# Jonathan E. Rubin

Department of Mathematics
University of Pittsburgh
Pittsburgh, PA 15260 USA

e-mail: jonrubin@pitt.edu
office: 503 Thackeray Hall
September 22, 2025

HIGHLIGHTS

- **SIAM Fellow, Class of 2021**
- **Editor-in-Chief, *SIAM Journal on Life Sciences***
- **Chair, Pitt Dept of Mathematics, 2017-2023**
- **Continuous funding from NSF/NIH, 1998-present**
- **Over 150 peer-reviewed journal papers published**
- **PhD advisor for 19 graduate students**
- **Undergraduate/graduate teaching at Pitt since 2000**
- **Led development of Pitt mathematical biology major**

PROFESSIONAL POSITIONS

- **University of Pittsburgh**
  **Department of Mathematics**
  **Chair** (September 2017 – August 2023)
  **Professor** (September 2008 – present)
  **Associate Professor** (September 2004 – September 2008)
  **Assistant Professor** (August 2000 – September 2004)
  **Department of Computational and Systems Biology**
  **Visiting Faculty** (secondary appointment, 2008 – present)
  **Training Faculty** (2005 – present)
  **McGowan Institute for Regenerative Medicine** (affiliated faculty, November 2005 - present)
  **Graduate Faculty** (October 2002 – present)
  **Center for Neuroscience, CNUP (**Graduate Training Faculty, July 2002 – present)
  **Center for the Basis of Neural Cognition** (member, 2000 – present)

- **The Ohio State University**
  **Department of Mathematics**
  **Zassenhaus Assistant Professor** (September 1996 – August 1998)
  **National Science Foundation Postdoctoral Research Fellow** (Sept. 1998 – August 2000)

CURRENT RESEARCH SUPPORT

1. **National Institutes of Health**, R01DA059993, "CRCNS: Decision dynamics in cortico-basal ganglia-thalamic networks", September 1, 2023 – August 31, 2028 (with co-PIs Timothy Verstynen and Eric Yttri, CMU, and Catalina Vich, U. des Illes Balears, Spain).
2. **National Science Foundation,** DMS2424684, "Multi-state bootstrap percolation on digraphs as a framework for neuronal network analysis", September 1, 2024 – August 31, 2027 (with co-PIs Gregory Constantine, Amin Rahimian, and Sabrina Streipert, University of Pittsburgh)
3. **National Institutes of Health**, R01MH137090-02, "Adolescent brain maturation and psychopathology", August 9, 2024 – April 30, 2029, PI: Konsale Prasad

Consultant for: **National Institutes of Health**: "The integration of laboratory data with computational 3-D modeling to analyze the role of the central amygdala in neuropathic pain", April 2023 – March 2026, PI: Rachael Neilan (Duquesne University)

PREVIOUS RESEARCH SUPPORT

- NSF Postdoctoral Fellowship
- NSF EMSW21-RTG Award, "Complex Biological Systems across Multiple Space and Time Scales", $1,900,532 (PI), 2008-2013
- 7 single-PI NSF research awards
- 4 Collaborative Research on Computational Neuroscience (CRCNS) awards (2 NSF, 2 NIH)
- Co-PI on NIH R01 award
- 2 NSF workshop awards

EDUCATION

- **Brown University**, Providence, RI
  Ph.D., Applied Mathematics, May 1996
  Sc.M., Applied Mathematics, May 1992

- **The College of William and Mary**, Williamsburg, VA
  B.S., Mathematics (High Honors), ***summa cum laude***, May 1991

HONORS

- **SIAM Fellow**, Class of 2021
- **PIMS Hugh C. Morris Lecture,** 2019
- **SIAM Conference on Life Sciences Plenary Lecture,** 2016
- **NSF Postdoctoral Research Fellowship,** awarded 1998
- **Lord Botetourt Medal** (highest academic honor to graduating student at the College of William and Mary) and **William and Mary Prize in Mathematics**, 1991

## RESEARCH

PRIMARY RESEARCH INTERESTS

- *Applied dynamical systems:* Multiple timescale dynamics, geometric singular perturbation theory, oscillations, bifurcations, and transient dynamics
- *Dynamics of neuronal networks*, including the roles of synaptic coupling and synaptic architecture in shaping and propagating activity in neural circuits
- *Neuronal rhythms*, especially the dynamic mechanisms underlying respiratory pacemaker rhythms and other central pattern generation
- *Dynamics of the basal ganglia*, including decision-making, synaptic plasticity associated with reinforcement learning, pathological activity in Parkinson's disease, and effects of deep brain stimulation
- *Dynamics of the acute inflammatory response and sepsis*, including optimization of therapeutic interventions and model-based diagnostics
- *Additional topics in mathematical biology* including parameter estimation for dynamical systems and modeling of other dynamic phenomena

ACCEPTED AND PUBLISHED REFEREED JOURNAL PUBLICATIONS
(graduate students in bold; undergraduates in bold & italics)

1. ***B. Hou*** and J.E. Rubin, "An accessible approach to density estimation neural networks with data preprocessing", *Math. Biosci. Eng.*, accepted, 2025
2. Z. Aminzare and J.E. Rubin, "Rhythm generation, robustness, and control in stick insect locomotion: modeling and analysis ", *J. Comp. Neurosci.*, accepted, 2025
3. P. Li, S. Lee, K.-Y. Choi, J.E. Rubin*, J.K. Kim*, "Cardiogenic and chronobiological mechanisms in seizure-induced sinus arrhythmias", *PLoS Comp. Biol.*, 21: e1013318, 2025
4. **K.N. Tse**, G.B. Ermentrout, J.E. Rubin, "A Nonlinear Map Describing Relaxation to Cluster States in an Adapting Neuronal Network", *SIAM J. Appl. Dyn. Syst.* 2 (2), 1585-1621, 2025
5. M.M. Parker, J.E. Rubin, C. Huang, "State modulation in spatial networks with three interneuron subtypes", *Science Advances* 11(26), eads9134, 2025
6. **N. Theis,** J. Bahuguna, J.E. Rubin, **S.S. Banerjee,** B. Muldoon, K.S. Prasad, "Energy of brain functional states correlates with cognition in adolescent-onset schizophrenia and healthy persons", *Human Brain Mapping,* 46:e70129, https://doi.org/10.1002/hbm.70129, 2025
7. **B. Sosis** and J.E. Rubin, "Calculation of expected reward rate in a two-alternative decision process", *SIAM. J. Appl. Math*., 85(2), 433-455, 2025 (Erratum: *SIAM J. Appl. Math.* 85 (3), 1314-1314, 2025)
8. **M. Clapp**, J. Bahuguna, **C. Giossi**, J.E. Rubin, T. Verstynen, C. Vich, "CBTPy: An extensible cortico-basal ganglia-thalamic framework for modeling biological decision making", *PLoS One,* 20(1), e0310367, 2025
9. **C. Giossi**, J. Bahuguna, J.E. Rubin, T. Verstynen, C. Vich, "Arkypallidal neurons in the external globus pallidus can mediate inhibitory control by altering competition in the striatum", *Proc. Natl. Acad. Sci. USA* 121(47)e2408505121, 2024
10. **S.R. John**, R.S. Phillips, J.E. Rubin, "A novel mechanism for ramping bursts based on slow negative feedback in model respiratory neurons", *Chaos* 34:063131, 2024
11. A. Aristieta, J.E. Parker, **Y.E. Gao**, J.E. Rubin*, A.H. Gittis*, "Dopamine depletion weakens direct pathway modulation of SNr neurons", *Neurobio. Disease* 196:106512, 2024
12. **C. Giossi**, J.E. Rubin, A. Gittis, T. Verstynen, C. Vich, "Rethinking the external globus pallidus and information flow in cortico-basal ganglia-thalamic circuits", *Eur. J. Neurosci.* 60:6129-44, 2024
13. **S.R. John**, W.H. Barnett, A.P.L. Abdala, D.B. Zoccal, J.E. Rubin*, Y.I. Molkov*, "Exploring the role of the Kolliker-Fuse nucleus in breathing variability by mathematical modelling", *J. Physiol.* 602:93-112, 2024
14. J.E. Parker, A. Aristieta, A.H. Gittis, J.E. Rubin, "Introducing the STReaC (spike train response classification) toolbox", *J. Neurosci. Meth.*, 401:110000, 2024
15. **T.C. Whalen***,* J.E. Parker, A.H. Gittis, J.E. Rubin**,** "Transmission of delta band (0.5-4 Hz) oscillations from the globus pallidus to the substantia nigra pars reticulata in dopamine depletion", *J. Comp. Neurosci.*, 51:361-380, 2023
16. **S.R. John**, B. Krauskopf, H.M. Osinga, J.E. Rubin, "Slow negative feedback enhances robustness of square-wave bursting", *J. Comp. Neurosci.*, 51:239-261, 2023
17. **N. Theis***,* J. Rubin, J. Cape, S. Iyengar, K.M. Prasad., "Threshold selection for brain connectomes", *Brain Connectivity,* 13:383-393, 2023
18. **X. Duan**, J.E. Rubin, D. Swigon, "Rigorous mapping of data to qualitative properties of parameter values and dynamics: a case study on a two-variable Lotka-Volterra system", *Bull. Math. Biol*. 85:64, 2023

