

Katherine Newhall

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Affiliation

University of North Carolina at Chapel Hill
Department of Mathematics
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Education

Ph.D. Rensselaer Polytechnic Institute, Mathematics (Aug 2011)
M.S. Rensselaer Polytechnic Institute, Aeronautical Engineering (Aug 2006)
B.S. Rensselaer Polytechnic Institute, Applied Physics and Applied Math (Dec 2004)

Advisors

Eric Vanden-Eijnden, Postdoc mentor; Peter Kramer, Gregor Kovačič and David Cai, Ph.D. co-advisors; Luciano Castillo, M.S. advisor

Employment

July 2020 - Present, Associate Professor
Department of Mathematics, University of North Carolina at Chapel Hill
July 2014 - June 2020, Assistant Professor
Department of Mathematics, University of North Carolina at Chapel Hill
Sept 2011 - June 2014, Courant Instructor/Assistant Research Professor
Courant Institute for Mathematical Sciences, New York University
June 2011 - Sept 2011, Assistant Research Professor
Department of Physics, New York University, under the direction of Jasna Brujic

Visiting Positions

- August 2015 to May 2016: SAMSI Faculty Fellow for year long program on Challenges in Computational Neuroscience.
- September to December of 2009: Visiting graduate student actively participating in the year long Stochastic Dynamics workshop at the Statistical and Applied Mathematical Sciences Institute (SAMSI), Durham, NC.
- July of 2005: Visiting graduate student designing an experiment for measuring turbulent boundary layers over rough surfaces at the Chalmers Institute of Technology, Göteborg, Sweden in the Turbulence Research Laboratory.

Honors and Awards

- 2018 Outstanding Referee of the Physical Review journals
- 2013 Cathleen S. Morawetz postdoctoral fellowship
- 2012 SIAM Postdoc Travel Award
- 2011 SIAM Student Travel Award; Joaquin B. Diaz Prize; Karen and Lester Gerhardt Prize
- 2010 SIAM Student Travel Award; Joint SIAM/RSME-SCM-SEMA DSPDE Travel Award; CIRM Travel Award
- 2009 SIAM Student Travel Award
- 2005 NSF Graduate Research Fellowship
- 2004 Founders Award of Excellence; Undergraduate student presentation award TREND REU program
- 2003 Academic Achievement Award for Foundations in Applied Mathematics; Inducted into Sigma Pi Sigma, Physics Honor Society; Inducted into the Order of Omega, Greek Honor Society

Refereed Publications

1. Y. Gao, J. Marzuola, J. Mattingly, K. Newhall (2020) Non-local SPDE limits of spatially-correlated-noise driven spin systems derived to sample a canonical distribution, *Phys. Rev. E*, Vol. 102, No. 5, 052112 (20 pages)
2. P. Pyzza, K. Newhall, D. Zhou, G. Kovačič, D. Cai (accepted 2020) *Network Mechanism for Insect Olfaction*, *Cognitive Neurodynamics*, arXiv:1908.11865 (37 pages)
3. Y. Gao, K. Kirkpatrick, J. Marzuola, J. Mattingly, K. Newhall (accepted 2020) *Limiting Behaviors of High Dimensional Stochastic Spin Ensembles* *Comm. in Math. Sci.*, arXiv:1806.05282
4. E. Weimer and K. Newhall (2019) *Data-Driven Modeling of Flow Cytometric Crossmatch: Enhanced Virtual Crossmatching* *Human Immunology*, Vol. 80, No. 12, 983-989 (7 pages)
5. J. Crodelle, K. Newhall, P. Pyzza, G. Kovačič (2019) *Coarse-Grained Descriptions of Oscillations in Neuronal Network Models*, *Comm. in Math. Sci.* Vol. 17, No. 5, 1437-1458 (22 pages)
6. B. Walker and K. Newhall (2018) *Inferring information flow in spike-train data sets using a trial-shuffle method*, *PLOS ONE*, 13(11): e0206977 (18 pages)
7. K. Newhall, G. Kovačič, I. Gabitov (accepted 2018) *Polarization dynamics in a resonant optical medium with initial coherence between degenerate states*, *Discrete Contin. Dyn. Syst. Ser. S*
8. K. Newhall and E. Vanden-Eijnden (2017) *Metastability of the Nonlinear Wave Equation: Insights from Transition State Theory*, *J. Nonlinear Sci.* Vol. 27, No. 3, 1007-1042 (36 pages)

