Christopher D. Muir

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Current position

2019 - Assistant Professor

Department of Botany University of Hawai'i at Mānoa Honolulu, Hawai'i, USA

Areas of specialization

Evolutionary Biology; Plant Ecophysiology; Quantitative Biology

Past Appointments

2017 - 2018 Scientist - Biological Statistics for Global Agronomy

Novozymes Inc.

Durham, North Carolina, USA

Novozymes develops biological solutions to improve yield and make crops more sustainable. I lead data analysis for the global field trial program to commercialize new agricultural products. I developed computational workflows to process, analyze, and interpret large datasets for stakeholders.

2017 Computational Biologist

Poisson Consulting Ltd.

Vancouver, Canada

I helped conserve natural resources in Canada through statistical consulting for industrial and government clients. I developed open source software in R to analyze and make sense of large ecological datasets using Bayesian statistical approaches.

2015 - 2017 Postdoctoral Researcher

Departments of Botany and Zoology University of British Columbia Vancouver, Canada

2013 - 2015 Biodiversity Postdoctoral Fellow

Biodiversity Research Centre University of British Columbia

Vancouver, Canada

As a postdoctoral researcher I studied fundamental problems in the evolution and ecology of biodiversity. My funding provided extraordinary independence to develop and pursue my research interests in evolutionary physiology using theory, computational approaches, phylogenetic comparative methods, and field experiments.

Education

PHD in Evolutionary Biology (Geology minor) Indiana University, Bloomington, Indiana, USA

BS in Biology (Economics minor), College of William and Mary Williamsburg, Virginia, USA

Grants, honors & awards

Submitted

EPSCoR RII Track 4

"Penetrating the inner lives of leaves to breed water-wise crops using math, 3D imaging, and experiments." PI **Muir**, \$133,971

Acquisition Performance Computing Cluster for Data Intensive Research. Collaborator.

Awarded

2019 UHM Office of Vice Chancellor of Research Faculty Tracel Award (\$2,000)

2013 - 2015 Biodiversity Postdoctoral Fellowship (UBC, \$100,000) 2012 - 2013 Payne Dissertation Year Fellowship (IU, \$20,000)

Evo-Devo-Eco Network Research Exchange Experience (\$3000)

Rosemary Grant Award from the Society for the Study of Evolution (\$2450)

2008 - 2012 NSF Graduate Research Fellowship (\$120,000)

2008 Charles B. Heiser Graduate Fellowship in Plant Evolution (IU, \$1000)

Indiana University Fellowship (\$10,000)

2008 METACYT Fellowship (IU, \$10,000)

Society for Systematic Biology Graduate Research Award (\$1650)

Publications

2007

19 peer-reviewed publications; 11 as first author

PREPRINTS

Muir CD. tealeaves: an R package for modelling leaf temperature using energy budgets. Revising for *AoB PLANTS*.

Rx preprint Code Cran

Muir CD, MÀ Conesa, J Galmés. Independent evolution of ab-and adaxial stomatal density enables adaptation.

R_χ preprint

Other manuscripts in review

Conesa MÀ, **CD Muir**, A Molins, J Galmés. Stomatal anatomy coordinates leaf size with Rubisco kinetics in the Balearic *Limonium*). In review at *AoB PLANTS*. \bigcirc code

Conesa MÀ, JJ Peguero-Pina, **CD Muir**, A Molins, EJ Roldán, E Gil-Pelegrín, J Galmés. Leaf hydraulics and venation traits are decoupled in the tomatoes and relatives (*Solanum* sect. *Lycopersicon* sect. *Juglandifolia* and sect. *Lycopersicoides*). In review at *Physiologia Plantarum*.

PEER-REVIEWED PUBLICATIONS

Lowry DB *et al.* (author 23 of 37). The case for the continued use of the genus name *Mimulus* for all monkeyflowers. *Taxon*.

R_χ preprint

2019

2018

Muir CD. Is amphistomy an adaptation to high light? Optimality models of stomatal traits along light gradients. *Integrative & Comparative Biology*. http://dx.doi.org/10.1093/icb/iczo85

𝚱 article RX preprint ♠ code

Bontrager M, **CD Muir**, AL Angert. Geographic and climatic drivers of reproductive assurance in *Clarkia pulchella*. *Oecologia* 190: 69-67.

S article RX preprint C code

Muir CD. Light and growth form interact to shape stomatal ratio among British angiosperms. *New Phytologist* 218: 242-52.



Muir CD & AL Angert. Grow with the flow: a latitudinal cline in physiology is associated with more variable precipitation in *Erythranthe cardinalis*. *Journal of Evolutionary Biology* 30: 2189-203.

