Benjamin D. Peterson, Ph.D.

Postdoctoral Scholar, University of California - Davis
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Education

University of Wisconsin - Madison Madison, WI
Ph.D. in Environmental Chemistry and Technology Program August 2021
Department of Civil and Environmental Engineering

State University of New York at Geneseo Geneseo, NY
Bachelor of Science, *summa cum laude* Biochemistry May 2012
Honors Minor (Edgar Fellows Honors Program)

Employment and Research Experience

Postdoctoral Scholar June 2022 - current
Department of Environmental Toxicology PI: Dr. Brett Poulin

- Research focus: Leveraging microbial communities to understand methylmercury production in the environment.
- Adapt microbial next-generation ecophysiological methods for use with research projects in Alaskan permafrost, Florida Everglades, drinking water reservoirs in California, and mine-impacted lakes in Upper Michigan.
- Conduct field sampling efforts in diverse ecosystems, including the Alaskan Arctic and the Florida Everglades.
- Develop and conduct experiments in the field and laboratory.
- Oversee, manage, and review data processing workflows for water chemistry analyses in lab. Assist in database development.
- Mentor graduate and undergraduate students and assist them with research efforts.
- Build and maintain mercury analytical equipment. Train graduate and undergraduate students on mercury analytical methods. Build and maintain other laboratory infrastructure.

Postdoctoral Research Assistant August 2021 - May 2022
Department of Bacteriology PI: Dr. Katherine McMahon

- Research focus: Microbial links between sulfate reduction and methylmercury production in a eutrophic freshwater lake.
- Paired meta-omics (DNA/RNA sequencing) techniques with *in situ* mercury methylation assays to understand link between sulfate reduction and mercury methylation.
- Developed interdisciplinary approach to characterizing the impact of sulfate-reduction activity on overall microbial community metabolic activity.
- Mentored first-year graduate student to continue studies developed during my Ph.D. work.

Graduate Research Assistant September 2015 - August 2021
Departments of Bacteriology and Civil & Environmental Engineering PI: Dr. Katherine McMahon
Thesis: Ecophysiology of mercury-methylating organisms in freshwater ecosystems

- Dissertation project combined metagenomic sequencing with functional assays and biogeochemical measurements to understand how microbes link biogeochemical cycles to the production of toxic methylmercury in freshwater ecosystems.
- Served as microbial ecology specialist on two large-scale U.S. Geology Survey projects studying mercury cycling in impacted sites (Hells Canyon Reservoir in Idaho and the Florida Everglades).
- Collaborated with USGS Mercury Research Laboratory in Middleton, WI.
- Maintained the North Temperate Lakes Microbial Observatory time series.

Animal Biologist (Contracter with Kelly's Government Services) 2014-2015
National Institute on Aging: Neuroplasticity and Behavior Unit PI: Dr. Henriette van Praag
Impacts of running on initial integration of adult-born hippocampal neurons.

Postbaccalaureate IRTA Research Fellow 2012-2014
National Institute on Aging: Neuroplasticity and Behavior Unit PI: Dr. Henriette van Praag
Tracing impacts of exercise on neuronal integration of adult-born hippocampal neurons.

Undergraduate Research Assistant 2009-2012
State University of New York at Geneseo: Biology Department PI: Dr. George Briggs
Characterization of a Novel Specifier Protein in the Glucosinolate-Myrosinase Pathway in *Brassica rapa*.

Summer Undergraduate Research Assistant Summer 2011
University of Buffalo: Department of Biological Sciences PI: Dr. Denise Ferkey
Impact of G-protein coupled signaling receptors on chemosensation of quinine in *Caenorhabditis elegans*.

Major Grants and Funding

DOE Joint Genome Institute New Investigator Community Science Project 2023
Influence of labile permafrost dissolved organic matter on mercury-methylating organisms
Role: Principle Investigator

Roland L. Girolami Fellowship Award - UW-Madison Dept. of Bacteriology 2020-2021
Funding covered 1 year of graduate stipend and $2000 for research expenses.

