# Peter J. Thomas

Assistant Professor of Mathematics, Biology, and Cognitive Science
Department of Mathematics
Case Western Reserve University
10900 Euclid Avenue; Cleveland, Ohio 44106-7058
Phone 216-368-3623 *pjthomas_at_case_dot_edu* Fax 216-368-5163


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## 1 Education

**The Salk Institute for Biological Studies**, La Jolla, Calif.
Postdoctoral: Computational Neuroscience and Computational Cell Biology. 2000-2004.

**The University of Chicago**, Chicago, Ill.
Ph.D. in Mathematics, August 2000.

**The University of Chicago**, Chicago, Ill.
Master of Arts in Conceptual Foundations of Science, March 2000.

**The University of Chicago**, Chicago, Ill.
Master of Science in Mathematics, June 1994.

**Yale University**, New Haven, Conn.
Bachelor of Arts in Physics and Philosophy, *cum laude*, June 1990.

## 2 Professional Appointments

**Assistant Professor of Mathematics, Biology and Cognitive Science, 2006-2012**
*Case Western Reserve University, Department of Mathematics, Cleveland, Ohio.*

**Research Associate, 2006-2012**
*Oberlin College, Department of Neuroscience, Oberlin, Ohio.*

**Assistant Professor of Mathematics and Neuroscience, 2004-2006.**
*Oberlin College, Department of Mathematics, Oberlin, Ohio.*

**Adjunct Assistant Professor of Biology, 2004-2006.**
*Case Western Reserve University, Department of Biology, Cleveland, Ohio.*

**Howard Hughes Medical Institute Research Associate, 2002-2004.**
*Salk Institute for Biological Studies, Computational Neurobiology Laboratory, La Jolla, Calif.*

**Sloan-Swartz Center Fellow, 2000-2002.**
*Salk Institute for Biological Studies, Sloan-Swartz Center for Theoretical Neurobiology and Computational Neurobiology Laboratory, La Jolla, Calif.*

**National Institutes of Health Graduate Trainee, 1999-2000.**
*University of Chicago, Department of Mathematics and Center for Computational Neuroscience, Chicago, Ill.*

**Teaching Assistant, 1998-1999.**
*University of Chicago, Program in Financial Mathematics, Chicago, Ill.*

**Lecturer, 1994-1998.**
*University of Chicago, Department of Mathematics, Chicago, Ill.*

**High School Science Teacher & Charter Corps Member, Teach for America, 1990-1992.**
*Baton Rouge Magnet High School, Baton Rouge, La.*

## 3 Membership in Professional Societies

American Mathematical Society

Mathematical Association of America

Society for Industrial and Applied Mathematics

Society for Mathematical Biology

Society for Neuroscience

## 4 Professional Honors and Awards

Early Career Award, Mathematical Biosciences Institute at The Ohio State University (Columbus, Ohio), August 15-December 15, 2011.

Nominated for a J. Bruce Jackson MD Award for Excellence in Undergraduate Mentoring (Case Western Reserve University). 2011.

Finalist for a Carl F. Wittke Award for Excellence in Undergraduate Teaching (Case Western Reserve University). 2011.

T. Keith Glennan Fellowship. This CWRU program honors tenure-track faculty for excellence in teaching and scholarship. 2010-2011.

Invited Participant, National Cancer Institute Think Tank: *Physical Sciences-Based Frontiers in Oncology: The Coding, Decoding, Transfer, and Translation of Information in Cancer.* October 29-31, 2008.

NIH External Review Board, Undergraduate Program in Computational Neuroscience, The University of Chicago. October 23-24, 2008.

Andrew W. Mellon Foundation Summer Research Stipend. *Computational Cell Biology: Modeling Protein Polymerization using the Gillespie Algorithm*, 2005.

Fellow, American Mathematical Society's Project NExT (New Experiences in Teaching), 2004-2005.

Participant, 1$^{st}$ Annual National Academies Keck *Futures Initiative* Conference, "Signals, Decisions and Meaning in Biology, Chemistry, Physics, and Engineering", 2003.

Howard Hughes Medical Institute Postdoctoral Fellowship Recipient, 2002.

Best Poster Award, Gordon Research Conference on Theoretical Biology and Biomathematics, 2002.

Sloan Foundation Postdoctoral Fellowship Recipient, 2000-2002.