S article RX preprint C code 49 data

MÀ Conesa, **CD Muir**, EJ Roldán, A Molins, JA Perdomo, J Galmés. Growth capacity in wild tomatoes and relatives correlates with original climate in arid and semi-arid species. *Environmental and Experimental Botany* 141: 181–90.

S article

2017

2015

2014

Guerrero RF, **CD Muir**, S Josway, LC Moyle. Pervasive antagonistic interactions among hybrid incompatibility loci. *PLoS Genetics* 13: e1006817.

Muir CD, MÀ Conesa, EJ Roldán, A Molins, J Galmés. Weak coordination between leaf structure and function among closely related tomato species. *New Phytologist* 213: 1642-53.

S article W data

Muir CD & M Thomas-Huebner (undergraduate coauthor). Constraint around quarter-power allometric scaling in wild tomatoes (*Solanum* sect. *Lycopersicon*; Solanaceae). *The American Naturalist* 186: 421-33.

🕜 article 😲 data

Muir CD. Making pore choices: repeated regime shifts in stomatal ratio. *Proc R Soc B* 282: 20151498.

S article W data

Muir CD & MW Hahn. The limited contribution of reciprocal gene loss to increased speciation rates following whole genome duplication. *The American Naturalist* 185: 70-86.

🗳 article 🐶 data

Muir CD, JB Pease, LC Moyle. Quantitative genetic analysis indicates natural selection on leaf phenotypes across wild tomato species (*Solanum* sect. *Lycopersicon*; Solanaceae). *Genetics* 198: 1629-43.

S article W data

Muir CD, RP Hangarter, LC Moyle, PA Davis. Morphological and anatomical determinants of mesophyll conductance in wild relatives of tomato (*Solanum* sect. *Lycopersicon* and sect. *Lycopersicoides*). *Plant, Cell & Environment* 37: 1415-26.



Muir CD. How did the Swiss cheese plant get its holes? *The American Naturalist* 181: 273-81.

S article

Hahn MW, BJ White, **CD Muir**, NJ Besansky. No evidence for biased co-transmission of speciation islands in Anopheles gambiae. *Phil. Trans. R. Soc. B* 367: 374-84.

S article

Moyle LC & CD Muir. Reciprocal insights into adaptation from agricultural and evolutionary studies in tomato. *Evolutionary Applications* 3: 409-21.

S article

2010

2009

Moyle LC, **CD Muir**, MV Han, MW Hahn. The contribution of gene movement to the 'Two Rules of Speciation'. *Evolution* 64: 1541-57.

S article

Muir CD & LC Moyle. Antagonistic epistasis for ecophysiological trait differences between *Solanum* species. *New Phytologist* 183: 789-802.

S article

Wilczek AM et al. (author 7 of 18). Effects of genetic perturbation on seasonal life history plasticity. Science 323: 930-4.

S article

Talks

Invited Seminars (20 since 2012)

University of Hawai'i at Mānoa, Department of Tropical Plant and Soil Sciences, Synthesizing evolution and ecophysiology using leaves, trees, and math.

University of Hawai'i at Manoa, Department of Botany, Synthesizing evolution and ecophysiology using leaves, trees, and math.

Michigan State University, Evolving resilience: Lessons from the ecophysiology of crop cousins and other wild plants.

University of Virginia, How and Why? Synthesizing Evolution and Physiology.
Rice University, How and Why? Synthesizing Evolution and Physiology.
Purdue University, How and Why? Synthesizing Evolution and Physiology.

University of Arizona, *How and Why? Synthesizing Evolution and Physiology*. University of Arkansas, *How and Why? Synthesizing Evolution and Physiology*.

University of Wyoming, *How and Why? Synthesizing Evolution and Physiology*. University of Pittsburgh, *How and Why? Synthesizing Evolution and Physiology*.

- Virginia Tech, How and Why? Synthesizing Evolution and Physiology.
 University of Texas, Arlington, How and Why? Synthesizing Evolution and Physiology.
 University California, Davis, How and Why? Synthesizing Evolution and Physiology.
 Purdue University, Is it time for an evolutionary physiological synthesis, yet?.
- ETH Zürich, The physiology and genetics of adaptation.
 Simon Fraser University, Phenotypic variation and constraint.
 Harvard University Herbarium, Why do some plants have stomata on both leaf surfaces?.
 University of British Columbia, Is it time for an evolutionary physiological synthesis, yet?.
 Michigan State University, Is it time for an evolutionary physiological synthesis, yet?.
- University of Virginia EEBio Seminar, Through thick and thin: the adaptive significance of leaf trait variation in wild tomatoes.