9. M. Erdogan, J. Marzuola, K. Newhall, N. Tzirakis (2015) *The structure of global attractors for dissipative Zakharov systems with forcing on the torus*, SIADS, Vol. 14, No. 4, 1978-1990. (13 pages)
10. K. Newhall, M. Shkarayev, P. Kramer, G. Kovačič, D. Cai (2015) *Synchrony in stochastically driven neuronal networks with complex topologies*, Phys. Rev. E, Vol. 91, No. 5, 052806 (25 pages)
11. J. Zhang, K. Newhall, D. Zhou, A. Rangan (2013) *Distribution of correlated spiking events in a population-based approach for Integrate-and-Fire networks*, J. Comput. Neurosci., Vol. 36, No. 2, pp. 279-295 (17 pages)
12. K. Newhall, E. Vanden-Eijnden (2013) *Averaged equation for energy diffusion on a graph reveals bifurcation diagram and thermally assisted reversal times in spin-torque driven nanomagnets*, J. Appl. Phys., Vol. 113, No. 18, 184105 (12 pages)
13. K. Newhall, E. Atkins, P. Kramer, G. Kovačič, I. Gabitov (2013) *Random polarization dynamics in a resonant optical medium*, Optics Letters, Vol. 38, No. 6, pp. 893-895 (3 pages)
14. K. Newhall, L. L. Pontani, I. Jorjadze, S. Hilgenfeldt, J. Brujić (2012) *Size-topology relations in Packings of Grains, Emulsions, Foams, and Biological Cells*, Phys Rev Lett, Vol. 108, 268001 (5 pages)
15. K. Newhall, I. Jorjadze, E. Vanden-Eijnden, and J. Brujić (2011) *A statistical mechanics framework captures the packing of monodisperse particles*, Soft Matter, Vol. 7, pp. 11518-11525 (8 pages)
16. I. Jorjadze, L. Pontani, K. Newhall, and J. Brujić (2011) *Attractive emulsion droplets probe the phase diagram of jammed granular matter*, PNAS, Vol. 108, No. 11, pp. 4286-4291 (6 pages)
17. K. Newhall, G. Kovačič, P. Kramer, A. Rangan, and D. Cai (2010) *Cascade-induced synchrony in stochastically-driven neuronal networks*, Phys Rev E, Vol. 82, 041903 (17 pages)
18. K. Newhall, G. Kovačič, P. Kramer, D. Zhou, A. Rangan, and D. Cai (2010) *Dynamics of Current-Based, Poisson Driven, Integrate-and-Fire Neuronal Networks*, Comm in Math Sci, Vol. 8, No. 2, pp. 541-600 (60 pages)
19. K. Newhall and D. Durian (2003) *Projectile-shape Dependence of Impact Craters in Loose Granular Material*, Phys Rev E, 68, 060301(R) (3 pages)

Non-Refereed Publications

- B. Brzek, R. B. Cal, K. Newhall, G. Johansson, and L. Castillo (2006) *LDA Measurements in Rough Surface ZPG Turbulent Boundary Layers*, Proceedings of 2006 ASME Joint US-European Fluids Engineering Summer Meeting, FEDSM2006-98508, (10 pages) July 17-20 Miami, FL

- K. Newhall, R. B. Cal, B. Brzek, G. Johansson, L. Castillo (2006) *Smooth and Rough Turbulent Boundary Layers: A look at Skin Friction, Pressure Gradient and Roughness*, Proceedings of 2006 ASME Joint US-European Fluids Engineering Summer Meeting, FEDSM2006-98517, pp. 1013-1021, July 17-20 Miami, FL
- K. Newhall, B. Brzek, R. B. Cal, G. Johansson, and L. Castillo (2006) *Skin Friction and the Inner Flow in Pressure Gradient Turbulent Boundary Layers*, 36th AIAA (11 pages) Fluid Dynamics Conference and Exhibit, AIAA-2006-2887, June 5-8 San Francisco, CA

