Samuel V. Hulse

Postdoctral Associate
Theoretical Evolutionary Biologist

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Professional Interests

For my doctoral work, I focused on expanding the domain of the sensory drive model beyond peripheral sensory processing, to explain the evolution of complex visual displays. In the Bruns Lab, I am working to develop theoretical models for how evolutionary feedbacks influence disease resistance in plant models. My understanding of the field has been greatly informed by my passion for mathematics, and I am captivated by how evolutionary theory can be made more rigorous through interdisciplinary approaches.

Professional Experience

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

Education

2021 **Ph.D., Biological Sciences**
University of Maryland Baltimore County, Baltimore, MD
Dissertation: The Evolution of Visual Patterning in North American Freshwater Fishes
Supervisor: Dr. Tamra Mendelson

2021 **M.S., Applied Mathematics**
University of Maryland Baltimore County, Baltimore, MD

2012 **B.S., Environmental Science**
Juniata College, Huntingdon, PA

Publications

Peer-Reviewed Publications

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. *Accepted, Evolution Letters*.

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.** 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.

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

Contributed Talks

2023 **Hulse, S.V.** A theoretical model for the shape of evolutionary tradeoffs. Southeastern Population Ecology and Evolutionary Genetics, Pembroke, VA.

2023 **Hulse, S.V.** The role of coevolution in mantaining host resistance structures. Evolution, Albuquerque, NM.

2023 **Hulse, S.V.** Does host-pathogen coevolution increase the risk of foreign pathogen invasion? Ecology and Evolution of Infectious Diseases, State College, PA.

2021 **Hulse, S.V.** Visual statistsics of habitat predict spatial aspect of visual signals. University of Maryland Behavior, Ecology, Evolution, and Systematics Department Retreat, Thurmont, MD.

2019 Mendelson, T.C., **Hulse, S.V.,** Renoult, J.P. Complex nuptial patterns of fish species mimic the spatial statistics of their habitat. Annual meeting of the Animal Behavior Society, Chicago, IL.

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.

Grants, Awards, and Fellowships

Fellowships

2019 Millhauser Fellowship, The Park School of Baltimore ($250)

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

Travel Awards

2020 NSF BIOtIC Workshop Student Support (Housing 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

2023	Developing Course: BSCI 338V: Introduction to Python for Life Sciences
2015-2021	Teaching Assistant, Comparative Vertebrate Physiology Lab
2016-2020	Teaching Assistant, Anatomy and Physiology II Lab
2018	Guest Lecturer, Sexual Selection
2017, 2018	Guest Lecturer, Animal Behavior

Mentoring

Undergraduate Mentoring, University of Maryland College Park

2023	Molly Gans, Amherst University
2022	Daniel Fu, University of Maryland College Park

Academic Service

Manuscript Peer Reviewed

2023	Biology Letters (Joint review with Dr. Emily Bruns)
2022	Evolutionary Ecology
2020	Behavioral Ecology

Misc. Service

2023 - Curr.	Founder and Organiser: UMD Mathematical Biology Journal Club
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