

Zachary Peter Kilpatrick

Assistant Professor
University of Houston, Department of Mathematics

zpkilpat@math.uh.edu
<http://www.math.uh.edu/~zpkilpat>

EDUCATION

- 2007 – 2010** University of Utah, PhD in Mathematics
2005 – 2007 University of Utah, M.S. in Mathematics
2001 – 2005 Rice University, B.A. in Computational and Applied Mathematics

ACADEMIC APPOINTMENTS

- 2012 –** University of Houston, Assistant Professor of Mathematics
2010 – 2012 University of Pittsburgh, NSF Mathematical Sciences Postdoctoral Research Fellow

GRANTS

- 2015 –** NSF DMS – Mathematical Biology (co-PI with K. Josić: **\$329,445**)
2013 – NSF DMS – Mathematical Biology (sole PI: **\$184,937**)
2013 – 2014 University of Houston, GEAR (co-PI with K. Josić: **\$30,000**)
2013 University of Houston, New Faculty Research Grant (sole PI: **\$6,000**)
2010 – 2012 NSF DMS Postdoctoral Research Fellowship (sole PI: **\$135,000**)

PUBLICATIONS undergraduate student*; graduate student†; postdoctoral fellow‡; equal contribution[Ⓞ]

1. A. Jacot-Guillarmod[Ⓞ], Y. Wang[Ⓞ], C. Pedroza, H. Ögmen, K. Josić[Ⓞ], and Z.P. Kilpatrick[Ⓞ], *Extending Levelt's Propositions to perceptual multistability involving interocular grouping*, submitted (2016).
2. D.B. Poll[†] and Z.P. Kilpatrick, *Persistent search in confined domains: a velocity-jump process model*, **J. Stat. Mech.** (2016) in press.
3. Z.T. McCleney* and Z.P. Kilpatrick, *Entrainment in up and down states of neural populations: non-smooth and stochastic models*, **J. Math. Biol.** (2016) in press.
4. D.B. Poll[†], K. Nguyen*, and Z.P. Kilpatrick, *Sensory feedback in a bump attractor model of path integration*, **J. Comput. Neurosci.** 40 (2016) pp. 137-155.
5. A. Veliz-Cuba[†], Z.P. Kilpatrick[Ⓞ], and K. Josić[Ⓞ], *Stochastic models of evidence accumulation in changing environments*, **SIAM Rev.** (2016) in press.
6. Z.P. Kilpatrick, *Ghosts of bump attractors in stochastic neural fields: bottlenecks and extinction*, **Discrete Contin. Dynam. Syst. Ser. B** (2016) in press.
7. A. Veliz-Cuba[†], H.Z. Shouval, K. Josić[Ⓞ], and Z.P. Kilpatrick[Ⓞ], *Networks that learn the precise timing of event sequences*, **J Comput. Neurosci.** 39 (2015) pp. 235-254.
8. D.B. Poll[†] and Z.P. Kilpatrick, *Stochastic motion of bumps in planar neural fields*, **SIAM J Appl. Math.** 75 (2015) pp. 1553-1577.
9. Z.P. Kilpatrick, *Stochastic synchronization of neural activity waves*, **Phys. Rev. E** 91 (2015) 040701(R).
10. P.C. Bressloff and Z.P. Kilpatrick, *Nonlinear Langevin equations for wandering patterns in stochastic neural fields*, **SIAM J Appl. Dyn. Syst.** 14 (2015) pp. 305-334.
11. Z.P. Kilpatrick, *Delay stabilizes stochastic motion of bumps in layered neural fields*, **Physica D** 295 (2015) pp. 30-45.
12. Z.P. Kilpatrick and G. Faye, *Pulse bifurcations in stochastic neural fields*, **SIAM J Appl. Dyn. Syst.** 13 (2014) pp. 830-860.

