

Samuel V. Hulse

Postdoctoral Associate
Mathematical Evolutionary Biologist

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Education

- 2021 **Ph.D., Biological Sciences**, University of Maryland Baltimore County
Supervisor: Dr. Tamra Mendelson
- 2021 **M.S., Applied Mathematics**, University of Maryland Baltimore County
- 2012 **B.S., Environmental Science**, Juniata College

Professional Appointments

- 2021 - Curr. **Postdoctoral Associate**, University of Maryland College Park
Supervisor: Dr. Emily Bruns

Publications

Peer-Reviewed Publications

- 2024 **Hulse, S.V.**, and Bruns, E.L. The Emergence of Non-Linear Evolutionary Trade-offs and the Maintenance of Genetic Polymorphisms. *Biology Letters* 20: 20240296.
- 2023 **Hulse, S.V.**, Antonovics, J., Hood, M.E., and Bruns, E.L. Host-pathogen coevolution promotes the evolution of general, broad-spectrum resistance and reduces foreign pathogen spillover risk. *Evolution Letters* 7: 467-477.
- 2023 **Hulse, S.V.**, Antonovics, J., Hood, M.E., and Bruns, E.L. Specific resistance prevents the evolution of general resistance and facilitates disease emergence. *Journal of Evolutionary Biology* 36: 753-763.
- 2022 **Hulse, S.V.**, Renoult, J.P., and Mendelson, T.C. Using deep neural networks to model similarity between visual patterns: Application to fish sexual signals. *Ecological Informatics* 67: 101486.
- 2020 **Hulse, S.V.**, Renoult, J.P., and Mendelson, T.C. Sexual signaling pattern correlates with habitat pattern in visually ornamented fishes. *Nature Communications* 11: 2561.

In Review

- 2025 **Hulse, S.V.**, and Bruns, E.L. Pathogens pull hardest in the coevolutionary arms-race to determine age-specific transmission biases.

Dissertation

- 2021 **Hulse, S.V.** The Evolution of Visual Patterning in North American Freshwater Fishes.

Conferences and Presentations

Invited Talks

- 2023 **Hulse, S.V.** The evolution and maintenance of host genetic diversity for pathogen resistance. Mathematical Biology Seminar, University of Maryland College Park.
- 2022 **Hulse, S.V.** Applications of Deep Learning to Fish Behavioral Patterns. Machine Learners Group Seminar, Scripps Institution of Oceanography.

Contributed Talks

- 2024 **Hulse, S.V.** Host-Pathogen Coevolution Makes or Breaks Transmission Modes. Symposium Talk, Evolution, Montreal, QC.
- 2023 **Hulse, S.V.** Does host-pathogen coevolution increase the risk of foreign pathogen invasion? Ecology and Evolution of Infectious Diseases, State College, PA.
- 2023 **Hulse, S.V.** A theoretical model for the shape of evolutionary trade-offs. Southeastern Population Ecology and Evolutionary Genetics, Pembroke, VA.
- 2023 **Hulse, S.V.** The role of coevolution in maintaining host resistance structures. Evolution, Albuquerque, NM.
- 2021 **Hulse, S.V.** Visual statistics of habitat predict spatial aspect of visual signals. University of Maryland Behavior, Ecology, Evolution, and Systematics Department Retreat, Thurmont, MD.
- 2018 **Hulse, S.V.** The Efficient Coding Hypothesis and Signal Design. UMBC Biological Sciences Departmental Seminar, Baltimore, MD.
- 2018 **Hulse, S.V.**, and Mendelson, T.C. The efficient coding hypothesis and signal design. Annual meeting of the Society for Integrative and Comparative Biology, San Francisco, CA.
- 2017 **Hulse, S.V.**, and Mendelson, T.C. The efficient coding hypothesis and signal design. Spotlight Talk, Evolution, Portland, OR.

Posters

- 2022 **Hulse, S.V.**, and Bruns, E.L. Disease Resistance at the Whole Organism Level, The Joint Evolution of General and Specific Resistance. Ecology and Evolution of Infectious Diseases, Atlanta GA.
- 2020 **Hulse, S.V.**, Mendelson, T.C., and Renoult, J.P. The spatial statistics of sexual signals in fishes correspond to their habitat: extending sensory drive to signal design. NSF workshop: Biology

through Information Communication Coding Theory, Alexandria, VA.