National Science Foundation Standard Grant - CBET 2020-2023
Unrecognized microbial sources of methyl mercury in freshwater lakes
Role: Key Personnel, wrote first draft, co-editing with PI McMahon
Funded amount: $329,608

NIWR/USGS National Competitive Grant Program 2019-2022
Microbial drivers of mercury methylation in freshwater eutrophic systems
Role: Key Personnel, wrote first draft, co-editing with PI McMahon
Funded amount: $221,160

National Science Foundation Graduate Research Fellowship Program 2016-2021

Publications

* indicates co-first authorship
** indicates undergraduate student mentee

Peer-reviewed

1. **Peterson, B.D.**, Poulin, B.A., Krabbenhoft, D.K., Tate, M.T., Baldwin, A.K., Naymik, J., Gastelecutto, N., McMahon, K.D. (2023). "Metabolically diverse microorganisms mediate methylmercury formation under nitrate-reducing conditions in a dynamic hydroelectric reservoir." *The ISME Journal*. https://doi.org/10.1038/s41396-023-01482-1
2. **Peterson, B.D.**, Krabbenhoft, D.K., McMahon, K.D., Ogorek, J.M., Tate, M.T., Orem, W.H., Poulin, B.A., (2023). "Environmental formation of methylmercury is controlled by synergy of inorganic mercury bioavailability and microbial mercury-methylation capacity." *Environmental Microbiology*, 25(8) 1409-1423. https://doi.org/10.1111/1462-2920.16364.
3. Vivar, C., **Peterson, B.D.**, Pinto, A., Janke, E., and van Praag, H. (2023) "Running throughout middle-age keps old adult-born neurons wired." *eNeuro* 10(5) ENEURO.0084-23.2023. https://doi.org/10.1523/ENEURO.0084-23.2023.
4. Capo, E., **Peterson, B.D.**, Kim, M., Jones, D.S., Acinas, S.G., Amyot, M., Bertilsson, S., et al. "A Consensus Protocol for the Recovery of Mercury Methylation Genes from Metagenomes." *Molecular Ecology Resources* 23(1), 190–204. https://doi.org/10.1111/1755-0998.13687.
5. Berg, S.M., **Peterson, B.D.**, McMahon, K.D., and Remucal, C.K., 2022. "Spatial and temporal variability of dissolved organic matter molecular composition in a stratified eutrophic lake." *Journal of Geophysical Research: Biogeosciences* 127. https://doi.org/10.1029/2021JG006550.
6. Lepak, R.F., Tate, M.T., Ogorek, J.M., DeWild, J.F., **Peterson, B.D.**, Hurley, J.P., Krabbenhoft, D.P., 2020. "Aqueous elemental mercury production versus mercury inventories in the Lake Michigan airshed: Deciphering the spatial and diel controls of mercury gradients in air and water." *ACS ES&T Water* 1, 719-727. https://doi.org/10.1021/acsestwater.0c00187.
7. **Peterson, B.D.**, McDaniel, E.A., **Schmidt, A.G., Lepak, R.F., Janssen, S.E., Tran P.Q., **Marick, R.A., Ogorek, J.M., DeWild, J.F., Krabbenhoft, D.P., McMahon, K.D. 2020. "Mercury methylation genes identified across diverse anaerobic microbial guilds in a eutrophic sulfate-enriched lake." *Environmental Science & Technology* 54, 15840-15851. https://doi.org/10.1021/acs.est.0c05435.
8. McDaniel, E.A., **Peterson, B.D.**, Stevens, S.L.R., Tran, P.Q., Anantharaman, K., McMahon, K.D., 2020. "Expanded phylogenetic diversity and metabolic flexibility of mercury-methylating organisms". *mSystems* 5 (4). https://doi.org/10.1128/mSystems.00299-20
9. Mohammad, H., Marchisella, F., Ortega-Martinez, S., Hollos, P., Eerola, K., Komulainen, E., Kulesskaya, N., Freemantle, E., Fagerholm, V., Savontous, E., Rauvala, H., **Peterson, B.D.**, van Praag, H., Coffey, E.T., 2018. "JNK1 controls adult hippocampal neurogenesis and imposes cell-autonomous control of anxiety behaviour from the neurogenic niche." *Molecular Psychiatry* 23, 362–374. https://doi.org/10.1038/mp.2016.203
10. Sah, N., ***Peterson, B.D.**, Lubejko, S.T., Vivar, C., van Praag, H., 2017. "Running reorganizes the circuitry of one-week-old adult-born hippocampal neurons." *Scientific Reports* 7, 10903. https://doi.org/10.1038/s41598-017-11268-z
11. Vivar, C., **Peterson, B.D.**, van Praag, H., 2016. "Running rewires the neuronal network of adult-born dentate granule cells." *NeuroImage* 131, 29–41. https://doi.org/10.1016/j.neuroimage.2015.11.031