19. **X. Duan**, J.E. Rubin, D. Swigon, "Qualitative inverse problems: mapping data to the features of trajectories and parameter values of an ODE model", *Inverse Problems* 39:075002, 2023
20. **Z. Yu**, J.E. Rubin, P.J. Thomas, "Sensitivity to control signals in triphasic rhythmic neural systems: a comparative mechanistic analysis via infinitesimal local timing response curves", *Neural Computation* 35:1028-1085, 2023
21. K. Bond, J. Rasero, R. Madan, J. Bahuguna, J. Rubin, T. Verstynen, "Competing neural representations of choice shape evidence accumulation in humans", *eLife* 12:e85223, 2023
22. K. Prasad, J. Rubin, S. Iyengar, J. Cape, "Global network disorganization underlying psychosis high risk states", *Schizophr. Res.* 255:67-68, 2023
23. **M.G. Codianni**, J.E. Rubin**,** "A spiking computational model for striatal cholinergic interneurons", *Brain Structure and Function* 228:589-611, 2023
24. **M. Lewis**, T. Santini, **N. Theis, B. Muldoon**, ***K. Dash***, J. Rubin, M.S. Keshavan, K.M. Prasad, "Modular architecture and resilience of structural covariance networks in first-episode antipsychotic-naïve psychoses", *Sci. Reports.* 13:7751, 2023
25. J.E. Rubin, D.J. Earn, P.E. Greenwood, T.L. Parsons, K.C. Abbott, "Irregular population cycles driven by environmental stochasticity and saddle crawlbys", *Oikos*, e09290, 2023
26. ***M. McCrea***, B. Ermentrout, J.E. Rubin, "A model for the collective synchronization of flashing in *Photinus carolinus*", *J. Roy. Soc. Interface*, 19:20220439, 2022
27. **B. Letson,** J.E. Rubin, "On the nonexistence of terrestrial canards: linking canards and rivers", SIAM J. Appl. Dyn. Syst., 21:2432-2462, 2022
28. C. Park, J.E. Rubin, "Activity patterns of a two-timescale neuronal ring model with voltage-dependent piecewise smooth inhibitory coupling", *SIAM J. Appl. Dyn. Syst*., 21:1952-1999, 2022
29. C. Vich, **M. Clapp**, J.E. Rubin*, T. Verstynen*, "Identifying control ensembles for information processing within the cortico-basal ganglia-thalamic circuit", *PLoS Comp. Biol*., 18:e1010255, 2022
30. R.S. Phillips, H. Koizumi, Y.I. Molkov, J.E. Rubin, J.C. Smith, "Predictions and experimental tests of a new biophysical model of the mammalian respiratory oscillator", *eLife* 11:e74762 DOI:10.7554/eLife.74762, 2022
31. R.S. Phillips, J.E. Rubin, "Putting the theory into 'burstlet theory' with a biophysical model of burstlets and bursts in the respiratory preBotzinger complex", *eLife* 11:e75713 DOI: 10.7554/eLife.75713, 2022
32. ***M.U. Abdulla,*** R.S. Phillips, J.E. Rubin, "Dynamics of ramping bursts in a respiratory neuron model", *J. Comp. Neurosci.,* 50:161-180, 2022
33. K. Prasad, J. Rubin, …, J. Cape, "Structural covariance networks in schizophrenia: A systematic review Part II", *Schiz. Res.*, 240:176-191, 2022
34. K. Prasad, J. Rubin, …, J. Cape, "Structural covariance networks in schizophrenia: A systematic review Part I", *Schiz. Res.*, 240:1-21, 2022
35. **I. Ramirez-Zuniga**, J.E. Rubin, D. Swigon, H. Redl, G. Clermont, "A data-driven model of the role of energy in sepsis", *J. Theor. Biol.,* 533:110948, 2022
36. **K. Bond**, K. Dunovan, A. Porter, J.E. Rubin, T. Verstynen, "Dynamic decision policy reconfiguration under outcome uncertainty", *eLife*, 10:e65540 DOI: 10.7554/eLife.65540, 2021
37. J.E. Rubin, J. Signerska-Rynkowska, J.D. Touboul, "Type III responses to transient inputs in hybrid nonlinear neuron models", *SIAM J. Appl. Dyn. Syst.,* 20:953-980, 2021
38. J.E. Rubin, C. Vich, **M. Clapp**, ***K. Noneman***, T. Verstynen, "The credit assignment problem in cortico-basal ganglia-thalamic networks: A review, a problem and a possible solution", *Eur. J. Neurosci.,* 53:2234-2253, 2021

39. **T.C. Whalen**, A.M. Willard, J.E. Rubin, A.H. Gittis, “Delta oscillations are a robust biomarker of dopamine depletion severity and motor dysfunction in awake mice”, *J. Neurophysiol.*, 124:312-329, 2020
40. **M.G. Codianni**, S. Daun, and J.E. Rubin, “The roles of ascending sensory signals and top-down central control in the entrainment of a locomotor CPG”, *Biol. Cyb.*, 114:533-555, 2020
41. **X. Duan**, J. Rubin and D. Swigon, “Identification of affine dynamical systems from a single trajectory”, *Inverse Problems*, 36.8: 085004, 2020
42. B.C. Schwab, D. Kase, ***A. Zimnik***, R. Rosenbaum, **M.G. Codianni**, J.E. Rubin, and R.S. Turner, “Neural activity during a simple reaching task in macaques is counter to gating and rebound in basal ganglia-thalamic communication”, *PLoS Biol.* 18(10): e3000829, 2020
43. R.S. Phillips, **I. Rosner**, A.H. Gittis, and J.E.Rubin, “The effects of chloride dynamics on substantia nigra pars reticulata responses to pallidal and striatal inputs”, *eLife*, 9:e55592, 2020
44. Y. Wang and J. Rubin, "Complex bursting dynamics in an embryonic respiratory neuron model", *Chaos,* https://doi.org/10.1063/1.5138993, 2020
45. **B. Letson** and J.E. Rubin, "Local orthogonal rectification: Deriving natural coordinates to study flows relative to manifolds", *Disc. & Cont. Dynam. Syst. - B*, doi: 10.3934/dcdsb.2020088, 2020
46. C. Vich, K. Dunovan, T.Verstynen and J. Rubin, "Corticostriatal synaptic weight evolution in a two-alternative forced choice task: a computational study", *Commun. Nonlin. Sci. Num. Simul.*, 82:105048, 2020
47. **B. Letson** and J.E. Rubin, "LOR for analysis of periodic dynamics: a one-stop shop approach", *SIAM J. Appl. Dyn. Sys.*, 19:58-84, 2020
48. R.S. Phillips and J.E. Rubin, "Effects of persistent sodium current blockade in respiratory circuits depend on the pharmacological mechanism of action and network dynamics" *PLoS Comput Biol* 15(8): e1006938, 2019
49. J.E. Rubin and J.C. Smith, "Robustness of respiratory rhythm generation across dynamic regimes", *PLoS Comput. Biol.*, 15(7): e1006860, 2019
50. D. Swigon, **S. Stanhope**, S. Zenker, and J.E. Rubin, "On the importance of the Jacobian determinant in parameter inference for ODE models", *SIAM/ASA J. Uncert Quant.*, 7:975-1006, 2019
51. K. Dunovan*, C. Vich Llompart*, ***M. Clapp,*** T. Verstynen, J. Rubin, "Reward-driven changes in striatal pathway competition shape evidence evaluation in decision-making", *PLoS Comput. Biol.,* https://doi.org/10.1371/journal.pcbi.1006998, 2019
52. ***S. Wittman***, A.P. Abdala, J.E. Rubin, "Reduced computational modelling of Kölliker-Fuse contributions to breathing patterns in Rett syndrome", *J. Physiology,* https://doi.org/10.1113/JP277592, 2019
53. **I. Ramirez-Zuniga**, J.E. Rubin, D. Swigon, G. Clermont, "Mathematical modeling of energy consumption in the acute inflammatory response", *J. Theor. Biol.* 460:101-114, 2019
54. **G. Young**, M. Demir, H. Salman, G.B. Ermentrout, J.E. Rubin, "Interactions of solitary pulses of *E. coli* in a one-dimensional nutrient gradient" *Physica D,* 395:24-36, 2019
55. **B. Letson** and J.E. Rubin, "A new frame for an old (phase) portrait: finding rivers and other flow features in the plane", *SIAM J. Appl. Dyn. Syst.* 17:2414-2445, 2018
56. ***L. Vaughan***, ***P. Ranganathan,*** **R. Kumar**, A. Wagner, J.E. Rubin, "A mathematical model of neuroinflammation in severe clinical traumatic brain injury", *J. Neuroinflammation* 15:345 (19 pages), 2018
57. S. Kubota and J.E. Rubin, "Numerical optimization of coordinated reset stimulation for desynchronizing neuronal network dynamics", *J. Comp. Neurosci.*, 45:45-58, 2018

58. J. Ausborn, **A.C. Snyder**, N.A. Shevtsova, I.A. Rybak, and J.E. Rubin, "State-dependent rhythmogenesis and frequency control in a half-center locomotor CPG", *J. Neurophysiol.*, 119:96-117, 2018
59. J.E. Rubin, B. Krauskopf, and H.M. Osinga, " Natural extension of fast-slow decomposition for dynamical systems", *Phys. Rev. E,* 97:012215, 2018
60. J.E. Rubin, J. Signerska-Rynkowska, J.D. Touboul, and A. Vidal, "Wild oscillations in a nonlinear neuron model with resets: (II) mixed-mode oscillations, *Disc. Cont. Dyn. Syst., Series B,* 22:4003-4039, 2017
61. J.E. Rubin, J. Signerska-Rynkowska, J.D. Touboul, and A. Vidal, "Wild oscillations in a nonlinear neuron model with resets: (I) bursting, spike-adding, and chaos, *Disc. Cont. Dyn. Syst., Series B,* 22:3967-4002, 2017
62. J.E. Rubin, "Computational models of basal ganglia dysfunction: the dynamics is in the details", *Curr. Opin. Neurobiol.*, 46:127-135, 2017
63. **S. Stanhope**, J.E. Rubin, and D. Swigon, "Robustness of solutions of the inverse problem for linear dynamical systems with uncertain data", *SIAM/ASA J. Uncert. Quant.*, 5:572-597, 2017
64. **B. Letson**, J.E. Rubin, and T. Vo, "Analysis of interacting local oscillation mechanisms in three-timescale systems", *SIAM J. Appl. Math.,* 77:1020-1046, 2017
65. **Y. Wang** and J.E. Rubin, "Timescales and mechanisms of sigh-like bursting and spiking in models of rhythmic respiratory neurons", *J. Math. Neurosci.,* 7:3 DOI 10.1186/s13408-017-0045-5, 2017
66. R. Bertram and J.E. Rubin, "Multi-timescale systems and fast-slow analysis", *Mathematical Biosciences,* 287:105-121, 2017
67. Y. Molkov, J.E. Rubin, I.A. Rybak, and J.C. Smith, "Computational models of the neural control of breathing", *WIREs Syst. Biol. Med.,* e1371. doi: 10.1002/wsbm.1371, 2017
68. R. Rosenbaum, M.A. Smith, A. Kohn, J.E. Rubin, B. Doiron, "The spatial structure of correlated neural variability", *Nature Neuroscience,* 20:107-114, 2017
69. **D. Burstein** and J.E. Rubin**,** "Sufficient conditions for graphicality of bidegree sequences", *SIAM J. Discrete Math.,* 31:50-62, 2017
70. R.S. Parker, **J.S. Hogg, A. Roy**, J.A. Kellum, T. Rimmele, S. Daun-Gruhn, M.V. Fedorchak, I.E. Valenti, W.J. Federspiel, J. Rubin, Y. Vodovotz, "Modeling and hemofiltration treatment of acute inflammation", *Processes*, 206, 4, 38; doi:10.3390/pr4040038, 2016
71. **Y. Wang** and J.E. Rubin, "Multiple timescale mixed bursting dynamics in a respiratory neuron model", *J. Comp. Neurosci*. 41:245-268, 2016
72. **V. Corbit, T.C. Whalen, K. Zitelli,** S. Crilly**,** J.E. Rubin*, A.Gittis*, "Pallidostriatal projections promote β oscillations in a dopamine-depleted biophysical network model", *J. Neurosci*, **36**:5556-5571, 2016
73. **M. Duanmu**, N. Whitaker, P.G. Kevrekidis, A. Vainchtein, and J. Rubin, "Traveling wave solutions in a chain of periodically forced coupled nonlinear oscillators", *Physica D*, doi:10.1016/j.physd.2016.02.001, 2016
74. **B.J. Bacak**, T. Kim, J.C. Smith, J.E. Rubin, I.A. Rybak, "Mixed-mode oscillations and population bursting in the pre-Bötzinger complex", *eLife,* doi:10.7554/eLife.13403, 2016
75. **P. Nan, Y. Wang**, V. Kirk, and J.E. Rubin, "Understanding and distinguishing three time scale oscillations: case study in a coupled Morris-Lecar system", *SIAM J. Appl. Dyn. Syst.,* **14**:1518-1557, 2015
76. **K.-L. Roberts**, J. Rubin, and M. Wechselberger, "Averaging, folded singularities and torus canards: explaining transitions between bursting and spiking in a coupled neuron model", *SIAM J. Appl. Dyn. Syst.,* **14**:1808-1844, 2015

