

ZACHARY BENJAMIN FREEDMAN

Assistant Professor

Division of Plant and Soil Sciences, West Virginia University

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EDUCATION

2012 **Ph.D.**, Ecology and Evolution, Rutgers University, New Brunswick, NJ

2005 **B.S.**, Biology, Fairfield University, Fairfield, CT

APPOINTMENTS

2018 – Program Coordinator for Environmental Microbiology, Division of Plant and Soil Sciences, West Virginia University

2016 – Assistant Professor, Division of Plant and Soil Sciences, West Virginia University

2012 – 2016 Postdoctoral Fellow, School of Natural Resources and Environment, University of Michigan

2008 – 2011 GK12 Teaching Fellow, National Science Foundation and The Math and Science Learning Center, Rutgers University

PUBLICATIONS

Landesman, B., **Freedman, Z. B.**, and D. Nelson. (2019) Seasonal, sub-seasonal and diurnal variation of soil bacterial community composition in a temperate deciduous forest. *FEMS Microbiology Ecology*. 95(2), fiz002.

Kellner, E., J. Hubbart, K. Stephan, E. M. Morrissey, **Z. B. Freedman**, E. Kutta, and C. Kelly. (2018) Characterization of sub-watershed-scale stream chemistry regimes in an Appalachian mixed-land-use watershed. *Environmental Monitoring and Assessment*. 190(10), 586.

Entwistle, E. M., K. J. Romanowicz, W. A. Argiroff, **Z. B. Freedman**, J. J. Morris, and D. R. Zak. (2018) Anthropogenic N deposition alters the composition of expressed class II fungal peroxidases. *Applied and Environmental Microbiology*. 84(9). e02816-17.

Cline, L. C., D. R. Zak, R. A. Upchurch, **Z. B. Freedman**, and A. R. Peschel. (2017) Soil microbial communities and elk migratory behavior: implications for soil biogeochemical cycling in the sagebrush steppe. *Ecology Letters*. 20(2): 202-211.

Zak, D. R., **Z. B. Freedman**, R. A. Upchurch, M. Steffens, and I. Kögel-Knabner. (2017) Anthropogenic N deposition increases soil organic matter accumulation without altering its biochemical composition. *Global Change Biology*. 23(2): 933-944.

Freedman, Z. B., R. A. Upchurch, and D. R. Zak. (2016) Microbial potential for ecosystem N loss is increased by experimental N deposition. *PLoS ONE*. 11(10), e0164531.

Romanowicz, K. J., **Z. B. Freedman**, R. A. Upchurch, W. A. Argiroff, and D. R. Zak. (2016) Active microorganisms in forest soils differ from the total community yet are shaped by the same environmental factors: the influence of pH and soil moisture. *FEMS Microbiology Ecology*. 92: w149. *Selected as Editor's Choice.

Freedman, Z. B., R. A. Upchurch, D. R. Zak, and L. C. Cline. (2016) Anthropogenic N deposition slows decay by favoring bacterial metabolism: Insights from metagenomic analyses. *Frontiers in Microbiology*. 7: 259.

- Freedman, Z. B.**, and D. R. Zak. (2015) Atmospheric N deposition alters connectance, but not functional potential among saprotrophic bacterial communities. *Molecular Ecology*. 24: 3170-3180.
- Freedman, Z. B.**, R. A. Upchurch, K. J. Romanowicz, and D. R. Zak. (2015) Differential responses of total and active soil microbial communities to future rates of atmospheric N deposition. *Soil Biology and Biochemistry*. 90: 275-282.
- Freedman, Z. B.**, and D. R. Zak. (2015) Soil bacterial communities are shaped by dispersal limitation and environmental filtering: evidence from a long-term chronosequence. *Environmental Microbiology*. 17: 3208-3218.
- Peschel, A., D. R. Zak, L. C. Cline, and **Z. B. Freedman**. (2015) Elk, sagebrush, and saprotrophs: indirect top-down control on microbial community composition and function. *Ecology*. 96: 2383–2393.
- Freedman, Z. B.**, and D. R. Zak. (2014) Atmospheric N deposition increases bacterial laccase-like multicopper oxidases: implications for organic matter decay. *Applied and Environmental Microbiology*. 80: 4460-4468. *Selected for Editor's Spotlight.
- Eisenlord, S. D., **Z. B. Freedman**, D. R. Zak, K. Xue, X. He, and J. Zhou. (2013) Microbial mechanisms mediating increased soil C storage under elevated atmospheric N deposition. *Applied and Environmental Microbiology*. 79: 1191-1182.
- Freedman, Z. B.**, S. D. Eisenlord, D. R. Zak, K. Xue, X. He, and J. Zhou. (2013) Towards a molecular understanding of N cycling in northern hardwood forests under future rates of N deposition. *Soil Biology and Biochemistry*. 66: 130-138.
- Freedman, Z. B.**, C. Zhu, and T. Barkay. (2012) Mercury resistance and mercuric reductase activities and expression among chemotrophic thermophilic Aquificae. *Applied and Environmental Microbiology*. 78: 6568-6575.
- Wang, Y., **Z. B. Freedman**, P. Lu-Irving, R. Kaletsky, and T. Barkay. (2009) An initial characterization of the mercury resistance (*mer*) system of the thermophilic bacterium *Thermus thermophilus* HB27. *FEMS Microbiology Ecology*. 67: 118-129.
- Lefcort, H., **Z. B. Freedman**, S. House, and M. Pendleton. (2008) Hormetic effects of heavy metals in aquatic snails: is a little bit of pollution good? *EcoHealth*. 5: 10-17.