NIH Computational Neuroscience Graduate Training Award Recipient, 1999.

## 5 Professional Service

**Editorial Service:** co-Guest Editor (with H. Chiel), *Journal of Neural Engineering*, Special Issue *Applied Dynamics: From Neural Dynamics to Neural Engineering*, 2011.

**Grant Review Panels:**

- National Science Foundation Review Panels (2008, 2009).
- National Science Foundation Mail Review (2008, 2009, 2011)

**Scholarly Review:**

- Bioessays (2003)
- Biological Cybernetics (2007, 2008)
- Biophysical Journal (2008)
- Biosystems (2002)
- BMC-Systems Biology (2011)
- Bulletin of Mathematical Biology (2011)
- Cerebral Cortex (2012)
- Entropy (2009)
- IET Systems Biology (2008)
- IEEE Transactions on Nanobiosciences (2011)
- Journal of Computational Neuroscience (2008, 2011, 2012)
- Journal of Neural Engineering (2011)
- Journal of Neuroscience Methods (2011)
- Journal of Neurophysiology (2000, 2001, 2002)
- Nature Reviews Neuroscience (2001)
- Neural Computation (2001, 2002, 2003, 2004, 2005, 2007, 2008)
- Neurocomputing (2001)
- Neuroreport (2001, 2002)
- Physica D (2002)
- PLoS Computational Biology (2010)
- Proceedings of the National Academy of Sciences (USA) (2012)
- Proceedings of the Royal Society of London, B (2002)
- Science (2011)

- SIAM Journal on Scientific Computing (2010)
- Transactions on Biomedical Engineering (2011, 2012)
- Trends in Neural Networks (2006)

**Conference Organizing**

- 2012-2013 Mathematical Biosciences Institute. Virtual Working Group on *Master Equations and Neural Dynamics* (co-organized with E. Shea-Brown).
- 2012 SIAM Life Sciences meeting (San Diego). Double minisymposium: *Stochastic Dynamics in Cell Biology: Simulation, Analysis, and Experiment*
- 2011 SIAM Dynamical Systems meeting (Snowbird, Utah). Minisymposium: *Flows Structured by Multiple Fixed Points.*
- 2011 Annual AMS-MAA Joint Mathematics Meeting (New Orleans). Special Session: *Applications of Stochastic Processes in Neuroscience.*
- 2010 AMS Central Section meeting (Notre Dame). Special Session: *Applications of Stochastic Processes in Cell Biology.*
- 2010 SIAM Life Sciences meeting (Pittsburgh). Minisymposium: *Stochastic Phenomena in Neural Dynamics.*
- 2007 Society for Mathematical Biology / Japanese Society of Mathematical Biology joint meeting (San José, Calif.). Double Minisymposium: *Mathematical Models of Biological Communication, Chemotaxis & Control.*
- 2007 ICIAM/SIAM joint applied mathematics meeting (Zurich). Minisymposium: *Stochastic Biochemical Systems.*
- 2005 Oberlin Conference on Computation and Modeling. Chair, scientific program committee.

**Service on Nonprofit Boards**

- 2012-present. Teach For America STEM (Science, Technology, Engineering & Mathematics) Alumni Board. Chair, recruitment working group.

# 6 Service on Institutional Committees

Lead Organizer, Mathematical Life Sciences Seminar / Biomathematics Research Forum (2007-2012)

Advisory Board, RIBMS (Research at the Interface of the Biological and Mathematical Sciences) Undergraduate Program (2007-2011)

Department of Mathematics Undergraduate Committee (2008-2011)

University Advisory Committee on Research Computing (2007-2009)

Department of Mathematics Colloquium Committee (2007-2009)

Lead Organizer, New Faculty Lunch Committee (2006-2007)

# 7 Teaching Activities

Courses Developed at Case Western Reserve University

- MATH 319, Applied Probability and Stochastic Processes for Biology. This course, which I developed *de novo*, introduces students to applications of stochastic processes in mathematical biology, particularly at the cellular level. It complements the BIOL 300-306 sequence, which focuses on deterministic methods in mathematical biology. It cross-lists as BIOL 319/419, EECS 319, PHOL 419, and EBME 419.
- MATH 378/478, Computational Neuroscience. This course was originally designed by Profs. Chiel (Biology) and Beer (EECS) as BIOL 378/EECS478. I completely redesigned the syllabus, adding significant mathematical content. It cross-lists as BIOL 378/478, COGS 378, NEUR 478, EBME 478, and EECS 478.
- MATH 342, Preparation for Research in Mathematical Biology. I co-developed this one-hour course with Prof. Snyder (Biology) as part of the RIBMS (Research at the Interface of the Biological and Mathematical Sciences) program. It cross-lists as BIOL 309.
- MATH 435, Ordinary Differential Equations. I revived this introductory graduate level course after a 15-year hiatus, and rewrote the syllabus.

