

# Patrick Murphy

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CONTACT INFORMATION	Rice University Department of Bioengineering 6100 Main St. Houston, TX 77251-1892	(713)348-3066 pam12@rice.edu patrickmurphy.blogs.rice.edu/
RESEARCH INTERESTS	Emergent behavior of complex systems and their robustness, kinetic models of collective behavior, data-driven agent-based simulations, stochastic hybrid systems, topological data analysis and applications to spatial pattern robustness, age-structured dynamics and applications in cellular biology and microbiology.	
EDUCATION	<b>Department of Mathematics, University of Utah</b> Ph.D. in Mathematics, May 2020 <ul style="list-style-type: none"><li>• Dissertation Topic: Cellular Diffusion in Heterogeneous and Age-structured Switching Environments</li><li>• Advisor: Paul C. Bressloff</li></ul> <b>Department of Mathematical Sciences, Montana State University</b> M.S. in Mathematics, May 2015 <ul style="list-style-type: none"><li>• Advisor: Tomáš Gedeon</li></ul> B.S. in Mathematics, May 2014	
PROFESSIONAL APPOINTMENTS	<b>Department of Bioengineering, Rice University</b> Postdoctoral Research Associate, July 2020 - Present <b>Center for Theoretical Biological Physics, Rice University</b> Postdoctoral Research Associate, July 2020 - Present	
ADDITIONAL EXPERIENCE	UC San Diego Visiting Graduate Student in Biophysics	Summer 2019
PUBLICATIONS	(*co-first authors, **primary author) 11. <b>P Murphy*</b> , J A Comstock*, J Zhang, R Welch, and O Igoshin. <i>Cellular behaviors underlying aggregate dispersal</i> . [In Preparation] 10. T Tyree, <b>P Murphy</b> , and WJ Rappel. <i>Annihilation dynamics during spiral defect chaos revealed by particle models</i> . [In Preparation] 9. <b>P Murphy*</b> , M A Perepelitsa*, I Timofeyev, B Islas, M Lieber-Kotz, and O Igoshin. <i>Breakdown of Boltzmann-type Models for Self-propelled Rods</i> . arXiv:2303.12250 8. M A Perepelitsa*, I Timofeyev*, <b>P Murphy*</b> , and O Igoshin. <i>Mean-field model for nematic alignment of self-propelled rods</i> . Phys. Rev. E. 106, 034613 (2022)	

7. J Zhang, J A Comstock, C R Cotter, **P A Murphy**, W Nie, R D Welch, A B Patel, O A Igoshin. *Quantification of Myxococcus xanthus Aggregation and Rippling Behaviors: Deep-Learning Transformation of Phase-Contrast into Fluorescence Microscopy Images*. Microorganisms (2021), 9, 1954.
6. P C Bressloff, S D Lawley, and **P Murphy\*\***. *Interaction Between Switching Diffusivities and Cellular Microstructure*. Multiscale Model. Simul. 18 572-588 (2020)
5. P C Bressloff\*, S D Lawley\*, and **P Murphy\***. *Effective Permeability of Gap Junctions with Age-structured Switching*. SIAM J. Appl. Math. 80 312-337 (2020)
4. P C Bressloff\*, S D Lawley\*, and **P Murphy\***. *Protein Concentration Gradients and Switching Diffusions*. Phys. Rev. E. 99, 032409 (2019)
3. P C Bressloff\*, S D Lawley\*, and **P Murphy\***. *Diffusion in an Age-structured Randomly Switching Environment*. J. Phys. A 51, 315001 (2018)
2. C Xia, C Cochrane, J DeGuire, G Fan, E Holmes, M McGuirl, **P Murphy**, J Palmer, P Carter, L Slivinski, and B Sandstede, *Lagrangian Data Assimilation in Traffic-flow Models*, Physica D 346, (2017) 59-72.
1. T Gedeon\* and **P Murphy\***, *Dynamics of Simple Food Webs*, Bull. Math. Biol. (2015) 77: 1833.

HONORS AND AWARDS

NSF Research Training Grant (RTG) Fellowship	2018-2019
Outstanding Graduating Seniors with Distinction	Fall 2014
Montana INBRE Undergraduate Student Research Program Award	Spring 2014

TEACHING

Instructor of Record, Calculus I	Fall 2019
Lab Instructor, Mathematics in Medicine	Spring 2019
Lab Instructor, Mathematical Biology I	Fall 2018
Instructor of Record, Precalculus	Fall 2017
Instructor of Record, Precalculus	Spring 2017
Instructor of Record, Intermediate Algebra	Fall 2016
Lab Instructor, Differential Equations and Linear Algebra	Spring 2016
Lab Instructor, Calculus for Engineers I	Fall 2015
Instructor of Record, College Algebra	Fall 2014

MENTORSHIP OF STUDENT RESEARCH	Undergraduate Research in Biophysics, Rice University	2020-2021
	<ul style="list-style-type: none"> <li>• Brandon Islas (Rice University, class of 2022). Numerical solutions of rippling patterns in the bacteria <i>Myxococcus xanthus</i> (co-mentor Oleg Igoshin).</li> <li>• Matan Lieber-Kotz (Rice University, class of 2022). Accuracy of Boltzmann models for cell collisions (co-mentor Oleg Igoshin).</li> </ul>	
TALKS AND POSTERS	Contributing talk, Banff BIRS Workshop on Emergent Behavior	May 2022
	Virtual seminar, University of Pennsylvania Simons Center for Mathematical Biology	February 2022
	Virtual seminar, University of Pittsburgh Department of Mathematics	January 2022
	Contributing talk, Annual International Meeting on the Biology of Myxobacteria	October 2021
	Virtual seminar, UC San Diego Department of Mathematics	October 2020
	Virtual seminar, New Jersey Institute of Technology Department of Mathematics	September 2020
	SIAM Conference on the Life Sciences (Poster) Minneapolis, MN	August 2018
	Montana State University Student Research Celebration (Poster) Bozeman, MT	April 2014
PROFESSIONAL MEMBERSHIPS	Society for Industrial and Applied Mathematics (SIAM)	