Conference Organizer

- Program Committee Member, SIAM Network Science (May 2019) Snowbird, UT
- Scientific Program Member, IMACS Nonlinear Evolution Equations and Wave Phenomena (Apr 2019) UGeorgia, Athens, GA
- Conference Organizer, 42nd SIAM-SEAS Conference (Mar 2018) UNC Chapel Hill, NC
- Conference Organizer, Women in Math Triangle Conference (Feb 2018) UNC Chapel Hill, NC

Conference Sessions Organized

- 11th IMACS International Conference on Nonlinear Evolution Equations (Apr 2019) Special Session Organizer “Stochastic Dynamics in Nonlinear Systems”
- SIAM Life Science (Aug 2018) Minneapolis, MN, mini-symposium co-organizer, “Neuronal Connectivity and Dynamics in Computation I and II”
- 42nd SIAM-SEAS Conference (Mar 2018) UNC Chapel Hill, NC, mini-symposium organizer, “Modern techniques for understanding Stochastic Dynamics”
- 42nd SIAM-SEAS Conference (Mar 2018) UNC Chapel Hill, NC, mini-symposium co-organizer, “Mathematical Advances in Neuroscience”
- 10th IMACS International Conference on Nonlinear Evolution Equations (Mar 2017) Athens, GA, special-session co-organizer, “Nonlinear dynamics in mathematical biology and neuroscience”
- SIAM Nonlinear Waves and Coherent Structures (Aug 2016) mini-symposium co-organizer, “Nonlinear Dynamics and Coherent Structures in Neuronal Networks”
- SIAM Annual Meeting (July 2016) Boston, MA, mini-symposium organizer, “Effects of Randomness on Extended Physical Systems”
- SIAM Life Science (July 2016) Boston, MA, mini-symposium co-organizer, “Connecting Network Architecture and Network Computation”
- SIAM Life Science (July 2016) Boston, MA, mini-symposium organizer, “Neuromechanical Modeling of Invertebrates”

- AIMS 11th Conference on Dynamical Systems, Differential Equations and Applications (July 2016) Orlando, FL, special-session co-organizer, “Modern Applications of Mathematical and Computational Sciences”
- SIAM Dynamical Systems (May 2015) Snowbird, UT, mini-symposium organizer, “Dynamics of High Dimensional Stochastic Models”
- SIAM Life Science (Aug 2014) Charlotte, NC, mini-symposium co-organizer, “Mechanisms and Computation in Neuronal Networks”
- SIAM Annual Meeting (July 2014) Chicago, IL, mini-symposium co-organizer, “Dynamics of Large Stochastic Neuronal Networks”
- SIAM Dynamical Systems (May 2013) Snowbird, UT, mini-symposium co-organizer, “Emergent Dynamics of Large Neural Networks”
- SIAM Computational Science and Engineering (Feb 2013) Boston, MA, mini-symposium co-organizer, “Computations of Stochastic Dynamics”
- SIAM Life Science (July 2012) San Diego, CA, 3 part mini-symposium co-organizer, “Coherent Dynamics of Neuronal Networks”
- SIAM Uncertainty Quantification (Apr 2012) Raleigh, NC, mini-symposium organizer, “Modeling Networks in Dynamic Systems”

Conference Talks Given

1. ICIAM (July 2019) Valencia, Spain, A network of transition pathways in a soft-sphere model, invited speaker in thematic minisymposium
2. Granular and Particulate Networks (July 2019) Max Planck Institute for Physics of Complex Systems, Dresden, Germany, A network of transition pathways in a soft-sphere model, invited speaker
3. SIAM Dynamical Systems (May 2019) Snowbird, UT, Statistical Network Representations of Energy Landscapes in Soft-Sphere Models
4. 11th IMACS International Conference on Nonlinear Evolution Equations (Apr 2019) Athens, GA, A network of transition pathways in a model granular system
5. SIAM Life Science (Aug 2018) Minneapolis, MN, Oscillations in Model Neuronal Networks, Invited Speaker in Minisymposium
6. International Conference on Applied Math and Computational Neuroscience (July 2018) SJTU, Shanghai, China (invited speaker) Synchrony and Information Flow in Integrate-and-Fire Neuronal Network Models
7. Society of Math Biology (July 2018) Sydney, Australia, Spike trains to force generation
8. APS March Meeting (March 2018) Los Angeles, CA Non-Markov Model for Self-Propelling Droplets

