, M.R. Fisk, and F.S. Colwell (in preparation), Ancient metabolisms persist in a bacterium from an olivine biofilm in a thermal suboceanic aquifer

***Smith, A.R.****,* R. Mueller, M.R. Fisk, O.U. Mason, R. Popa, and F.S. Colwell (in preparation), The Wood-Ljungdahl pathway for carbon fixation predominates in an olivine biofilm from young thermal oceanic crust

***Smith, A.R.****,* M.R. Fisk, A.R. Thurber, G.E. Flores, O.U. Mason, R. Popa, and F.S. Colwell (2016), Deep Crustal Communities of the Juan de Fuca Ridge are Governed by Mineralogy, *Geomicrobiology,* DOI: 10.1080/01490451.2016.1155001.

***Smith, A.R*.**, R. Popa, M.R. Fisk, M. Nielsen, C.G. Wheat, H W. Jannasch, A.T. Fisher, K. Becker, S.M. Sievert, and G.E. Flores (2011), *In situ* enrichment of ocean crust microbes on igneous minerals and glasses using an osmotic flow-through device, *Geochemistry, Geophysics, Geosystems*, 12, Q06007, doi:10.1029/2010GC003424.

Popa, R., ***A.R. Smith***, R. Popa, J. Boone, and M.R. Fisk (2012), Olivine-Respiring Bacteria Living in Mars-Like Conditions at the Rock-Ice Interface in a Lava Tube Ice Cave, *Astrobiology* 12:1 (9-18).

**Cortés, V.A., D.E. Curtis, S. Sukumaran, X. Shao, V. Parameswara, S. Rashid****, *A.R. Smith*, J. Ren, V. Esser, R.E. Hammer, A.K. Agarwal, J.D. Horton, and A. Garg (2009),** Molecular Mechanisms of Hepatic Steatosis and Insulin Resistance in the AGPAT2-Deficient Mouse Model of Congenital Generalized Lipodystrophy, *Cell Metabolism* 9:2 (165-176).

EDUCATION

2017Ph.D. Ocean, Earth, and Atmospheric Sciences, Oregon State University (OSU);Advisors Rick Colwell and Martin Fisk 2011 – Present

2011 M.S. Biology, Portland State University (PSU), Advisor Radu Popa 1995 B.S. Biology,University of Texas at Arlington (UTA)

1993 A.A. Natural Science, Tyler Junior College (TJC)

HONORS, AWARDS, AND FELLOWSHIPS

2016 Graduate School Travel Award, OSU

2016 Oregon Lottery Graduate Scholarship, OSU

2016 Chipman-Downs Memorial Fellowship, OSU

2012 – 2014 Graduate Research Fellowship – Center for Dark Energy Biosphere Investigations (C-DEBI)

2013 NASA Astrobiology Institute Scholarship for the International Astrobiology Summer School, Santander, Spain

2013 Deep Carbon Observatory Travel Award for Deep Life Meeting, Portland, OR

2009 Outstanding Teacher Award, PSU

1991 – 1993 University Presidential Scholarship, TJC and UT Tyler 1993 Honor Graduate, TJC 1991 David Ross Memorial Scholarship, KHS

PROFESSIONAL EXPERIENCE

2017 *Graduate Teaching Assistant*, OSU Dept. of Integrative Biology. Functional Anatomy of the Human Muscular System.

2015 – 2017 *Graduate Teaching Assistant*, OSU Dept. of Integrative Biology. Introduction to Human Anatomy and Physiology Laboratory.

2012 -2014 *Graduate Fellow* (C-DEBI), OSU.

2011 – 2012 *Graduate Research Assistant*,OSU.

2007 – 2011 *Microbiology Laboratory Teaching Assistant*, PSU.

2007 – 2011 *Graduate Research Assistant*, PSU.

1998 – 2007 *Research Associate*, Department of Biophysics and Molecular Genetics, UT Southwestern Medical Center, Dallas, Texas.

1996 – 1997 *Mammal Keeper*, Dallas Zoo, Dallas, Texas.

