OSCAR GARRETT

EDUCATION

PhD University of California – Davis, Plant Biology — Expected May 2029

BS Haverford College, Biology — May 2023
Minor in Environmental Studies — **GPA**: 3.96/4.00
Concentration in Biochemistry — *Magna Cum Laude*

RESEARCH EXPERIENCE

University of California, Davis, Department of Plant Pathology, Davis, CA
Junior Specialist and Graduate Student Researcher, Ronald Lab — Aug 2023 to Present

- Utilized high throughput protein-protein interaction screening and machine learning to simulate host-pathogen molecular coevolution in rice and rice blast
- Utilized high throughput directed evolution to enhance immune receptor recognition of pathogens in rice
- Used proximity labeling to identify proteins in rice immune signal transduction

Haverford College, Department of Biology, Haverford, PA
Research Assistant, Whalen Lab — May 2021 to Jul 2023

- Examined the impact of a bacterial quorum sensing molecule on phytoplankton dihydroorotate dehydrogenase activity

Student Researcher, Cooke Lab — Aug 2021 to Oct 2021

- Used Luciferase-based reporter system to study the role of the RNA-binding protein YBX3 in post-transcriptional regulation

Haverford College, Department of Chemistry, Haverford, PA
Student Researcher, Streu Lab — Mar 2022 to May 2022

- Used computational methods to examine the effect of cyclic peptide preorganization on protein binding affinity

Student Researcher, Charkoudian Lab — Jan 2021 to Mar 2022

- Identified, expressed, and characterized novel acyl carrier proteins (ACP) and phosphopantetheinyl transferases (PPTase) from non-actinomycetes bacteria

PUBLICATIONS

Garrett, O. and Whalen, K. E. (2023). A Bacterial Quorum Sensing Signal is a Potent Inhibitor of *de novo* Pyrimidine Biosynthesis in the Globally Abundant *Emiliania huxleyi*. *Frontiers in Microbiology.* https://doi.org/10.3389/fmicb.2023.1266972

Rim, E. Y., **Garrett, O. D.**, Howard, A. J., Shim, Y., Li, Y., Van Dyke, J. E., Packer, R. C., Ho, N., Jain, R. S., Stewart, V. J., Dinesh-Kumar, S. P., Notwell, J. H., & Ronald, P. C. (2024). Directed evolution of a plant immune receptor for broad spectrum recognition of pathogen effectors. *bioRxiv preprint*. https://doi.org/10.1101/2024.09.30.614878

Howard, A. J., Rim, E. Y., **Garrett, O. D.**, Shim, Y., Notwell, J. H., & Ronald, P. C. (2025). *Combining Directed Evolution with Machine Learning Enables Accurate Genotype-to-Phenotype Predictions*. Cold Spring Harbor Laboratory. https://doi.org/10.1101/2025.01.27.635131

Berlingeri, J., Fuentes, A., Ranario, E., Yun, H., Rim, E. Y., **Garrett, O.**, Howard, A., LaPorte, M.-F., Lo, S., Pauli, D., Hershberger, J., Earles, M., Van Deynze, A., Brummer, E. C., Michelmore, R., Wong, C. Y. S., Magney, T. S., Ronald, P. C., Runcie, D. E., … Diepenbrock, C. H. (2025). Integration of crop modeling and sensing into molecular breeding for nutritional quality and stress tolerance. *Theoretical and Applied Genetics*, 138(9), 205. https://doi.org/10.1007/s00122-025-04984-y

Bifendeh, A. L. N., Hsu, K. K., McBride, C. M., Ferguson, C. M., Baumann, E. R., Capcha-Rodriguez, D., Chen, X., Chery, B., Chihade, M. M., Umpierre, P. D., Evans, T., Everett, C. H., Faheem, S. F., **Garrett, O. D.**, Gottesfeld, A. R., Gupta, I. G., Haas, J. D., Haupt, T. A., Katz, J., … Charkoudian, L. K. (2025). Exploring the compatibility of phosphopantetheinyl transferases with acyl carrier proteins spanning type II polyketide synthase sequence space. *Journal of Industrial Microbiology and Biotechnology*, *52*, kuaf031. https://doi.org/10.1093/jimb/kuaf031

PRESENTATIONS

Oral Presentation, Garrett, O. D., *Dethroning the Red Queen: Predicting Pathogen Effector Evolution for Preemptive Engineering of Host Defenses*. September 22, 2025

Poster Presentation, Rim, E. Y**., Garrett, O. (Presenter),** Howard, A. J., Shim, Y., Li, Y., Van Dyke, J. E., Packer, R. C., Ho, N., Jain, R. S., Stewart, V. J., Dinesh-Kumar, S. P., Notwell, J. H., & Ronald, P. C. *Directed evolution of a plant immune receptor for broad-spectrum recognition of pathogen effectors.* Genetic Engineering for a Sustainable Future, Keystone Symposia. January 20-23, 2025; Keystone, CO.

Poster Presentation, Rim, E. Y**., Garrett, O. (Presenter),** Howard, A. J., Shim, Y., Li, Y., Van Dyke, J. E., Packer, R. C., Ho, N., Jain, R. S., Stewart, V. J., Dinesh-Kumar, S. P., Notwell, J. H., & Ronald, P. C. *Directed evolution of a plant immune receptor for broad-spectrum recognition of pathogen effectors.* Invitation-only: IGI Scientific Advisory Board Meeting. November 21, 2024; Berkeley, CA.