77. **G. Young**, B. Ermentrout, and J.E. Rubin, "A boundary value approach to optimization with an application to Salmonella competition", *Bull. Math. Biol.*, 77:1327-1348, 2015
78. **A.C. Snyder** and J.E. Rubin, "Conditions for multi-functionality in a rhythm generating network inspired by turtle scratching", *J. Math. Neurosci.*, doi10.1186/s13408-015-0026-5, 2015
79. **R.G. Kumar,** J.E. Rubin, R.P. Berger, P.M. Kochanek, A.K. Wagner, "Principal components derived from CSF inflammatory profiles predict outcome in survivors after severe traumatic brain injury. *Brain Behav Immun*., doi:10.1016/j.bbi.2015.12.008, 2015
80. A. Bose and J.E. Rubin, "Strategies to maximize burst lengths in rhythmic anti-phase activity of networks with reciprocal inhibition", *Int. J. Bif. Chaos*, 25, 1540004 (20 pages), 2015
81. W. Wei, J.E. Rubin, and X.-J. Wang, "Role of the indirect pathway of the basal ganglia in perceptual decision making", *J. Neurosci*., 35:4052-4064, 2015
82. **S. Stanhope**, J.E. Rubin, and D. Swigon, "Identifiability of linear and linear-in-parameters dynamical systems from a single trajectory", *SIAM J. Appl. Dyn. Syst.*, 13:1792-1815, 2014
83. Y. Molkov, N. Shevtsova, C. Park, A. Ben-Tal, J. Smith, J. Rubin, I. Rybak, "A closed-loop model of the respiratory system: focus on hypercapnia and active expiration, *PLoS One*, 9:e109894 (15 pages), 2014
84. R. Rosenbaum, ***A. Zimnik***, F. Zheng, R.S. Turner, C. Alzheimer, B. Doiron, and J.E. Rubin, "Axonal and synaptic failure suppress the transmission of firing rate oscillations, synchrony, and information during high frequency deep brain stimulation", *Neurobiol. Disease*, 62:86-99, 2014
85. D. Terman, J.E. Rubin, and C. Diekman, "Irregular activity arises as a natural consequence of synaptic inhibition", *Chaos*, 23:4, 046110 (doi:10.1063/1.4831752), 2013
86. S.E. Folias, S. Yu, ***A. Snyder***, D. Nikolic, and J.E. Rubin, "Synchronisation hubs in the visual cortex may arise from strong rhythmic inhibition during gamma oscillations", *Eur. J. Neurosci.*, 38:2864-2883, 2013
87. ***N.D. Jimenez***, S. Mihalas, R. Brown, E. Niebur, and J. Rubin, "Locally contractive dynamics in generalized integrate-and-fire neurons", *SIAM J. Appl. Dyn. Syst.*, 12:1474-1514, 2013
88. ***J.J. Rubin***, J.E. Rubin, G.B. Ermentrout, "Analysis of synchronization in a slowly changing environment: how slow coupling becomes fast weak coupling", *Phys. Rev. Lett*., 110, 204101, 2013
89. R. Rosenbaum, J.E. Rubin, and B. Doiron, "Short term synaptic depression and stochastic vesicle dynamics reduce and reshape neuronal correlations", *J. Neurophysiol.*, 109, 475-484, 2013
90. C. Park and J.E. Rubin, "Cooperation of intrinsic bursting and calcium oscillations underlying activity patterns of model pre-Botzinger complex neurons", *J. Comp. Neurosci.,* 34, 345-366, 2013
91. J. Arciero, G.B. Ermentrout, R. Siggers, A. Afrazi, D. Hackam, Y. Vodovotz, and J. Rubin, "Modeling the interactions of bacteria and Toll-like receptor-mediated inflammation in necrotizing enterocolitis", *J. Theor. Biol.*, 321, 83-99, 2013
92. **D.R. Cleary**, A.M. Raslan, J.E. Rubin, D. Baghat, A. Viswanathan, M.M. Heinricher, and K.J. Burchiel, "Deep brain stimulation entrains local neuronal firing in human globus pallidus internus", *J. Neurophysiol.*, 109, 978-987, 2013
93. J.E. Rubin, C.C. McIntyre, R.S. Turner, and T. Wichmann, "Basal ganglia activity patterns in parkinsonism and computational modeling of their downstream effects", *Eur. J. Neurosci.* 36, 2213-2228, 2012
94. R. Rosenbaum, J. Rubin, and B. Doiron, "Short term synaptic depression imposes a frequency dependent filter on synaptic information transfer", *PLoS Comp. Biol.*, 8: e1002557, 2012
95. J. Rubin and D. Terman, "Explicit maps to predict activation order in multiphase rhythms of a coupled cell network", *J. Math. Neurosci.,* 2:4 doi:10.1186/2190-8567, 2012
96. R. Curtu and J. Rubin, "Interaction of canard and singular Hopf mechanisms in a neural model", *SIAM J. Appl. Dyn. Syst*., **10**:1443-1479 (2011).

97. **P. Reitsma**, B. Doiron, and J. Rubin, "Correlation transfer from basal ganglia to thalamus in Parkinson's disease", *Frontiers Comp. Neurosci.*, **5**: doi10.3389/fncom.2011.00058 (2011).
98. **L.E. Spardy**, S.N. Markin, N.A. Shevtsova, B.I. Prilutsky, I.A. Rybak, and J.E. Rubin, "A dynamical systems analysis of afferent control in a neuromechanical model of locomotion: I. Rhythm generation", *J. Neural Eng.,* **8**: doi:10.1088/1741-2560/8/6/065003 (2011).
99. **L.E. Spardy**, S.N. Markin, N.A. Shevtsova, B.I. Prilutsky, I.A. Rybak, and J.E. Rubin, "A dynamical systems analysis of afferent control in a neuromechanical model of locomotion: II. Phase asymmetry*", J. Neural Eng.*, **8**: doi:10.1088/1741-2560/8/6/065004 (2011).
100. **D.J. Bourbeau**, **J.A. Hokanson**, J.E. Rubin, and D.J. Weber, "A computational model for estimating recruitment of primary afferent fibers by intraneural stimulation in the DRG", *J. Neural Eng.,* **8**: doi:10.1088/1741-2560/8/5/056009 (2011).
101. **Z. Hao**, **L.E. Spardy**, E.B.L. Nguyen, J.E. Rubin, and A. Berkowitz, "Strong interactions between spinal cord networks for locomotion and scratching", *J. Neurophysiol.*, **106**:1766-1781 (2011).
102. S. Kubota and J.E. Rubin, "NMDA-induced burst firing in a model subthalamic nucleus neuron", *J. Neurophysiol.*, **106**:527-537 (2011).
103. J.E. Rubin, **B.J. Bacak**, Y.I. Molkov, N. Shevtsova, J.C. Smith, and I.A. Rybak, "Interacting oscillations in neural control of breathing: modeling and qualitative analysis", *J. Comp. Neurosci.* **30**:607-632 (2011).
104. Y. Guo and J.E. Rubin, "Multi-site stimulation of subthalamic nucleus diminishes thalamocortical relay errors in a biophysical network model", *Neural Networks*, **24**:602-616 (2011).
105. **C. Gaiteri** and J.E. Rubin, "The interaction of intrinsic dynamics and network topology in determining network burst synchrony", *Frontiers in Comp. Neurosci.,* **5**, article 10, pages 1-14, doi: 10.3389/fncom.2011.00010 (2011).
106. **J. Wang**, ***W. Costello***, and J.E. Rubin, "Tailoring inputs to achieve maximal neuronal firing"*, J. Math. Neurosci.,* **1**:3, doi:10.1186/2190-8567-1-3 (2011).
107. **J. Dunmyre**, C.A. Del Negro, and J.E. Rubin, "Interactions of persistent sodium and calcium-activated nonspecific cationic currents yield dynamically distinct busting regimes in a model of respiratory neurons", *J. Comp. Neurosci.*, DOI: 10.1007/s10827-010-0311-y (2011).
108. ***H.F. Parks***, B. Ermentrout, and J.E. Rubin, "The dynamics of a forced coupled network of active elements", *Physica D*, **240**:554-567 (2011).
109. G.B. Ermentrout, J.Z. Jalics, and J.E. Rubin, "Stimulus-driven traveling solutions in continuum neuronal models with a general smooth firing rate function", *SIAM J. Appl. Math.*, **70**:3039-3064 (2010).
110. J. Day, J. Rubin, G. Clermont, "Using nonlinear model predictive control to find optimal therapeutic strategies to modulate inflammation", *Math. Biosci. Eng.*, **7**:739-763 (2010).
111. **E. Manica**, G.S. Medvedev, and J.E. Rubin, "First return maps for the dynamics of synaptically coupled conditional bursters", *Biological Cybernetics*, **103**:87-104, (2010).
112. S. Kubota, J. Rubin, T. Kitajima, and T. Nakamura, "A variety of competitive properties arising from STDP incorporating metaplastic regulation", *Artifical Life and Robotics,* **15:**185-188 (2010).
113. J.C. Arciero, G.B. Ermentrout, J.S. Upperman, Y. Vodovotz, and J.E. Rubin, "Using a mathematical model to analyze the role of probiotics and inflammation in necrotizing enterocolitis", *PLoS ONE*, **5(4)**, e10066 (2010).
114. **J. Dunmyre** and J. Rubin, "Optimal intrinsic dynamics for bursting in a three-cell network", *SIAM J. Appl. Dyn. Syst.*, **9**:154-187 (2010).
115. **J. Day**, J. Rubin, C. Chow, "Competition between transients in the rate of approach to a fixed point", *SIAM J. Appl. Dyn. Syst.*, **8**: 1523-1563 (2009).

