

# Curriculum Vitae

Jay Newby

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## EDUCATION

PhD in Mathematics · University of Utah · 2010  
BS in Mathematics · University of Utah · 2006

## PREVIOUS EMPLOYMENT

Postdoctoral Fellow · University of North Carolina, Chapel Hill · September 2015 - August 2017  
Postdoctoral Fellow · Ohio State University · September 2012 - August 2015  
Postdoctoral Fellow · University of Oxford · October 2010 - August 2012

## AWARDS/FELLOWSHIPS

Isaac Newton Institute visiting fellow · 2016  
MBI/NSF Postdoctoral Fellowship · 2012-2015  
Oxford (OCCAM) Postdoctoral Fellowship · 2010-2012  
Oxford (OCCAM) Visiting Studentship · 2009  
IGERT/NSF Graduate Fellowship · 2006-2009

## TEACHING EXPERIENCE

*Differential Equations* · Ohio State · Fall 2013  
*Mathematical Physiology* · Oxford · Spring 2011  
*Perturbation Methods* · Oxford · Fall 2010  
*Business Calculus* · University of Utah · Summer 2010  
*College Algebra* · University of Utah · Spring 2009  
*Calculus* · University of Utah · Fall 2008

## LABORATORY EXPERIENCE

*Cellular Neuroscience Lab Rotation* · Eric Jorgensen Lab, University of Utah · Summer 2007  
*Lab Assistant* · Biochemistry Dept., University of Utah · 2002 - 2006  
*Lab Assistant* · Mario Capecchi Lab, Genetics Dept., University of Utah · 2000 - 2002  
*Cellular Neuroscience Research* · Kendal Broadie Lab, University of Utah · 2000 - 2001

## SUBMITTED PAPERS

1. A. Khan, J. Newby, and A. Gladfelter. *Control of septin filament flexibility and bundling.* (submitted), 2017

2. J. Newby, A. Schaefer, P. Lee, M. G. Forest, and S. Lai. *Deep neural networks automate detection for tracking of submicron scale particles in 2D and 3D*. [Nature Communications \(under review\)](#), 2017
3. I. Seim, J.A. Cribb, J. Newby, P. Vasquez, M. Lysy, D.B. Hill, M.G. Forest. *Evidence that self-similar microrheology of highly entangled polymeric hydrogels scales robustly with, and is tunable by, polymer concentration*. *J. Rheology*, April 2017

## PUBLICATIONS

1. J. Newby, J. Schiller, T. Wessler, M. G. Forest, and S. Lai. *A blueprint for fast dynamic crosslinking of mobile species in biogels with weak molecular anchors*. [Nature Communications](#), 8:833, 2017
2. L. Miao, J. Newby, M. Lin, Z. Lu, F. Xu, W. Kim, M. G. Forest, S. Lai, M. Milowsky, S. Wobker, and L. Huang. *The Binding Site Barrier Elicited by Tumor Associated Fibroblasts Interferes Disposition of Nanoparticles in Stroma-Vessel Type Tumors*. [ACS Nano.](#), 10 (10), pp 9243-9258, 2016
3. J. Newby and J. Allard. *First-passage time to clear the way for receptor-ligand binding in a crowded environment*. [Phys. Rev. Lett.](#), 116:128101, 2016
4. S. Isaacson, A. Mauro, and J. Newby. *Uniform asymptotic approximation of diffusion to a small target: generalized reaction models*. [Phys. Rev. E](#), 2016
5. M. Schwemmer and J. Newby. *Metastable switching in a planar limit cycle system with additive noise*. [Physica D](#), 317, pp 15-27, 2016
6. J. Newby. *Bistable switching asymptotics for the self regulating gene*. [J. Phys. A](#), 2015
7. J. Newby. *Spontaneous excitability in the Morris–Lecar model with ion channel noise*. [SIAM J. Appl. Dyn. Syst.](#), 13:4, pp 1756-1791, 2014
8. J. Newby and M. Schwemmer. *Effects of moderate noise on a limit cycle oscillator: Counterrotation and bistability*. [Phys. Rev. Lett.](#), 112:114101, 2014
9. J. Newby, P. C. Bressloff, and J. P. Keener. *Breakdown of fast-slow analysis in an excitable system with channel noise*. [Phys. Rev. Lett.](#), 111:128121, 2013
10. J. Newby and J. Chapman. *Metastable behavior in Markov processes with internal states*. [J. Math. Biol.](#), 2013
11. S. Isaacson and J. Newby. *Uniform asymptotic approximation of the first passage time density for diffusion to a small spherical trap within a bounded domain*. [Phys. Rev. E](#), 88:012820, 2013
12. P. C. Bressloff and J. Newby. *Stochastic models of intracellular transport*. [Rev. Mod. Phys.](#), 85:135-196, 2013
13. P. C. Bressloff and J. Newby. *Metastability in a stochastic neural network modeled as a velocity jump Markov process*. [SIAM J. Appl. Dyn. Syst.](#), 12:1394-1435, 2013