RESEARCH FUNDING

2019 – 2023	U.S. Department of Agriculture, Agriculture and Food Research Initiative (PI; \$749,743)
2018 – 2022	U.S. Department of Agriculture, Forest Service (PI; \$280,000)
2018 – 2021	U.S. Department of Energy, Established Program to Stimulate Competitive Research (EPSCoR), Office of Basic Energy Sciences (Co-PI; \$729,681)
2017 – 2018	West Virginia University, Research and Scholarship Advancement Program (PI; \$15,000)
2017 – 2018	U.S. Department of Energy, Joint Genome Institute Community Science Program (PI; provided 360 Gb metagenomic sequencing and bioinformatic analysis)
2016 – 2019	U.S. Department of Agriculture, Natural Resources Conservation Service (Co-PI; \$250,142)
2013 – 2017	U.S. Department of Energy, Office of Biological and Environmental Research (Senior Personnel; \$1,467,520)
2012 – 2014	U.S. Department of Agriculture, McIntyre-Stennis Program (Co-PI; \$60,000)
2007	National Science Foundation, Yellowstone National Park Research Coordination Network (\$1,700)

AWARDS AND HONORS

- 2011 Excellence in Graduate Studies, Theobald Smith Society, the NJ Branch of the American Society for Microbiology
- 2010 Outstanding Oral Presentation, Theobald Smith Society, the NJ Branch of The American Society for Microbiology Annual Meeting
- 2010 Academic Excellence Award, Department of Ecology and Evolution, Rutgers University
- 2008 Robert A. and Eileen S. Robison Award for Excellence in Graduate Studies, Department of Biochemistry and Microbiology, Rutgers University
- 2007 Karl C. Ivarson Award, Rutgers University

TEACHING EXPERIENCE AND DEVELOPMENT

- 2019 – Participant, First2 Network, an NSF Alliance program increase the number of first-generation college students who graduate with degrees in STEM fields in WV.
- 2018 – Instructor, Living in a Microbial World (AEM 216), West Virginia University
- 2018 – Instructor, Environmental Microbiology (AEM 401), West Virginia University
- 2017 – Instructor, General Microbiology (AEM 341), West Virginia University
- 2016 Guest Lecturer, Agroecosystem Management, University of Michigan
- 2013 Preparing Future Faculty Workshop, Rackham School of Graduate Studies and The Center for Research on Learning and Teaching, University of Michigan
- 2008 – 2011 GK12 Teaching Fellowship, National Science Foundation and The Math and Science Learning Center, Rutgers University
- 2005 – 2008 Teaching Assistant, General Microbiology, Rutgers University
- 2004 – 2005 Teaching Assistant, General Biology and General Ecology, Fairfield University

MENTORSHIP

- 2019 – Jenni Kane (PhD expected 2023)
- 2019 – Elisabeth Six (MS expected 2021)
- 2017 – Gregory Martin (PhD expected 2022)
- 2017 – 2019 Brianna Mayfield (MS, 2019)
- 2017 – 2019 Jenni Kane (MS, 2019. Current Position - PhD student at West Virginia University)
- 2017 – 2019 Kinsey Reed (Honors Thesis, 2019. Current Position - Employee at Rivendale Farms)
- 2016 – 2018 Jordan Koos (MS, 2018. Current Position - PhD student at the University of Illinois)

INVITED PRESENTATIONS

- 2019 Soil Science Society of America Annual Meeting, San Antonio, TX
- 2019 Department of Microbiology and Immunology, West Virginia University, Morgantown, WV
- 2018 Department of Biology, Duquesne University, Pittsburgh, PA
- 2018 Roach Bauer Forestry Forum, US Forest Service, Kane, PA
- 2017 Ecological Society of America Annual Meeting, Portland, OR
- 2017 Department of Environmental and Plant Biology, Ohio University, Athens, OH

