

Heidi J Smith
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Montana State University
Center for Biofilm Engineering
317 Barnard Hall
Bozeman, MT 59717

CURRENT POSITIONS

Assistant Research Professor, Department of Microbiology and Immunology, Montana State University

CBE Bio-Imaging Facility Manager, The Center for Biofilm Engineering, Montana State University

Montana Institute on Ecosystems Affiliate, Montana State University, Montana, USA

ACADEMIC TRAINING

Ph.D. Ecology and Environmental Sciences

Montana State University Bozeman, MT May 2016

B.S. Biology, Minor: Soil Science

Montana State University Bozeman, MT May 2009

RESEARCH EXPERIENCE

June 2016-October 2019 Montana State University
Bozeman, MT

Postdoctoral Research Assistant

- The Center for Biofilm Engineering (CBE) under CBE Director Dr. Matthew W. Fields
- Research topics: Microbial and biogeochemical carbon cycling dynamics in aquatic systems and biogenic coal bed methane formation, responsible for the oversight of a radioisotope laboratory and protocol development

September 2009- May 2016 Montana State University Bozeman, MT

Graduate Research Assistant

- Department of Land Resources and Environmental Science, Center for Biofilm Engineering under Dr. Christine M. Foreman

2008-2009 Montana State University Bozeman, MT

Soil Science Research Technician -- focusing on water infiltration rates of rangeland soil

ADDITIONAL TRAINING

Next generation of polar researcher's leadership symposium May 2019
Catalina Island CA
US-China Workshop, Rules of life in a changing cryosphere, FLBS May 2019
US-China Workshop, Impacts of a changing cryosphere on lakes and streams in mountain regions August 2017
Eco-DAS (Ecological Dissertations in Aquatic Sciences) Symposium October 2016
Workshop on Organic Matter Characterization September 2016
Workshop on Effective Teaching September 2014
Woods Hole MBL Strategies of analyzing microbial populations (STAMPS) August 2014
Woods Hole Marine Biological Labs, Microbial Diversity Course August 2013
Microbiome Sequencing and Analysis Workshop using MiSeq December 2013
Internship at the Max Planck Society for Marine Microbiology February-June 2012

AWARDS AND DISTINCTIONS

Montana Academy of Sciences, Best Research Presentation 2015

W.G Characklis Outstanding Student Award, Montana State University	2014
Antarctic Service Medal of the United States of America	2013
Center for Biofilm Engineering Seminar Committee Member	2012-2016
NASA Earth and Space Science Fellow	2010-2014
NSF-IGERT Student Associate, Montana State University	2009-2016
Award of Academic Excellence Scholarships LRES, Montana State University	2006-2009
Dean's List, Montana State University	2005-2009

PROFESSIONAL SOCIETIES

American Geophysical Union
 American Society of Limnology and Oceanography
 American Society of Microbiology
 International Society of Microbial Ecology

REFEREED JOURNAL ARTICLES

D'Andrilli J, Junker J.R., **Smith H.J**, Scholl E., C.M. Foreman (2019). In Dissolved organic matter composition signatures provide insights into the coupled nature of biological processing and chemical energy source. *Biogeochemistry*. 142(2), 281-298.

Smith, H.J., A.J. Zelaya, K.B. De León, R. Chakraborty, D.A. Elias, T.C. Hazen, A.P. Arkin, A.B. Cunningham, M.W. Fields (2018). Flow and Mixing Zones in the Shallow, Terrestrial Subsurface: Potential Effects on Biofilm Dynamics. *FEMS microbiology ecology*, 94(12), fiy191.

Olsen, A.J., **Smith, H.J.**, Camper, A.K. Ammonium Oxidation by a Single Archaeal Lineage Within a Nitrifying Microbial Biofilm Community. In Review: *Biogeochemistry*

Smith, H.J., Dieser, M. Foreman, C (2018). Relationship between dissolved organic matter quality and microbial community composition across polar glacial environments. *FEMS microbiology ecology*. DOI: 10.1093/femsec/fiy090

Smith, H.J., Tigges, M., D'Andrilli, J., Parker, A., Bother, B., Foreman, C (2017). Dynamic processing of DOM: Insight from exometabolomics, fluorescence spectroscopy, and mass spectrometry. *Limnology and Oceanography Letters*. DOI:10.1002/lol2.10082