14. P. C. Bressloff and J. Newby. *Stochastic hybrid model of spontaneous dendritic NMDA spikes*. [Physical Biol.](#), 11:-16006, 2013
15. J. Newby. *Isolating intrinsic noise sources in a stochastic genetic switch*. [Physical Biol.](#), 9:026002, 2012
16. P. C. Bressloff and J. Newby. *Filling of a Poisson trap by a population of random intermittent searchers*. [Phys. Rev. E](#), 85:031909, 2012
17. L. Y. Ming, J. Newby, and P. C. Bressloff. *Effects of demographic noise on the synchronization of a metapopulation in a fluctuating environment*. [Phys. Rev. Lett.](#), 107:118102, 2011
18. J. P. Keener and J. Newby. *Perturbation analysis of spontaneous action potential initiation by stochastic ion channels*. [Phys. Rev. E](#), 84:011918, 2011
19. J. Newby and J. P. Keener. *An asymptotic analysis of the spatially-inhomogeneous velocity-jump process*. [Multiscale Model. Simul.](#), 9:735-765, 2011
20. P. C. Bressloff and J. Newby. *Quasi-steady state analysis of two-dimensional random intermittent search processes*. [Phys. Rev. E](#), 83:061139, 2011
21. J. Newby and P. C. Bressloff. *Local synaptic signalling enhances the stochastic transport of motor-driven cargo in neurons*. [Phys. Biol.](#), 7:036004, 2010
22. J. Newby and P. C. Bressloff. *Random intermittent search and the Tug-of-war model of motor-driven transport*. [J. Stat. Mech.](#), 4:04014, 2010
23. J. Newby and P. C. Bressloff. *Quasi-steady state reduction of molecular motor-based models of directed intermittent search*. [Bull. Math. Biol.](#), 72:1840-1866, 2010
24. J. Newby and P. C. Bressloff. *Directed intermittent search for a hidden target on a dendritic tree*. [Phys. Rev. E](#), 80(2):021913, 2009

## INVITED TALKS

- ▶ *Harvard Widely Applied Math Seminar* 21 September 2017  
Cambridge, USA
- ▶ *Arizona State Math Bio Seminar & Statistics Seminar* 10 February 2017  
Phoenix, USA
- ▶ *UNC Chapel Hill Probability Seminar* 3 November 2016  
Chapel Hill, USA
- ▶ *UNC Chapel Hill Applied Math Seminar* 7 October 2016  
Chapel Hill, USA
- ▶ *U. of Washington Applied Math Colloquium* 19 January 2016  
Seattle, USA