- 2018 **Hulse, S.V.**, Renoult, J.P., and Mendelson, T.C. The Efficient Coding Hypothesis and the Evolution of Signal Design. Evolution, Montpellier, France.
- 2017 **Hulse, S.V.**, and Mendelson, T.C. The efficient coding hypothesis and signal design. Annual meeting of the Society for Integrative and Comparative Biology, New Orleans, LA.

Outreach

- 2019 **Hulse, S.V.** Understanding the signals animals send each other. High School Assembly Presentation, The Park School of Baltimore.

Grants, Awards, and Fellowships

Fellowships

- 2018 Chateaubriand Fellowship, The Embassy of France in the United States (\$4200)

Travel Awards

- 2020 NSF BIOTIC Workshop Student Support (Housing and Travel Support)
- 2018 SICB Charlotte Magnum Student Support (Housing Support)
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- 2018 Wilson Ornithological Society Travel Award (\$285)

Other Awards

- 2018 AAAS/Science Program for Excellence in Science (Full AAAS Membership benefits)

Training

- 2022 University of Maryland Mentoring Workshops for Postdoctoral Fellows, College Park, MD.
- 2020 MIT Brains, Minds Machines Virtual Summer Course, Woods Hole, MA.

Teaching Experience

Instructor of Record

- 2025 Principles of Ecology (BSCI 361).
I am currently teaching the UMD biology departments upperclassman ecology course as instructor of record. This is a 4 credit class, which includes a discussion section and has a 50 student enrollment. This course is a broad overview, including topics from the physical environment, psychological ecology, population ecology and landscape ecology.
- 2024 Introduction to Python for Life Sciences (BSCI 338V).
I developed and taught an 1 credit undergraduate course designed to introduce biologists to the python programming language. Through this course, I taught my students the basics of the python

language, as well as numerical simulations and data analysis using numpy, pandas, and matplotlib. Students engaged with real biological data, such as the Iris dataset, and implemented basic epidemiological models.

Teaching Assistant Roles and Guest Lectures

2023	Guest Lecturer, Principles of Ecology and Evolution
2015-2021	Teaching Assistant, Comparative Vertebrate Physiology Lab
2016-2020	Teaching Assistant, Anatomy and Physiology II Lab
2018	Guest Lecturer, Advanced Topics in Ecology and Evolution: Sexual Selection
2017-2018	Guest Lecturer, Animal Behavior

Mentoring

Undergraduate Mentoring

2024 - Curr	Bhargav Srinivasan, Undergraduate Student, University of Maryland College Park <i>I have been working with Bhargav to develop a model to predict whether it is advantageous for infected plants to flower prior to susceptible plants.</i>
2023	Molly Gans, Visting Undergraduate Student from Amherst University <i>I worked with Molly to develop a modeling component of her senior thesis, using linear systems of differential equations to model the infection process.</i>
2022	Daniel Fu, Undergraduate Student, University of Maryland College Park <i>I supervised Daniel to develop a model for predicting when evolution would favor sterility virulence versus mortality virulence.</i>

Academic Service

Peer Reviewing

2025	Nature Communications
2024	Evolutionary Applications
2024	Ecology and Evolution
2024	Grant Reviewer: Deutsche Forschungsgemeinschaft
2023	Biology Letters (Joint review with Dr. Emily Bruns)
2022	Evolutionary Ecology
2020	Behavioral Ecology

Other Service

2025	Committee Member: Biology Department Committee for Maryland Day Outreach
2024 - Curr	Organizing Committee Member: Quantitative Ecology and Evolution Dynamics Group
2023 - 2024	Founder and Organizer: UMD Mathematical Biology Journal Club
2023	Poster Judge, Southeastern Population Ecological and Evolutionary Genetics 2023
2023	SSE W. D. Hamilton Award Judge
2023	Maryland Day 2023 Outreach Volunteer
2016-2020	UMBC Department of Biological Science FUN Committee
2016-2017	UMBC Graduate Student Association Senator

Professional Memberships

2025 - Curr

2017 - Curr Sigma Xi
Society for the Study of Evolution