

John Vastola

Curriculum Vitae

✉ john.j.vastola@vanderbilt.edu
U.S. Citizen

Education

- 2016–Present **Ph.D. in Physics**, *Vanderbilt University*, Nashville, TN.
- Advisor: William R. Holmes
- Research Focus: Quantitative biology; stochastic gene regulation; non-equilibrium stat. mech.
- Overall GPA – 3.774/4.0
- Anticipated completion: Spring 2021
- 2012–2016 **B.S. in Mathematics, B.S. in Physics**, *University of Central Florida*, Orlando, FL.
- Ronald E. McNair Scholar, 2015 Rhodes Finalist, Burnett Honors College Student
- Overall GPA – 3.884/4.0

Publications

- ¹**J. J. Vastola** and W. R. Holmes, “Chemical Langevin equation: a path-integral view of Gillespie’s derivation”, *Phys. Rev. E* **101**, 032417 (2020).

Submitted

- ²**J. J. Vastola**, “Solving the chemical master equation for monomolecular reaction systems analytically: a Doi-Peliti path integral view”, arXiv e-prints, arXiv:1911.00978, arXiv:1911.00978 (2019).

Preprints

- ³**J. J. Vastola** and W. R. Holmes, “Stochastic path integrals can be derived like quantum mechanical path integrals”, arXiv e-prints, arXiv:1909.12990, arXiv:1909.12990 (2019).
- ⁴**J. J. Vastola**, “The chemical birth-death process with additive noise”, arXiv e-prints, arXiv:1910.09117, arXiv:1910.09117 (2019).
- ⁵**J. J. Vastola**, “The chemical birth-death process with Gillespie noise”, arXiv e-prints, arXiv:1910.10807, arXiv:1910.10807 (2019).

In Preparation

- ⁶**J. J. Vastola**, G. Gorin, L. Pachter, and W. R. Holmes, “Diagrammatic approach to the analytic solution of chemical master equations involving gene switching”, (2020).
- ⁷**J. J. Vastola** and W. R. Holmes, “Different noise assumptions yield qualitatively different landscapes and transition paths in gene regulation models”, (2020).

Essays

- ⁸**J. J. Vastola**, “Can Brazilian butterfly flaps destroy the universe? How fundamental limits on knowledge and computation force Laplace’s demon to become a scientist”, Essay about variants of Laplace’s demon and what aspects of the world are ultimately accessible to scientific inquiry. Written for the Foundational Questions Institute’s 2020 Undecidability, Uncomputability, and Unpredictability Essay Contest.
- ⁹**J. J. Vastola**, “Who’s Afraid of Max Delbrück?”, Essay about labels on the interface of physics and biology. Won runner-up in 2020 History of Physics Essay Contest put on by the Forum on the History of Physics.

Recent Talks and Poster Presentations

- Sep. 2020 **Understanding multistep splicing dynamics without simulations: the power and promise of new analytical approaches to solving the chemical master equation**, *Quantitative Systems Biology Center Seminar Series*, Vanderbilt University, Oral Presentation.
- March 2020 **Different noise assumptions yield qualitatively different landscapes and transition paths in gene regulation models**, *2020 Virtual APS March Meeting*, American Physical Society, Oral Presentation.
- February 2020 **Osteogenesis versus adipogenesis as a stochastic cell fate switch dysregulated by aging**, *9th Annual Southern California Regional Systems Biology Conference*, UC Riverside, Poster Presentation.
- Sep. 2019 **Waddington's epigenetic landscape does not exist**, *Quantitative Systems Biology Center Seminar Series*, Vanderbilt University, Oral Presentation.
- July 2019 **From useful metaphor to quantitative framework: a unified view of Waddington landscapes**, *2019 q-bio conference*, q-bio, Poster Presentation.
- June 2018 **Towards a coherent theory of stochastic gene dynamics: from landscapes to green field theory**, *2018 q-bio conference*, q-bio, Poster Presentation.
- June 2018 **What is the correct Lagrangian description of stochastic gene dynamics?**, *2018 q-bio summer school*, q-bio, Oral Presentation.

