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.

Dissertation

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

Conferences and Presentations

Invited Talks

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.** 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.** 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)
2018 SICB Charlotte Magnum Student Support (Housing Support)
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

2024 Introduction to Python for Life Sciences.
Developed and taught an undergraduate course designed to introduce biologists to the python programing 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 Bhargav Srinivasan, Undergraduate Student, University of Maryland College Park
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.

2023 Molly Gans, Visting Undergraduate Student from Amherst University
I worked with Molly to develop a modeling component of her senior thesis, using linear systems of differential equations to model the infection process.

2022 Daniel Fu, Undergraduate Student, University of Maryland College Park
I supervised Daniel to develop a model for predicting when evolution would favor sterility virulence versus mortality virulence.

Academic Service

Peer Reviewing

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