9. Stochastic Perturbations of Dynamical Systems in honor of Alexander Wentzell and his work (Oct 2017) Tulane, New Orleans, LA, (invited speaker) Metastability of the Nonlinear Wave Equation
10. SIAM Dynamical Systems (May 2017) Snowbird, UT, A Non-Markov Model for Swimming Droplets, Invited Speaker in Minisymposium
11. 10th IMACS International Conference on Nonlinear Evolution Equations (Mar 2017) Athens, GA, Metastability of the Nonlinear Wave Equation, invited speaker in special session
12. Southern Sectional AMS Meeting (Nov 2016), Raleigh, NC, (invited) Metastability of the Nonlinear Wave Equation
13. International Conference on Multiscale Materials Modeling (Oct 2016), Dijon, France, (invited) Reversal-time scaling in low-damping ferromagnetic models
14. SIAM Nonlinear Waves and Coherent Structures (Aug 2016), Philadelphia, PA, The Causes of Metastability and Their Effect on Transition Times, Invited Speaker in Mini Symposium
15. SIAM Annual Meeting (July 2016), Boston, MA, Causes of Metastability and Their Effects on Transition Times, Mini Symposium Speaker
16. SIAM Life Sciences (July 2016), Boston, MA, Spike Trains to Force Generation, Mini Symposium Speaker
17. AIMS 11th Conference on Dynamical Systems (July 2016), Orlando, FL, Polarization Switching in a Resonant Optical Medium, and also The Causes of Metastability and Their Effect on Transition Times
18. Dynamic Days (Jan 2016) Durham, NC, The Causes of Metastability and Their Effects on Transition Times, Invited Speaker
19. Banff Workshop on Connecting Network Architecture and Network Computation (Dec 2015), Banff, Alberta, Variability in Network Dynamics, Invited Speaker
20. SIAM Dynamical Systems (May 2015) Snowbird, UT, Low-Damping Transition Times in a Ferromagnetic Model System, Invited Speaker in Mini Symposium
21. IMACS Nonlinear Evolution Equations and Wave Phenomenon (April 2015) Athens, GA, Low-Damping Transition Times in a Ferromagnetic Model System
22. SIAM Annual Meeting (July 2014) Chicago, IL, Dynamics of Ferromagnets, Invited Speaker in Mini Symposium
23. APS March Meeting (March 2014) Denver, CO, Universality in Size-Topology Relationships of Packings, Despite their History Dependence
24. SIAM Conference on Applications of Dynamical Systems (May 2013) Snowbird, UT, Dynamics of Nanomagnets with Spin-Transfer Torques, Invited Speaker in Mini Symposium