116. S. Daun, J. Rubin, I. Rybak, "Control of oscillation periods and phase durations in half-center central pattern generators: a comparative mechanistic analysis", *J. Comp. Neurosci.,* **27**: 3-36 (2009).
117. S. Kubota, J. Rubin, and T. Kitajima, "Modulation of LTP/LTD balance in STDP by an activity-dependent feedback mechanism", *Neural Networks*, doi:10.1016/j.neunet.2009.06.012 (2009).
118. J. Rubin, N. Shevtsova, B. Ermentrout, J. Smith, I. Rybak. Multiple rhythmic states in a model of the respiratory CPG, *J. Neurophysiol.*, **101**:2146-2165 (2009).
119. J. Rubin*, **J. Hayes***, ***J. Mendenhall***, C. Del Negro. Calcium-activated nonspecific cation current and synaptic depression promote network-dependent burst oscillations, *Proc. Natl. Acad. Sci. USA*, **106**: 2939-2944 (2009).
120. Y. Vodovotz, G. Constantine, J. Rubin, M. Csete, E. Voit, G. An. Mechanistic simulations of inflammation: Current state and future prospects, *Math. Biosci.*, **217**: 1-10 (2009).
121. S. Daun, J. Rubin, Y. Vodovotz, **A. Roy**, R. Parker, G. Clermont. An ensemble of models of the acute inflammatory response: results from parameter reduction, *J. Theor. Biol.*, **253**: 843-853 (2008).
122. S. Daun, J. Rubin, Y. Vodovotz, and G. Clermont, "Equation-based models of dynamic biological systems", *J. Critical Care,* **23**: 585-594 (2008).
123. Jonathan Rubin and Martin Wechselberger. The selection of mixed mode oscillations in a Hodgkin-Huxley model with multiple timescales, *Chaos*, **18:**015105-1—015105-12 (2008).
124. Y. Guo*, J. Rubin*, C. McIntyre, J. Vitek, and D. Terman, "The effect of subthalamic nucleus deep brain stimulation on thalamocortical relay fidelity: Predictions using a data-driven computational model", *J. Neurophysiology,* **99:** 1477-1492 (2008).
125. S. Zenker, J. Rubin, and G. Clermont. From inverse problems in mathematical physiology to quantitative differential diagnosis, *PLoS Comp. Biol.,* **3**: 2072-2086 (2007).
126. Jonathan Rubin and Kresimir Josic. The firing of an excitable neuron in the presence of stochastic trains of strong synaptic inputs, *Neural Comp.,* **19**: 1251-1294 (2007).
127. Jonathan Rubin and Martin Wechselberger. Giant squid – hidden canard: the 3D geometry of the Hodgkin-Huxley model, *Biol. Cybernetics*, **97**: 5-32 (2007).
128. Silvia Daun, Robert Parker, **Anirban Roy**, Jonathan Rubin, and Gilles Clermont. Parameter identificability in a model of the acute inflammatory response, *J. Crit. Care*, **22**: 345 (2007).
129. Jonathan Rubin and Amitabha Bose. The geometry of neuronal recruitment, *Physica D*, **221**: 37-57 (2006).
130. Jonathan E. Rubin. Bursting induced by excitatory synaptic coupling in nonidentical conditional relaxation oscillators or square-wave bursters, *Phys. Rev. E*, **74**: 021917, 1-15 (2006).
131. J.M. Prince, R.M. Levy, J. Bartels, A. Baratt, J.M. Kane III, C. Lagoa, J. Rubin, **J. Day**, J. Wei, M.P. Fink, and S.M. Goyert, In silico and in vivo approach to elucidate the inflammatory complexity of CD14- deficient mice, Mol. Medicine, **12**: 88-96, (2006).
132. **Judy Day**, Jonathan Rubin, Yoram Vodovotz, Carson Chow, **Angela Reynolds**, and Gilles Clermont. A reduced mathematical model for the acute inflammatory response II. Capturing scenarios of repeated endotoxin administration, *J. Theor. Biol.*, **242**: 237-256 (2006).
133. **Angela Reynolds**, Jonathan Rubin, Gilles Clermont, **Judy Day**, Yoram Vodovotz, and G. Bard Ermentrout. A reduced mathematical model for the acute inflammatory response: I. Derivation of model and analysis of anti-inflammation, *J. Theor. Biol.*, **242**: 220-236 (2006).
134. Janet Best, Alla Borisyuk, Jonathan Rubin, David Terman and Martin Wechselberger. The dynamic range of bursting in a model respiratory pacemaker network, *SIAM J. Appl. Dyn. Sys.*, **4**: 1107-1139 (2005).
135. Jonathan Rubin. Surprising effects of synaptic excitation, *J. Comp. Neurosci.*, **18**: 333-342 (2005).

136. Guo-Qiang Bi and Jonathan Rubin. Timing in synaptic plasticity: from detection to integration, *Trends in Neuroscience*, **28**: 222-228 (2005).
137. Jonathan E. Rubin, **Richard C. Gerkin**, Guo-Qiang Bi, and Carson C. Chow. Calcium time course as a signal for spike-timing-dependent plasticity, *J. Neurophys.*, **93**: 2600-2613 (2005).
138. **Jonathan Drover**, Jonathan Rubin, Jianzhong Su, and Bard Ermentrout. Analysis of a canard mechanism by which excitatory synaptic coupling can synchronize neurons at low firing frequencies, *SIAM J. Appl. Math.*, **65**: 65-92 (2005).
139. Kresimir Josic and Jonathan Rubin. Deriving information about architecture from activity patterns in coupled cell systems, *SIAM J. Appl. Dyn. Syst.*, **4**: 53-77 (2005).
140. Jonathan Rubin and William Troy. Sustained spatial patterns of activity in neuronal populations without recurrent excitation, *SIAM J. Appl. Math*., **64**: 1609-1635 (2004).
141. Jonathan Rubin and David Terman. High frequency stimulation of the subthalamic nucleus eliminates pathological thalamic rhythmicity in a computational model, *J. Comp. Neurosci.*, **16**: 211-235 (2004).
142. Jonathan Rubin and Amitabha Bose. Localized activity patterns in excitatory neuronal networks, *Network: Comp. Neural Sys.*, **15**: 133-158 (2004).
143. Jonathan E. Rubin. A nonlocal eigenvalue problem for the stability of a traveling wave in a neuronal medium, *Discrete and Continuous Dynamical Systems – A,* **10**: 925-940 (2004).
144. Jianzhong Su, Jonathan Rubin, and David Terman. Effects of noise on elliptic bursters, *Nonlinearity,* **17**: 133-157 (2004).
145. **Remus Osan, Rodica Curtu**, Jonathan Rubin, and Bard Ermentrout. Multiple-spike waves in a one-dimensional integrate-and-fire neural network, *Journal of Mathematical Biology,* **48**: 243-274 (2004).
146. Jonathan Rubin and David Terman. Synchronized activity and loss of synchrony among heterogeneous conditional oscillators, *SIAM Journal on Applied Dynamical Systems,* **1**: 146-174 (2002).
147. **Remus Osan**, Jonathan Rubin, and Bard Ermentrout. Regular traveling waves in a one-dimensional network of theta neurons, *SIAM Journal of Applied Mathematics,* **62**: 1197-1221 (2002).
148. D. Terman, J.E. Rubin, A.C. Yew, and C.J. Wilson. Activity patterns in a model for the subthalamopallidal network of the basal ganglia, *Journal of Neuroscience*, **22**: 2963-2976 (2002).
149. Jonathan Rubin, David Terman, and Carson Chow. Localized bumps of activity sustained by inhibition in a two-layer thalamic network, *Journal of Computational Neuroscience,* **10**: 313-331 (2001).
150. Jonathan Rubin. Steady states in an iterative model for multiplicative spike-timing dependent plasticity, *Network: Computation in Neural Systems*, **12**: 131-140 (2001).
151. Jonathan Rubin, Daniel D. Lee, and Haim Sompolinsky. Equilibrium properties of temporally asymmteric Hebbian plasticity, *Physical Review Letters,* **86**: 364-367 (2001).
152. Jonathan Rubin and David Terman. Analysis of clustered firing patterns in synaptically coupled networks of oscillators, *Journal of Mathematical Biology*, **41**: 513-545 (2000).
153. J.E. Rubin and D. Terman. Geometric analysis of population rhythms in synaptically coupled neuronal networks, *Neural Computation*, **12**: 597-645 (2000).
154. Todd Kapitula and Jonathan Rubin. Existence and stability of standing hole solutions to complex Ginzburg-Landau equations, *Nonlinearity*, **13**: 77-112 (2000).
155. J. E. Rubin. Stability, bifurcations and edge oscillations in standing pulse solutions to an inhomogeneous reaction-diffusion system, *Proceedings of the Royal Society of Edinburgh*, **129A**: 1033-1079 (1999).

156. C. K. R. T. Jones and J. E. Rubin. Existence of standing pulse solutions to an inhomogeneous reaction-diffusion system, *Journal of Dynamics and Differential Equations*, **10**: 1-35 (1998).
157. Jonathan E. Rubin and Christopher K.R.T. Jones. Bifurcations and edge oscillations in the semiconductor Fabry-Pérot interferometer, *Optics Communications*, **140**: 93-98 (1997).
158. J. Rubin, C. K. R. T. Jones, and M. Maxey. Settling and asymptotic motion of aerosol particles in a cellular flow field, *Journal of Nonlinear Science*, **5**: 337-358 (1995).
159. André C. M. Ran, Leiba Rodman, and Jonathan E. Rubin. Direct complements of invariant Lagrangian subspaces and minimal factorizations of skew-symmetric rational matrix functions, *Linear Algebra and its Applications*, **180**: 61-94 (1993).

ADDITIONAL PUBLICATIONS

Editor: *Coherent Behavior in Neuronal Networks* (with K. Josic, M. Matias, and R. Romo), Springer Verlag, 2009.

Section Editor: *Basal Ganglia*, Springer Encyclopedia of Computational Neuroscience, 2014-present.

Online Encyclopedia Articles:

1. J. Rubin, "Comparative analysis of half-center central pattern generators (CPGs)", Springer Encyclopedia of Computational Neuroscience, DOI 10.1007/978-1-4614-7320-6_39-1, 2014.
2. J. Rubin and C. McIntyre, "Computational models of deep brain stimulation (DBS)", Springer Encyclopedia of Computational Neuroscience, DOI 10.1007/978-1-4614-7320-6_364-1, 2014.
3. J. Rubin, "Basal ganglia: Overview", Springer Encyclopedia of Computational Neuroscience, DOI 10.1007/978-1-4614-7320-6_760-1, 2014.
4. J. Rubin, "Burst synchronization" Scholarpedia, 2(10):1666, 2007.

