

Zachary R. Miller

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EDUCATION

University of Chicago

Chicago, IL

Ph.D. in Ecology and Evolution

2022

NSF Graduate Research Fellow

Dissertation: *Theoretical approaches to environmental feedbacks and community coexistence*

Advisor: Stefano Allesina

Yale University

New Haven, CT

B.S. in Ecology and Evolutionary Biology (with distinction) & Applied Mathematics

2017

Magna cum laude

Advisors: Oswald Schmitz and David Vasseur

PROFESSIONAL APPOINTMENTS

Yale University, Postdoctoral Associate

New Haven, CT

Advisors: Pincelli Hull (Earth & Planetary Science)

2023 – present

David Vasseur (Ecology & Evolutionary Biology)

University of Illinois, Postdoctoral Research Associate

Urbana, IL

Advisor: James O'Dwyer (Plant Biology)

2022 – 2023

PUBLICATIONS

Google Scholar: scholar.google.com/citations?user=0IL4BIIAAA

(* equal contribution)

REFEREED JOURNAL ARTICLES:

Z.R. Miller and S. Allesina (2023). *Habitat heterogeneity, environmental feedbacks, and species coexistence across timescales*. The American Naturalist, 202 (2). DOI: [10.1086/724821](https://doi.org/10.1086/724821)

A. Skwara, P. Lemos-Costa, **Z.R. Miller**, and S. Allesina (2022). *Modeling ecological communities when composition is manipulated experimentally*. Methods in Ecology & Evolution, 14 (2). DOI: [10.1111/2041-210X.14028](https://doi.org/10.1111/2041-210X.14028)

T. Gibbs, Y. Zhang, **Z.R. Miller**, and J.P. O'Dwyer (2022). *Stability criteria for the consumption and exchange of essential resources*. PLOS Computational Biology, 18 (9). DOI: [10.1371/journal.pcbi.1010521](https://doi.org/10.1371/journal.pcbi.1010521)

Z.R. Miller, P. Lechón-Alonso, and S. Allesina (2022). *No robust multispecies coexistence in a canonical model of plant-soil feedbacks*. Ecology Letters, 25 (7). DOI: [10.1111/ele.14027](https://doi.org/10.1111/ele.14027)

Z.R. Miller and S. Allesina (2021). *Metapopulations with habitat modification*. PNAS, 118 (49). DOI: [10.1073/pnas.2109896118](https://doi.org/10.1073/pnas.2109896118)

D.S. Maynard, **Z.R. Miller**, and S. Allesina (2020). *Predicting coexistence in experimental ecological communities*. Nature Ecology & Evolution, 4. DOI: [10.1038/s41559-019-1059-z](https://doi.org/10.1038/s41559-019-1059-z)

PRE-PRINTS AND WORKS-IN-PROGRESS:

Z.R. Miller*, M. Clenet*, K. Della Libera, F. Massol, and S. Allesina. *Coexistence of many species under a random competition-colonization trade-off*. Pre-print: [10.1101/2023.03.23.533867](https://doi.org/10.1101/2023.03.23.533867)

—Recommended by PCI Ecology: <https://doi.org/10.24072/pci.ecology.100533>

P. Lemos-Costa, **Z.R. Miller**, and S. Allesina. *Phylogeny structures species' interactions in experimental ecological communities*. Pre-print: [10.1101/2023.09.04.556236](https://doi.org/10.1101/2023.09.04.556236)

Z.R. Miller and J.P. O'Dwyer. *Metabolic trade-offs can reverse the resource-diversity relationship*. Pre-print: [10.1101/2023.08.28.555123](https://doi.org/10.1101/2023.08.28.555123)

C.A. Serván, J.A. Capitán, **Z.R. Miller**, and S. Allesina. *Effects of phylogeny on coexistence in model communities*. Pre-print: [10.1101/2020.09.04.283507](https://doi.org/10.1101/2020.09.04.283507)

S. Allesina, **Z.R. Miller**, and C.A. Serván. *Intraspecific variation stabilizes classic predator-prey dynamics*. Pre-print: [10.1101/2021.09.27.461947](https://doi.org/10.1101/2021.09.27.461947)

OTHER REFEREED WORKS:

Z.R. Miller (2019). *Digest: Does sexual conflict complicate a trade-off between fecundity and survival?*. *Evolution*. DOI: [10.1111/evo.13855](https://doi.org/10.1111/evo.13855)

A.J. Mossman*, K.E. Culhane*, **Z.R. Miller***, K.M. Brock, P. Pafilis, and C.M. Donihue (2016). *Natrix natrix (LINNAEUS, 1758) found on the small islet of Tigani (Central Cyclades, Greece)*. *Herpetozoa*, 29.

