

Dr. Carrie F. Olson-Manning
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RESEARCH INTERESTS

The goal of my lab is to understand the evolution of biochemical pathways. How do novel functions arise? What determines when and how pathways change size? How is flux controlled in biochemical pathways and what evolutionary forces drive control? To answer these questions, my lab studies plant and animal systems using a combination of biochemistry, genetics, molecular and cell biology, and phylogenetic techniques.

TEACHING INTERESTS

My teaching focuses on active and authentic experiences for students in the classroom and in the lab and to teach them how to think like a scientist. In the classroom, students work on challenging problems in groups. In the lab, students complete authentic research whenever possible.

EDUCATION

- Ph.D. Duke University, Evolutionary Genetics, 2013 Thesis · *Evolution of flux control and function in the glucosinolate pathway*
B.Sc. University of Minnesota, *Summa Cum Laude*, 2007, Thesis · *The effect of random amino acid replacement on function and fitness*

APPOINTMENTS

- 2016- Assistant Professor of Biology, Augustana University, Sioux Falls, SD
2013-2016 Postdoctoral fellow, University of Chicago, Department of Ecology and Evolution · Advisor · Dr. Joseph Thornton, *Evolution of the corticosteroid pathway in vertebrates*
2007-2013 Duke University, Department of Biology · Advisor · Dr. Thomas Mitchell-Olds, *Evolution of the glucosinolate pathway in the Brassicaceae*
2006-2007 University of Minnesota, College of Biological Sciences Advisor · Dr. Antony Dean
2004-2006 University of Minnesota, College of Biological Sciences Advisor · Dr. Susan Weller

PUBLICATIONS (♦ Indicates undergraduate mentee as co-author)

C.F. Olson-Manning, J.W. Thornton, (in preparation - *manuscript available upon request*) Elaboration of the corticosteroid synthesis pathway in primates through duplication and specialization of a multi-step enzyme.

Westerman, E L., ♦N A, ♦S Kreuzmann, ♦A Peterson, ♦S Pineda, M. R. Kronforst, and **C. F. Olson-Manning**. 2019. "Behaviour before Beauty: Signal Weighting during Mate Selection in the Butterfly *Papilio Polytes*." Edited by S. Bertram. *Ethology: Formerly Zeitschrift Fur Tierpsychologie* 3 (May). <https://doi.org/10.1111/eth.12884>.

C.F. Olson-Manning, ♦C. Strock, T. Mitchell-Olds. 2015. Flux control in a plant defense pathway is robust to environmental perturbations and controls variation in adaptive traits. *G3 Genes|Genomes|Genetics* DOI: 10.1534/g3.115.021816

C.F. Olson-Manning, C.R. Lee, M.D. Rausher, T. Mitchell-Olds. 2013 Evolution of flux control in the glucosinolate pathway in *Arabidopsis thaliana*. *Molecular Biology and Evolution* 30:14-23. DOI: 10.1093/molbev/mss204

C.F. Olson-Manning, M.R. Wagner, T. Mitchell-Olds. 2012. Adaptive evolution: evaluating empirical support for theoretical predictions. *Nature Reviews Genetics* 13: 867-877 DOI:10.1038/nrg3322

V.S.K. Prasad*, B. Song*, **C.F. Olson-Manning***...♦I. Naqvi...et al. 2012 A Gain-of-Function Polymorphism Controlling Complex Traits and Fitness in Nature. *Science*. 337:1081-1084. DOI: 10.1126/science.1221636

* These authors contributed equally.

Pedagogical Publication

Wright, R.L., Charlson, A., and **Olson, C.F.** 2005 Review of: A 15-Year Study of 63 Teachers at 24 Institutions Reveals: "What the Best College Teachers Do". *Cell Biology Education*. 4: 279-280

PATENTS

In collaboration with Novita Nutrition: Patent submission #62/746692 "Diagnostic Assay for Rumen Undegraded Protein Detection"

TEACHING

Formal Training

2014-2016 Attended Workshops from the Center for Teaching and Learning, University of Chicago
2008-2013 Certificate in College Teaching, Duke University

Courses

Augustana University

2019 Biological Principles II (BIOL 121)
2019 Big Data in Medicine (BIOL/COSC 219)
2018 Introduction to Computer Science I (COSC 210)
2018 Genetics (BIOL 233)
2018 Introduction to Environmental Science (BIOL 180)
2017 Biological Principles I (BIOL 120)
2017 Introduction to Bioinformatics (BIOL/COSC 397)
2017 Programming for Everyone (COSC 185)
2017, 2019 Evolution (Biol 360)

Duke University

2012 Instructor of record, Bioinformatics for Undergraduates (BIOL 490S)
2008-2012 Teaching assistant, Cell and Molecular Biology Lab (BIOL 184L)
2011, 2012 Guest Lecturer, Molecular Evolution "Signatures of Selection in Sequences"
2010-2012 Teaching assistant, Introductory Biology Lab

University of Minnesota

2006-2007 Teaching assistant, Animal Diversity Lab
2005-2006 Peer Mentor, Nature of Life, College of Biological Sciences

