MOLLY E. GALLAGHER

Postdoctoral Fellow
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EDUCATION

University of Chicago
Ph.D. in Ecology and Evolution 2017
Graduate Thesis: Combining high-performance computing and ecological field experiments to understand insect outbreaks
M.S. in Ecology and Evolution 2014

The Ohio State University
B.S. in Ecology & Evolution and Anthropology, *magna cum laude* 2011
with Honors, and with Honors Research Distinction; Mandarin Chinese minor

PROFESSIONAL EXPERIENCE

Postdoctoral Research 2017-Present

I develop multiscale models of viral dynamics at the *in vitro*, within-host, and epidemiological levels. My work focuses on designing simulations of disease outbreaks, incorporating spatial structure into models, and understanding how defective interfering particles affect viral dynamics.

Adviser: Dr. Katia Koelle, Department of Biology, Emory University

EDUCATIONAL EXPERIENCE

Graduate Research 2011-2017

I used statistical analysis, high-performance computing, and downscaled climate models to understand complex population dynamics, particularly to evaluate interacting drivers of outbreak collapse in the forest pest insect jack pine budworm.

Adviser: Dr. Greg Dwyer, Department of Ecology & Evolution, University of Chicago
Committee: Dr. Stefano Allesina, Dr. Sarah Cobey, Dr. Marcus Kronforst, Dr. J. Timothy Wootton

Undergraduate Laboratory Research 2009-2011

I used molecular methods including PCR and chromatin immunoprecipitation to study the evolution and development of reproductive tissues in *C. elegans* and related species.

Adviser: Dr. Helen Chamberlin, Department of Molecular Genetics, The Ohio State University

Research Experience for Undergraduates (REU) Summer 2010

I collected and analyzed field data on the nesting behavior and predation of passerine birds on the Lake Erie islands.

Adviser: Dr. James Marshall, Department of Biology, Rockford College

PUBLICATIONS

Kyle et al., 2020. Stochasticity and Infectious Disease Dynamics: Density and Weather Effects on a Fungal Insect Pathogen. The American Naturalist 195(3), 504-523.

Greischar et al., 2020. Evolutionary consequences of feedbacks between within-host competition and disease control. Evolution, Medicine, and Public Health, 2020(1): 30–34.

Gallagher, M. E. and Dwyer, G. 2019. Combined effects of natural enemies and competition for resources on a forest defoliator: a theoretical and empirical analysis. The American Naturalist, 194(6): 807-822.

Gallagher, M. E. et al., 2018. Causes and consequences of within-host viral spread. Viruses, 10(11): 627.

Sharanya et al., 2015. Mutations in *Caenorhabditis briggsae* identify new genes important for limiting the response to EGF signaling during vulval development. Evolution & Development, 17: 34–48.

Gallagher, M. E. et al. Indirect benefits are a crucial consideration when evaluating SARS-CoV-2 vaccine candidates. Accepted at Nature Medicine.

Gallagher, M. E. and Koelle, K. A macroparasite within-host framework accommodating spatial structure can recapitulate key aspects of influenza A infection dynamics. In preparation.

Gallagher, M. E. and Dwyer, G. Models of the interaction of fire, weather, and jack pine budworm outbreaks predict severe effects of climate change on jack pine forests. In preparation.

PRESENTATIONS

Invited Presentations

(Canceled): Effects of deleterious mutation load on the global circulation patterns of influenza A/H3N2. Evolutionary Epidemiology Minisymposium, European Conference on Mathematical and Theoretical Biology, Heidelberg, Germany. September 2020.

How do defective interfering particles impact influenza virus dynamics? Presented with Jeremy Harris. Center for Vaccine Research, University of Pittsburgh. Pittsburgh, PA. April 2019.

Parameter estimation and model selection. Bioinformatics User Group, Georgia Tech. Atlanta, GA. April 2019.

Conference Talks

Gallagher, M.E. et al. 2019. A macroparasite within-host framework accommodating spatial structure can recapitulate key aspects of influenza A infection dynamics. Presented at the Epidemics 7 meeting in Charleston, SC.

Gallagher, M. E. and Dwyer, G. 2016. Combining models with data: Parasitoids and plant quality drive the complex population dynamics of a forest pest insect. Presented at the annual meeting of the Ecological Society of America in Ft. Lauderdale, FL.

Gallagher, M. E. and Dwyer, G. 2015. Modeling the population dynamics of jack pine budworm *Choristoneura pinus.* Presented at the annual meeting of the Ecological Society of America in Baltimore, Maryland.