13. J.K. Kim[†], Z.P. Kilpatrick, M.R. Bennett, and K. Josić, *Molecular mechanisms that regulate the coupled period of the mammalian circadian clock*, **Biophys. J** 106 (2014) pp. 2071-2081.
14. Z.P. Kilpatrick, *Coupling layers regularizes wave propagation in stochastic neural fields*, **Phys. Rev. E** 89 (2014) 022706.
15. Z.P. Kilpatrick, *Wilson-Cowan model*, **Encyclopedia of Computational Neuroscience** (2014), Ed. D. Jaeger and R. Jung, Springer Verlag.
16. S. Carroll*, K. Josić, and Z.P. Kilpatrick, *Encoding certainty in bump attractors*, **J Comput. Neurosci.** 37 (2014) pp. 29-48.
17. G.B. Ermentrout, S.E. Folias, and Z.P. Kilpatrick, *Spatiotemporal pattern formation in neural fields with linear adaptation*, **Neural Field Theory** (2014), Ed. S. Coombes, P. beim Graben, R. Potthast and J.J. Wright, Springer Verlag.
18. Z.P. Kilpatrick, B. Ermentrout, and B. Doiron, *Optimizing working memory with heterogeneity of recurrent cortical excitation*, **J Neurosci.** 33 (2013) pp. 18999-19011.
19. Z.P. Kilpatrick, *Interareal coupling reduces encoding variability in multi-area models of spatial working memory*, **Front. Comput. Neurosci.** 7 (2013) 82.
20. Z.P. Kilpatrick and B. Ermentrout, *Wandering bumps in stochastic neural fields*, **SIAM J Appl. Dyn. Syst.** 12 (2013) pp. 61-94.
21. Z.P. Kilpatrick, *Short term synaptic depression improves information transfer in perceptual multistability*, **Front. Comput. Neurosci.** 7 (2013) 85.
22. S.M. Jayasuriya* and Z.P. Kilpatrick, *Effects of time-dependent stimuli on a competitive neural network model of perceptual rivalry*, **Bull. Math. Biol.** 6 (2012) pp. 1396-1426.
23. Z.P. Kilpatrick and B. Ermentrout, *Response of traveling waves to transient inputs in neural fields*, **Phys. Rev. E** 85 (2012) 021910.
24. Z.P. Kilpatrick and G.B. Ermentrout, *Hallucinogen persisting perception disorder in neuronal networks with adaptation*, **J Comput. Neurosci.** 32 (2012) pp. 25-53.
25. Z.P. Kilpatrick and G.B. Ermentrout, *Sparse gamma rhythms arising through clustering in adapting neuronal networks*, **PLoS Comput. Biol.** 7 (2011), e1002281.
26. P.C. Bressloff and Z.P. Kilpatrick, *Two-dimensional bumps in piecewise smooth neural fields with synaptic depression*, **SIAM J Appl. Math.** 71 (2011) pp. 379-408.
27. Z.P. Kilpatrick and P.C. Bressloff, *Binocular rivalry in a competitive neural network model with synaptic depression*, **SIAM J Appl. Dyn. Syst.** 9 (2010) pp. 1303-1347.
28. Z.P. Kilpatrick and P.C. Bressloff, *Stability of bumps in piecewise smooth neural networks with nonlinear adaptation*, **Physica D** 239 (2010) pp. 1048-1060.
29. Z.P. Kilpatrick and P.C. Bressloff, *Spatially structured oscillations in a two-dimensional excitatory neuronal network with synaptic depression*, **J Comput. Neurosci.** 28 (2010) pp. 193-209.
30. Z.P. Kilpatrick and P.C. Bressloff, *Effects of synaptic depression and adaptation on spatiotemporal dynamics of an excitatory neuronal network*, **Physica D** 239 (2010) pp. 547-560.
31. P.C. Bressloff and Z.P. Kilpatrick, *Nonlocal Ginzburg-Landau equation for cortical pattern formation*, **Phys. Rev. E** 78 (2008) 041916.
32. Z.P. Kilpatrick, S.E. Folias, and P.C. Bressloff, *Traveling pulses and wave propagation failure in inhomogeneous neural media*, **SIAM J Appl. Dyn. Syst.** 7 (2008), pp. 161-185.