Courses developed at Oberlin College

- MATH 236, Partial Differential Equations and Applied Complex Analysis. This course, which I developed *de novo*, introduces students to elements of complex analysis through applications to partial differential equations, following the text by Asmar, with hands-on computational exercises involving COMSOL (a finite element numerical package).
- MATH 345, Mathematical Methods for Computational Neuroscience. This course, which I developed *de novo*, introduces students to mathematical modeling within the neurosciences, following the text by Dayan and Abbott, with hands-on computational exercises involving Matlab, XPP, and NEURON.

- MATH 362, Seminar: Mathematical Biology. This course, which I developed *de novo*, introduces students to mathematical modeling in biology, following the text by Edelstein-Keshet, with hands-on computational exercises involving Matlab and XPP.

Courses taught as a faculty member at Case Western Reserve University (2006-2012) including semesters and enrollments.

1. Math 223: Calculus for Science and Engineering III. 2008S (30), 2008F (36), 2009F (63), 2010F (34), 2012F (30). Total enrollment: 193.
2. Math 224: Differential Equations. 2006F (34), 2012S (13). Total enrollment: 47.
3. Math 319: Applied Probability and Stochastic Processes for Biology, 2007S (8), 2008F (8), 2011S (7). Total enrollment: 23.
4. Math 321/421: Fundamentals of Analysis I. 2010F (25). Total enrollment: 25.
5. Math 322/422: Fundamentals of Analysis II. 2011S (19). Total enrollment: 19.
6. Math 342: Preparation for Research in Mathematical Biology 2007S (4). Total enrollment: 4. This was a one credit-hour course only, with shared teaching responsibilities.
7. Math 378/478: Computational Neuroscience. 2008S (31), 2010S (20), 2012S (20). Total enrollment: 71.
8. Math 435: Ordinary Differential Equations 2010S (5). Total enrollment: 5.
9. Math 441: Mathematical Modeling 2012F (11). Total enrollment: 11.

Total enrollment in regular (three credit-hour) courses with 100% responsibility: 394.

Courses taught as a faculty member of Oberlin College (2004-2006)

1. MATH 133: Calculus I (2005F)
2. MATH 232: Linear Algebra (2004F, 2005S, 2005F)
3. MATH 234: Ordinary Differential Equations (2004F)
4. MATH 236: Partial Differential Equations and Applied Complex Analysis (2006S)
5. MATH 345: Mathematical Methods for Computational Neuroscience (2006S)
6. MATH 362: Seminar: Mathematical Biology (2005S)

Courses taught as a graduate student at The University of Chicago (1995-1998)

1. MATH 131-132-133: Elementary Functions and Calculus I-II-III
2. MATH 195-196: Mathematical Methods for Biological or Social Sciences I-II
3. MATH 250: Elementary Linear Algebra

Courses assisted as a graduate student at The University of Chicago (1993-1995,1998-1999)

1. MATH 121-122: Mathematical Sciences (for humanities track) (S. Kurtz; R. Thisted, instructors)
2. MATH 277: Mathematical Logic I (T. Slaman, instructor)
3. FIMATH* 330: Differential Equations (J. Cowan, instructor)
4. FIMATH* 320: Numerical Methods-1 (R. Almgren, instructor)
5. FIMATH* 332: Neural Networks (J. Cowan, instructor)
   *Financial Mathematics Program.

Theses Supervised at CWRU

1. Suparat Chuechote, "Amplification and Accuracy in a Stochastic 2D Gradient Sensing Pathway Model", Masters's thesis, May 2010.
2. Edward Agarwala, "Food for Thought: When Information Maximization Fails to Optimize Utility", Master's thesis, May 2009.
3. Matthew Garvey, "Diffusion Mediated Signaling: Information Capacity and Coarse Grained Representations", Master's thesis, December 2008.
4. Drew P. Kouri, "A Nonlinear Response Model for Single Nucleotide Polymorphism Detection Assays", Master's thesis, June 2008.