Book Chapters:

1. J.Rubin and J. Rinzel, "Neurons and neuronal networks as dynamical systems" (pg. 101-127) in M. Arbib, editor, *From Neurons to Cognition,* MIT Press, 2016.
2. R. Gerkin, G.-Q. Bi, and J. Rubin, "A phenomenological calcium-based model of STDP," in V. Cutsuridis, B. Graham, S. Cobb, and I. Vida, editors, *Hippocampal Microcircuits*, Springer, 2010.
3. J. Rubin, "Emergent bursting in small networks of model conditional pacemaker cells in the pre-Botzinger complex," *Advances in Experimental Biology and Medicine* [proceedings of the Xth Oxford Conference on Modeling and Control of Breathing], 2007.
4. R. Butera, J. Rubin, D. Terman, and J. Smith, "Oscillatory bursting mechanisms in respiratory pacemaker neurons," in S. Coombes and P. Bressloff, editors, *Bursting: The Genesis of Rhythm in the Nervous System*, World Scientific Press, 2006.
5. G. Clermont, Y. Vodovotz, and J. Rubin, "Equation-based models of dynamic biological systems," in W.C. Aird, editor, *Comprehensive Treatise on Endothelial Biomedicine*, Cambridge University Press, 2006.
6. J. Rubin and D. Terman. Geometric singular perturbation analysis of neuronal dynamics. Chapter 3 of *Handbook of Dynamical Systems*, Volume II (B. Fiedler, editor), North-Holland, 2002.

Conference Proceedings:

1. K. Liu, S. Hashemkhani, J. Rubin, R. Kubendran, Neuromorphic networks using nonlinear mixed-feedback multi-timescale bio-mimetic neurons, 2023 IEEE International Symposium on Circuits and Systems (2023).

2. Shigeru Kubota, Jonathan Rubin, Numerical optimization of deep brain stimulation by direct search, Proceedings of the 4th RIEC International Symposium on Brain Functions and Brain Computer (2016).
3. Shigeru Kubota, Jonathan Rubin, Bursting oscillation in subthalamic nucleus induced by hyperdirect pathway, Proceedings of the 3rd RIEC International Symposium on Brain Functions and Brain Computer, S5-1 (2015).
4. S. Kubota, J. E. Rubin, A model for low-frequency bursts in subthalamic nucleus neurons, In Proceedings of International Conference on Artificial Life and Robotics (ICAROB 2014), p.162-165 (2014).
5. J.S. Upperman et al., "Mathematical modeling in necrotizing enterocolitis – a new look at an ongoing problem," *J. Pediatric Surgery*, 42: 445-453 (2007).
6. Y. Vodovotz et al., "In silico models of acute inflammation in animals," *Shock*, **26**: 235-244 (2006).
7. B. Siegler, M. Ritchey, and J. Rubin, "Spike-timing dependent plasticity as a mechanism for ocular dominance shift," *Neurocomputing* , **65-66**: 181-188 (2005).
8. Gerardina Hernandez, Paul Munro, and Jonathan Rubin. Mapping from the spike domain to the rate-based domain. 2003 International Conference on Neural Information Processing (ICONIP); also selected for an oral presentation (given by P. Munro).
9. Gerardina Hernandez, Jonathan Rubin, and Paul Munro. The effect of spike redistribution in a reciprocally connected pair of neurons with spike timing-dependent plasticity, *Neurocomputing,* **52-54**: 347-353 (2003).
10. R. Osan, J. Rubin, R. Curtu, and B. Ermentrout. Traveling waves in a one-dimensional integrate-and-fire neural network with finite support connectivity, *Neurocomputing*, **52-54**: 869-875 (2003).
11. D. Terman, J.E. Rubin, A.C. Yew, and C.J. Wilson. Synchronous parkinsonian rhythms in a model for the indirect pathway of the basal ganglia, *Neurocomputing*, **38-40:** 973-982 (2001).
12. J. Rubin and D. Terman. Geometric analysis of neuronal firing patterns in network models with fast inhibitory synapses, *Neurocomputing*, **26-27**: 491-498 (1999).

Commentary:

1. K. Prasad, J. Rubin, S. Iyengar, J. Cape, "Global network disorganization underlying psychosis high risk states", *Schizophr. Res.* 255:67-68 (2023)
2. R. Kass, J. Rubin, and S. Zenker, Comment on "Parameter estimation for differential equations: A generalized smoothing approach" by J. Ramsay, G. Hooker, D. Campbell, and J. Cao, *J. Royal Statist. Soc.,* **69**:741-796 (2007).

General Interest Articles:

1. D. Terman and J.E. Rubin, "Neuronal Dynamics in the Basal Ganglia," *SIAM News*, **40(2),** pg. 5, March, 2007.
2. Jonathan Rubin. Catch the Buzz: Staging an Integration Bee. *FOCUS* (the newsletter of the Mathematical Association of America), **22(9)**: 4-5 (2002).

Research Reviews:

C. K. R. T. Jones, G. Haller, P. D. Miller, and J. Rubin. Settling and chaotic mixing in oceanic flows: the role of heteroclinic orbits, *Naval Research Reviews*, One/1995, Volume XLVII, pp. 17-28.

<u>RECENT RESEARCH PRESENTATIONS (from 2015-present, outside of University of Pittsburgh)</u>
Named Lectures:

- **POSTECH CM2LA Young Il Colloquium,** Pohang University of Technology, September 7, 2023
- **PIMS Hugh C. Morris Lecture (https://www.pims.math.ca/scientific/distinguished-lecture-series/hugh-morris-distinguished-lecture-series),** University of Alberta, March 15, 2019

Keynote/Plenary Lectures:

- **Mathematical Biosciences Workshop, Penn State University,** plenary speaker, August 8, 2024
- **Institute for Brain and Neuroscience Research, NJIT, Research Showcase**, keynote speaker, April 6, 2020 (cancelled due to COVID-19)
- **SIAM Conference on the Life Sciences,** invited plenary talk, July 14, 2016

Conferences/Workshops/Lecture Series:

- **International Conference on Mathematical Neuroscience,** Barcelona, Spain, selected talk, June 18, 2025
- **CRM (McGill University) Workshop: Rhythms, Networks & Slow-Fast Analysis in Neural & Endocrine Systems,** invited talk, June 5, 2025
- **SIAM Conference on Applications of Dynamical Systems,** minisymposium talk, May 14, 2025
- **Breathing for Life: 16$^{th}$ Oxford Conference on Breathing, Emotion & Beyond**, invited speaker, October 1, 2024
- **Frontiers in Applied Dynamical Systems,** University College Cork, invited speaker, June 19, 2024
- **Gordon Research Conference on Basal Ganglia,** invited speaker, March 27, 2024
- **Institute for Pure and Applied Mathematics, workshop on Mathematical Approaches for Connectome Analysis**, invited speaker, February 13, 2024
- **Organization for Computational Neuroscience, Annual Meeting**, Leipzig, Germany, selected talk, July 17, 2023; poster presentation, July 18, 2023
- **International Basal Ganglia Society, XIV meeting,** Stockholm, Sweden, poster presentation, June 15, 2023
- **Advances in Mathematical Ecology, Pitt Mathematics Research Center Workshop**, invited speaker, June 1, 2023
- **SIAM Conference on Applications of Dynamical Systems,** minisymposium talk, May 16, 2023
- **NSF/NIH CRCNS PI Meeting**, Atlanta, GA, poster presentation, October 27-28, 2022
- **Society for Mathematical Biology Annual Meeting,** minisymposium talk, September 23, 2022
- **Van Vreeswijk Theoretical Neuroscience Seminar**, invited speaker, May 25, 2022
- **SWEBAGS (Swedish Basal Ganglia Society)**, monthly guest lecture, November 19, 2021
- **Society for Mathematical Biology Annual Meeting,** minisymposium talk, June 15, 2021
- **SIAM Conference on Applications of Dynamical Systems,** minisymposium talk, May 25, 2021
- **Virtual Workshop on Motor Control** (jointly organized by researchers from Case Western Reserve and U. Cologne)**,** invited talk (online), October 27, 2020
- **International Conference on Mathematical Neuroscience**, invited talk (online), October 16, 2020
- **2020 International Conference on Mathematical Neuroscience**, invited talk (online), July 6, 2020
- **Dynamical Disease and mHealth workshop, CRM,** Université de Montreal, invited speaker, November 20, 2019
- **Society for Mathematical Biology Annual Meeting,** minisymposium talk, July 22, 2019
- **National Institute for Mathematical and Biological Synthesis, workshop on Transient Dynamics**, invited speaker, May 29, 2019
- **SIAM Conference on Applications of Dynamical Systems,** minisymposium talk, May 20, 2019
- **International Basal Ganglia Society, XIIIth meeting,** Biarritz, France, invited speaker, April 30, 2019
- **Dynamics Days dynamical systems meeting**, Northwestern University, invited speaker, January 5, 2019

- **2nd International Workshop on Neurodynamics (Ndy'18)**, invited talk, Castro-Urdiales, Spain, September 28, 2018
- **Mathematical Biosciences Institute Undergraduate Capstone Conference**, plenary speaker and panelist, August 9, 2018
- **Society for Industrial and Applied Mathematics Conference on the Life Sciences,** Minneapolis, invited minisymposium talk, August 6, 2018
- **Frontiers in Mathematical Biology workshop,** University of Central Florida, invited speaker, May 3, 2018
- **American Mathematical Society Spring Central Sectional Meeting,** The Ohio State University, Mathematical Neuroscience Session; invited talk, March 17, 2018
- **Workshop, Computational properties of basal ganglia neurons,** invited talk, December 6, 2017.
- **XIV Oxford Conference on Modelling and Control of Breathing,** invited session talk, September 20, 2017.
- **AMS Fall Central Sectional Meeting,** Mathematical Biology Minisymposium, invited talk, September 9, 2017.
- **NetSci 2017,** refereed contributed talk, June 23, 2017.
- **SIAM Conference on Applications of Dynamical Systems,** minisymposium talk, May 18, 2017.
- **12$^{th}$ International Basal Ganglia Society Meeting**, two posters, March 27-29, 2017.
- **CRCNS Conference 2016**, poster, October 26, 2016.
- **SIAM Conference on the Life Sciences,** minisymposium talk, July 11, 2016.
- **International Conference on Mathematical Neuroscience,** invited talk, May 31, 2016; tutorial, May 29, 2016.
- **Mathematical Biosciences Institute Workshop, "Dynamics in Networks with Special Properties"**, invited talk, January 27, 2016.
- **SIAM Conference on Applications of Dynamical Systems,** minisymposium talk, May 21, 2105.
- **Fourth Annual Winter Workshop on Neuromechanics and Dynamics of Locomotion**, invited talk, Tulane University, January 30, 2015.

