

Sean D. Lawley

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RESEARCH INTERESTS Mathematical Biology, Probability and Stochastic Processes, Applied Mathematics, Analysis, Dynamical Systems, Biochemistry

EMPLOYMENT **University of Utah**
Assistant Professor, 2016-present
Research Assistant Professor, 2014-2016

EDUCATION **Duke University**
Ph.D., Mathematics with Certificate in College Teaching, May 2014
Advisors: Jonathan C. Mattingly and Michael C. Reed
M.A., Mathematics, 2011
Carnegie Mellon University
B.S., Computational Finance, 2009

PUBLICATIONS AND PREPRINTS (* denotes undergraduate student co-author, ** denotes graduate student co-author)

- submitted 35. SD Lawley, JB Madrid**. First passage time distribution of multiple impatient particles with reversible binding. Submitted.
34. SD Lawley, V Shankar. Asymptotic and numerical analysis of a stochastic PDE model of volume transmission. Submitted.
33. PC Bressloff, SD Lawley, P Murphy**. Effective permeability of a gap junction with age-structured switching. Submitted.
32. SD Lawley, CE Miles. Diffusive search for diffusing targets with fluctuating diffusivity and gating. Submitted.
31. SD Lawley, CE Miles**. How receptor surface diffusion and cell rotation increase association rates. Submitted.
- 2019 30. SD Lawley, JP Keener. Electrodiffusive flux through a stochastically gated ion channel. *SIAM Journal on Applied Mathematics*, 79(2), 2019.
29. PC Bressloff, SD Lawley, P Murphy**. Protein concentration gradients and switching diffusions. *Physical Review E*, 99(3), 2019.
28. G Handy**, SD Lawley, A Borisjuk. Role of trap recharge time on the statistics of captured particles. *Physical Review E*, 99(2), 2019.
- 2018 27. SD Lawley. Blowup from randomly switching between stable boundary conditions for the heat equation. *Communications in Mathematical Sciences*, 16(4), 2018.
26. CE Miles**, SD Lawley, JP Keener. Analysis of non-processive molecular motor transport using renewal reward theory. *SIAM Journal on Applied Mathematics*, 78(5), 2018.
25. PC Bressloff, SD Lawley, P Murphy**. Diffusion in an age-structured randomly switching environment. *Journal of Physics A: Mathematical and Theoretical*, 51(31), 2018.