ORAL AND POSTER PRESENTATIONS

2016 Genomic evidence for the Wood­Ljungdahl pathway for carbon fixation in warm basaltic ocean crust, ***Smith, A.R.,*** M.R. Fisk, R. Mueller, F.S. Colwell, O.U. Mason and R. Popa (2016), Abstract B13J:  195024 presented at *2016 Fall Meeting*, AGU, San Francisco, Calif., 12 Dec.

2014 Functional metagenomes of minerals in the suboceanic aquifer ecosystem, *C-DEBI Annual Meeting*, Marina, CA (Invited).

2014 Functional metagenomes of minerals in the suboceanic aquifer ecosystem, *International Symposium on Subsurface Microbiology,* Pacific Grove, CA.

2014 Functional metagenomics of igneous minerals incubated in the suboceanic aquifer, *Deep Carbon Observatory Summer School*, Big Sky, MT.

2013 A comparison of microbial communities from deep igneous crust*,* ***Smith, A.R.***, G.E. Flores, M.R. Fisk, F.S. Colwell, A.R. Thurber, O.U. Mason, and R. Popa (2013), Abstract B22B-04 presented at *2013 Fall Meeting*, AGU, San Francisco, Calif., 9-13 Dec.

2013 Delving into the Deep Biosphere, S. Grim, M. Sogin, A. Boetius, B. Briggs, W. Brazelton, S. D’Hondt, K. J. Edwards, M. Fisk, E. Gaidos, J. Gralnick, K.-U. Hinrichs, C. Lazar, H. Lavalleur, M. A. Lever, V. Marteinsson, D. Moser, B. Orcutt , K. Pedersen, R. Popa, A. Ramette, M. Schrenk, J. Sylvan, ***A. Smith***, A Teske, E. Walsh, and F. Colwell (2013), Abstract B22B-01 presented at *2013 Fall Meeting, AGU*, San Francisco, Calif., 9-13 Dec.

2013 *C-DEBI Annual Meeting*, Marina, California.

2013“Life in Deep Ocean Crust” video, *STC Directors Meeting,* Portland, OR.

2013 Inca City, Mars: Biosignatures and probedevelopment for life detection*, NASA International Astrobiology Summer School*, Santander, Spain.

2013Microbial communities colonizing igneous phases in deep ocean crust, *Deep Carbon Observatory: Deep Life Meeting***,** Portland, OR.

2012Variability in microbial communities attached to igneous minerals and glasses incubated in deep ocean crust***Smith, A. R*.**, F. Colwell, R. Popa, and M. Fisk (2012), *American Geophysical Union, Fall Meeting 2012*.

2012Microbial Diversity in the Columbia River Basalt Group and the Context for Life in Subsurface Basalts*,* Lavalleur, H., ***A. Smith***, M. Fisk, F. Colwell (2012), *American Geophysical Union, Fall Meeting 2012*.

2012 Assessing the Oceanic Crustal Biosphere, C-DEBI All-Hands Meeting, Marina, CA.

2012 Microbial Communities in Deep Ocean Crust, CEOAS Student Seminar, Corvallis, OR.

2012 Microbial Diversity of Igneous Minerals in the Ocean Crust, *Astrobiology Graduate Conference (AbGradCon)*, CalTech, Pasadena, CA.

2012 Microbial Diversity of Subseafloor Igneous Minerals and Glasses, DEBI RCN Meeting, Bremen, Germany.

2012 Basalt mineral oxidation by ocean crust bacteria, *National Ocean Sciences Bowl – OSU Salmon Bowl*, Corvallis, OR.

2012-13 Subsurface Life: What can DNA tell us?, *daVinci Days,* Corvallis, OR .

2011 Microbial phylogeny of igneous minerals and glasses in deep ocean crust, **Smith, A. R.**, R. Popa, M. Fisk, M. Nielsen, C. G. Wheat, H. Jannasch, A. Fisher, K. Becker, S. Sievert, and G. Flores (2011), *American Geophysical Union, Fall Meeting 2011*.

2010 Basalt mineral oxidation by ocean crust bacteria, *Ridge 2000 Meeting,* Portland, OR *.*

2010 Basalt mineral oxidation by ocean crust bacteria, *ISME (International Society for Microbial Ecology) Meeting*, Seattle, WA.