Universities/Laboratories:

- **University of Alabama, Applied Mathematics Seminar,** February 27, 2025
- **Brandeis University, Mathematical Biology Seminar** and **Computational Neuroscience Seminar**, November 29 & 30, 2023
- **McGill University, Quantitative Life Sciences Seminar**, November 21, 2023
- **University of Iowa, Mathematical Biology Seminar**, November 13, 2023
- **Institute for Basic Sciences Daejeon, Center for Cognition and Sociality, Invited Lecture**, October 4, 2023
- **KAIST, Department of Brain & Cognitive Science Colloquium**, September 27, 2023
- **KAIST, Mathematical Sciences Colloquium**, September 14, 2023
- **Pohang University of Technology, Mathematics Colloquium**, September 8, 2023
- **Brandeis University, Department of Mathematics, Mathematical Biology Seminar,** February 15, 2023
- **Unversity of Michigan, Workshop on Computational Psychiatry and Fatigue,** December 13, 2022
- **Case Western Reserve University Mathematics Colloquium,** October 21, 2022
- **American University of Beirut, Biomedical Engineering Seminar**, January 31, 2022 (online)
- **Cologne Theoretical Neuroscience Forum**, October 14, 2021 (online)
- **Emory University Neuroscience Colloquium,** April 16, 2021 (online)
- **Southern Methodist University Mathematics Colloquium**, March 24, 2021 (online)
- **U Mass Amherst, Mathematical Biology Seminar,** December 14, 2020 (online)

- **University of Minnesota Dynamics Seminar,** October 13, 2020 (online)
- **McGill University, Centre for Applied Mathematics in Bioscience and Medicine (CAMBAM) seminar,** August 7, 2020 (online)
- **University of Minnesota, Dynamics Seminar,** October 13, 2020 (online)
- **University of Notre Dame, Department of Applied Mathematics,** colloquium, September 30, 2019
- **University of Iowa, Deparment of Mathematics**, colloquium, March 28, 2019
- **Universitat de les Illes Balears, Mathematics/IFISC seminar**, October 1, 2018
- **University of Zaragoza**, dynamical systems seminar, September 24, 2018
- **University of Central Florida, Mathematics Colloquium**, November 3, 2017.
- **Oxford University, NeuroTheory Seminar**, September 21, 2017.
- **University of Texas, Arlington, Bridge Program Seminar**, September 8, 2017.
- **University of Twente, Basal Ganglia Seminar,** April 22, 2016.
- **University of Texas, Arlington, Mathematics Colloquium,** April 1, 2016.
- **Johns Hopkins University, Biomedical Engineering Colloquium**, January 11, 2016.
- **New York University/Courant Institute, Biomathematics Seminar** and **Dynamical Systems Seminar,** December 8 and 9, 2015.

ADDITIONAL RESEARCH EXPERIENCE

- **Visitor**, **Biomedical Mathematics Group, Institute for Basic Science,** Daejeon, South Korea, September 1-October 31, 2023
- **Co-organizer and participant, Workshop of U. des Illes Balears (Spain) on Basal Ganglia Function,** June 19-20, 2023
- **Visitor, University of Sydney Department of Mathematics,** July 2-26, 2013
- **Visitor, University of Auckland Department of Mathematics,** January 9 – June 30, 2013
- **American Institute of Mathematics,** February 20-24, 2012, Participant in Workshop, Stochastic dynamics of small networks of neurons
- **National Institutes of Health**, November – December 2006, Visitor to the laboratory of Jeffrey Smith, participated in dynamic clamp experiments on respiratory rhythms in the mammalian brainstem
- **Mathematical Biosciences Institute, Sleep Workshop,** October 26-27, 2006, Participant
- **IAS/Park City Mathematics Institute, 2005 Summer Session on Mathematical Biology,** June 26-30, 2005**,** Research Program participant
- **Woods Hole Marine Biological Laboratory**, August 1-28, 1999, Completed course on Methods of Computational Neuroscience
- **Brown University,** May 18-20, 1998, Participated in Workshop on Recent Advances in Stability Theory of Nonlinear Waves
- **Institute for Mathematics and its Applications**, University of Minnesota, January 20-23, 1998, Participated in Workshop on Computational Neuroscience
- **University of Edinburgh**, Aug. 1st-20th, 1994, Participated in European Science Foundation Study Centre, "Nonlinear Optics and Guided Waves"
- **Universitaet Stuttgart**, Feb.-April, 1994, Visitor to Mathematisches Institut A
- **Boston University**, Semester I, 1993-4, Investigated bursting phenomena in excitable membranes and other applications of dynamical systems to oscillators in a group led by Professor Nancy Kopell
- **The College of William and Mary**, Summer 1990, National Science Foundation Research Experience for Undergraduates in Matrix Analysis

## TEACHING AND ADVISING

TEACHING EXPERIENCE

- **University of Pittsburgh**, Department of Mathematics, fall semester of 2000 - present: **undergraduate**: Calculus I & II for Engineers (MATH 0220-0230, integrated curriculum sections), Matrix Theory and Differential Equations (MATH 0250), Introduction to Linear Algebra and Matrix Theory (MATH 0280), Differential Equations (MATH 0290), Discrete Mathematical Structures (MATH 0400), Honors Linear Algebra (MATH 1185), Ordinary Differential Equations I and II (MATH 1270-1280), Modeling in Applied Mathematics (MATH 1360), Introduction to Computational Neuroscience (MATH 1370), Mathematical Biology (MATH 1380), Partial Different Equations I (MATH 1470), Advanced Calculus I & II (MATH 1530-1540); **graduate**: Ordinary Differential Equations I and II (MATH 2920-2921), Methods of Applied Mathematics (MATH 2950), Mathematics of Finance I (MATH 3225), Mathematical Neuroscience (MATH 3370), Computational Neuroscience (MATH 3375), Nonlinear Dynamical Systems (MATH 3950); **Modeling and Medicine:** guest lecturer for graduate course, A Systems Approach to Inflammation, offered in Critical Care Medicine/Surgery
- **Guest lecturer: IUPUI REU program,** June 30, 2022
- **Pitt-CMU Program in Neural Computation** & **Pitt TECBIO REU**, guest lecturer, summers of 2009-2021 (except 2013) & 2016, respectively
- **Guest lecturer:** *"Statistical Models of the Brain"* graduate course, Carnegie Mellon University, 2021-2023
- **Graduate School Panelist, MBI REU Capstone week,** July 2020
- **International Conference on Mathematical Neuroscience,** tutorial lecture, May 29, 2016
- **Okinawa Summer School in Computational Neuroscience,** lecturer/faculty member, June 11-16, 2015
- **University of Ottawa Summer School in Computational Neuroscience,** lecturer/faculty member, May 29-31, 2018; May 7-9, 2014; June 21-23, 2010
- **Woods Hole Marine Biological Laboratory,** Methods of Computational Neuroscience summer course, faculty member, 2003, 2014
- **Pacific Institute for Mathematical Sciences,** summer course, "Mathematics for Biological Networks", Co-main lecturer for May 23-June 2, 2010
- **Institute for Mathematics and Applications,** Co-lead instructor, New Directions course, "Mathematical Neuroscience", summer 2008
- **Mathematical Association of America/Exxon Foundation Project NExT Consultant** (summer 2004 – present); **Fellow** (summer 1997-summer 1998)
- **The Ohio State University,** Department of Mathematics, 1996-1999: Introduction to Dynamical Systems (graduate level); Linear Algebra with Applications I & II (with Matlab); Ordinary and Partial Differential Equations; Theory of Functions (precalculus)
- **Brown University**, Division of Applied Mathematics, 1992-1993: Teaching Assistant for Honors Ordinary Differential Equations (undergraduate level)
- **University of Maryland, European Division**, Kaiserslautern, Germany, summer 1992: Instructor for Transitional Mathematics

UNDERGRADUATE CURRICULUM DEVELOPMENT

- developed Mathematical Biology (Math 1380) undergraduate course at the University of Pittsburgh, which I have now taught 7 times
- led the development of the Mathematical Biology major at the University of Pittsburgh
- worked with colleagues from Statistics and Computer Science to develop the Data Science major at the University of Pittsburgh (open to students starting fall 2021)

POSTDOCTORAL, GRADUATE AND UNDERGRADUATE STUDENT SUPERVISION

**Postdoctoral supervision: (**co-)supervisor for

1. Sven Zenker (July 2005-2008)
2. Silvia Daun (July 2006-2008)
3. Julia Arciero (August 2008-2011)
4. Stefanos Folias (August 2008-2012)
5. Choongseok Park (August 2011-2013)
6. Robert Rosenbaum (August 2011-2014)
7. Yury Sokolov (August 2016-2018)
8. Ryan Phillips (August 2017-2021)
9. Jyotika Bahuguna (July 2021-December 2023)
10. John Parker (August 2021-July 2025)
11. Madeline Edwards (May 2022-August 2024)
12. Jianan Jian (June 2023-September 2024)
13. Zhuojun Yu (July 2024-present)

**Thesis Advisor:** (19 completed PhD students, 2 completed MS students)

- Ka Nap Tse, Ph.D. in Mathematics (co-advised with Bard Ermentrout), July 2025
  "Neuronal Clustering and Phase Relationships in Basal Ganglia Circuits: A Time-to-Spike Function Approach"
- Baram Sosis, Ph.D. in Mathematics, December 2024
  "A mathematical analysis of effective learning and decision-making in neuronal circuits"
- Sushmita John, Ph.D. in Mathematics, August 2023
  "Dynamical systems analysis of patterning and robustness of bursts in neuronal models"
- Xiaoyu Duan, Ph.D. in Mathematics (co-advised with David Swigon), May 2022
  "Parameter identification and estimation of dynamical systems from a single trajectory"
- Marcello Codianni, Ph.D. in Mathematics, December 2021
  "Case Studies in Forcing Small Motor Neural Circuits"
- Timothy Whalen, Ph.D. in Neural Computation, March, 2021
  "Delta oscillations: Prevalence, propagation, and relation to motor dysfunction in mouse models of Parkinson's disease"
- Ivan Ramirez-Zuniga, Ph.D. in Mathematics, August, 2020
  "Mathematical modeling of energy consumption in the acute inflammatory response during sepsis"
- Benjamin Letson, Ph.D. in Mathematics, December, 2019
  "Local Orthogonal Rectification: A New Tool for Geometric Phase Space Analysis"
- Pamela Fiordilino, M.S. in Mathematics, December, 2017
  "Coordination and Frequency Control in Reduced Models of Locomotion Pattern Generating Circuits"
- Abigail Snyder, Ph.D. in Mathematics, August, 2016,
  "Computational Analysis of Pattern Generation in Reduced Vertebrate Motor Circuit Models"
- Glenn Young, Ph.D. in Mathematics, (co-advised with Bard Ermentrout), August, 2016,
  "Pathogen Dynamics: Modeling and Analysis of Competition, Organization, and Vaccination"
- Shelby Stanhope, Ph.D. in Mathematics, (co-advised with David Swigon), August, 2016,
  "Parameter Estimation for Dynamical Systems"
- David Burstein, Ph.D. in Mathematics, August, 2016,
  "Challenges in Random Graph Models with Degree Heterogeneity: Existence, Enumeration and Asymptotics of the Spectral Radius"
- Yangyang Wang, Ph.D. in Mathematics, August, 2016,