24. SD Lawley. A probabilistic analysis of volume transmission in the brain. *SIAM Journal on Applied Mathematics*, 78(2), 2018.
23. G Handy**, SD Lawley, A Borisyuk. Receptor recharge time drastically reduces the number of captured particles. *PLoS Computational Biology*, 14(3), 2018.
22. Y Bakhtin, T Hurth, SD Lawley, JC Mattingly. Smooth invariant densities for random switching on the torus. *Nonlinearity*, 31(4), 2018.
- 2017 21. PC Bressloff, BR Karamched**, SD Lawley, E Levien**. Diffusive transport in the presence of stochastically gated absorption. *Physical Review E*, 96(2), 2017.
20. SD Lawley, JP Keener. Rebinding in biochemical reactions on membranes. *Physical Biology*, 14(5), 2017.
19. PC Bressloff, SD Lawley. Hybrid colored noise process with space-dependent switching rates. *Physical Review E*, 96(1), 2017.
18. PC Bressloff, SD Lawley. Mean first passage times for piecewise deterministic Markov processes and the effects of critical points. *Journal of Statistical Mechanics: Theory and Experiment*, 063202, 2017.
17. PC Bressloff, SD Lawley. Temporal disorder as a mechanism for spatially heterogeneous diffusion. *Physical Review E - Rapid Communication*, 95(6), 2017.
16. PC Bressloff, SD Lawley. Residence times of a Brownian particle with temporal heterogeneity. *Journal of Physics A: Mathematical and Theoretical*, 50(19), 2017.
15. PC Bressloff, SD Lawley. Dynamically active compartments coupled by a stochastically-gated gap junction. *Journal of Nonlinear Science*, 2017.
- 2016 14. SD Lawley, JP Keener. Including rebinding reactions in well-mixed models of distributive biochemical reactions. *Biophysical Journal*, 111(10), 2016.
13. PC Bressloff, SD Lawley. Diffusion on a tree with stochastically-gated nodes. *Journal of Physics A: Mathematical and Theoretical*, 49(24), 2016. *Named to the journal's 'Highlights of 2016' collection.*
12. SD Lawley. Boundary value problems for statistics of diffusion in a randomly switching environment: PDE and SDE perspectives. *SIAM Journal on Applied Dynamical Systems*, 15(3), 2016.
11. SD Lawley, J Best, MC Reed. Neurotransmitter concentrations in the presence of neural switching in one dimension. *Discrete and Continuous Dynamical Systems - Series B*, 21(7), 2016.
- 2015 10. PC Bressloff, SD Lawley. Stochastically gated diffusion-limited reactions for a small target in a bounded domain. *Physical Review E*, 92(6), 2015.
9. PC Bressloff, SD Lawley. Escape from subcellular domains with randomly switching boundaries. *SIAM Multiscale Modeling and Simulation*, 13(4), 2015.
8. SD Lawley, M Tuft*, HA Brooks**. Coarse-graining intermittent intracellular transport: Two- and three-dimensional models. *Physical Review E*, 92(4), 2015.
7. SD Lawley, JP Keener. A new derivation of Robin boundary conditions through homogenization of a stochastically switching boundary. *SIAM Journal on Applied Dynamical Systems*, 14(4), 2015.
6. PC Bressloff, SD Lawley. Escape from a potential well with a randomly switching boundary. *Journal of Physics A: Mathematical and Theoretical*, 48(22), 2015.
5. PC Bressloff, SD Lawley. Moment equations for a piecewise deterministic PDE. *Journal of Physics A: Mathematical and Theoretical*, 48(10), 2015. *Chosen by editors as 'Publisher's pick' featured article.*
4. SD Lawley, JC Mattingly, MC Reed. Stochastic switching in infinite dimensions with applications to random parabolic PDE. *SIAM Journal on Mathematical Analysis*, 47(4), 2015.

- 2014 3. SD Lawley, JC Mattingly, MC Reed. Sensitivity to switching rates in stochastically switched ODEs. *Communications in Mathematical Sciences*, 12(7), 2014.
2. SD Lawley, J Yun*, M Gamble, M Hall, MC Reed, HF Nijhout. Mathematical modeling of the effects of glutathione on arsenic methylation. *Theoretical Biology and Medical Modelling*, 11(20), 2014.
- 2011 1. SD Lawley, M Cinderella*, M Hall, M Gamble, HF Nijhout, MC Reed. Mathematical model insights into arsenic methylation. *Theoretical Biology and Medical Modelling*, 8(31), 2011.

GRANTS AND AWARDS

- NSF DMS-1814832, 2018-2021: Diffusion in stochastic environments: analysis and biological applications, \$250,000 (Sole PI)
- SIAM Activity Group on Life Sciences Early Career Prize, 2018
- NSF DMS RTG-1148230: Research training in mathematical and computational biology, \$2,496,299 (co-PI 2016-2019)
- L.P. and Barbara Smith Award for Teaching Excellence, 2013

INVITED TALKS

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| SIAM Dynamical Systems Minisymposium: Advances in reaction diffusion systems
Snowbird, USA | May 2019 |
| Conference on Recent Advances in Pure and Applied Stochastics
New Orleans, USA | March 2019 |
| Tufts University Mathematics Colloquium
Boston, USA | March 2019 |
| Washington State University Mathematics Colloquium
Pullman, USA | January 2019 |
| University of Neuchâtel Mathematics Colloquium
Neuchâtel, Switzerland | December 2018 |
| Workshop on Advanced asymptotics in PDEs, probabilistic methods
in statistical physics for extreme statistics, and rare events
Pisa, Italy | September 2018 |
| Colorado State University Applied Math Seminar
Fort Collins, USA | September 2018 |
| SIAM Life Sciences Minisymposium: Agent-based Modeling in the Life Sciences
Minneapolis, USA | August 2018 |
| AMS Special Session: Biomathematics - Progress and Future Directions
Portland, USA | April 2018 |
| SIAM Dynamical Systems Minisymposium: Random Dynamics in Microbiology
Snowbird, USA | May 2017 |
| University of California, Irvine Applied and Computational Mathematics Seminar
Irvine, USA | March 2017 |
| Tulane University Probability and Statistics Seminar
New Orleans, USA | November 2016 |