Bioinformatics curriculum development

Augustana University

2018 Summer research bioinformatics workshop in R (for faculty and summer research students in biology and chemistry)
2017 Bioinformatics analysis of response to drought in tomatoes (BIOL 233)
2017 Data science in infectious disease (CIVT 202)
2017 Phylogeny and functional inference of alkaline phosphatase (BIOL 354)

Dakota Wesleyan

2016 Integration of bioinformatics into biochemistry lab

RESEARCH ADVISEES

Augustana University

- 2018-2019 Sydney Kreutzmann, Avery Selberg, Noah Hanson, Brianne Haskell, and Erica Bien
2017-2018 Alexandra Peterson, Erica Bien, Tori Leean, Jessa Kack, Sydney Kreutzmann, Avery Selberg, and Krista Erdman
2016-2017 Alexandra Peterson, Skyy Pineda, Sydney Kreutzmann, and Nicholas Antonson
2016-2017 Tori Leann, Jessa Kack, Maggie Donovan, and Madeline Valentin

Duke University

- 2011-2013 Allison Khoo
2011 Chris Strock
2010-2011 Rui Jiang
2009-2010 Ibtehaj Naqvi
2009-2010 Kathy Chu

FELLOWSHIPS AND GRANTS

- 2017 Augustana Research and Artist Fund (ARAF, \$2,812) with Dr. Sally Mallowa
2014-2016 NIH Ruth L. Kirschstein National Research Service Award Individual Postdoctoral Fellowship (\$104,812)
2012-2013 Duke Graduate School Bass Instructorship (\$25,950)
2012, 2013 Society of Molecular Biology and Evolution Student travel award (\$1,500)
2011 Department of Biology Grant-in-Aid (\$1,000) “Enzyme polymorphism on a geographic landscape”
2010-2013 Duke University Graduate Travel Grant (\$500)
2010 National Science Foundation Doctoral Dissertation Improvement Grant (\$14,700) “Evolution of novel phenotypes: The role of generalized enzyme function in adaptation”
2010 Student Science Outreach Grant (\$540) Project to teach 6-8th graders about the scientific method through baking experiments
2009 Department of Biology Grant-in-Aid (\$1,000) “An empirical test of flux control, pathway position and selective constraint”
2008 Department of Biology Grant-in-Aid (\$1,000) “Functional characterization of a herbivore resistance QTL”

SERVICE AND OUTREACH

- 2018 South Dakota Discovery Center, Outdoor Adventure Camp Pierre National Grasslands, Hybridization of Milkweeds field trip
2018 South Dakota Education Portal “Milkweed Hybridization”
2017,2018 Pathways Program workshop, Augustana University, SD
2014-2016 Workshop for Expanding Your Horizons, Chicago, IL
2011-2012 Lead Science Coach for Building Opportunities and Overtures in Science and Technology (BOOST)
2011 Workshop on Scientific Method for 6th-8th grade, Moorhead, MN and Durham, NC
2008-2010 Women and Math Mentoring Program for 8th grade girls, Durham County
2009 Plant Biology Workshop with 2nd grade, Durham, NC
2009 DNA Extraction Workshop with 5th grade, Moorhead, MN

PROFESSIONAL MEMBERSHIP AND SERVICE

2019- Associate Editor for the Journal of Molecular Evolution
Society Membership

The Society for Molecular Biology and Evolution, The Society for the Study of Evolution, American Society of Molecular Biology and Biochemistry (2018), The Society of Plant Biology (2011), The Entomological Society of America (2005-2006)

Reviewer

Evolution, Plant Physiology, Plant Journal, PLoS Biology, Science, BMC Evolutionary Biology, New Phytologist

PRESENTATIONS

Invited Seminars

2019 Society of Molecular Biology and Evolution ♦
2018 University of Arizona, Tucson, AZ
2018 South Dakota State University, Brookings, SD
2015 Augustana University, Sioux Falls, SD
2015 Harvey Mudd College, Claremont, CA
2015 St. Norbert College, De Pere, WI
2014 St. Thomas University, St. Paul, MN

Symposium (S) and Poster (P) Presentations - Author or co-author with undergraduate advisees ♦

2018 (P) American Society for Molecular Biology and Biochemistry, San Diego, CA ♦
2018 (P) South Dakota Student Research Symposium, Pierre, SD ♦
2017 (P) South Dakota Student Research Symposium, Pierre, SD ♦
2017 (P) Society for Molecular Biology and Evolution, Austin, TX
2016 (P) Evolution Meeting, Austin, TX
2015 (S) Menten Keynote, Mechanisms of Protein Evolution III, SMBE
2015 (P) Gordon Conference Molecular Mechanisms of Evolution, Easton, MA
2013 (S) Society of Molecular Biology and Evolution, Walter M. Fitch Award Finalist
2013 (S) Mechanisms of Protein Evolution II, SMBE
2012 (S) Society of Molecular Biology and Evolution
2011 (P) Plant Biology Meeting, Minneapolis, MN
2010 (S) Duke Biochemistry Departmental Retreat
2007 (P) Undergraduate Poster Presentation, University of Iowa
2005-2007 Undergraduate Poster Presentation, University of Minnesota
2005 (P) Entomology Society Meeting

COMPUTER LANGUAGE PROFICIENCY

Python, R, Unix