Beckstead, A.A., Zhang, Y., Hilmer, J.K., **Smith, H.J.**, Bermel, E., Foreman, C.M., Kohler, B (2017). Ultrafast Excited-State Deactivation of the Bacterial Pigment Violacein. *The Journal of Physical Chemistry*. DOI:10.1021/acs.jpca.7b05769

D'Andrilli J, **Smith H.J**, Dieser M, Foreman C.M. (2017). Climate driven carbon and microbial signatures through the last ice age. *Geochemical Perspectives Letters*. 4:29-34.

Smith, H.J., R. Foster, D. M. McKnight, J. T. Lisle, S. Littman, M. M. M. Kuypers, and C. M. Foreman (2017). Microbial formation of labile organic carbon in Antarctic glacial environments. *Nature Geoscience*. Published online April 3, 2017. DOI: 10.1038/NGEO2925.

Kelly, P.T., Bell, T., Reisinger, A.J., Spanbauer, T.J.,... and **H.J. Smith**. Ecological Dissertations in the Aquatic Sciences: An Effective Networking and Professional Development Opportunity for Early Career Aquatic Scientists (2017) *ASLO Bulletin*.

Guy-Haim, T., Alexander, H., Bell, T. W., Bier, R. L., Bortolotti, L. E., Briseño-Avena, C., ... **H.J. Smith** & Hasnain, S. (2017). What are the type, direction, and strength of species, community, and ecosystem responses to warming in aquatic mesocosm studies and their dependency on experimental characteristics? A systematic review protocol. *Environmental Evidence*, 6(1), 6.

SanClements, M. D., **Smith, H. J.**, Foreman, C. M., Tedesco, M., Chin, Y. P., Jaros, C., & McKnight, D. M. (2017). Biogeophysical properties of an expansive Antarctic supraglacial stream. *Antarctic Science*, 29(1), 33-44.

Smith, H., Foster, R., Schmidt, A., Foreman, C. Biofilms on glacial surfaces: hotspots for biological activity. *Nature Biofilms and Microbiomes*. (2016). Biofilms on glacial surfaces: hotspots for biological activity. *NPJ Biofilms and Microbiomes*, 2, 16008.

Santillana, G.E., **Smith, H.J.**, Burr, M., Camper, A.K. (2016). Archaeal Ammonium Oxidation Coupled with Bacterial Nitrite Oxidation in a Simulated Drinking Water Premise Plumbing System. *Environmental Science: Water Research & Technology*.

Smith, H.J., Foreman, C., Akiyama, T., Franklin, M., Devitt, N., Ramaraj, T. (2016). Genome sequence of *Janthinobacterium* sp. CG23_2, a violacein-producing isolate from an Antarctic supraglacial stream. *Genome Announcements*, 4(1).

Smith, H.J., Foreman, C., Ramaraj, T. (2014). Draft Genome Sequence of a Metabolically Diverse Antarctic Supraglacial Stream Organism, *Polaromonas* sp. Strain CG9_12, Determined Using Pacific Biosciences Single-Molecule Real-Time Sequencing Technology. *Genome Announcements*, 2(6).

Smith, H.J., Akiyama, T., Foreman, C., Franklin, M., Woyke, T., Teshima, H., et al. (2013). Draft Genome Sequence and Description of *Janthinobacterium* sp. Strain CG3, a Psychrotolerant Antarctic Supraglacial Stream Bacterium. *Genome Announcements*, 1(6).

Foreman, C. M., Cory, R. M., Morris, C. E., SanClements, M. D., **Smith, H. J.**, Lisle, J. T., et al. (2013). Microbial growth under humic-free conditions in a supraglacial stream system on the Cotton Glacier, Antarctica. *Environmental Research Letters*, 8(3), 035022.

REFEREED JOURNAL ARTICLES IN PREPARATION

Baron, J., Brahney, J., Burpee, B., D'Andrilli, J., Foreman, C.M., Hood, E., Peitzch, E., Olesky, I., Prosser, D., Takekawa, J., Ren, Ze., **Smith, H.J.**, Qu, J., Elser, J. The impacts of a changing cryosphere on the ecology of lakes and streams in high mountain regions. In Prep.