TEACHING

TEACHING ASSISTANT

Theoretical Community Ecology (graduate) Guest lecture on statistical methods and models.	University of Chicago Spring 2021
Computing Skills for Biologists (graduate) Worked closely with 25 students in project-based course. Guest lecture on advanced programming practices (Python-based).	University of Chicago Winter 2020
Principles of Population Genetics (graduate) Led quantitative review sessions and weekly paper discussions. Developed probability review materials used in future course iterations.	University of Chicago Winter 2019
Fundamentals of Biological Data Analysis (undergraduate) Worked closely with 20 students in project-based course. Guest lectures on scientific visualization and principle component analysis.	University of Chicago Fall 2018

OTHER TEACHING

Software Carpentry , Workshop Instructor and Organizer Led 2-3 workshops annually on programming basics (R-based), version control, and Unix shell. Collaborated with instructor team to design and adapt lesson plans.	University of Chicago 2019 – 2022
Statistical Theory and Methods , Peer Tutor Hosted weekly tutorials for Biology PhD students taking statistics coursework.	University of Chicago 2019 – 2021
Linear Algebra Tutorial , Invited Lecturer Designed and led linear algebra tutorial for Winter School on Quantitative Systems Biology.	ICTP (virtual) Dec. 2020
Quantitative Biology Bootcamp , Course Assistant Supported week-long intensive course for incoming students across all Biology PhD programs. Led sessions on population genetics and programming skills (R-based).	University of Chicago / MBL Sept. 2019

INVITED TALKS AND SEMINARS

Penn State University Theoretical Biology Seminar , University Park, PA <i>Will a stable complex system be large?</i>	Oct. 2023
University of California Davis Center for Population Biology Seminar , Davis, CA <i>Theoretical approaches to environmental feedbacks and community coexistence</i>	Jan. 2023
Princeton University Lewis-Sigler Scholars Day Symposium , Princeton, NJ <i>Minimal models for complex plant-soil feedbacks</i>	Nov. 2022
University of Chicago Sarah Cobey Lab Group Meeting , Chicago, IL <i>Host heterogeneity, immune imprinting & strain coexistence: Insights from metapopulation models</i>	March 2022
Stanford University Eco-Evo Lunch Seminar , Virtual <i>Coupled metapopulation dynamics with patch memory and modification</i>	March 2021
Princeton University Theoretical Ecology Lab Tea , Virtual <i>Coupled metapopulation dynamics with patch memory and modification</i>	Feb. 2021
Evolutionary and Ecological Systems Biology Seminar (hosted at MIT) , Virtual <i>Predicting coexistence in experimental ecological communities</i>	June 2020
University of Chicago Neuroscience Theory Group , Chicago, IL <i>Modeling complex networks as intersection graphs</i>	April 2019
Yale University Invited EEB Senior Thesis Symposium , New Haven, CT <i>Elemental cycling, physiological stress, and ecosystem functioning: Confronting a stoichiometrically-explicit model with data</i>	May 2017

CONFERENCE PRESENTATIONS

Ecological Society of America (ESA) Annual Meeting , Montreal, QC <i>Theoretical foundations of multispecies coexistence maintained by plant-soil feedbacks</i> Invited for organized session: “Integrating the frontiers of plant-soil feedback research”	Aug. 2022
Ecological Society of America (ESA) Annual Meeting , Virtual <i>Coupled metapopulation dynamics with patch memory and modification</i> Slides: https://zacharymiller.netlify.app/img/esa_2021_slides.pdf	Aug. 2021
Ecological Society of America (ESA) Annual Meeting , Virtual <i>Testing the predictive value of phylogeny for community productivity</i> Video: https://zacharymiller.netlify.app/talk/esa_2020/video	Aug. 2020
Ecological Society of America (ESA) Annual Meeting , Louisville, KY <i>Predicting coexistence in experimental ecological communities</i> Slides: https://doi.org/10.7490/f1000research.1117379.1	Aug. 2019
REU Research Symposium University of Delaware , Lewes, DE <i>Characterizing the sources and structure of genetic diversity in a model of mutualism exploitation</i>	Aug. 2015

FELLOWSHIPS AND AWARDS

Best Dissertation Award in Ecology & Evolution University of Chicago	2023
Center for Population Biology Postdoctoral Fellowship UC Davis – declined	2023
NSF Graduate Research Fellowship – \$102,000	2019 – 2022