25. SIAM Conference on Computational Science and Engineering (Feb 2013) Boston, MA, Thermally Induced Magnetization Reversals, Invited Speaker in Mini Symposium
26. SIAM Conference on the Life Sciences (Aug 2012) San Diego, CA, Synchronous Firing Events in Stochastic Model Neuron Systems, Invited Speaker in Mini Symposium
27. AIMS 9th Conference on Dynamical Systems (July 2012) Orlando, FL, Synchrony in Stochastic Pulse-Coupled Neuronal Network Models, and also Magnetization Reversal in Thin Film Magnetic Elements, Invited Speaker in Special Session
28. SIAM Conference on Nonlinear Waves (June 2012) Seattle, WA, Monte-Carlo Simulations of a Stochastic Maxwell-Bloch System, Invited Speaker in Mini Symposium
29. SIAM Conference on Uncertainty Quantification (Apr 2012) Raleigh, NC, Size of Synchronous Firing Events in Model Neuron Systems, Invited Speaker in Mini Symposium
30. APS March Meeting (Feb 2012) Granular Matter, Foams, and Beyond: Applications of the Granocentric Model
31. SIAM Conference on Applications of Dynamical Systems (May 2011) Snowbird UT, Dynamical regimes of integrate-and-fire neuronal network models, Invited Speaker in Mini Symposium
32. Invited Speaker, Biomathematics Conference (Mar 2011) University of Florida, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
33. SIAM Conference on Nonlinear Waves and Coherent Structures (Aug 2010) Philadelphia PA, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
34. SIAM Conference on Life Sciences (July 2010) Pittsburgh PA, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
35. Joint SIAM/RSME-SCM-SEMA DSPDE (June 2010) Barcelona Spain, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
36. Invited Speaker, Frontiers in Nonlinear Waves Conference (Mar 2010) University of Arizona, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
37. Applied Math Days (Mar 2010) RPI, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
38. Stochastic Models in Neuroscience (Jan 2010) CIRM Marseille France, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
39. Invited Speaker, SAMSI Opening workshop on Stochastic Dynamics - Dynamics of Biological Networks Theme (Sep 2009) Synchrony in Stochastic Pulse-coupled Neuronal Network Models
40. SIAM Conference on Applications of Dynamical Systems (May 2009) Snowbird UT, Synchronous Behavior in a Current-Based Neuronal Network Invited Speaker in Mini Symposium

41. IMACS Nonlinear Evolution Equations and Wave Phenomenon (Mar 2009) Synchronous Behavior in a Current-Based Neuronal Network
42. Applied Math Days (Oct 2008) Synchronous Behavior in Current-Based Neuronal Network
43. APS 59th DFD (Nov 2006) Power Law for Rough Favorable Pressure Gradient Turbulent Boundary Layers
44. AIAA 36th Fluid Dynamics (Jun 2006) Skin Friction and the Inner Flow in Pressure Gradient Turbulent Boundary Layers
45. APS 58th DFD (Nov 2005) Favorable Pressure Gradient Turbulent Boundary Layers: part 1. Wall Shear Stress Calculations
46. APS 57th DFD (Nov 2004) Particle Size Dependence in Granular Couette Flow

Invited University Talks Given

1. Fluids and Materials Seminar (Nov 2020) University of Bristol, Bristol, UK, Energy Landscapes, Metastability, and Transition Paths
2. AWM Lecture Series (Sept 2020) UNC Chapel Hill, Chapel Hill, NC, Metastability and Transition Paths
3. Applied Math and Analysis Seminar (Jan 2020) Duke University, Durham NC, Stochastic Dynamics in Spatially Extended Magnetic Systems
4. Biomath Seminar (March 2019) Virginia Commonwealth University, Richmond VA, Oscillations in Model Neuronal Networks
5. AWM Colloquium (Oct 2018) Wake Forest University, Winston-Salem NC, Stochastic Dynamics in Magnetic Systems
6. Physics Colloquium (Oct 2018) U Houston, Houston TX, Stochastic Dynamics in Magnetic Systems
7. Math Lecture Series (Feb 2018) Rutgers University, Camden NJ, Metastability of the Nonlinear Wave Equation
8. Computational and Applied Mathematics Colloquium (Nov 2017) U Chicago, IL, Metastability of the Nonlinear Wave Equation
9. Probability Seminar (April 2017) Tulane, LA, The Causes of Metastability and Their Effects on Transition Times
10. Mathematical Science Colloquium (March 2017) RPI, NY, A Non-Markov Model for Swimming Droplets
11. Condensed Matter Physics Seminar (Oct 2016) U Virginia, VA, The Causes of Metastability and Their Effects on Transition Times