Smith, H.J., Schweitzer, H.D., Barnhart, E., Fields, M.W. Linking coal degradation and microbial assemblage composition to subsurface methane production in the Powder River Basin. In Prep: *Environmental Sciences and Technology*

Smith, H.J., Zelaya, A., Miller, I., Joyner, D., Hazen, T., Arkin, A.P., Adams, P., Fields, M.W. Insights into the role of active shallow subsurface microbial assemblages in groundwater and sediment habitats. In Prep: *Nature Communications*

Alexander, H., Beros, D., Bier, R., Johnson, W., Muscarella, M., Pitz, K., and **Smith, H.J.**, The role of auxotrophy in facilitating community stability. In Prep: *Environmental Microbiology*

Murphy, A., **Smith, H.J.**, Mine, A., Bellamy, A., Brentrup, J. Organic matter reactivity across aquatic ecosystems. In Prep: *ASLO*

SERVICE

NASA Habitable Planets Review Panel (August 2019)

NASA Exobiology Review Panel (August 2018)

Reviewer for the following journals:

Environmental Science and Technology

Environmental Microbiology

Nature Geoscience

Microbial Ecology

Aquatic Sciences

The ISME Journal

American Society of Limnology and Oceanography (ASLO)

ORAL PRESENTATIONS

Smith, H.J. Center for Biofilm Engineering Imaging Capabilities: An Overview. Montana Biofilm Meeting. Bozeman, MT. July 2018.

Smith, H.J., Schweitzer, H.D., Barnhart, E., Orem, R., Gerlach, R., Fields M.W. Linking Organic Matter Degradation to Subsurface Methane Production in the Powder River Basin. International Society for Subsurface Microbiology. Rotorua, New Zealand. November 2017.

Smith, H.J., Foster, R., McKnight, D.M., J. Lisle, M.M. Kuypers, and C.M. Foreman The role of glacial organic matter in the context of a changing climate. Impacts of a changing cryosphere on lakes and streams in mountain regions a China-US cooperation Workshop. Quinghai Lake, China. August 2017.

D'Andrilli, J., Junker, J., Scholl, E., **Smith, H.J.**, Foreman, C.M. Integrating Chemistry, Microbiology, and Ecosystem Ecology to Discern the Nature and Fate of Dissolved Organic Matter in Streams. Society for Freshwater Science. Sacramento, California. May 2016.

Smith, H.J., Wei-Haas, M., SanClements, M., D'Andrilli, J., McKnight, D., Chin, Y-P., Foreman, C.M. Biotic and Abiotic Transformations in autochthonous DOM in an Antarctic Supraglacial Stream. International Workshop on Organic Matter Spectroscopy. Sopot, Poland. September 2015

Smith, H.J., A. Schmit, R. Foster and C.M. Foreman (paper). Using HISH-nanoSIMS to probe trophic interactions in cryoconite sediments from the McMurdo Dry Valleys, Antarctica. 25th Anniversary Goldschmidt Conference, Prague August 2015.

Wee, SY., **Smith, H.J.**, Chang, C.B., Foreman, C.M. Chemotaxis of Microbial Life: A Microfluidic Chemotaxis Method. National Conference for Undergraduate Research. Spokane, Washington. April 2015.

Smith, H.J., Wei-Haas, M., SanClements, M., D'Andrilli, J., McKnight, D., Chin, Y-P., Foreman, C.M. Transformations in autochthonous DOM: An Antarctic supraglacial case study. American Chemical Society Conference. Denver, Colorado. March 2015.

D'Andrilli, J., **Smith, H.J.**, Foreman, C.M. Antarctic Ice-locked Reservoirs of Organic Matter: Probing the bulk and molecular level characterization of organic matter by fluorescence spectroscopy and mass spectrometry. American Chemical Society Conference. Denver, Colorado. March 2015.

Smith, H.J. M. Tigges, B. Bothner and C.M. Foreman. Understanding microbially mediated transformations of dissolved organic matter in a supraglacial stream: a systems approach. Association for the Sciences of Limnology and Oceanography Annual Meeting. Portland, OR, May 2014.