University of Alberta Applied Mathematics Institute Seminar Edmonton, Canada	November 2016
University of Alberta Mathematical Biology Seminar Edmonton, Canada	October 2016
AIMS Conference special session: Randomness meets life Orlando, USA	July 2016
Frontier Probability Days Salt Lake City, USA	May 2016
Stochastic and deterministic dynamics in networks workshop Mathematical Biosciences Institute, Ohio State University Columbus, USA	February 2016
University of Utah Special Colloquium Salt Lake City, USA	February 2016
University of Arizona Special Colloquium Tucson, USA	January 2016
JMM Minisymposium: Probability meets dynamics in biology Seattle, USA	January 2016
University of Utah Joint Applied Math/Math Biology/Stochastics Seminar Salt Lake City, USA	December 2015
University of Idaho Center for Modeling Complex Interactions Seminar Moscow, USA	November 2015
University of Colorado Boulder Applied Mathematics Seminar Boulder, USA	November 2015
University of British Columbia Stochastic Dynamics Seminar Vancouver, Canada	September 2015
AMMCS-CAIMS Minisymposium: Topics in mathematical neuroscience Waterloo, Canada	June 2015
SIAM Life Sciences Minisymposium: Mathematical questions in neural dynamics Charlotte, USA	August 2014
Duke University Probability Seminar Durham, USA	December 2013
University of Utah Mathematical Biology Seminar Salt Lake City, USA	October 2013
SIAM Dynamical Systems Minisymposium: Stochastic dynamics on neuronal networks Snowbird, USA	May 2013

TEACHING

Mathematics Education Committee, University of Utah	2017-present
University Mathematics Education Steering Committee, University of Utah	2017-present
University Advisory Council on Teacher Education, University of Utah	2017-present

Courses

<i>Applied Complex Variables</i> , University of Utah	Spring 2019
<i>Introduction to Applied Mathematics</i> , University of Utah	Fall 2018
<i>Topics in Probability: Advanced Stochastic Processes</i> , University of Utah	Spring 2018
<i>Introduction to Partial Differential Equations</i> , University of Utah	Fall 2017
<i>Mathematical Biology I</i> , University of Utah	Fall 2016
<i>Mathematical Biology II</i> , University of Utah	Spring 2016 and Spring 2017
<i>Introduction to Probability</i> , University of Utah	Fall 2015
<i>Differential Equations and Linear Algebra</i> , University of Utah	Fall 2014
<i>Math in Genetics and Genomics</i> , Duke University	Spring 2014 and Spring 2013
<i>Laboratory Calculus I</i> , Duke University	Fall 2011

Undergraduate research mentored

Hannah Choi (University of Utah, class of 2018)	Academic year 2017-2018
Chong Wang (University of Utah, class of 2018) and Bo Zhu (University of Utah, class of 2018) Mentored both students on a summer long project using branching processes to study cancer progression.	Summer 2017
Jacob Madrid (University of Utah, class of 2017) Mentored on a project testing recently developed mathematical techniques for incorporating spatial-temporal correlations into well-mixed models.	Fall 2016
Jacob Madrid (University of Utah, class of 2017) Mentored on a project developing a new stochastic simulation algorithm for diffusion in the presence of a partially absorbing boundary.	Summer 2016
Daniel Armstrong (University of Utah, class of 2016) Mentored on a semester long project modeling neurite growth.	Spring 2016
Marie Tuft (University of Utah, class of 2015) Mentored on a yearlong honors thesis project modeling virus trafficking. Our work was published in <i>Physical Review E</i> .	Academic year 2014-2015
Oliver Richardson (University of Utah, class of 2017) Mentored on a yearlong project modeling learning on neural networks.	Academic year 2014-2015
Braden Schaer (University of Utah, class of 2015) and Anand Singh (University of Utah, class of 2016) Mentored both students on a yearlong project modeling diffusion of neurotransmitters.	Academic year 2014-2015
Adela Yang (Bowdoin College, class of 2016) and Ana Martinez (Northeast Texas Community College, class of 2015) Mentored both students during a mathematical biology workshop held at Duke University. Project title: <i>Analysis and applications of phylogenetic trees</i> .	Summer 2014