Invited Conference Presentations

- Muir CD. Synthesizing evolution and ecophysiology using leaves, trees, and math. Society for Integrative and Comparative Biology, Tampa, Florida, USA.
- 2016 **Muir CD**. What is evolutionary physiology?. Evolution, Austin, Texas, USA.
- Muir CD. Functional and genetic analysis of leaf traits associated with drought in wild tomatoes (Poster). Ecological Genomics Symposium, Kansas City, Missouri, USA.

CONTRIBUTED CONFERENCE PRESENTATIONS

- **CD Muir**. Poster: Assimilation *in silico* and in practice: Open source computational tools for simulating CO₂ assimilation and fitting models to data. *Gordon Research Conference: CO₂ Assimilation in Plants from Genome to Biome*. Newry, Maine.
- Conesa MÃ, **CD Muir**, EJ RoldÃin, JJ Piguero-Pina, A Molins, J Galmés. Poster: Adaptive strategies in tomato wild relatives: sources to adapt tomato crop to more water-restrictive cultivation conditions. *XIV Solanaceae and 3rd Cucurbitaceae Joint Conference*. Barcelona, Spain.
- Muir CD & M Thomas-Huebner. Constraint around quarter-power allometric scaling in wild tomatoes. *Botany*, Edmonton, Alberta, Canada
- Muir CD, JB Pease, LC Moyle. Connecting macroevolution to the genetics of adaptation: a case study using stomatal ratio. *Evolution*, Raleigh, North Carolina, USA
 - **Muir CD**. Pore choices: the adaptive significance of stomatal ratio. *American Society of Naturalists*, Asilomar, California, USA

Muir CD. Pore choices: the adaptive significance of stomatal ratio. *Evolution*, Snowbird, Utah, USA

Muir CD. Poster: Functional and genetic analysis of leaf traits associated with drought in wild tomatoes. *Society of Integrative and Comparative Biology*, San Francisco, California, USA

Muir CD. Through thick and thin: the adaptive significance of leaf trait variation in wild tomatoes. *Evolution*, Ottawa, Ontario, Canada

Muir CD. Genetics of drought adaptation in wild tomatoes. *Evolution*, Portland, Oregon, USA

Evolution, Minneapolis, Minnesota, USA

Evolution, Stony Brook, New York, USA

Professional Activities, Affiliations & Outreach

EDITOR

2016 - 2017 Axios Review

External Grant Reviews

Austrian Science Fund (FWF)

NSF Division of Environmental Biology

Manuscript Reviews

American Journal of Botany, American Naturalist, Applications in Plant Sciences, Botany, Current Biology, Evolution, Global Ecology and Biogeography, International Journal of Plant Sciences, Journal of Evolutionary Biology, Molecular Biology and Evolution, Molecular Ecology, Nature Ecology and Evolution, New Phytologist, Photosynthesis Research, Plant Physiology, PLOS Biology, PLOS ONE, Proceedings B, Scientific Reports, Theoretical Population Biology

University Service

Botany department scholarship reviewer

Professional Service

2019 - 2021 Secretary, Division of Botany, Society for Integrative and Comparative Biology
 2013 - 2015 Co-organizer SFU/UBC/UVic Ecology and Evolution Retreat
 2014 - 2015 Organized UBC Biodiversity Lunchtime Internal Seminar Series (BLISS)

PROFESSIONAL SOCIETY MEMBERSHIPS

- The American Society of Naturalists
- Society for Integrative and Comparative Biology

Mentorship & Teaching

GRADUATE STUDENT COMMITTEES

Devon DeBevoise (member) Caitlyn Genovese (member)

Undergraduate Thesis Committees

Amanda Wong (member)

Other student mentorship

Courtney van den Elzen - Local adaptation to climate in monkeyflowers

Meret Thomas-Huebner (NSF REU) - Constraint around quarter-power allometric scaling in wild tomatoes

Other undergraduate assistants:

Selina Dhanani, Alyson Eng, Geety Hafizi, Curtis Logan, Emily Okun Vicki Thill and Austin Koontz (Univ Nevada-Reno undergraduates) Lisa Lin and Erin Warkman (UBC Work-learn students)

TEACHING EXPERIENCE

Instructor for BOT 455: Analysis of Biological Data (University of Hawai'i)
Assistant Instructor for L318: Evolution (Indiana University)
Assistant Instructor for L111: Evolution and Diversity (Indiana University)

Press Coverage

Discover: "Why Do Houseplants Have Holey Leaves?" https://discovermagazine.com/2014/april/2-o-holey-leaf

New Phytologist: "Plant evolutionary ecology: molecular genetics, global warming and invasions, and the novel approaches we are using to study adaptations" https://dx.doi.org/10.1111/nph.12028

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