INVITED TALKS

1. **SIAM Life Sciences**, Boston MA, 7/2016

2. **Bernstein Sparks Workshop: Recurrent Network Theory**, Göttingen DE, 5/2016
3. **University of Arkansas, Physics Colloquium**, Fayetteville AR, 3/2016
4. **BIRS Workshop: Connecting Network Architecture and Computation**, Banff AB, 12/2015
5. **AMS Sectional Meeting**, New Brunswick NJ, 11/2015
6. **LSUHSC School of Medicine, Cell Biology and Anatomy Seminar**, New Orleans LA, 9/2015
7. **SIAM Applications of Dynamical Systems**, Snowbird UT, 5/2015
8. **UH Summer School on Dynamical Systems**, Houston TX, 5/2015
9. **University of Texas Conference on Learning and Memory**, Austin TX, 4/2015
10. **IMACS Nonlinear Waves**, Athens GA, 4/2015
11. **University of Colorado, Applied Mathematics Colloquium**, Boulder CO, 11/2014
12. **Houston Museum of Natural Science**, Sugar Land TX, 10/2014
13. **SIAM Life Sciences**, Charlotte NC, 8/2014
14. **AIMS Dynamical Systems**, Madrid ESP, 7/2014
15. **Nonlinear dynamics and stochastic methods**, Pittsburgh PA, 3/2014
16. **University of Houston, Undergraduate Mathematics Colloquium**, Houston TX, 2/2014
17. **GCC Theoretical and Computational Neuroscience**, Houston TX, 1/2014
18. **University of Minnesota, Mathematical Biology Seminar**, Minneapolis MN, 11/2013
19. **Frontiers in Applied and Computational Mathematics**, Newark NJ, 6/2013
20. **IMA Workshop: Stochastic Modeling of Biological Processes**, Minneapolis MN, 5/2013
21. **IMACS Nonlinear Waves**, Athens GA, 3/2013
22. **University of Houston, Graduate Mathematics Colloquium**, Houston TX, 3/2013
23. **University of Houston, Neuro-Engineering Seminar**, Houston TX, 11/2012
24. **University of Houston, Pi Mu Epsilon**, Houston TX, 10/2012
25. **SIAM Life Sciences**, San Diego CA, 8/2012
26. **Canadian Applied and Industrial Mathematical Society Meeting**, Toronto ON, 6/2012
27. **Progress in Neural Field Theory**, Reading UK, 4/2012
28. **University of Houston, Mathematics Colloquium**, Houston TX, 2/2012
29. **Hungarian Academy of Sciences, Neural Computing Seminar**, Budapest HU, 11/2011
30. **Spatio-temporal evolution equations and neural fields**, CIRM, Marseille FR, 10/2011
31. **Rice University, Computational and Applied Mathematics Colloquium**, Houston TX, 1/2011
32. **University of Nottingham, Mathematical Neuroscience Group**, Nottingham UK, 11/2009
33. **INRIA, NeuroMathComp Seminar**, Sophia Antipolis FR, 10/2009
34. **NIH-NIDDK, Laboratory of Biological Modeling Seminar**, Bethesda MD, 9/2009
35. **University of Pittsburgh, Mathematical Biology Seminar**, Pittsburgh, PA, 9/2009

CONFERENCE ORGANIZING

- **International Conference on Mathematical Neuroscience**,
Conference Chair, Boulder, CO, 6/2017
- Conference Co-Chair, Juan-les-Pins, FR, 6/2016

- **GCC Annual Conference on Theoretical and Computational Neuroscience**, (co-organizer)
Rice University, Houston TX: 2014-2015
- **Nonlinear and stochastic dynamics in large neuronal networks**, (with Jonathan Touboul)
Minisymposium at SIAM Applications of Dynamical Systems, Snowbird UT, 5/2015
- **Neural mechanisms of working memory limits**, (with Albert Compte)
Workshop at Annual Conference on Computational Neuroscience, Paris FR, 7/2013
- **Stochasticity in large networks of the brain**, (with Jonathan Touboul)
Minisymposium at SIAM Applications of Dynamical Systems, Snowbird UT, 5/2013
- **Spatiotemporal dynamics in networks of the brain**, (with Stefanos Folias)
Minisymposium at SIAM Life Sciences, San Diego CA, 8/2012
- **Criticality, threshold phenomena, and network dynamics**, (co-organizer)
Conference at CBSG Theme Days, University of Pittsburgh, Pittsburgh PA, 5/2012
- **SIAM/MAA Mid-Atlantic Regional Applied Mathematics**, (co-organizer)
Conference at Shippensburg University, Shippensburg PA, 4/2012
- **Sensorimotor processes reflected in spatiotemporal dynamics of neuronal activity**, (with Jian-Young Wu) Workshop at Computational Systems Neuroscience, Snowbird UT, 2/2012
- **The role of adaptation and depression in neuronal network dynamics** (with Rodica Curtu)
Minisymposium at SIAM Life Sciences, Pittsburgh PA, 7/2010
- **Cortical network dynamics** (with Steve Coombes)
Minisymposium at SIAM Life Sciences, Montreal QC, 8/2008
- **IGERT Annual Student Workshop** (co-organizer)
Workshop at University of Utah, Salt Lake City UT, 5/2008