Foreman, C.M., J. D'Andrilli and **H J. Smith** (paper). West Antarctic Ice Sheet (WAIS) Divide Ice Core: A Microbially Derived Reservoir of Glacial Organic Matter. Association for the Sciences of Limnology and Oceanography Annual Meeting. Portland, OR, May 2014.

Smith, H.J., Pitts, B., Foreman, C.M. Confocal Microscopy to Assess: Microbial diversity and ecophysiology of cryoconite sediments from the Dry Valleys, Antarctica. Center for Biofilm Engineering Seminar Series. Bozeman, Montana. October, 2013.

Foreman, C., **H. Smith**, R. Foster and D. McKnight. Single-cell analysis of microbial synthesis and transformation of dissolved organic matter in a glacial environment. SCAR Open Science Conference, Portland, OR 15-19 July 2012.

Smith, H.J and Foreman, C.M. The Role of Microbes in Microbial Synthesis and Transformation of Dissolved Organic Matter in Glacial Environments. Land Resources and Environmental Sciences Seminar Series. Bozeman, Montana. September 2011.

POSTER PRESENTATIONS

Smith, H.J., Zelaya, A., Miller, I., Joyner, D., Hazen T., Fields M.W., Arkin, A.P., Adams, P. Linking Activity to Phylogeny in Groundwater/Soil Ecosystems. Department of Energy Genomic Sciences Meeting. Washington D.C. February 2018.

Chakraborty, R., Wu, X., Kosina, S., Hazen, T.C., **Smith, H.J.**, Northen, T.R., Fields, M.W., Lui, L., Hess, N.J., Zhang, P., Zhou, J., Arkin, A.P., Adam, P.D. Natural Organic Matter (NOM) Dynamics and Exometabolomics for Microbial Cultivation from the Shallow Subsurface at the Oak Ridge FRC. Department of Energy Genomic Sciences Meeting. Washington D.C. February 2018.

Chakraborty, R., Wu, X., Voriskova, J., Deutschbauer, A.M., Chandonia, J.M., Carlson, H.K., Mukhopadhyay, A., Garber, M.E., Kothari, A., Fields, M.W., **Smith, H.J.**, Northen, T., Song, F., Lui, L., Justice, N.B., Arkin, A.P., Adam, P.D. Field-relevant Isolates from the Oak Ridge FRC and their Deep Phenotypic and Functional Analysis. Department of Energy Genomic Sciences Meeting. Washington D.C. February 2018.

Smith, H.J., Zelaya, A., Miller, I., Joyner, D., Hazen T., Fields M.W., Arkin, A.P., Adams, P. Temporal Variability and Microbial Activity in Groundwater Ecosystems. Department of Energy Genomic Sciences Meeting. Washington D.C. January 2017.

Smith, H.J., Foster, R., McKnight, D.M., J. Lisle, M.M. Kuypers, and C.M. Foreman. Microbial formation of labile glacial organic carbon. Environmental Sciences: Water Gordon Research Conference, Holderness, New Hampshire. June, 2016.

D'Andrilli, J. **Smith, H.J.**, Foreman, C.M. Bulk and Molecular Level Characterization of Organic Matter in Glacial Ice. International Workshop on Organic Matter Spectroscopy, Sopot, Poland, September 2015.

Foreman, C.M., M. Dieser and **H. J. Smith**. Microbial Biodiversity in Glacial Ecosystems. 25th Anniversary Goldschmidt Conference, Prague August 2015.

Smith, H.J., D'Andrilli, J., Junker, J.R., Scholl, E., Foreman, C.M. Riverine Dissolved Organic Matter Decomposition and Dynamics. Montana Academy of Sciences. Butte, Montana. April, 2015.

Smith, H.J., A. Schmit, R. Foster and C. M. Foreman (poster). Microbial diversity and ecophysiology of cryoconite granules from the Dry Valleys, Antarctica. Association for the Sciences of Limnology and Oceanography Annual Meeting. Portland, OR, May 2014.

Tigges, M., **Smith, H.J.**, Bothner, B. and C. M. Foreman. Understanding the microbially mediated transformation of dissolved organic carbon: An interdisciplinary metabolomics approach. Poster session presented at the annual meeting of the American Chemical Society. Dallas, TX. March 2014.

