Philip Woods

Curriculum Vitae

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Education

California Institute of Technology, Pasadena, CA
Ph.D. student, Geobiology — 2018 – present
Advisor: Victoria Orphan
Committee: Victoria Orphan, Jared Leadbetter, Dianne Newman, Woody Fischer, Joe Parker

Harvey Mudd College, Claremont, CA
B.S., Joint Major in Chemistry and Biology — May 2017
Graduated with Distinction
Thesis: *The effects of ribosomal DNA copy number on lifespan, health, and dietary restriction.*
Advisor: Jae Hur

Fellowships, Honors, and Awards

Certificate of Achievement, *American Society for Microbiology, Southern California branch* — 2022
Benjamin M. Rosen Graduate Fellowship, *California Institute of Technology* — 2018
CEMI 1st Year Fellowship, *California Institute of Technology* — 2018
Mindlin Prize for Innovative Ideas in the Sciences, *Harvey Mudd College* — 2017
Best Senior Thesis in Biology, *Harvey Mudd College* — 2017
Departmental Honors in Biology, *Harvey Mudd College* — 2017

Grants

Caltech Center for Environmental Microbial Interactions, "Targeted sequencing of ANME-3 genomes from enrichment cultures and FACS", $7,500 — 2022 – 2023

Research Experience

California Institute of Technology
Advisor: Victoria Orphan — 2019 – present
- Built a comprehensive phylogeny of high-quality *Methanomicrobiales* genomes.
- Used comparative genomics to identify distinctive genome features of the ANME-3 clade.
- Identified several key evolutionary processes in the evolution of ANME from methanogens.

California Institute of Technology
Advisor: Jared Leadbetter — 2019 – 2021
- Investigated the manganese-dependent growth potential of a novel *Methylobacterium* isolate.
- Established growth yields and growth kinetics for the *Methylobacterium* under several conditions.
- Assayed manganese oxidation in microbial cultures using spectrophotometry.

Northwestern University Center for Connected Learning and Computer-Based Modeling
Advisors: Uri Wilensky and Hillary Swanson — 2017 – 2018
- Developed multiple NetLogo computational models of CRISPR-Cas in bacterial cells and communities.
- Developed a NetLogo computational model of the evolution of anisogamy.
- Designed experiments using this model to address questions in theoretical biology literature.
- Developed and implemented high school science curricula to teach computational thinking.
- Designed assessments to evaluate the efficacy of these curricula.

Harvey Mudd College Biology Department
Advisor: Jae Hur — 2016 – 2017
- Designed and executed a research agenda independently as a senior thesis project.
- Investigated the molecular mechanisms behind dietary restriction-based lifespan extension.
- Performed lifespan, dietary restriction, stress, and qPCR assays on Drosophila.

Pomona College Biology Department
Advisor: Melissa Petreaca 2014
- Studied the role of the LIGHT protein in mouse neutrophil degranulation and NETosis.
- Analyzed NET formation using ELISA and fluorescence microscopy.

Harvey Mudd College Chemistry Department
Advisor: Katherine van Heuvelen 2013
- Synthesized cyclam derived ligands for nickel complexes to model cofactor F430.
- Characterized these with Gaussian DFT calculations and UV-vis, NMR, and IR spectroscopy.
- Tested the model complexes for methane oxidation potential using spectrophotometry.

Teaching Experience

California Institute of Technology

Certificate of Practice in University Teaching 2019 – present
- Received formal instruction in pedagogy and teaching practices.
- Apply these practices in a series of teaching experiences.
- Refine teaching practice based on feedback from students and teaching specialists.

Ge/ESE/Bi 178: Microbial Ecology Winter 2023
Instructors: Victoria Orphan
- Developed assignments covering physical constraints, taxonomy, and evolution of microbial communities.
- Organized and ran regular discussion of relevant research literature with students.

Bi/Ge/ESE 105: Evolution Winter 2020, Winter 2024
Instructors: Victoria Orphan and Rob Phillips
- Developed and implemented lessons covering phylogeny, population genetics, speciation, and coevolution.
- Helped facilitate weekly laboratory exercises on concepts and techniques relevant to evolution.

Service & Outreach

California Institute of Technology

Co-founder & treasurer of the student chapter of the American Society for Microbiology 2022 – 2023
- Coordinated seminars with invited speakers from domestic and international institutions.

Co-coordinator of the Southern California Geobiology Symposium 2024
- Organized conference venue, agenda, talks, and posters.

Peer Reviewed Publications

1. Arastoopour Irgens, G., Dabholkar, S., Bain, C., **Woods**, **P.**, Hall, K., Swanson, H., Horn, M. & Wilensky, U. Modeling and Measuring High School Students' Computational Thinking Practices in Science. *Journal of Science Education and Technology* **29,** 137–161 (2020).

Conference Submissions

Oral presentations

1. **Woods**, **P.** *Convergence and horizontal transfer drive the evolution of anaerobic methanotrophy in ANME-3* Talk. Southern California Geobiology Symposium 2023. Santa Barbara, CA, 2023.

Poster presentations

1. **Woods**, **P.** *Using evolution to investigate key features of MCR in methanogens and anaerobic methanotrophs* Poster. Southern California Geobiology Symposium. Pasadena, CA, 2024.
2. **Woods**, **P.** & Mayr, M. J. *Systems Level Insights Into The Physiology Of Methane Fueled Syntrophy Between ANME Archaea And Sulfate-Reducing Bacteria* Poster. DOE GSP and ECR Annual Meeting. North Bethesda, MD, 2024.

3. **Woods**, **P.** *Convergence and horizontal transfer drive evolution of anaerobic methanotrophy* Poster. SCASM 86th Annual Meeting. La Jolla, CA, 2022.

Other submissions

1. Swanson, H., Irgens, G. A., Bain, C., Hall, K., **Woods**, **P.**, Rogge, C., Horn, M. & Wilensky, U. *Characterizing computational thinking in high school science* in *Proceedings of International Conference of the Learning Sciences, ICLS* 13th International Conference of the Learning Sciences, ICLS 2018: Rethinking Learning in the Digital Age: Making the Learning Sciences Count. **2** (International Society of the Learning Sciences, 2018), 871–878.

Professional Associations

American Society for Microbiology, Member 2022 – present
Phi Lambda Upsilon, Member 2017 – present

Other Skills

Proficient in building agent-based models.
Proficient with Python, Bash scripting, Anvi'o, and NetLogo.
Experience with Matlab, Javascript, C++, Java, Igor Pro, and Racket.
Working proficiency in Portuguese.