"Analysis of complex bursting pattens in multiple time scale respiratory neuron models"

- Daniel Smith, Ph.D. in Mathematics, (co-advised with David Swigon), December, 2012
  "Mathematical Models of Branching Actin Networks: Results and Methods"
- Lucy Spardy, Ph.D. in Mathematics, August, 2012
  "Investigating the Effects of Network Structure and Afferent Feedback in Models of Rhythmic Movement"
- Justin Dunmyre, Ph.D. in Mathematics, August, 2011
  "A Study of Synchronous Bursting in the Pre-Bötzinger Complex"
- Pamela Reitsma, M.S. in Mathematics (co-advised with Brent Doiron), August, 2010
  "Correlation Transfer from Basal Ganglia to Thalamus in Parkinson's Disease"
- Evandro Manica, Ph.D. in Mathematics, December, 2008
  "Effects of Couping and Heterogeneity in the Pre-Bötzinger Complex Cells Using First Return Maps"
- Judy Day, Ph.D. in Mathematics, August 2007
  "Mathematical Approaches to Modeling, Understanding, and Controlling the Acute Inflammatory Response to Pathogen and Endotoxin"
- Gerardina Hernandez, Ph.D. in Intelligent Systems (co-advised with Paul Munro, School of Information Sciences), December, 2001
  "Spike Timing-Dependent Plasticity under Temporal Correlation Mechanisms,"

Currently Ph.D. (co-)advisor for Kalya Kraueter, Anna Thomas, Haihui Zhu

**Membership on Thesis Committees:**

1. Fu Zhang, Ph.D. student of Stuart Hastings (mathematics); defended in spring, 2002
2. Remus Osan, Ph.D. student (in physics) of Bard Ermentrout (mathematics); defended in spring, 2002
3. Yixin Guo, Ph.D. student of Carson Chow (mathematics); defended in summer, 2003
4. Rodica Curtu, Ph.D. student of Bard Ermentrout (mathematics); defended in summer, 2003
5. Rukmini Kumar, Ph.D. student of Carson Chow (mathematics); defended in fall, 2004
6. Jonathan Drover, Ph.D. student of Bard Ermentrout (mathematics); defended in summer, 2005
7. Richard Gerkin, Ph.D. student of Guoqiang Bi (neurobiology); defended in winter, 2008
8. Chen Li, Ph.D. student of John Horn (neurobiology); defended in fall, 2007
9. Fatma Gurel, Ph.D. student of Bard Ermentrout (mathematics); defended in spring, 2007
10. Baris Hancioglu, Ph.D. student of David Swigon (mathematics); defended in summer, 2007
11. Angela Reynolds, Ph.D. student of Bard Ermentrout (mathematics); defended in summer, 2007
12. Lakshmi Chandrasekaran, Ph.D. student of Amitabha Bose (mathematics, New Jersey Institute of Technology); defended in spring, 2008
13. Saishuai Tang, Ph.D. student of David Swigon (mathematics); defended in spring, 2010
14. Daeyup Lee, Ph.D. student of Marla Ripoll and James Feigenbaum (economics); defended in summer, 2010
15. Sergio Verduzco, Ph.D. student of Bard Ermentrout (mathematics); defended in fall, 2010
16. Chistopher Gaiteri, Ph.D. student of Etienne Sibille (neurobiology); defended in winter, 2011
17. Dennis Bourbeau, Ph.D. student of Doug Weber (bioengineering); defended in summer, 2011
18. Emily Harvey, Ph.D. student of Vivien Kirk (mathematics, University of Aukland, New Zealand); defended in fall, 2011
19. Kubra Komek, Ph.D. student of Bard Ermentrout (neural computation); defended in spring, 2014
20. Lawrence Udeigwe, Ph.D. student of Paul Munro/Bard Ermentrout (information sciences); defended in summer, 2014

21. Theo Vo, Ph.D. student of Martin Wechselberger (mathematics, University of Sydney, Australia); defended in summer, 2014
22. Gabriel Ocker, Ph.D. student of Brent Doiron (neuroscience); defended in spring, 2015
23. Bettina Schwab, Ph.D. student of Stephan van Gils (mathematics, Universiteit Twente, Netherlands); defended in spring, 2016
24. Elif Koksal, Ph.D. student of Mathieu Desroches, J.P. Francoise, and Frederique Clement (mathematics, University Pierre et Marie Curie, France); defended in fall, 2016
25. Jeremy Harris, Pitt, Mathematics, Ph.D. student of Bard Ermentrout; defended in spring, 2017
26. Aubrey Thompson, CMU, Program in Neural Computation, MS student of Brent Doiron
27. Kyle Dunovan, Pitt, Psychology, Ph.D. student of Timothy Verstynen; defended in spring, 2017
28. Emma Everett, Pitt, Mathematics, MS student of Jeff Wheeler, defended in spring, 2017
29. Colin Bradenburg, Pitt, Mathematics, BPhil student of Brent Doiron, defended in spring, 2017
30. Youngmin Park, Pitt, Mathematics, Ph.D. student of Bard Ermentrout, defended in spring, 2018
31. Jeffrey Dunworth, Pitt, Mathematics, Ph.D. student of Brent Doiron and Bard Ermentrout, defended in summer, 2018
32. Jason Pina, Pitt, Mathematics, Ph.D. student of Bard Ermentrout, defended in winter, 2018
33. Tohar Yarden, Hebrew U. of Jerusalem, Ph.D. student in Neural Computation, defended in fall, 2019
34. Carlos Contreras, U. Alberta, Ph.D. student in Mathematics, defended in March, 2020
35. Grishma Palkar, Pitt, Mathematics, MS student of Bard Ermentrout, defended in November, 2020
36. Derek Orr, Pitt, Mathematics, Ph.D. student of Bard Ermentrout, defended in March, 2021
37. Hammed Fatoyinbo, Massey University (NZ), Mathematics, Ph.D. student of Richard Brown, defended in June, 2021
38. Yujie Ding, Pitt, Mathematics, Ph.D. student of Bard Ermentrout, defended in November, 2022
39. Karin Cox, Pitt, Computer Science, Ph.D. student of Robert Turner, defended in December, 2023
40. Jordi Penalva Vadell, Universitat de les Illes Balears, Department of Mathematics, Ph.D. student of Catalina Vich, completed May, 2024
41. Xinruo Yang, Pitt, Mathematics, Ph.D. student of Brent Doiron, defended June, 2024
42. Matthew Clapp, Carnegie Mellon University, Program in Neural Computation, Ph.D. student of Timothy Verstynen, defended August, 2024
43. Bouwei Ouyang, Pitt, Mathematics, Ph.D. student of Bard Ermentrout, defended in October, 2024
44. Ryan LeFebre, Pitt, Physics, Ph.D. student of Andrew Mugler, defended in May, 2025
45. Jack Burgess, Carnegie Mellon University, Program in Neural Computation, Ph.D. student of Timothy Verstynen
46. Matteo Martin, University of Padova (Italy), Bioengineering, Ph.D. student of Morten Gram Pedersen
47. Julia Ostrowski, Carnegie Mellon University, Program in Neural Computation, Ph.D. student of Marco Capogrosso
48. Phuong Tran, Drexel College of Medicine, Biomedical Science Ph.D. student of Jessica Ausborn

**Center for Neuroscience at University of Pittsburgh (CNUP):**

1. Co-organizer, CNUP Annual Retreat, 2006
2. Graduate Training Faculty member
3. IGERT Fellowship mentor for graduate students Abigail Kalmbach, 2004; Dennis Bourbeau, 2008-2010
4. Rotation supervisor for graduate students Richard Gerkin, summer 2002 (jointly with Carson Chow); Beth Ann Siegler, fall 2002; Cory Coleman, fall 2004; Christopher Gaiteri, summer 2006
5. Interviewed candidates for CNUP graduate programs, 2003-2020

**Center for the Neural Basis of Cognition (CNBC) & Program in Neural Computation:**

1. Executive Committee member, 2025-present
2. Co-PI, NIH T90 & R90 training grants, 2020-2022
3. Co-organizer, summer research program for undergraduates, 2012
4. Rotation supervisor for graduate student Michael Leone, 2015
5. Interviewed candidates for Ph.D. program, 2010-present

**Computational Biology**: rotation supervisor for graduate students Justin Hogg, 2006; Ericka Mochan, 2012; interviewed several Ph.D. applicants

**Undergraduate research and independent study supervision (45 total, resulting in 11 papers):** Danny Yeung (Shanghai, Applied Mechanics, winter 2024-present), Darius Colangelo (Notre Dame, Mathematics, summer 2024); Mia DeCataldo (Pitt, Mathematics, winter-spring 2023); Bosi Hou (Pitt, Statistics, 2022-23 academic year); Madeline McCrea (Pitt, Mathematics, summer 2021-spring 2022); Stephen Arndt (Pitt, Mathematics, winter 2020-2021, winter-spring 2022, summer 2022); Megan Burkhalter (TECBio, summer 2020, 2020-21 AY); Casey Weiner (PNC, summer 2020); Isaiah Glymour and Charlene Houchins (Pitt, Mathematics, 2019-20 AY, summer 2020, 2020-21 AY); Joseph Nelson (Pitt, Mathematics, summer 2019); Kendra Noneman (Program in Neural Computation – PNC, summer 2019); Muhammad Abdalla (U. Florida, summer 2019); Isaac Dobes (Pitt, Mathematics, fall 2018); Naina Balempur (Pitt TECBio REU, summer 2018); Nina Edwards (Carnegie Mellon University, Mathematics, Jan.-May 2018); Ryan Hughes (mathematics, summer 2017-May 2018); Alexandra Savage (PNC, 2016); Samuel Wittman (PNC, 2015-2016); Prerna Ranganathan and Leah Vaughan (Pitt and Washington and Jefferson Mathematical Biology students, respectively, 2015-2016); Timothy Whalen (PNC, 2014); Carsen Stringer (PNC, 2012-2013); Anna LoPresti (MBI REU, summer 2012); Jeffrey Moulton, Jonathan J. Rubin (mathematics, 2011-2012); Kaska Adoteye, Kelli Lafferty (mathematics, 2010-2011); Anastas Stoyanovsky (PNC 2010-2011); Helen Parks, Abigail Snyder (mathematics, 2009-2010); Hannah Vogel (Carnegie-Mellon University mathematics, summer, 2009); Vikram Raghu, Justin Ritter, and Christian Woods (mathematics, 2008-2009); Willie Costello (mathematics, summer 2007); Marcus Burrell (neuroscience, winter 2006 – spring 2007); Seun Adebiye (mathematics, honors thesis committee member, spring 2006); Nitin Agarwal (mathematics, summer 2005); Brian Aunkst and Melissa Loveranes (neuroscience, spring 2005); Hayley Bagwell (neuroscience, fall 2004); Pedram Roushan (mathematics, summer 2003); Maureen Ritchey (CNUP, summer 2003); Irina Egoudina (general science, spring 2003).