Jina Yun (Duke University, class of 2015) Summer 2013
Co-mentored with two Duke University professors. Our work modeling arsenic detoxification was published in *Theoretical Biology and Medical Modelling*.

Andrew Gao (Duke University, class of 2016) Summer 2013
Co-mentored during a mathematical biology REU on a cancer modeling project.
Project title: *Modeling the inhibition of angiogenesis*.

Charnelle Bland (Emory University, class of 2014) Summer 2012
and Kirsten Bell (Wheaton College, class of 2015)
Mentored both students during a mathematical biology workshop held at Duke University.
Project title: *Arsenic poisoning in Bangladesh and mathematical experimentation*.

Priyanka Nadar (Mary Baldwin College, class of 2012) Summer 2011
Co-mentored during a mathematical biology workshop held at Duke University.
Project title: *Mathematical insights into arsenic poisoning in Bangladesh*.

Molly Cinderella (Duke University, class of 2012) Summer 2010
Co-mentored with two Duke University professors. Our work modeling arsenic poisoning in Bangladesh was published in *Theoretical Biology and Medical Modelling*.

Other teaching experience

Led journal club for first and second year graduate students, University of Utah, Spring 2015 and Spring 2016.

Instructor for real analysis qualifying exam review, Duke University, August 2012 and 2011.

Teaching assistant for *Laboratory Calculus and Functions I*, Duke University, Fall 2009.

Teaching assistant for *Integration, Differential Equations and Approximation*, Carnegie Mellon University, Spring 2009.

Teaching assistant for *Differential and Integral Calculus*, Carnegie Mellon University, Fall 2008.

SERVICE

Reviewer for SIAM Journal on Applied Dynamical Systems.
Reviewer for SIAM Journal on Applied Mathematics.
Reviewer for Journal of Physics Communications.
Reviewer for Journal of Mathematical Biology.
Reviewer for Annals of Applied Probability.
Reviewer for Proceedings of the Royal Society A.
Reviewer for Journal of Nonlinear Science.
Reviewer for Multiscale Modeling and Simulation.
Reviewer for Journal of Theoretical Biology.
Reviewer for Statistics and Probability Letters.
Reviewer for Mathematical Biosciences.
Reviewer for Discrete and Continuous Dynamical Systems - Series B.
Reviewer for Scientific Reports.
Reviewer for International Journal of Bifurcation and Chaos.
Mathematics Education Committee, 2017-present.
University Mathematics Education Steering Committee, 2017-present.
University Advisory Council on Teacher Education, 2017-present.
Center for Science and Mathematics Education Hiring Subcommittee, 2018-present.
Transformative Excellence Program (TEP) Committee, 2017-2018.
Instructorship Committee, 2017-2018.
Colloquium and Distinguished Lecture Committee, 2016-present.
College of Science Day Committee, 2016-2018.
Faculty Advisor to the University of Utah chapter of Sigma Phi Epsilon, 2014-2016.
Lectures to middle school math students, Northwest Middle School, Salt Lake City, UT, May 2015.
Lectures to high school math students, Riverside High School, Durham, NC, May 2013 and 2014.
Lectures to middle school math students, Central Middle School, Melbourne, FL, November 2010.

PROFESSIONAL
MEMBERSHIPS

American Mathematical Society
Society for Industrial and Applied Mathematics