Smith, H., A. Schmit, B. Pitts, R. Foster, C. Foreman. Microbial Diversity and Ecophysiology of Cryoconite Sediments from the McMurdo Dry Valleys, Antarctica. Polar & Alpine Microbiology, Big Sky, MT, September 8-12, 2013

Tigges, M., **H. Smith**, B. Bothner and C.M. Foreman (poster). An 'omics' approach to characterizing the relationship between microbial metabolism and dissolved organic matter in Antarctica. Polar & Alpine Microbiology, Big Sky, MT, September 8-12, 2013.

Smith, H., C. Foreman, R. Foster, D. McKnight (poster). Single-cell analysis of Microbial Synthesis and Transformation of Dissolved Organic Matter in Glacial Environments. FEMS 2103 5th Congress of European Microbiologists, Leipzig, Germany, 21-25 July 2013.

Smith, H.J., Zinder, S.H., Buckley, D.H. Diel nitrogen fixation dynamics in an intertidal photosynthetic microbial mat from Great Sippewissett Marsh, MA. American Society for Microbiology. Denver, Colorado. May 2013.

Jaros, C., M. SanClements, D. McKnight, C. Foreman, M. Tedesco, **H. Smith**, M. Wei-Haas and Y. Chin. Characterization of a rarely studied ecosystem: initial insights into the functioning of Antarctic supraglacial streams. American Geophysical Union Annual Meeting, San Francisco, CA. December 2012.

Smith, H.J., C. M. Foreman, R. Foster, D. M. McKnight. Microbial synthesis and transformation of dissolved organic matter in glacial environments. ISME Conference, Copenhagen, DE August 2012.

Tigges, M., **H. Smith**, B. Bothner, C. Foreman. An "omics" approach to characterizing dissolved organic matter from microbially derived sources in Antarctica. ISME Conference, Copenhagen, DE August 2012.

Smith, H.J., C. M. Foreman, R. Foster, D. M. McKnight (poster). Microbial synthesis and transformation of dissolved organic matter in glacial environments. ISME Conference, Copenhagen, DE August 2012.

Wei-Haas, M., M. SanClements, **H. Smith**, J. D'Andrilli, C. Foreman, D. McKnight, and YP. Chin. Transformation of Supraglacial Dissolved Organic Carbon from the Cotton Glacier, Antarctica. ASLO Open Science Meeting, Salt Lake City, UT 19-24 February 2012.

Tigges, M., **H. Smith**, C. Foreman, B. Bothner, Y. Chin and D. McKnight (poster). Microbes in Icy Systems: An interdisciplinary approach to characterize microbes in a humic-free environment. NSF IGERT poster session. May, 2011.

SanClements, M., D. McKnight, Y. Chin, C. Foreman, **H. Smith** and J. Kilduff (poster). Search for the origins of dissolved organic matter in a supraglacial stream on the Cotton Glacier, Antarctica. Limnology and Oceanography Meeting, San Juan, Puerto Rico. February, 2011.

Smith, H., C. Foreman, B. Sattler, Y.-P. Chin and D. McKnight (poster). Microbial diversity in a humic-free environment on the Cotton Glacier, Antarctica. International Society of Microbial Ecology, Seattle, WA. August, 2010.

Smith, H., C. Foreman, B. Sattler, Y.-P. Chin and D. McKnight (poster). Microbial diversity in a humic-free environment on the Cotton Glacier, Antarctica. International Polar Year Meeting, Oslo, Sweden, June 2010.