## PROFESSIONAL ACTIVITIES AND SERVICE

PROFESSIONAL ACTIVITIES

- **Chair,** SIAM Activity Group in Dynamical Systems, January 1, 2024-present
- **NITMB Scientific Advisory Committee,** 2025-present
- **University of Maryland, MathQuantum RTG, Advisory Board,** February 2024-present
- **National Science Foundation Committee of Visitors,** 2024
- **SIAM John von Neumann Lecture Selection Committee,** fall 2024
- **Brigham Young University**, **External Reviewer**, Department of Mathematics, fall 2024
- **Math Alliance, National Alliance for Doctoral Studies in Mathematics** (promotes opportunities for graduate studies for members of underrepresented groups): student mentor, 2014-2019 & 2023-2025; Doctoral Faculty Council, 2020-2023
- **International Basal Ganglia Society Council**, 2023-2025

- **SIAM Richard DiPrima Prize Committee,** 2021-2022
- **Boston University, External Reviewer** for the Undergraduate Program in Neuroscience, spring 2020
- **Co-author: MAA Committee on the Undergraduate Program in Mathematics, "Guide to Programs" section on Mathematical Biology** (to appear)
- **SIAM Jürgen Moser Prize Committee** (chair, 2017; member, 2019)
- **SIAM Activity Group in Dynamical Systems (SIAG-DS), advisory board**, January 1, 2018 – present; **nominating committee**, 2019
- **Scientific Advisory Committee**, Mathematical Biosciences Institute, 2013-2016
- **Chair**, SIAM Activity Group in the Life Sciences, January 1, 2011 – December 31, 2012
- **Program Director** for the **SIAM Activity Group in the Life Sciences (SIAG-LS)**, January 1, 2007 – December 31, 2008
- **Mathematical Association of America:** Special Interest Group on Mathematical/Computational Biology, secretary, 2006-2008; Committee on Special Interest Groups (SIGMAAs), 2008-2020

CONFERENCE/WORKSHOP ORGANIZATION (excludes many conference minisymposia organized)

- **Advisory Committee, 2025 International Conference on Mathematical Neuroscience,** Barcelona, Spain, June 17-20, 2025
- **Co-organizer, Dynamics on Networks,** workshop of the University of Pittsburgh Mathematics Research Center; April 5-6, 2025
- **Co-organizer, 2024 International Conference on Mathematical Neuroscience**, Dublin, Ireland, June 12-14, 2024
- **Co-organizer, Organization for Computational Neuroscience annual meeting workshop,** "Evidence, value, and action: from cortex to behavior, and everything in between", July 19, 2023
- **Co-organizer, Advances in Mathematical Ecology,** workshop of the University of Pittsburgh Mathematics Research Center; partially supported via our successful application for NSF funding; June 1-2, 2023
- **Organizer, special minisymposium**, "Dynamic ion concentrations and neuronal network dynamics", featuring talks by 3 early-career and 1 senior researcher, International Conference on Mathematical Neuroscience, June 28-July 1, 2021
- **Applied for and received funding** ($5000) from the Institute for Mathematics and its Applications for the conference "Complex Systems in Neuroscience: Bridging Theory and Experiment", held at Pitt on March 8-10, 2018 (this conference was organized by our mathematical biology postdocs and I served as a consultant to their efforts)
- **Chair,** Session on "Modelling of the respiratory networks and the lungs", XIV Oxford Conference on Modelling and Control of Breathing, September 20, 2017.
- **Co-organizer** for the Mathematical Biosciences Institute Theme Semester on Control in Biological Systems, fall 2017, and for Workshop 1: Control and Modulation of Neuronal and Motor Systems, September 11-15, 2017.
- **Program Committee** for the SIAM Network Science Workshop, July 13-14, 2017.
- **Co-organizer** for the "Parameter Estimation and Uncertainty Quantification for Dynamical Systems" Workshop, University of Pittsburgh Mathematical Research Center, March 5-6, 2017.
- **Organizer** for the "Computational Modeling of Respiratory Central Pattern Generators" Workshop, University of Pittsburgh Mathematical Research Center, December 8-9, 2016.
- **Co-organizer** for the "Advances in Discrete Networks" Workshop, University of Pittsburgh, December 12-14, 2014, and Theme Semester, Fall 2014; **co-PI** for successful NSF award to support these events.

- **Co-organizer** for the Conference "Nonlinear dynamics and stochastic methods: from neuroscience to other biological applications", University of Pittsburgh, March 10-12, 2014.
- **Co-chair of the Organizing Committee** for the **SIAG-LS Meetings**, August 4-7, 2008 and July 12-15, 2010.
- **Co-organizer** for the **Workshop on Mathematical Neuroscience,** Centre des Recherches Mathematiques, University of Montreal, September 16-19, 2007.
- **Co-organizer** for the **Workshop on Coherent Behavior in Neuronal Networks (CoBeNN),** IFISC, Palma de Mallorca, October 17-20, 2007; **co-PI** for successful NSF and ONR-Global awards to fund this workshop.
- **Organizing Committee** member for the **SIAM Annual Meeting**, July 6-10, 2009.
- **Program Committee** member for the **Mathematical Association of America's MathFest**, Aug 5-7, 2010.
- **Panelist, Project NExT** session, "Getting Involved in Professional Organizations", **MAA MathFest**, Aug 2, 2010.
- **Organizing Committee,** "Nonlinear Dynamics and Stochastic Methods: from Neuroscience to Other Biological Applications", University of Pittsburgh, March 10-12, 2014.
- **Co-organizer** for many minisymposia at major conferences.

EDITORIAL, GRANT REVIEW, AND REFEREEING ACTIVITIES

- **Co-founder and Editor-in-Chief,** *SIAM Journal on Life Sciences,* 2025-present
- **Editorial Board Member:** *PLoS Computational Biology*, 2019-present; *SIAM Journal of Applied Mathematics*, 2012-present; *SIAM Journal of Applied Dynamical Systems,* 2015-present; *Biological Cybernetics,* 2006-present; *Frontiers in Applied Dynamical Systems,* 2015-present; *Lecture Notes on Mathematical Modelling in the Life Sciences,* 2011-present; *Mathematical Biosciences,* 2010-2016; *Chaos, Solitons, and Fractals,* 2013-2015
- **Section Editor:** *SIAM Journal of Applied Mathematics*, 1/2018-present
- **Guest editor:** *SIAM Journal of Applied Mathematics*, special section on Life Sciences (paper submissions in February-June 2022)
- **Guest editor:** *European Journal of Neuroscience,* papers relating to the International Basal Ganglia Society 2023 conference
- **Referee/reviewer** for mathematics, neuroscience, and biology journals; for the Simons Foundation Collaboration Grants Program, and for research proposals from Belgium, Canada, France, Ireland, Israel, Luxembourg, the Netherlands, Switzerland, the UK, and the U.S. National Science Foundation; and for a habilitation thesis at the Universite Pierre et Marie Curie's Ecole Doctorale de Sciences Mathematiques de Paris Centre; also repeated reviewer of abstracts for a variety of conferences (especially SIAM Network Science Workshop and Organization for Computational Neuroscience Annual Meeting)

OUTREACH

- Co-organizer (with S. Iyengar), ***Science Revealed***: Public events involving Pitt faculty and community experts, explaining the capabilities and limitations of science, 2020-present

PROFESSIONAL MEMBERSHIPS

- Society for Industrial and Applied Mathematics (Activity Group in Dynamical Systems, Activity Group in the Life Sciences)
- Society for Mathematical Biology
- Society for Neuroscience

- Mathematical Association of America

UNIVERSITY OF PITTSBURGH COMPETITIONS

- **Co-organizer of the Pitt Integration Bee,** held each March/April, 2001-2012, 2014-2017
- **Co-organizer of the Pittsburgh High School Integration Bee,** held each April/May, 2005-2012, 2014-2017
- **Faculty advisor for the University of Pittsburgh teams in the COMAP Mathematical Competition in Modeling,** 2002-2012, 2014-2016

UNIVERSITY AND DEPARTMENTAL SERVICE

- **Faculty Advisor, *Pittsburgh Interdisciplinary Mathematics Review*,** a University of Pittsburgh journal founded by undergraduate students to provide an undergraduate-friendly outlet for a variety of articles on a variety of mathematics-related topics
- **Department Chair,** September 2017-August 2023
- **UPPDA (University of Pittsburgh PostDoctoral Association) Faculty Advisory Board,** 2020-present
- **Committee to re-envision and re-invigorate the Center for the Neural Basis of Cognition,** 2021-22
- **Dietrich School Council,** 2020-21 AY
- **University of Pittsburgh Oversight Committee on Outlier,** 2020
- **Chair, Interdisciplinary Search Committee for 2 hires in Mathematics of Life Sciences,** 2018-19 AY
- **Co-Undergraduate Director, Department of Mathematics,** August 2015-August 2017
- **Application Reviewer for College of Arts and Sciences Undergraduate Research Awards,** 2010-2012
- **University Research Council,** 2009-2012
- **Faculty Assembly of University Senate representative, Faculty of Arts and Sciences,** 2006-9
- **Undergraduate Committee** (2004-7, 2008-2017), **Applied Analysis Hiring Committee** (2010-11, 2002-3), **Graduate Committee** (2007-8), **Stochastic Analysis Hiring Committee** (2007-8), **Mathematical Biology Hiring Committee** (2006-7, 2003-4), **Applied Analysis Seminar Organization** (2005), **Planning and Budget Committee** (2004-5), **Mathematics Colloquium Committee** (2002-3), **Calculus Textbook Committee** (2003)**, Mathematics Preliminary Examination Committee in Analysis** (2004, 2001-2)
- **Mathematical Biology Working Group,** 2000-present. With other mathematics faculty members, I organize and participate in weekly meetings of faculty and graduate students from a variety of departments at the University of Pittsburgh, centered on the theme of research topics in mathematical biology
- **Undergraduate Mathematics Majors Advisor**, 2003-present; completed **Career Champion** program, 2021

PROFESSIONAL DEVELOPMENT

- Cutting Edge Leadership Group Coaching Program, 2018-19