Resources

1. Hg-cycling Microorganisms in Aquatic and Terrestrial Ecosystems (Hg-MATE) Database: Caitlin Gionfriddo, Eric Capo, **Benjamin D. Peterson**, Heyu Lin, Daniel Jones, Andrea G Bravo, Stefan Bertilsson, John Moreau, Katherine McMahon, Dwayne Elias, Cynthia Gilmour. Version 1. Posted January 29th, 2021

Pre-prints

1. Tran, P.Q., Bachand, S.C., **Peterson, B.D.**, He, S., McMahon, K.D., Anantharaman, K. "Viral impacts on microbial activity and biogeochemical cycling in a seasonally anoxic freshwater lake." bioRxiv, posted April 19, 2023. https://doi.org/10.1101/2023.04.19.537559
2. White, A.M., Gonzalez Vazquez, A., McDaniel, E.A., **Peterson, B.D.**, Koch, P.L., Remucal, C.K., McMahon, K.D. "Expanded diversity of tfdA harboring bacteria across the natural and built environment." bioRxiv, posted September 30, 2022. https://doi.org/10.1101/2022.09.28.509959
3. **Marick, R.A., **Peterson, B.D.**, McMahon, K.D. "Stratification in microbial communities with depth and redox status in a eutrophic lake across two years" bioRxiv, posted October 16, 2021. https://doi.org/10.1101/2021.10.15.464574

Teaching and Mentoring

Course contributor

- Volunteer Teaching Assistant: ETOX198: Chemistry and Toxicology of Metals Spring 2023
  - Developed Learning Assessments using Community Edition of The Geochemist Workbench
  - Developed and conducted modules on mercury cycling, microbiology of acid mine drainage, emerging issues in toxicology, and microbial methods.
- Volunteer Teaching Assistant: Environmental Microbiology Spring 2021
  - Conducted previously designed modules.
  - Assisted with NSF-style proposal and review board final project
- Volunteer Teaching Assistant: Environmental Microbiology Spring 2019
  - Designed and conducted modules on mercury-methylating microbes and microbiology of freshwater lakes
  - Assisted with design and execution of final project centered on writing NSF-style proposal and review board

Omic's Study Group lead: Fall 2019

- Metagenomic Assembly study group lead
- Phylogenetic Analysis and Tree-Thinking study group lead

Undergraduate Mentor in McMahon Lab 2015-2020

- **Anna Schwendinger** - Assisting with routine mercury sampling. *Fall 2019 - Spring 2020*
- **Robert Marick** - Spatial and temporal dynamics of microbial communities along strong redox gradients in Lake Mendota. Preprint posted on bioRxiv. *Summer 2018 - Spring 2020*
- **Anna Grace Schmidt** - Zooplankton-associated microbiome in Lake Mendota. Lead undergrad for Microbial Observatory sampling. *Summer 2017 - Spring 2020*
  - UW–Madison College of Agricultural and Life Sciences Research Award 2018

