Benjamin D. Peterson, Ph.D.

Postdoctoral Scholar, University of California - Davis, Poulin Lab
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Education

University of Wisconsin - Madison Madison, WI
PhD in Environmental Chemistry and Technology Program 2021
Department of Civil and Environmental Engineering

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

Employment and Research Experience

Postdoctoral Scholar June 2022-current
Poulin Lab – Department of Environmental Toxicology

- Research focus: Leveraging microbial communities to understand methylmercury production in the environment
- Adopt 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 individual research efforts.
- Build and maintain mercury analytical equipment. Train graduate and undergraduate students on mercury analytical methods. Build and maintain other laboratory equipment.

Postdoctoral Research Assistant August 2021 - May 2022
McMahon Lab – Department of Bacteriology

- Research focus: Microbial links between sulfate reduction and methylmercury production in a eutrophic freshwater lake
- Conducted field-based experiments
- Paired meta-omics (DNA/RNA sequencing) techniques with mercury methylation assays to understand link between microbial sulfate reduction and methylmercury production
- 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 PhD work.

Graduate Research Assistant 2015-2021
McMahon Lab – Departments of Bacteriology and Civil & Environmental Engineering
Thesis: Ecophysiology of mercury-methylating organisms in freshwater ecosystems

- Dissertation project combined meta-omics techniques with functional assays and biogeochemical measurements to understand how microbes link biogeochemical cycling 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

- Designed and led a study to characterize initial integration of new adult-born neurons into hippocampal networks
- Used fluorescent proteins delivered by injection of modified viruses into hippocampus to trace developing neural networks with two-photon microscopy
- Maintained experimental mouse colony

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

- Performed stereotaxic surgeries, perfusions, and immunohistochemical staining
- Used two-photon microscope to analyze tracings and expression of neurotransmitter receptors and chloride transporters
- Conducted animal behavior experiments
- Developed protocol to trace initial stages of neuronal integration by adult-born hippocampal cells

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

- Identified novel protein in the glucosinolate-myrosinase pathway in *B. rapa* and cloned it into E. coli for characterization
- Designed a gas chromatography/mass spectroscopy protocol to identify the effect of the putative specifier protein on the products of the glucosinolate-myrosinase pathway
- Analyzed isothiocyanate production of B. rapa under conditions of stress

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 C. elegans

- Used behavioral assays to identify TRPV channel necessary for chemosensation of quinine
- Used SNP mapping to identify location of TRPV channel gene

Peer-reviewed publications

* indicates co-first authorship
** indicates undergraduate student I mentored

1. **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*, 1462–2920. https://doi.org/10.1111/1462-2920.16364.
2. 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.
3. 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.
4. 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.
5. **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.
6. 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
7. 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
8. 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
9. 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

Oral presentations

Contributed talks

1. Microbial and Biogeochemical Controls on Mercury Methylation in the Everglades.**Greater Everglades Ecosystem Restoration Conference**. Coral Spring, FL, United States. *April 2023*
2. 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*
3. Potential role of PVC microbes in mercury methylation in freshwater lakes. **Webinar on Planctomycetes, Verrucomicrobia, and Chlamydiae**. Virtual conference. *April 2021*
4. Identification of Mercury Methylating Organisms along a Trophic Gradient. **Greater Everglades Ecosystem Restoration Conference**. Virtual conference. *April 2021*
5. 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*

6. Identification of Mercury Methylating Organisms along a Trophic Gradient. **Society for Environmental Toxicology and Chemistry**. Virtual conference. *November 2020*
7. 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*
8. Mercury-methylating organisms in Lake Mendota. **American Water Resources Association Wisconsin Section Annual Meeting**. Delavan, WI. *March 2019*

Internal Seminars

1. Investigating the microbial influence on mercury methylation in the Florida Everglades. **Center for Limnology Weekly Seminar**, University of Wisconsin - Madison, virtual presentation. *April 2021*
2. 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*
3. Identification and activity of mercury-methylating microbes in Lake Mendota. **NTL-LTER Early Career Scientist Meeting**, University of Wisconsin - Madison, virtual presentation. *April 2020*
4. Identification and activity of mercury-methylating microbes in Lake Mendota. **Environmental Chemistry and Technology Seminar**, University of Wisconsin - Madison. *March 2020*
5. Mercury-methylating organisms in Lake Mendota. **Environmental Chemistry and Technology Seminar**, University of Wisconsin - Madison. *April 2019*
6. Mercury-methylating organisms in Lake Mendota. **Center for Limnology Weekly Seminar**. University of Wisconsin - Madison. *May 2019*
7. 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*
8. Meta-omics, microbes, and freshwater biogeochemistry! Oh My! **Environmental Chemistry and Technology Seminar**, University of Wisconsin - Madison. *April 2017*

Poster Presentations

1. 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*
2. 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*
3. 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*
4. Spatial distribution of ultramicrobacteria along Lake Erie. **IAGLR's Conference on Great Lakes Research**. Detroit, MI. *May 2017*
5. Vertical distribution of microbial communities during late stratification in a eutrophic, dimictic lake. **International Society for Microbial Ecology Conference**. Montreal, Canada *September 2016*

Teaching and Mentoring

Omic's Study Group lead: Fall 2019

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

Volunteer Teaching Assistant: Environmental Microbiology: Spring 2019, Spring 2021

- Assisted with curriculum development
- Designed new course module on freshwater microbiology with emphasis on hypolimnetic anoxia and impact on methylmercury production
- Delivered lectures
- Graded homework
- Provided assistance during in-class group work
- Led mock review panel through peer review of fellow classmates' research proposals for final project

Undergraduate Mentor in McMahon Lab 2015-present

- **Anna Schwendinger** - Assisting with routine mercury sampling. *Fa. 2019-Sp. 2020*
- **Robert Marick** - Spatial and temporal dynamics of microbial communities along strong redox gradients in Lake Mendota. Manuscript in prep. *Su. 2018-Sp. 2020*
- **Anna Grace Schmidt** - Zooplankton-associated microbiome in Lake Mendota. Lead undergrad for Microbial Observatory sampling. Manuscript in prep. *Su. 2017-Sp. 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 *Su-Fa 2017*
- **Ariel Sorg** - Metagenomic characterization of methylotrophic freshwater Betaproteobacteria in Wisconsin, USA. *Su. 2017*
- **Mykala Sobieck** - Assisted with routine mercury sampling program *Su.-Fa. 2016*
- **North Temperate Lakes Microbial Observatory Team** - Led team of 2-4 undergraduates per year in maintaining 20+ year time series. *Su. 2017-current*

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

Service

Mersorcium: Organizing Board and Founding Member 2022-current
Ad hoc Journal Reviewer: Environmental Science and Technology (6), Environmental Science and Pollution Research (1), Frontiers in Microbiology (1), Chemosphere (1), Environmental Research Letters (1), FACETS (1), Science of the Total Environment (1).
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

Grants, Honors, and Awards

Roland L. Girolami Fellowship Award - UW-Madison Dept. of Bacteriology 2020
Student Research Travel Grants - Conference: $1500 2018
Anna Grant Birge Memorial Scholarship: $1942 2018
Anna Grant Birge Memorial Scholarship: $1917 2017
NSF Graduate Research Fellowship Program 2016-2021
Anna Grant Birge Memorial Scholarship: $2000 2016
Becker Travel Award: $200-250 2016, 2018, 2020
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

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

Association for the Sciences of Limnology and Oceanography 2020-current
International Society of Microbial Ecology 2018