12. Dynamical Systems/RTG Seminar (June 2016) RPI, NY, A Closer Look at Transition State Theory
13. Differential Equations Seminar (April 2016) NCSU, NC, The Causes of Metastability and Their Effects on Transition Times
14. Math Colloquium (Feb 2016) RPI, NY, Reversal times in a low-damping ferromagnetic model
15. Seminar (June 2015) Beijing Computational Science Research Center, China, Dynamics of Nanomagnets with Spin-transfer Torques
16. Seminar (June 2015) Shanghai Jiao Tong University, Institute of Natural Sciences, China, The Causes of Metastability and Their Effects on Transition Times
17. Probability Seminar (April 2015) Cornell University, NY, The Causes of Metastability and Their Effects on Transition Times
18. Applied Math Seminar (Sept 2014) Duke University, NC, The Causes of Metastability and Their Effects on Transition Times
19. Mathematical Science Colloquium (April 2014) RPI, NY, Dynamics of ferromagnets: averaging methods, bifurcation diagrams, and thermal noise effects
20. Applied Math Seminar (April 2014) Courant Institute NYU, NY, The Causes of Metastability and Their Effects on Transition Times
21. Applied Math Colloquium (Dec 2013) U Arizona, AZ, Synchronous Firing Events in Stochastic Neuronal Network Models
22. Dynamical Systems Seminar (Jan 2013) RPI, NY, Dynamics of Nanomagnets with Spin-Transfer Torques
23. Mathematical Biology Seminar (Jan 2013) NJIT, NJ, Synchronous Firing Events in Stochastic Neuronal Network Models
24. Applied Mathematics Seminar (Oct 5, 2012) UNC Chapel Hill, NC, Dynamics of Nanomagnets with Spin-Transfer Torques
25. Grad Student/Postdoc Seminar (Apr 2012) Courant Institute NYU, NY, Why go Random?
26. O'Hern Group Meeting (Mar 2012) Yale, CT, Granular Matter, Foams, and Beyond: Applications of the Granocentric Model
27. Applied Math Seminar (Nov 2011) Courant Institute NYU, NY, Investigating Jammed Matter from the Granocentric Point of View
28. Mathematical Biology Colloquium Seminar (Jan 2011) Duke University, NC, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
29. Applied Math Lab Seminar (Oct 2009) Courant Institute NYU, NY, Synchrony in Stochastic Pulse-coupled Neuronal Network Models
30. Neurodynamics Group Seminar (July 2009) Boston University, MA, Synchronous Dynamics of a Current-Based Integrate-and-Fire Neuronal Network

Teaching Experience

University of North Carolina at Chapel Hill

MATH 233 Calculus III
MATH 383 Differential Equations
MATH 528 Methods for the Physical Sciences I
MATH 668 Methods of Applied Math I
MATH 769 Math Modeling II (Stochastic Modeling)
MATH 891 Module on Neuromechanics

Courant Institute, New York University

MATH 122 Calculus II
MATH 250 Mathematics of Finance
MATH 251 Introduction to Mathematical Modeling
MATH 262 Ordinary Differential Equations

Graduate Students

- Kate Daftari, graduate student, *Self-avoidant-memory effects on enhanced diffusion in a stochastic model of environmentally responsive particles*, Masters Dec 2020, anticipated PhD graduation May 2023
- Chris Moakler, physics graduate student, *Extracting dynamics from statistical network representations of complex energy landscapes*, Masters May 2020, anticipated PhD graduation May 2022
- Ben Walker, graduate student, *Inferring Information Transfer from Experimentally Recorded Spike-train Data Sets*, summer research project 2016
Thesis title *Emergent clustering behavior from pairwise interactions in genome polymer models*, anticipated graduation May 2021
- Yuan Gao, graduate student, *Limiting Behaviors of High Dimensional Stochastic Spin Ensemble*, graduation May 2019

Undergraduate Students

- Rui Li, *Inferring Hidden Variables for Virtual Transplant Crossmatching*, Spring 2019 - present
- Clara Bay, *Neuromechanics of Insect Walking*, Summer 2018 - Summer 2019
- Giles Somerville, *Diffusion in crystalized soft-sphere model*, Fall semester 2017
- Eric Markley, *Diffusion in randomly-packed soft-sphere model*, Fall semester 2017

Thesis Committee Member

1. Andrew Ford, Ph. D. Thesis with Greg Forest, *Molecular dynamics modeling of the natural and synthetic human lung mucus*, in progress