  - ASM-Undergraduate Research Fellowship 2018
  - UW-Madison Sophomore Research Fellowship Award 2018
- **Diana Mendez** - Impact of zebra mussel feeding on planktonic microbial community *Summer, fall 2017*
- **Ariel Sorg** - Metagenomic characterization of methylotrophic freshwater Betaproteobacteria in Wisconsin, USA. *Summer 2017*
- **Mykala Sobieck** - Assisted with routine mercury sampling *Summer, fall 2016*
- **North Temperate Lakes Microbial Observatory Team** - Led team of 2-4 undergraduates per year in maintaining 20+ year time series. *2017-2019*

Organic Chemistry Tutor and Grader: Chemistry Department, SUNY-Geneseo 2010-2012

- Held office hours and set up private tutoring lessons
- Helped set up curriculum and provided feedback on class progress

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Service

Mersorcium: Organizing Board and Founding Member 2022-current
- Co-lead Seminar Committee, hosts monthly virtual seminar and workshops during semester
Ad hoc Journal Reviewer: The ISME Journal, Environmental Science and Technology, Environmental Science and Pollution Research, Frontiers in Microbiology, Chemosphere, Environmental Research Letters, FACETS, Science of the Total Environment.
Water at UW Graduate Student Representative 2018-2019
SETAC Young Environmental Scientist meeting: Organizer 2018
- Organized 1-day science communication workshop
O.N. Allan Soil and Environmental Microbiology Small Grants Review Panelist 2018
Postbac IRTA Representative: National Institute on Aging 2013-2015
Geneseo Presidential Scholar: SUNY-Geneseo 2011-2012

Other Grants, Scholarships, Awards, and Honors

NorCal SETAC Distinguished Early Career Scientist Award 2023
Becker Travel Award: $200-250 2016, 2018, 2020
Student Research Travel Grants - Conference: $1500 2018
Anna Grant Birge Memorial Scholarship: $1942 2018
Anna Grant Birge Memorial Scholarship: $1917 2017
Anna Grant Birge Memorial Scholarship: $2000 2016
Phi Beta Kappa 2012
Ulmer-Jackson Biochemistry Award 2012
Goldwater Scholar 2011
CRC Award to the Best Overall Student in Introductory Chemistry 2009
Geneseo Dean's List 7 semesters

Presentations

Contributed oral presentations

1. Leveraging microbial communities to understand biogeochemical drivers of mercury methylation. **NorCal SETAC's 31st Annual Meeting: Invited talk**. Sacramento, CA, United States. *September 2023*
2. Linking microbial ecophysiology to environmental mercury methylation. **Applied and Environmental Microbiology Gordon Research Seminar**. South Hadley, MA, United States. *July 2023*
3. BONCAT applications for environmental biogeochemistry. **UC-Davis Environmental Biogeochemistry Symposium**. Davis, CA, United States. *July 2023*
4. Microbial and Biogeochemical Controls on Mercury Methylation in the Everglades. **Greater Everglades Ecosystem Restoration Conference**. Coral Spring, FL, United States. *April 2023*
5. Inorganic mercury bioavailability and microbial methylation capacity constraints on *in situ* mercury methylation. **International Conference on Mercury as a Global Pollutant**. Virtual conference. *July 2022*
6. Potential role of PVC microbes in mercury methylation in freshwater lakes. **Webinar on Planctomycetes, Verrucomicrobia, and Chlamydiae**. Virtual conference. *April 2021*
7. Identification of Mercury Methylating Organisms along a Trophic Gradient. **Greater Everglades Ecosystem Restoration Conference**. Virtual conference. *April 2021*
8. Identification of Mercury Methylating Organisms along a Trophic Gradient in the Florida Everglades. **International Symposium on the Biogeochemistry of Wetlands Conference**. Virtual conference. *March 2021*
9. Identification of Mercury Methylating Organisms along a Trophic Gradient. **Society for Environmental Toxicology and Chemistry**. Virtual conference. *November 2020*
10. Novel hgcA+ organisms dominate mercury-methylating community in water column of sulfate-enriched lake. **International Conference on Mercury as a Global Pollutant**. Krakow, Poland. *September 2019*
11. Mercury-methylating organisms in Lake Mendota. **American Water Resources Association Wisconsin Section Annual Meeting**. Delavan, WI, United States. *March 2019*