Conference Posters

Gallagher, M.E. et al. 2019. A macroparasite within-host framework accommodating spatial structure can recapitulate key aspects of influenza A infection dynamics. Presented at Ecology and Evolution of Infectious Disease meeting in Princeton, NJ.

Gallagher, M.E. et al. 2019. A macroparasite within-host framework accommodating spatial structure can recapitulate key aspects of influenza A infection dynamics. Presented at the MIDAS Network Meeting in Bethesda, MD.

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Gallagher, M. E. et al. 2018. Modeling the community ecology and competitive dynamics of influenza virus defective interfering particles. Presented at the Ecology and Evolution of Infectious Disease meeting in Glasgow, UK.

Gallagher, M. E. and Dwyer, G. 2014. Do the effects of host-parasitoid interactions and plant quality result in chaos? Presented at the Ecological Society of America meeting in Sacramento, California.

Gallagher, M.E. and H. M. Chamberlin. 2011. Identifying the genetic loci responsible for development of multivulval phenotypes in model organism *C. briggsae.* Presented at the Society for Developmental Biology National Conference in Chicago, IL.

Gallagher, M. E. and J. Marshall. 2011. Survey of Lake Erie island passerine nest predation. Presented at the American Ornithologists' Union National Meeting in Jacksonville, FL.

Gallagher, M.E. and H. M. Chamberlin. 2010. Transcription factor duplication in nematode worms. Presented at the Society for Developmental Biology Midwestern Conference in Cincinnati, OH.

TEACHING EXPERIENCE

Co-Teacher, Emory University

- Quantitative Methods for PBEE Graduate Students, with Dr. Katia Koelle — Spring 2020

Teaching Assistant, University of Chicago

- The Public and Private Lives of Insects, Dr. Eric Larsen — Winter 2015
- Ecology and Evolution of Infectious Disease, Dr. Greg Dwyer — Autumn 2012, 2013
- Evolution and Ecology, Dr. Stefano Allesina and Dr. Jerry Coyne — Winter 2013

Teaching Assistant, The Ohio State University

- Introduction to Biology, Dr. Kristin Smock — Winter 2011

Guest Lectures

"Forest pest insects and their parasites",
The Public and Private Lives of Insects, University of Chicago — Winter 2015

"Human evolution",
Evolution, Emory University — Fall 2019

SERVICE

Volunteer, Skype a Scientist	2019-present
Organizer, Emory Ecology & Evolution of Species Interactions Seminar	2019-present
Member & Volunteer, 500 Women Scientists Atlanta Pod	2018-present
Manuscript Review: Ecology, Viruses, PLOS Computational Biology, and others	2017-present
Judge, Emory GGDBS Graduate Research Symposium	2018, 2019
Mentor, Girls' Do Hack, Adler Planetarium	2013
Organizer, UChicago E&E Prospective Student Weekend	2012-2013
Peer Research Contact, Ohio State Office of Undergraduate Research	2010-2011

ORGANIZATIONS

Theory and Modeling of Living Systems Initiative at Emory
Emory Biology Postdoctoral Group (Co-Founder)
Ecological Society of America
National Honor Society

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FELLOWSHIPS AND AWARDS

IDEAS EEID Pre-Meeting Workshop, Travel & Lodging	2019
Summer Institute in Statistics and Modeling of Infectious Diseases Scholarship	2018
GAANN Training Grant Support, Quantitative Ecology	2013, 2016-2017
Graduate Research Fellow, National Science Foundation	2013-2016
Marian P. and David M. Gates Graduate Student Support Fellowship	2014, 2015
University of Michigan Biological Station Summer Fellowship	2013
National Women's Farm and Garden Foundation Fellowship	2013
Hind's Fund Research Award, Committee on Evolutionary Biology	2012
GRFP Honorable Mention, National Science Foundation	2012
Travel Award, American Ornithologists' Union	2011
Recipient of the President's Salute to Undergraduate Academic Achievement	2011
Pelotonia Undergraduate Fellowship, James Comprehensive Cancer Center	2010-2011
Dean's List, The Ohio State University	2007-2011
National Merit Scholarship, Ohio State	2007-2011
Helix Tri-Beta National Biological Honor Society	Appointed 2010
Dean's Undergraduate Research Scholarship, Ohio State	2009
Outstanding Poster Award, Natural Sciences Undergraduate Research Forum	2009

SKILLS AND EXPERTISE

Modeling: Ordinary and stochastic differential equation models, individual-based models, parameter estimation and model selection, Bayesian statistics, MCMC, statistical computing

Computing: Proficient in R, Matlab, LaTeX, and high-performance computing systems; Intermediate in C, Java, Bash, and git

Other: Experimental design, manuscript preparation, grant writing, teaching, project management, mentoring, and outreach