ALEXANDRA WALLING

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PROFESSIONAL INTERESTS

Comparative Genomics, Phylogenetics, Microbial Evolution, Horizontal Gene Transfer, Teaching Evolution

EDUCATION

Ph.D. Comparative Biology, American Museum of Natural History Sept 2018 - Nov 2022
New York, NY

B.S. Molecular Biology, California State University, Monterey Bay Sept 2012 - Dec 2015
Cum Laude *Seaside, CA*

PUBLICATIONS

1. Brianna Smith, **Alexandra Walling**, Rachel Schwartz *Phylogenomic investigation of lampreys* (Petromyzontiformes). 2023. *Molecular Phylogenetics and Evolution* Vol. 189
2. **Alexandra Walling**, Susan Perkins, Rob DeSalle. *Phylogenomic and comparative genomic approaches to unravelling the patchy distribution of photosynthesis in* Erythrobacteraceae. In Prep.
3. Alyssa Hartmann, **Alexandra Walling**, Kerina Whelan, Alison Roberts, Rachel Schwartz. *Diversification of cellulose synthase (CESA) genes in mosses suggests both ancient and recent gene duplications.* 2024. Submitted *Journal of Molecular Evolution*
4. Alexander Knyshov, **Alexandra Walling**, Caitlin Guccione, and Rachel Schwartz. *Predicting locus phylogenetic utility using machine learning.* BioRxiv: https://doi.org/10.1101/2024.05.06.592828

RESEARCH EXPERIENCE

University of Rhode Island December 2022 - Present
Postdoctoral Scientist *Advisor: Dr. Rachel Schwartz*

- Designed a study to survey plasmids in the Narragansett Bay and use random forest regression to study horizontal exchange of genes related to nitrogen cycling on these plasmids
- Prepared manuscript on phylogenetic approaches to paralog detection in CesA genes in Mosses
- Spearheaded project to test different machine learning approaches' suitability for predicting phylogenetic informativeness. Developed code and prepared manuscript on use of random forest regression to filter for most phylogenetically informative genes in phylogenomic datasets.

American Museum of Natural History August 2018 - November 2022
Research Assistant *Advisors: Dr. Rob DeSalle and Dr. Susan Perkins*

- Conducted research into the evolutionary history of a clade of environmental bacteria
- Used statistical, phylogenetic, and comparative genomic methods to document evidence of widespread horizontal gene transfer in *Erythrobacteraceae*
- Wrote custom scripts in Python, Bash, and R for processing large datasets in an HPC environment

TEACHING EXPERIENCE

University of Rhode Island Fall 2023
Instructor *Kingston, RI*

- Taught two sections of URI 101, a one credit seminar on college readiness, for biology majors.

University of Rhode Island Fall 2023
Guest Lecturer *Kingston, RI*

- Delivered multiple guest lectures for a sophomore research seminar and upper division Genetics course on bacterial evolution and viral genetics.

University of Rhode Island August 2023
Instructor for Data Carpentry Workshop *Kingston, RI*

- Co-taught a Data Carpentry workshop in R for graduate students, postdocs, and faculty.

American Museum of Natural History June 2021 - August 2021
Teaching Assistant, Research Experiences for Undergraduates in Systematics *New York, NY*

- Developed and delivered lectures on Systematics, Taxonomy, and Phylogenetic Inference (Parsimony, Maximum Likelihood, Bayesian)
- Designed and delivered an online laboratory practicum taking students through a complete pipeline for bacterial phylogenetic analysis

Columbia University January 2020 - May 2020
Teaching Assistant for Life Systems II *New York, NY*

- Led a laboratory section covering topics in evolution, ecology, and natural history in collaboration with lecture instructors and other TAs
- Adapted laboratory materials for delivery in an online environment.

American Museum of Natural History September 2017 - August 2018
Helen Fellowship, BridgeUP: STEM Program *New York, NY*

- Developed project using comparative and metagenomic methods to identify virus genome from previously sequenced genome of green algae *Cymbomonas tetramitiformis*.
- In collaboration with Dr. Eunsoo Kim, designed a bioinformatics internship project for six high school girls.
- Served as a TA for a year-long after school Python course for high school girls at the Natural History Museum.

California State University, Monterey Bay January 2016 - July 2016
Curriculum Development Coordinator *Seaside, CA*

- Developed curricula for use by undergraduate teaching assistants serving undergraduate students enrolled in upper-division Genetics course
- Produced materials for use training future undergraduate TAs on developing their own curricula.

California State University, Monterey Bay June 2016
Teaching Assistant *Seaside, CA*

- Served as teaching assistant for intensive summer upper division genetics course, leading daily review and problem sessions

CONFERENCE PRESENTATIONS

1. **EVOLUTION** July 2024
   Improving identification of phylogenetically useful loci: a comparison of three machine learning models *Montreal, Canada*

2. **EVOLUTION** June 2022
   Unraveling the patchy distribution of photosynthesis in Erythrobacteraceae *Cleveland, OH*

3. **PSA/ISOP** August 2018
   Virus Hunting in the Genome of Cymbomonas tetramitiformis *Vancouver, BC*

4. **CSUPERB** January 2016
   From collinearity to phylogeny in the genus Erythrobacter *Garden Grove, CA*

SELECTED COURSEWORK

Computational Biology Hunter College
Topics in Machine Learning for Biology *2021*

Comparative Genomics AMNH
Assembly, Annotation, and Analyses of Non-Model Organism Genomes *2018*

Systematics AMNH
Parsimony, Maximum Likelihood, and Bayesian approaches for Phylogenetic Inference *2018*

TECHNICAL SKILLS

1. **Programming Languages** `Python`, `R`, Shell scripting.
2. **Genome Assembly:** `FastQC`, `MaSuRCA`, `SPAdes`, `Trycycler/Unicycler`, `Flye`, `Velvet`, `BUSCO`, `QUAST`
3. **Genome Annotation:** `BLAST+`, `PGAP`, `Prokka`, `gggenes`
4. **Phylogenetics:** `RAxML`, `IQTree`, `BEAST`, `ASTRAL`, `ape`, `SISRS`, `ggtree`
5. **Data science frameworks**: `scikit-learn`, `pandas`, `numpy`, `matplotlib`, `ggplot2` etc.
6. **Machine Learning methods**: `Random forests`, `Support Vector Machines`, `Neural Networks`
7. **Other software:** `LaTeX`, `git`.
8. **General skill areas** - Subject area expertise in microbial evolution and horizontal gene transfer, broad teaching experience, technical writing and communication.

HONORS AND AWARDS

1. **Honorable Mention, 2020 NSF Graduate Research Fellowship Program**

REFERENCES

1. **Dr. Rob DeSalle** Curator
   American Museum of Natural History *desalle@amnh.org*

2. **Dr. Susan Perkins** Dean of Science
   City College of New York *sperkins@ccny.cuny.edu*

3. **Dr. Rachel Schwartz** Assistant Professor
   University of Rhode Island *rsschwartz@uri.edu*

4. **Dr. Christopher Raxworthy** Curator
   American Museum of Natural History *rax@amnh.org*

5. **Dr. Cheryl Hayashi** Senior Vice President and Provost of Science
   American Museum of Natural History *chayashi@amnh.org*