2. Grace Conte, Ph. D. Thesis with Jeremy Marzuola, *Searching for Time Periodic Solutions to the Cubic Nonlinear Schrödinger Equation*, in progress
3. Michael Senter, Ph. D. Thesis with Laura Miller, *Semi-Automated Mesh Generation for use with IB2d and IBAMR*, in progress
4. Wesley Hamilton, Ph. D Thesis with Jeremy Marzuola, *Discrete-to-Continuum Operators on Graphs: Pointwise Convergence of Nodal Sets of Graph Laplacians*, in progress
5. Adam Waterbury, STOR Ph. D Thesis with Nico Fraiman and Amarjit Budhiraja, *TBD*, in progress
6. Wyatt Bridgman, Ph. D Thesis with Sorin Mitran, *Adaptive information refinement in non-linear, stochastic systems*, in progress
7. Colin Thomson, Ph. D. Thesis with Rich McLaughlin and Roberto Camassa, *Theory, Experiments, and Simulations of Internal Waves in Deep Water*, in progress
8. Fuhui Fang, Ph. D. Thesis with Boyce Griffith and Greg Forest, *Numerical Advances for Fluid-Structure Interactions in Entangled Polymer Solutions with Applications to Active Microbead Rheology*, August 2020
9. Yunyan He, Ph. D Thesis with Greg Forest, *Modeling Chromosome Dynamics with Structural Protein*, May 2020
10. Claire Kiers, Ph. D. Thesis with Chris Jones, *Rate-induced Tipping in Applied Dynamical Systems: Multi-dimensional Flows and Maps*, May 2020
11. Yanni Lai, Ph. D Thesis with Boyce Griffith, *Multigrid Methods for the Bidomain Equations*, Dec 2019
12. Colin Guider, Ph. D Thesis with Chris Jones, *Ensemble Data Assimilation on Adaptive Moving Meshes*, August 2019
13. Aaron Barrett, Ph. D. Thesis with Boyce Griffith, *An Adaptive Viscoelastic Fluid Solver*, August 2019
14. Ryan Gibson, Undergraduate Honors Thesis with Peter Mucha, *Pruning Sets of Modularity Partitions in Single and Multilayer Networks Via an Equivalence to Stochastic Block Model Inference*, March 2019
15. Carol Sadak, Masters Thesis, Chaired by Katie Newhall, *Analysis of Indiana's Extension of Graduated Driver Licensing Law*, November 2018
16. Caroline Yan, Ph. D. Thesis with Nancy Rodriguez, *Analysis of Monotone and Non-Monotone Traveling Waves in a System for Social Outbursts*, August 2018
17. Zeliha Kilic, Ph. D. Thesis with Rich McLaughlin and Roberto Camassa, *Symmetry Breaking in a Random Passive Scalar*, August 2018

18. Francesca Bernardi, Ph. D. Thesis with Roberto Camassa and Rich McLaughlin, *Space/Time Evolution in the Passive Tracer Problem*, August 2018
19. Elijah DeLee, Undergraduate Honors Thesis with Boyce Griffith, *Assessing the Scalability of Parallel Programs: Case studies from IBAMR*, April 2018
20. Avishai Halev, Undergraduate Honor Thesis with Nancy Rodriguez, *Modeling Gentrification: an Agent-Based, Amenities-Driven Approach*, April 2018
21. Dangxing Chen, Ph. D. Thesis with Jingfang Huang, *Spatio-Temporal Integral Equation Methods with Applications in Time-Dependent Density Functional Theory*, August 2017
22. Yan Feng, Ph. D. Thesis with Sorin Mitran, *Reduced order stochastic models in molecular biomechanics*, June 2017
23. Timothy Wessler, Ph. D. Thesis with Greg Forest, *Mathematical Modeling of Biological Processes at the Cellular, Tissue, and System Levels*, May 2017
24. Anya Katsevich, Undergraduate Honors Thesis with Jeremy Marzuola, *The hydrodynamic limit of a crystal surface jump diffusion with Metropolis-type rates*, May 2017
25. Manuchehr Aminian, Ph. D. Thesis with Rich McLaughlin, *The role of cross sectional geometry in the passive tracer problem*, December 2016
26. Wenhua Guan, Ph. D. Thesis with Jingfang Huang, *Fast algorithms for Brownian dynamics with hydrodynamic interactions*, May 2016
27. Zichao Li, Undergraduate Honors Thesis with Peter Mucha, *Hitting time of the Von Neumann entropy for networks undergoing rewiring*, May 2016
28. Alexis Sparko, Masters Thesis with Peter Mucha, *Graphipulate: An Interactive Network Visualization Tool*, May 2015