2010Differential bacterial colonization of volcanic minerals in deep thermal basalts,**Smith, A. R**., R. Popa, M. R. Fisk, M. Nielsen, C. G. Wheat, H. Jannasch, A. Fisher, and S. Sievert (2010), presented at the *Astrobiology Science Conference* (AbSciCon) meeting, Houston, TX.

2008 Sub-seafloor microbial colonization of igneous minerals and glasses, **Smith, A**., R. Popa, M. Fisk, M. Nielsen, G. Wheat, H. Jannasch, A. Fisher, and S. Sievert (2008), *American Geophysical Union, Fall Meeting 2008*, abstract #B53C-0506.

2008 Microbial mediation of olivine dissolution: the role of iron-oxidizing bacteria in the formation of microchannels, *AbGradCon*, SETI Institute, San Jose, CA.

OTHER MEETINGS AND WORKSHOPS – NON-PRESENTER

2017 NASA’s *Workshops Without Walls: Serpentinizing Systems Science*

2016 *Critical Measurements In Martian Geobiology With Mars-2020: Finding Signs Of Past Rock-Hosted Life*

2016 *Chemistry of Microbiomes*

2016 *EarthCube Oceanography and Geobiology Environmental ‘Omics (ECOGEO): Introduction to Environmental ‘Omics*, Univ. Hawai’i, Manoa

2013 *NSF Science and Technology Centers: Charting Today the Science & Technology of Tomorrow*, Student Pre-meeting for NSF STC Director’s Meeting, Portland, OR

2013 Deep Carbon Observatory Workshop, Pre-AGU

2011 *Mars Science Lander* 5th Landing Site Meeting

2008 *AbSciCon,* NASA Ames Research Center

FUNDING

2016 Graduate Student Travel Award, OSU ($500)

2016 Oregon Lottery Graduate Scholarship ($2550)

2016 Chipman-Downs Memorial Fellowship ($2400)

2016 EarthCube Oceanography and Geobiology Environmental ‘Omics (ECOGEO): Introduction to Environmental ‘Omics Travel Funding

2014 *Deep Carbon Observatory* Travel Funding for DCO Summer School

2014-15 Training Grant Extension Fellowship, OSU Graduate School ($3969)

2014 *Center for Dark Energy Biosphere Investigations (C-DEBI)*, Student travel funding for C-DEBI Annual Meeting

2014 *Student Advisory Committee* ($300), student travel funding for AGU Fall Meeting 2013

2013 *NASA Astrobiology Institute Scholarship* forInternational Astrobiology Summer School, Santander, Spain.

2013 *Center for Dark Energy Biosphere Investigations (C-DEBI)*, Student travel funding for C-DEBI Annual Meeting

2013 *Center for Deep Energy Biosphere Investigations (C-DEBI) Graduate Student Fellowship* ($33,000) *“*Modeling Rates of Olivine Bioweathering in Ocean Crust”

2013 *Deep Carbon Observatory* Travel Funding for Deep Life Meeting, Portland, OR

2013 *Census of Deep Life/Deep Carbon Observatory* Supplementary Research Grant,

“Metagenomic Sequencing of Low Diversity Microbial Communities Colonizing Olivine Incubated in the Oceanic Crust”, Principal Investigators: A.R. Smith, O.U. Mason, M.R. Fisk, F.S. Colwell, and R. Popa.

2012 Graduate Laurels Scholarship, OSU Graduate School ($5832)

2012 *Deep Carbon Observatory* Travel Funding for AGU Workshop

2012 *Student Advisory Committee* ($500), student travel funding for DEBI RCN

2012 *NASA Jet Propulsion Laboratory* ($450), student travel funding for AbGradCon

2012 *Center for Dark Energy Biosphere Investigations (C-DEBI) Graduate Student Fellowship* ($33,000) *“*Modeling Rates of Olivine Bioweathering in Ocean Crust”

2012 *Center for Dark Energy Biosphere Investigations (C-DEBI)*, DEBI RCN($1510), Student travel funding for 2012 DEBI RCN Meeting

2012 *NASA Astrobiology Institute,* AbGradCon student travel funding

2011 *Census of Deep Life/Deep Carbon Observatory* Research Grant, “Proposal to apply 454-based tag sequencing technology to igneous minerals incubated for four years in the ocean crust”, Principal Investigators: R. Popa, A. R. Smith, M. R. Fisk, and O. U. Mason.