Poster Presentation, Rim, E. Y**., Garrett, O. (Presenter),** Howard, A. J., Shim, Y., Li, Y., Van Dyke, J. E., Packer, R. C., Ho, N., Jain, R. S., Stewart, V. J., Dinesh-Kumar, S. P., Notwell, J. H., & Ronald, P. C. *Directed evolution of a plant immune receptor for broad-spectrum recognition of pathogen effectors.* Inside IGI Climate. October 16, 2024; Berkeley, CA.

Poster Presentation, O. Garrett and K. Whalen. "A Bacterial Quorum Sensing Signal Inhibits Pyrimidine Synthesis Thereby Inducing Cellular Stasis in a Global Phytoplankton". Aquatic Sciences Meeting. June 4-9, 2023; Palma de Mallorca, Spain.

Oral Presentation, O. Garrett and K. Whalen. *A Microbial Alliance: How a Bacterial Signaling Molecule Protects Emiliania huxleyi from Viral Infection.* KINSC Summer Research Symposium. September 22, 2022; Haverford, PA.

Poster Presentation, **O. Garrett** and K. Whalen. "Probing the Biomolecular Mechanism of Bacterial Alkylquinolone-Induced Viral Protection in *Emiliania huxleyi*", Ocean Science Meeting 2022, February 28, 2022; Honolulu, HI.

Poster Presentation, **O. Garrett** and K. Min. "A Jack of all Trades: YBX3 in Post-Transcriptional Gene Regulation", Marian E. Koshland Integrated Natural Sciences Center Superlab Symposium, October 21, 2021; Haverford, PA.

Poster Presentation, **O. Garrett** and K. Whalen. "Probing the Biomolecular Mechanism of Bacterial Alkylquinolone-Induced Viral Protection in *Emiliania huxleyi*", Marian E. Koshland Integrated Natural Sciences Center Summer Research Symposium, September 25, 2021; Haverford, PA

Contributed Oral Presentation, K. Whalen, **O. Garrett**, M. Wilbrink, M. Cheam, E. Harvey. *Impacts of Bacterially Mediated Chemical Interactions on Viral Success in Marine Ecosystems*. Society of Integrative and Comparative Biology Annual Meeting. Jan 2-6, 2024; Seattle, WA

FELLOWSHIPS

Beckman Scholar 2022

A prestigious national scholarship offered at roughly 30 academically rigorous colleges and universities to recognize exceptional students with an interest in the chemical and biological sciences. Since 2000, when Haverford started receiving this funding, only 30 students have received this award.

Marian E. Koshland Integrated Natural Sciences Center Summer Scholar 2021

A competitive award which funds summer research experience for students at Haverford College. All STEM students are eligible to apply, of which about 20 are selected each year.

HONORS AND AWARDS

Jastro-Shields Award 2025

Awarded to outstanding graduate students in recognition of their potential to carry out research projects related to the mission of the College of Agricultural and Environmental Sciences.

National Science Foundation Graduate Fellowship Honorable Mention 2024

Awarded to students who demonstrate potential for significant achievements in science and engineering research. The NSF GRFP is a highly competitive fellowship that provides financial support for three years of graduate study.

The Ariel G. Loewy Prize for Senior Research in Biology 2023

Established in 2001 in memory of Ariel G. Loewy, professor of biology from 1953 to 2000, this prize is given to one or more graduating seniors in biology whose efforts and accomplishments incorporate the rigor and diligence of experimental science.

Haverford Albert Harris Wilson Award 2020

The Albert Harris Wilson Award recognizes the members of the first-year class in mathematics who during the year have proved to have exceptional character and scholarship.

Haverford Magill-Rhoads Scholar 2019

The Magill-Rhoads scholarship is awarded on the basis of academic excellence and significant achievement in the arts, athletics, or school or community service while in high school. Only 14 students in the class of 2023 were awarded this scholarship.

SERVICE

Science Says Leadership Board 2024 to Present

- Graduate student led group aimed at making science more accessible through public outreach and workshops to teach other scientists to communicate to broader audiences.

Volunteer Writer for Jolt Science Magazine 2021 to 2023

- Jolt is a student-led science magazine featuring current and interesting research on Haverford's campus and beyond, written in an easily digestible style.

Freelance Tutor 2020 to 2022

- Tutor high school to early college students in STEM courses and standardized test prep.

Teachers Assistant for General Chemistry 2020 to 2021

- Assist general chemistry lab instructor and help college freshmen through their lab and written work.

PROFESSIONAL SKILLS

Laboratory techniques

- Expertise in cloning techniques, such as restriction digest, Gibson, Golden Gate, Gateway, and PCR.
- Skilled working with proteins, including protein purification, enzyme assay development, Western blotting, and protein-protein interaction assays such as yeast two-hybrid and microscale thermophoresis.
- Proficient in culturing and transforming various organisms, including *Agrobacterium,* yeast, *E. coli*, mammalian cells, and phytoplankton.
- Experience in plant cultivation (e.g. *Nicotiana, Oryza sativa*), agrobacterium-mediated transformation, and confocal microscopy.
- Experience with high throughput protein screening methodologies, such as yeast surface display and fluorescence-activated cell sorting.

Programming and computational skills

- **Programming languages:** Python (intermediate), R (beginner), C (beginner), and JavaScript (beginner)
- Proficient in data analysis using Python libraries such as Pandas, NumPy, and Matplotlib.
- Experience with standard machine learning methods, such as regression, decision trees, SVM, KNN, neural networks, etc.
- Familiar with methods to fine-tune large language models, including protein language models such as ESM2.
- Experience with molecular dynamics simulation using OpenMM and MDTraj libraries.