TEACHING EXPERIENCE

- | | |
|---|--|
| • Mathematical Biology | • Calculus for Biologists 1 & 2 |
| • Advanced Linear Algebra | • Calculus 1 & 2 |
| • Honors Engineering Mathematics | • |

TRAINEES SUPERVISED

- | | |
|---|--|
| • Daniel Poll, PhD , expected 2017 | • Sam Carroll, undergraduate , 2013 |
| • Alan Veliz-Cuba, postdoc , 2013–2015 | • Stephanie Willoughby, undergraduate , 2013 |
| • Nicholas Troutman, undergraduate , 2015 | • Shawn Gu, undergraduate , 2013 |
| • Zachary McCleney, undergraduate , 2014–2015 | • Mahjub Hammond, undergraduate , 2012 |
| • Kate Nguyen, undergraduate , 2013–2014
(2014 Goldwater Scholar) | • Suren Jayasuriya, undergraduate , 2010–2012 |

DISSERTATION COMMITTEES

- | | |
|---|---|
| • Adrian Radillo, PhD , Mathematics, in progress | • Jose Manuel Lopez, PhD , Mathematics, 2014 |
| • Wei-Ting Li, PhD , Biology, in progress | |

REVIEWING

<i>Biological Cybernetics</i>	<i>Journal of Mathematical Neuroscience</i>	<i>PLoS One</i>
<i>Cosyne Abstracts</i>	<i>Journal of Neurophysiology</i>	<i>Scientific Reports</i>
<i>European Journal of Applied Mathematics</i>	<i>Journal of Neuroscience</i>	<i>SIAM Books</i>
<i>Frontiers in Computational Neuroscience</i>	<i>Neural Networks</i>	<i>SIAM Journal of Applied Dynamical Systems</i>
<i>Frontiers in Systems Neuroscience</i>	<i>Neurocomputing</i>	<i>SIAM Journal of Applied Mathematics</i>
<i>Journal of Computational Neuroscience</i>	<i>Nonlinearity</i>	<i>SIAM Journal on Mathematical Analysis</i>
<i>Journal of Mathematical Biology</i>	<i>Physica D</i>	<i>Taylor and Francis Books</i>
	<i>Physical Review E</i>	<i>Wellcome Trust Fellowships</i>
	<i>Physical Review Letters</i>	
	<i>PLoS Computational Biology</i>	

MEMBERSHIPS

- **Center for Neuro-Engineering and Cognitive Science**
- **Society for Neuroscience**
- **Society for Industrial and Applied Mathematics**

COMMITTEES

- **Graduate Studies Committee**, UH, Department of Mathematics, 2014–2015
- **Gulf Coast Consortium for Theoretical and Computational Neuroscience**, UH/Rice University/Texas Medical Center, 2012–2016
- **Colloquium Committee**, UH, Department of Mathematics, 2012–2016
- **NETWORKS Seminar Committee**, UH, 2012–2016

OUTREACH

- **Summer Undergraduate Research Fellowship**, UH, professional development panelist, 2015
- **SIAM/AMS Student Chapter**, UH, professional development panelist, 2013–2016
- **Cougar and Houston Area Mathematics Program (CHAMP)**, UH, facilitating high school mathematics outreach program, 2013–2016
- **SIAM Student Chapter**, U Pittsburgh, faculty advisor, 2011–2012