- ▶ *U. of Notre Dame Applied Math Colloquium*  
Notre Dame, USA 1 December 2015
- ▶ *UC Irvine Math Bio Seminar*  
Irvine, USA 1 June 2015
- ▶ *U. of Florida Math Bio Seminar*  
Gainesville, USA 24 March 2015
- ▶ *UT Austin Joint Math/Neuro Colloquium*  
Austin, USA 29 January 2015
- ▶ *Duke University Probability Seminar*  
Durham, USA 2 October 2014
- ▶ *U. of Wisconsin Probability Seminar*  
Madison, USA 2 February 2014
- ▶ *Northwestern Applied Math Colloquium*  
Chicago, USA 9 December 2013
- ▶ *RPI Math Colloquium*  
Troy, USA 14 November 2013
- ▶ *U. of Delaware Math Colloquium*  
Delaware, USA 1 October 2013
- ▶ *École Normale Supérieure Computational Neuroscience Seminar*  
Paris, France 28 May 2013
- ▶ *Penn State Math Biology Seminar*  
State College, USA 29 November 2012

#### INVITED CONFERENCE TALKS

- ▶ *Stochastic Perturbations of Dynamical Systems*  
*A conference in honor of Alexander Wentzell and his work*  
New Orleans, USA 5 October 2017
- ▶ *Isaac Newton Institute Workshop*  
*Stochastic Dynamical Systems in Biology*  
Cambridge, UK 5 April 2016
- ▶ *Multiscale transport of particles*  
Vienna, Austria 14 September 2015
- ▶ *Search and Exploration*  
Cargèse, France 3 June 2013
- ▶ *MBI Cellular Neuroscience Workshop*  
Columbus, USA 8 April 2013

- ▶ *Mathematical Modeling in Cell Biology* 25 March 2013  
Lyon, France
- ▶ *Stochastic Phenomena in Physical and Biological Systems* 28 May 2012  
Mallorca, Spain
- ▶ *Search and Exploration* 25 May 2011  
Cargèse, France

## EVENT ORGANIZATION

- ▶ *Axonal transport and neuronal mechanics* 3 November 2014  
Columbus, USA
- ▶ *Workshop for young researchers in mathematical biology* 25 August 2014  
Columbus, USA

## CURRENT GRANT AWARDS

1. *Collaborative Research: Spatial stochastic rare events by asymptotics and weighted ensemble sampling to understand how cells make space*  
**Primary Investigator:** Elizabeth Read  
**Co-Investigators:** Jun Allard and Jay Newby  
**Project Location:** University of California-Irvine  
**Source of Support:** NSF-DMS  
**Total Award Amount:** \$369,293  
**Total Award Period:** 36 months
2. *Artificial neural networks for high performance, fully automated particle tracking analysis even at low signal-to-noise regimes*  
**Primary Investigator:** Sam Lai  
**Co-Investigators:** Greg Forest and Jay Newby  
**Project Location:** University of North Carolina at Chapel Hill  
**Source of Support:** NIH  
**Total Award Amount:** \$210,278  
**Total Award Period:** 12 months

## PENDING GRANT APPLICATIONS

1. *BIGDATA: IA: Collaborative Research: An integrated pipeline for acquisition, automated conversion, analytics, modeling, and visualization of 4D bio-imaging data*  
**Primary Investigator:** Greg Forest  
**Co-Investigators:** Amy Gladfelter, Sam Lai, Paul Maddox, and Jay Newby  
**Project Location:** University of North Carolina at Chapel Hill  
**Source of Support:** NSF  
**Total Award Amount:** \$1,985,691  
**Total Award Period:** 48 months

## UNAWARDED GRANT APPLICATIONS

1. *Enhanced Data Acquisition Coupled with Bayesian Inference and Predictive Modeling of Tracked Microscopic Species for Biomedical and Biological Applications*

**Primary Investigator:** Sam Lai  
**Co-Investigators:** Greg Forest and Jay Newby  
**Project Location:** University of North Carolina at Chapel Hill  
**Source of Support:** NSF-NIGMS  
**Total Award Amount:** \$1,600,000  
**Total Award Period:** 48 months