Edgar J. Boell Prize Yale University <i>“Awarded annually to a senior for excellence in biology”</i>	2017
NSF Research Experiences for Undergraduates – \$6,000 Supplement to DEB-1354762 (Yale University)	2016
NSF Research Experiences for Undergraduates – \$5,500 REU site OCE-1460963 (University of Delaware)	2015
Summer Environmental Fellowship Yale University – \$1,500	2014
Freshman Summer Research Fellowship Yale University – \$3,400	2014
FINALIST (NOT AWARDED)	
Schmidt Science Fellows (1 of 6 nominees across all sciences at UChicago)	2023
Lewis-Sigler Scholars Princeton University	2023
Environmental Fellows, High Meadows Institute Princeton University	2023

PROFESSIONAL SERVICE

Student Seminar Chair , Department of Ecology and Evolution Organized and hosted weekly student research seminars. Organized selection and hosting of student-invited speakers for departmental seminars.	University of Chicago 2020 – 2021
Panelist on Peer Review , Department of Ecology and Evolution Discussed peer-reviewing process, best practices, and strategies with graduate students and postdocs.	University of Chicago Sep. 2021
PhD Admissions Committee Member , Department of Ecology and Evolution Evaluated and interviewed PhD applicants as a student representative on departmental admissions committee. Solicited, summarized, and presented student input to faculty.	University of Chicago 2018 – 2019
Co-President , Yale Ecology and Evolutionary Biology Undergraduates Society Organized department outreach events, field trips, and social activities.	Yale University 2016 – 2017

Journal Peer Reviewer

The American Naturalist, Ecography, Ecology Letters, Journal of Mathematical Biology, Oikos, Methods in Ecology and Evolution, Nature Computational Science, Nature Ecology & Evolution, New Phytologist, PLOS Computational Biology

Grant Peer Reviewer

NSF DEB - Population & Community Ecology (ad hoc reviewer, 2023)

MENTORSHIP

Dillon Max University of Illinois, undergraduate research	2023 – present
Sylvia Gimbel University of Illinois, undergraduate research	2022 – present
Pablo Lechón-Alonso University of Chicago, graduate research	2020 – 2022
Ricardo Muñoz Trejo University of Chicago, graduate community mentor	2020 – 2021

OUTREACH

Young Scholars Program , University of Illinois Chicago Guest speaker on “Randomness and rainforests” for summer mathematics program.	Chicago, IL July 2021
Volunteer Tutor , Strive Tutoring (2018-2019) and Tutoring Chicago (2020-2021) Provided one-on-one instruction and support for local K-12 students (weekly).	Chicago, IL 2018 – 2021
Panelist , Women in STEM Symposium Panelist on research careers and opportunities for Chicago-area women in STEM.	Chicago, IL March 2019
Exam Writer and Grader , UChicago Science Olympiad Mentored undergraduate Science Olympiad chapter through writing and grading ecology and herpetology exams for high school invitational.	Chicago, IL 2018 – 2019
Staff Writer , Yale Scientific Magazine Authored articles on scientific research for a general audience. Select articles available at http://www.yalescientific.org/author/zacharymiller/ .	New Haven, CT 2013 – 2016
Event Volunteer , Resonance Guided high school students through events, tours, and group discussions on Yale campus.	New Haven, CT 2014 – 2016
Event Volunteer , Science on Saturdays Led science demonstrations and hands-on activities for local K-8 students.	New Haven, CT 2013 – 2015

WORKSHOPS AND WORKING GROUPS

Understanding and Predicting Pathogen Communities (PATHOCOM) Annual Meeting Attended as external collaborator (PI: Detlef Weigel; ERC Synergy Grant 9514444)	New York, NY Sep. 2023
Merging Statistical Theory and Analyses at the Interface of Microbial and ‘Macrobial’ Ecology Invited working group (PI: Mathew Leibold; NSF Award number: 2224331)	Montreal, QC Aug. 2022
Data and Models in Ecology & Evolution Funded summer school at Institut Pascal, Université Paris-Saclay	Orsay, France July 2019

SKILLS, CERTIFICATIONS, AND MEMBERSHIPS

Natural languages: English (native), Spanish (limited)
Programming languages: R (expert); Python, Java, MATLAB (proficient); C (limited)
Other computing: L^AT_EX, Git, Mathematica
Certifications: Software Carpentry Instructor
Professional Memberships: Ecological Society of America