

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 into two 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 the lab of Dr. Michael J. Harms

Montana State University

Bozeman, MT

B.S. IN BIOCHEMISTRY

Sep. 2009 - June 2012

- Graduated with honors from Department of Chemistry and Biochemistry

Teaching Experience

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

Honors & Awards

INTERNATIONAL

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

Strengths & Skills

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| 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

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| Citizens' Climate Lobby | <i>Golden, CO</i> |
| VOLUNTEER | 2018 - present |
| Quantitative Problem Solving & Research Communication Consortium | <i>Eugene, OR</i> |
| CO-CHAIR | 2016 - 2017 |
| UO SafeRide Program | <i>Eugene, OR</i> |
| VOLUNTEER | 2018 - present |
| Mad Duck Science Fridays | <i>Eugene, OR</i> |
| VOLUNTEER | 2013 - 2017 |
| Associated Students of MSU | <i>Bozeman, MT</i> |
| STUDENT SENATOR | 2010 - 2011 |
| Undergraduate Chemistry Society | <i>Bozeman, MT</i> |
| SECRETARY & VICE-PRESIDENT | 2009 - 2012 |
| Sacajawea Middle School | <i>Bozeman, MT</i> |
| VOLUNTEER MENTOR | 2009-2010 |
| Juniper Elementary School | <i>Bend, OR</i> |
| 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