Grants

- Simons Foundation Collaboration grant, award for \$30,000 over 5 years (awarded, did not accept)
- NSF Watch Us mini-grant 2017, PI, with Francesca Bernardi and Katrina Morgan, *Women in Math Triangle Conference*, awarded \$2,500
- NSF DMS 2017, PI, awarded \$144,483 over 3 years

UNC Service

- Math Dept. VITAE hiring and diversity committee member (Summer 2020-present)
- Math Dept. Undergraduate Highest Honors review panel member (Spring 2020)
- Internal grant-review committee member (Spring 2020)

- Computational Medicine Tenure Track Hiring Committee, member (Fall 2019)
- Math Dept. Tenure Track Hiring Committee, member (Fall 2019)
- Math Dept. Tenure Track Hiring Committee, member (Fall 2018)
- Math Dept. Undergraduate Committee, member (Fall 2018 - Fall 2020)
- Math Dept. Social Infrastructure Committee, co-founding member (Spring 2018 - Fall 2020)
Created spontaneous interaction space in main hallway (chalkboards, tables, wall art)
Improved math lounge to create an emotionally positive space
- Math Dept. Advising Policy Sub-Committee, Chair (Spring 2018 - Fall 2020)
- Math Dept. Postdoctoral Hiring Committee, member (Spring 2018)
- Faculty Advisor to Association of Women in Mathematics chapter (Fall 2016 - present)
- Math Dept. Linker award committee, member (Spring 2016 - Spring 2019)
- Distinguished Dissertation Award review committee, member (Fall 2015)
- Math Dept. Diversity Committee, member (Fall 2014 - Spring 2020)
- Math Dept. Methods Comp Exam, reader (Fall 2014 - Spring 2016), member (Fall 2016 - present)

Mathematics Community Activities

- Promoting Mathematics

Nov 2017: organized Public Lecture by Dr. Moon Duchin *Political Geometry: How and why shapes matter for voting districts*

Feb 2018: advertised and co-hosted visit and public lecture by oulipo author Dr. Michèle Audin *Mathematics & Literature*

Feb 2018: co-organized, and panelist for *Women in Math Triangle Conference*

Jun 2016: Mentor for 13th Annual Graduate Student Mathematical Modeling Camp, held at RPI

Oct 2018: Invited Lecturer for half-day workshop at Modern Math Workshop, San Antonio TX concerning Stochastic dynamics on energy landscapes

Jul 2020: Virtual “Lab Tour” and Lecture *Random Walks in Mathland* for WinSPIRE, summer math program for high school girls

Jun 2018: Lecture and Lunch, SWiM held at Duke University, summer math program for high school girls

Nov 2018: Presentation for Carolina Math Club, UNC Chapel Hill *From stability to metastability: adding noise to differential equations*

Jun 2017: Presentation for the Girls Talk Math camp

Apr 2017, 2018, 2019: Volunteer at UNC Science Expo

- Journal Referee

Recent report available at Publons

2015: Reviewer for Brain Research, Reviewer for Nonlinearity

2014: Reviewer for Scientific Reports, Reviewer for Journal of Physics: Condensed Matter

2013–: Reviewer for Journal of Computational Neuroscience, Reviewer for Journal of Theoretical Biology, Reviewer for New Journal of Physics

2012–: Reviewer for MEMOCS (Mathematics and Mechanics of Complex Systems) and SIADS (SIAM Journal on Applied Dynamical Systems)

2011–: Reviewer for Physical Review Letters and Physical Review E

- Mathematical Modeling Training

Oct 2020: Coach for SIMIODE SCUDEM undergraduate competition (2 teams)

Feb 2020: Co-coordinated training and participation of 7 teams of undergraduate students to compete in the Mathematical Competition in Modeling run by COMAP

Jun 2009: Mathematical Problems in Industry (MPI) workshop participant