Lucas C.Wheeler, PhD

Postdoctoral Researcher · Department of Ecology and Evolutionary Biology · CU Boulder

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Research Interests

My research interests are focused on understanding the interactions between different biological scales. For example, how are genetic changes manifested at the biochemical and cellular levels and in turn at the level of organismal phenotypes and ecological effects? I aim to develop a research program that addresses these fundamental questions using plant secondary metabolism as a model system. I strive to use experiments, field studies, and computational modeling to develop a framework for unifying biological scales and understanding emergent properties of biological systems.

Research Experience

University of Colorado

Jan 2018 – present

Postdoctoral Research — *Boulder, CO*

- I am using transcriptomics, biochemistry, functional genetics, and bioinformatics to study the evolution of floral coloration in the Petunieae sub-family of Solanaceae.
- I have developed a computational approach for modeling the evolution of metabolic pathways and used it to simulate the evolution of the anthocyanin pigmentation pathway.

University of Oregon

Sep 2012 – Dec 2017

Graduate Research — *Eugene, OR*

- Designed an experiment that coupled ancestral sequence reconstruction with high-throughput binding experiments to study the evolution of target binding specificity in the S100 protein family.
- Studied the evolution of metal binding affinity and specificity in the S100 protein family using calorimetry and phylogenetics.

Montana State University

Sep 2009 – June 2012

Undergraduate research — *Bozeman, MT*

- Engineered virus-like particles containing various functional peptides including defensins and conotoxins, for biomedical applications.

Publications

Wheeler LC, Stacey SD (2019). Computational modeling of anthocyanin pathway evolution: Biases,hotspots, and trade-offs. Integrative and Comparative Biology.

Hiranmayi Duvvuri, **Wheeler LC**, Harms MJ (2018). pytc: open source python software for global analyses of isothermal titration calorimetry data. Biochemistry.

Wheeler LC, Anderson JA, Morrison AJ, Wong CE, Harms MJ (2017) Conservation of specificity intwo low-specificity proteins. Biochemistry.

Wheeler LC, Harms MJ (2017). S100A5 binds Ca2+ and Cu2+ independently. BMC Biophysics.

Wheeler LC, Donor MT, Prell JS, Harms MJ (2016). Multiple Evolutionary Origins of Ubiquitous Cu2+ and Zn2+ Binding in the S100 protein Family. PLoS ONE.

Wheeler LC, An-Lim S, Marqusee S, Harms MJ (2016). The thermostability and specificity of ancient proteins. Current Opinions in Structural Biology.

Education

University of Oregon

Eugene, Oregon

Ph.D. in Biochemistry — *Sep. 2012 - Dec. 2017*

- Completed my PhD in Harms lab, Department of Chemistry and Biochemistry

Montana State University

Bozeman, MT

B.S. in Biochemistry — *Sep. 2009 - June 2012*

- Graduated with honors from the Department of Chemistry and Biochemistry

Teaching Experience

2019	**Floral Pigmentation Activity**, Volunteer Instructor	*Pinhead Institute*
2018	**Floral Pigmentation Lab & Lecture**, Volunteer Instructor	*CU Upward Bound*
2013	**Biochemistry Recitation**, Instructor	*University of Oregon*
2013	**Biochemistry Laboratory**, Teaching assistant	*University of Oregon*
2012	**General Chemistry Laboratory**, Teaching assistant	*University of Oregon*

Honors & Awards

2015	**Mechanisms of Protein Evolution III: Best Student Talk**, Winner	*Denver, CO*
2015	**Mechanisms of Protein Evolution III: Student Travel Award**, Recipient	*Denver, CO*
2011-2012	**Montana INBRE Research Award**, Recipient	*Bozeman, MT*
2011	**Geer-Howald-Callis & Swager Summer Research Awards**, Recipient	*Bozeman, MT*

Strengths & Skills

Molecular Biology	Gene cloning, RNA/DNA extraction, preparation of NGS libraries, Virus-induced gene silencing
Biochemistry/Biophysics	Protein expression & purification, Isothermal Titration Calorimetry, Circular Dichroism Spectroscopy, HPLC
Botanical Field Work	Plant collections, Preservation of tissues, Reflectance spectroscopy, Photography, Microscopy
Scientific Programming	Python, R, Julia, Snakemake, Jupyter, Git & Github
Bioinformatics Tools	Trinity, Salmon & Kallisto, Sleuth & DEseq2, BBtools, BWA, PhyML, RaxML, & ExaBayes
Languages	English (native), Spanish (intermediate)

Service & Outreach

Citizens' Climate Lobby — *Golden, CO*
Volunteer — *2018 - present*

Quantitative Problem Solving & Research Communication Consortium — *Eugene, OR*
Co-chair — *2016 - 2017*

UO SafeRide Program — *Eugene, OR*
Volunteer — *2018 - present*

Mad Duck Science Fridays — *Eugene, OR*
Volunteer — *2013 - 2017*

Associated Students of MSU — *Bozeman, MT*
Student Senator — *2010 - 2011*

Undergraduate Chemistry Society — *Bozeman, MT*
Secretary & Vice-president — *2009 - 2012*

Sacajawea Middle School — *Bozeman, MT*
Volunteer Mentor — *2009-2010*

Juniper Elementary School — *Bend, OR*
Volunteer Mentor for students with special needs — *2005 - 2008*

Conference Presentations

Evolution meeting — *Providence, RI*

"Preferential fixation of structural or regulatory mutations depends on pathway position" — *June 2019*

- Submitted talk

Society for Integrative and Comparative Biology — *Tampa, FL*

"Computational modeling of anthocyanin pathway evolution" — *Jan. 2019*

- Submitted talk

Society for Molecular Biology and Evolution — *Austin, TX*

"Phage display and deep sequencing to study the evolution of binding specificity" — *July 2017*

- Submitted talk

Third International Symposium on Protein Folding and Dynamics — *Bangalore, India*

"Tracing the evolution of peptide binding specificity in the S100 protein family using phage display and deep sequencing" — *Nov. 2016*

- Submitted talk

Gibbs Conference on Biological Thermodynamics — *Carbondale, IL*

"Preferential fixation of structural or regulatory mutations depends on pathway position" — *Sep. 2016*

- Submitted talk

Mechanisms of Protein Evolution III: Origins — *Denver, CO*

"Tracing the evolutionary fluctuations of peptide binding specificity in the S100 protein family" — *Nov. 2015*

- Submitted talk

Gibbs Conference on Biological Thermodynamics — *Carbondale, IL*

"Tracing the evolutionary fluctuations of peptide binding specificity in the S100 protein family" — *Sep. 2015*

- Submitted poster

Protein Folding Consortium Workshop — *Berkeley, CA*

"Probing the evolutionary history of peptide binding specificity in the S100 protein family" — *May. 2015*

- Submitted talk

Gibbs Conference on Biological Thermodynamics — *Carbondale, IL*

"Evolutionary biophysical studies of peptide specificity in the S100s" — *Sep. 2014*

- Submitted poster

Protein Folding Consortium Workshop — *Ann Arbor, MI*

"Evolutionary biophysical studies of protein function in the S100 family" — *May. 2014*

- Submitted poster