UNDERGRADUATE AND GRADUATE ADVISEES

- KaeLee Massey, Undergraduate Student in Biological Engineering, 2017-Present. “The ecological distribution and function of microorganisms in the shallow subsurface” Undergraduate scholar program (\$1,500) and Emerging Scholars (\$3,000)
- Isaac Miller, Graduate Student in Microbiology and Immunology, 2016-Present. National Science Foundation graduate research fellowship, “Growth of Microalgae on Wastewater for Bio-feed Production” (total award \$120,000)
- Hannah Schweitzer, Graduate Student in Microbiology and Immunology, 2016-Present
- Anna Zelaya, Graduate Student in Microbiology and Immunology, 2016-Present
- Caitlin Olson, Undergraduate Student, Chemical Engineering. 2016-2017. Microbially mediated nitrate reduction in groundwater aquifers. Undergraduate scholar program (\$3,000)
- Laura Fisch, Undergraduate Student, Chemical and Biological Engineering. 2015-2016. Stress Tolerance of Antarctic Organisms to Multiple Environmental Stressors.
- Amber Schmidt. Undergraduate student. 2010-2014. Isolate characterization and confocal imaging of sediment particles. Undergraduate scholar program (\$1,500)
- Emily Bermel. Undergraduate student, Chemical and Biological Engineering. 2012-2015. The Effects of UV Light on Biofilm Formation and Pigment Production of two Antarctic *Janthinobacterium* sp. Strains CG23_2 and CG3. Undergraduate scholar program (\$3,000)
- Shu Ying Wee. Undergraduate student, Chemical and Biological Engineering. 2012-2016. Chemotaxis of Arctic and Antarctic isolates towards environmentally relevant carbon sources. Undergraduate scholar program (\$3,000)
- Emma Mean. Undergraduate student, Nursing. Summers: 2009, 2010, 2011. Nitrogen cycling in cryoconites from the Canada Glacier in the McMurdo Dry Valleys, Antarctica
- Kendra Teague. Undergraduate student, Sustainable Food Systems. Summer 2010. Carbon Source Utilization to Characterize and Identify Microbial Antarctic Isolates

TEACHING EXPERIENCE

- 2018 Guest Lecturer in Microbial Diversity, Ecology, and Evolution for Dr. Luke McKay (MB520)
- 2014, 2015, 2016, Microbes in the Environment Course Instructor (UNIV 125). Montana State University, Bozeman, MT
- 2014 Guest lecturer in Microbial Diversity, Ecology, and Evolution (BIOM 415) for Dr. Christine Foreman
- 2010 Nutrient Cycling Teaching Assistant. Montana State University, Bozeman, MT
- 2007-2009 Soil Science Laboratory Teaching Assistant. Montana State University, Bozeman, MT

MEDIA AND OUTREACH

- Highlighted in Nature Geoscience: News and Views. April 3, 2017. Cryospheric science: The power of glacial microbes.
<http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo2933.html>
- Montana State University. April 3, 2017. MSU scientists publish study on glacial carbon cycle.
<http://www.montana.edu/news/16819/msu-scientists-publish-study-on-glacial-carbon-cycle>
- Max Planck Institute for Marine Microbiology. April 03, 2017. Glacier bacteria's contribution to carbon cycling.
<https://www.mpi-bremen.de/en/Glacier-bacteria-s-contribution-to-carbon-cycling.html>
- Montana State University. June 13, 2016. MSU doctoral student publishes research on microbial biofilms and carbon cycling on glacial surfaces.
<http://www.montana.edu/news/16225/msu-doctoral-student-publishes-research-on-microbial-biofilms-and-carbon-cycling-on-glacial-surfaces>
- Max Planck Institute for Marine Microbiology. June 13, 2016. Hotspots for biological activity and carbon cycling on glaciers.
http://www.mpi-bremen.de/en/Hotspots_for_biological_activity_and_carbon_cycling_on_glaciers.html
- Presentation to Bozeman High School Calculus class on "Ice core carbon dating" January 2014
- Workshop coordinator for CBE annual members meeting, "Image analysis of "thick" samples", July 2013.
- Local Organizing committee for the Polar and Alpine Microbiology Conference (PAM), Big Sky Montana, September 2013.
- Climate Change Teacher workshop in Yellowstone National Park workshop coordinator July 2012
- Mentor for Bridging Tribal College Students to Montana State University Program (BRIDGES) May-September 2011
- National Science Teachers Association, workshop coordinator March 2011
- Research presentation for Belgrade AP Biology Class May 2010- Life in Ice.

FIELD EXPERIENCE

Powder River Basin, Birney MT June 2016, 2017, 2018, 2019

Glacier National Park, August 2015

Dry Valleys Antarctica, November 2012- February 2013

Dry Valleys Antarctica, November 2011- February 2012

Dry Valleys Antarctica, November 2010- February 2011

Dry Valleys Antarctica, November 2009- February 2010

Beaverhead National Forest, Montana Summer 2008