2011 *Center for Dark Energy Biosphere Investigations (C-DEBI)* Research Grant ($50,000),

“Genetic diversity and distribution of microbes colonizing igneous minerals and glasses incubated in IODP Hole 1301A on the eastern flank of the Juan de Fuca Ridge”, Principal Investigators: R. Popa, A. Smith, G. Flores, and M. Fisk.

2010 *NASA Astrobiology Institute,* AbSciCon student travel funding ($750)

2008 *Cave Research Foundation* Grant ($1500), “Mineral Weathering of Lava Tubes: Iron-Oxidizing Bacteria and the Search for Life on Mars”, Principal Investigators: A. Smith and R. Popa.

2008 *NASA Astrobiology Institute* ($750), Student travel award for AbGradCon

FIELD RESEARCH

2012 Yaquina Bay and Coastal Shelf Sampling in Newport, Oregon

2011 Cascadia Field Course in Oregon and Washington for push coring and water sampling

2008 Olivine-rich basalt collection in Coos Bay, Oregon

2008 Ice cave basalt collection in Eastern Oregon

2008 *AT 15-35* WHOI Atlantis/Alvin Expedition to Eastern Juan de Fuca Ridge for recovery and deployment of subseafloor microbial experiments at IODP Holes 1301A and 1026B

COMMUNITY SERVICE, MEDIA, AND OUTREACH

2017 “Science week” at OSU Beaver Beginnings Preschool – performed three educational activities geared toward preschool-age children:

1. Marine underwater volcanoes with papier mache, art, and apps

2. Microscopy and algae art

3. Reading “Charlotte the Scientist is Squished”, by Camille Andros, learning the scientific method and applying it to make paper rockets to go to the moon, and taking a virtual reality tour of the International Space Station

2016 Girl Scout Service Unit 29 & Troop 20059 Fall Product Sale Manager

2015 – 2016 Field Trip Volunteer – Adams Elementary

2015 Developed and implemented curricular materials for Kindergarten – 2nd Grade: “A Subseafloor Journey: Exploring the Ocean Crust” incorporated coring into a homemade seafloor cake and reading and distributing a free Joides Resolution children’s book found at <http://joidesresolution.org/node/2998>.

2014 – Present Girl Scout Troop 20059 Co-leader

2013 “Life in the Crust: The Earth’s Biggest Ecosystem and Its Implications” *Corvallis Advocate,* commentary

2013 - 2017 daVinci Days – Subsurface microbiology interactive table “Strawberry DNA extraction”

2012 Undergraduate Poster Presentation Judge, AbGradCon 2012

2012 daVinci Days – Subsurface microbiology interactive table

2012 OSU Discovery Days volunteer

2012 National Ocean Sciences Bowl - OSU Salmon Bowl

*2008 “Better” TV* segment: “The Five Second Rule and Double Dipping”

2008 Science Fair Judge, Gordon Russell Middle School

UNDERGRADUATE MENTORING

2012 – 13 Teague Green

2009 Dijana Karanovich

2008 Hien Nguyen

2007 – 09 Susan Holmes

BIOINFORMATICS AND OTHER RELEVANT LABORATORY EXPERIENCE

* Metagenomic assembly using VELVET, IDBA-UD, and RAY
* Genomic Binning with VizBin, PhyloPythia
* Annotation of genomic data using DIAMOND, PRODIGAL, KEGG KOALA
* 454 pyrotag and Illumina sequencing analysis using MOTHUR
* Phylogenetic tree construction with MEGA5
* Community analysis using PRIMER
* Analysis using MG-RAST
* Culturing and isolation of microaerophilic lithotrophs from environmental samples
* Genomic DNA and RNA extraction and analysis, including PCR, cloning, and blotting techniques
* ESEM and light microscopy techniques, including DAPI staining
* X-ray diffraction and electron microprobe for rock and mineral analysis
* Spectroscopy