Internal seminars

1. Leveraging microbial ecology to understand the environmental cycling of mercury. **Department of Environmental Toxicology Seminar**, University of California - Davis. *June 1st, 2023*
2. Investigating the microbial influence on mercury methylation in the Florida Everglades. **Center for Limnology Weekly Seminar**, University of Wisconsin - Madison, virtual presentation. *April 2021*
3. Investigating the microbial influence on mercury methylation in the Florida Everglades. **Environmental Chemistry and Technology Weekly Seminar**, University of Wisconsin - Madison, virtual presentation. *February 2021*
4. Identification and activity of mercury-methylating microbes in Lake Mendota. **NTL-LTER Early Career Scientist Meeting**, University of Wisconsin - Madison, virtual presentation. *April 2020*
5. Identification and activity of mercury-methylating microbes in Lake Mendota. **Environmental Chemistry and Technology Seminar**, University of Wisconsin - Madison. *March 2020*

6. Mercury-methylating organisms in Lake Mendota. **Environmental Chemistry and Technology Seminar**, University of Wisconsin - Madison. *April 2019*
7. Mercury-methylating organisms in Lake Mendota. **Center for Limnology Weekly Seminar**. University of Wisconsin - Madison. *May 2019*
8. Distribution of mercury-methylating microbes along spatial and temporal redox gradients in a freshwater lake. **Environmental Chemistry and Technology Seminar**, University of Wisconsin - Madison. *April 2018*
9. Meta-omics, microbes, and freshwater biogeochemistry! Oh My! **Environmental Chemistry and Technology Seminar**, University of Wisconsin - Madison. *April 2017*

Poster presentations

1. From a black box to a window: Leveraging microbes to understand environmental mercury cycling. **Applied and Environmental Microbiology Gordon Research Conference**. South Hadley, MA. *July 2023*
2. Distribution of mercury-methylating microbes along spatial and temporal redox gradients in a freshwater lake. **International Society for Microbial Ecology Conference**. Leipzig, Germany. *August 2018*
3. Distribution of mercury-methylating microbes along spatial and temporal redox gradients in a freshwater lake. **SETAC Young Environmental Scientist Meeting**. University of Wisconsin - Madison. *March 2018*
4. Distribution of mercury-methylating microbes along spatial and temporal redox gradients in a freshwater lake. **International Conference on Mercury as a Global Pollutant**. Providence, RI. *July 2017*
5. Spatial distribution of ultramicrobacteria along Lake Erie. **IAGLR's Conference on Great Lakes Research**. Detroit, MI. *May 2017*
6. Vertical distribution of microbial communities during late stratification in a eutrophic, dimictic lake. **International Society for Microbial Ecology Conference**. Montreal, Canada *September 2016*

Professional Development

Geochemist Workbench Virtual Workshop: "GWB Community Edition"	February 2023
DELTA Teaching in the College Classroom	Spring 2019
Anvi'o Workshop, University of Chicago	April 2017
Data Carpentry Workshop	Fall 2016
DELTA Research Mentorship Training	Summer 2016
EDAMAME bioinformatics workshop	Summer 2016

Society Memberships and Other Affiliations

Berkeley Lab Affiliate at Lawrence Berkeley National Laboratory 2023-current Association for the Sciences of Limnology and Oceanography 2020-2021, 2023-current
International Society of Microbial Ecology 2018, 2023-current