Zachary Freedman - *Curriculum vitae*

- 2016 Appalachian Laboratory, University of Maryland, Frostburg, MD
- 2015 Department of Biology, Illinois Institute of Technology, Chicago, IL
- 2015 Division of Plant and Soil Science, West Virginia University, Morgantown, WV
- 2015 Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY
- 2015 Department of Biology, Eastern Michigan University, Ypsilanti, MI
- 2014 The New College of Interdisciplinary Arts and Sciences, Arizona State University, Glendale, AZ
- 2011 School of Natural Resources and Environment, University of Michigan, Ann Arbor, MI
- 2011 Department of Marine Science, University of Georgia, Athens, GA
- 2011 Department of Biology, Fairfield University, Fairfield, CT
- 2011 Department of Biochemistry and Microbiology, Rutgers University, New Brunswick, NJ
- 2011 Theobald Smith Society Annual Meeting, New Brunswick, NJ
- 2010 Theobald Smith Society Annual Meeting, New Brunswick, NJ
- 2008 NSF Yellowstone National Park Research Coordination Network Workshop, Mammoth, WY

OTHER PRESENTATIONS

Oral

- 2019 WVU Horticulture Seminar Series, Morgantown, WV
- 2019 WVU Davis College and Extension Research Symposium, Morgantown, WV
- 2018 National Association of Abandoned Mine Land Programs Annual Meeting, Williamsburg, VA
- 2018 Ecological Society of America Annual Meeting, New Orleans, LA
- 2018 ASM Microbe Annual Meeting, Atlanta, GA
- 2017 Argonne National Lab Soil Metagenomics Meeting, Argonne, IL
- 2016 Eastern Deciduous Forest Symposium, Rector, PA
- 2016 WVU-Forest Service Seminar Series, Morgantown, WV
- 2015 Argonne National Lab Soil Metagenomics Meeting, Lisle, IL
- 2015 Ecological Society of America Annual Meeting, Baltimore, MD
- 2014 Ecological Society of America Annual Meeting, Sacramento, CA
- 2013 Argonne National Lab Soil Metagenomics Meeting, Bloomingdale, IL
- 2013 Ecological Society of America Annual Meeting, Minneapolis, MN

Poster

- 2019 Department of Energy Joint Genome Institute Users Meeting, San Francisco, CA
- 2018 American Society of Mining and Reclamation, St. Louis, MO
- 2018 Department of Energy Joint Genome Institute Users Meeting, San Francisco, CA
- 2016 Department of Energy Genomic Science Annual Grantee's Meeting, Tysons, VA
- 2014 Argonne National Lab Soil Metagenomics Meeting, St. Charles, IL
- 2014 Ecological Society of America Annual Meeting, Sacramento, CA
- 2014 Department of Energy Genomic Science Annual Grantee's Meeting, Arlington, VA
- 2014 American Society for Microbiology Annual Meeting, Boston, MA

Zachary Freedman - *Curriculum vitae*

- 2013 Department of Energy/USDA Genomic Science Annual Conference, Bethesda, MD
- 2012 Argonne National Lab Soil Metagenomics Workshop, St. Charles, IL
- 2012 Ecological Society of America Annual Meeting, Portland, OR
- 2011 American Society for Microbiology Annual Meeting, New Orleans, LA
- 2010 Theobald Smith Society Annual Meeting, New Brunswick, NJ
- 2009 American Society for Microbiology Annual Meeting, Philadelphia, PA
- 2007 American Society for Microbiology Annual Meeting, Toronto, ON

PROFESSIONAL ACTIVITIES

Member: American Society for Microbiology, Ecological Society of America.

Review Editor: Frontiers in Microbiology and Frontiers in Earth Science.

Ad-hoc Manuscript Reviewer: Applied and Environmental Microbiology, Applied Microbiology and Biotechnology, Biogeochemistry, Biological Invasions, Ecosphere, FEMS Microbiology Ecology, Forest Ecology and Management, Frontiers in Microbiology, Global Change Biology, Journal of the American Society of Mining and Reclamation, Microbial Ecology, Molecular Ecology, Mycologia, Nature Reviews Microbiology, PeerJ, Plant and Soil, Science of the Total Environment, Soil Biology and Biochemistry.

Ad-hoc Grant Reviewer: National Science Foundation, U.S. Department of Energy, U.S. Department of Agriculture, U.S. Army Corps of Engineers Engineer Research and Development Center.

University Service: General Education Foundations Committee.

PROFESSIONAL REFERENCES

- 1) Dr. Donald R. Zak
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School of Natural Resources & Environment
University of Michigan
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- 2) Dr. Tamar Barkay
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Department of Biochemistry and Microbiology
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