Selected Graduate-level Coursework

- Physics - **Classical Mechanics, Quantum Mechanics, Electrodynamics, Statistical Mechanics Quantum Field Theory I-II, QM of Solids.**
- Quantitative Biology - **Theoretical Systems Biology, Cancer Systems Biology, Physical Measurements of Bio. Systems, Instrumental and Automated Biology, Physics of Living Systems, Modeling of Dopaminergic Neuron Dev..**
- Biology Mini-Courses - **Macromolecular Structure and Function, Genetics, Gene Expression, Cell Bio., Cell Signaling, Cell Cycle and Chromosome Dynamics, Membrane Protein Structure and Function, DNA Structure and Topology, Intro to Structural Bio., Protein-Protein Interactions, Quantitative Systems Bio., Techniques in Biomed. Research I.**
- Math - **Analysis I-II, Algebra I-II, Topology, Algebraic Topology, Complex Analysis, Functional Analysis, Lie Groups and Algebras, Special Functions.**

Additional Professional Preparation

- 2020 **Deep Learning Specialization courses (in progress)**, Coursera/deeplearning.ai.
- 2020 **Machine Learning course**, Coursera.
- 2020 **Short Course in Systems Biology - Foundations**, UC Irvine.
- 2018 **q-bio summer school**, Rice University.

Teaching Experience

- 2016 – 2018 **Physics 2 Lab Graduate Teaching Assistant**, under Forrest Charnock, VU.
- 2015 – 2016 **Wave Mechanics I-II Learning Assistant**, for Richard Klemm, University of Central Florida.
- 2012 – 2014 **Undergraduate Math Tutor**, *UCF Math Lab*, University of Central Florida.
- Spring 2014 **Linear Algebra Grader**, for Costas Efthimiou, University of Central Florida.
- Fall 2013 **Calculus I Teaching Assistant**, for Costas Efthimiou, University of Central Florida.

Leadership

- Summer 2017 **VU-EDGE Leadership Alliance Summer Fellow/Mentor**, *VU / Leadership Alliance*.
- 2014 – 2016 **Society of Physics Students Vice President, President**, *Society of Physics Students*.
- 2015 – 2016 **Pi Mu Epsilon Chapter President**, *Pi Mu Epsilon*.
- 2013 – 2015 **Math Club Vice President, Math Club President**.
- 2013 – 2015 **ICubed Fellowship**, *National Science Foundation*.

Honors and Awards

- October 2020 **Runner-up in 2020 History of Physics Essay Contest**, \$ 500.
- February 2020 **McMinn Summer Research Award**, \$ 2000.
- June 2019 **McMinn Summer Research Award**, \$ 2000.
- June 2018 **McMinn Summer Research Award**, \$ 2000.
- October 2015 **Rhodes Scholarship Finalist**.
- August 2015 **Pi Mu Epsilon Outstanding Presentation Award**, \$ 150.
- August 2015 **Pi Mu Epsilon Travel Grant**, \$ 850.
- June 2015 **Astronaut Scholarship**, \$ 10,000.
- May 2015 **Vanderbilt REU in Physics and Astronomy Student**, \$ 5000.
- January 2015 **AAPT Winter Meeting Outstanding Presentation Award**.
- Dec 2014 **Society of Physics Students Travel Award**, \$ 200.
- October 2014 **Kennesaw Mountain Undergraduate Math Conference Best Poster Presentation**.
- October 2014 **Kennesaw Mountain Undergraduate Math Conference Travel Award**, \$ 200.
- June 2014 **McNair Scholars Program Summer Research Fellowship**, \$ 2000.
- October 2013 **Emerging Leader Scholarship**, \$ 1000.
- October 2013 **Ronald E. McNair Scholar**.
- August 2013 **ICubed Fellowship**, \$ 4000.
- August 2013 **Burnett Research Scholars Grant**, \$ 1000.
- February 2012 **National Merit Scholarship**, \$ 64,000.