Undergraduate Student Mentoring at CWRU

1. 2011-2012. Alexander J. White. BS. Systems Biology (CWRU '13, exp.).
2. 2010-2012. Young-Min Park. BS. Applied Mathematics (CWRU '12, exp.).
3. 2009-2011. David Kent. BS. Mathematics and BS. Computer Science (CWRU '11). Entered industry (Epic Systems Corporation).
4. 2009-2010. Michael Steward. BS. Mathematics (CWRU '11). Entered Ph.D. program in Mathematics, Ohio State University.
5. 2008-2010. Stephen J. Fleming. BS. Physics and BS. Biochemistry (CWRU '11). Pursued graduate study in Physics at Cambridge University and Harvard University. **Winner of a Churchill Fellowship**.
6. 2008-2009. Heather McGinnis. BS. Mathematics (CWRU '09).
7. 2007-2010. Bennet Rummel. BS. Biomedical Engineering (CWRU '10).
8. 2007-2009. Edward K. Agarwala, MS/BS. Applied Mathematics (CWRU '09, '10). Entered industry (American Greetings).
9. 2006-2008. Drew P. Kouri. MS/BS. Mathematics (CWRU '08). Entered graduate program in Computational and Applied Mathematics, Rice University (Ph.D. 2012).

10. 2007. Jocelyn E. Eckert, B.S. Systems Biology (CWRU '09).

Undergraduate Student Mentoring at Oberlin College

1. 2005-2006. Emily R. Miraldi. BS. Biochemistry (Oberlin College '06). Entered Ph.D. program in Biomedical Engineering, Massachusetts Institute of Technology.
2. 2004-2006. Peter B. Kruskal. BS. Mathematics (Oberlin College '06). Entered Ph.D. program in Computational Neuroscience, The University of Chicago.
3. 2004-2006. Joseph P. Kimmel. BS. Composition (Oberlin Conservatory '06). BS. Computer Science (Oberlin College '06). Entered Ph.D. program in Computational Neuroscience, The University of Chicago.
4. 2004-2005. Andrew Bartholomew. BS. Computer Science (Oberlin College '06). Entered Ph.D. program in Computer Science, Brown University. **Winner of a Goldwater Scholarship**.

# 8 Research Support

Funded Proposals

1. Principal Investigator (100% responsibility), NSF-DMS 0720142. *AMC-SS: Stochastic Simulation and Analysis of Biochemical Reaction Networks.* 9/1/2007 - 8/31/2010. $120,000. (TDC=$77,670)
2. co-Principal Investigator (50% responsibility, with R. Snyder), NSF-DUE 0634612. *UBM: Undergraduate Research at the Interface of Mathematics and Biology.* 1/1/2007 - 12/31/2010. $240,000. (TDC=$221,995)
3. co-Principal Investigator (33% responsibility, with R. Snyder and P. Wintrode), NSF-EF 1038677. *Revealing Structure via Dynamics: Biological Networks from Protein Folding to Food Webs.* 9/1/2010 - 8/31/2013 $660,000. (TDC=$432,267).
4. co-Principal Investigator (50% responsibility, with H. Chiel), NSF-DMS 1010434. *CRCNS: Robust Dynamics of a Feeding Pattern Generator.* 9/1/2010 - 8/31/2013. $500,000 (TDC=$336,597).

Proposals Submitted but not Funded

1. Principal Investigator (100% responsibility), NSF-IIS 0515092. *Collaborative Research: Multi-Scale Modeling of Cortical Function.* $177,428. Submitted 2005.
2. Principal Investigator (50% responsibility, with H. Baskaran), NSF-DMS 0540756. *Single Cell Psychophysics: Decision Making under Uncertainty during Eukaryotic Chemotaxis.* $523,451. Submitted 2005.

3. Principal Investigator (100% responsibility), NSF-IIS 0613455. *Collaborative Research: Multi-Scale Modeling of Cortical Function.* $367,060. Submitted 2006.
4. Principal Investigator (50% responsibility, with L. Romberg), NSF-DMS 0616920. *Simulation and Analysis of Biochemical Reaction Networks.* $847,136. Submitted 2006.
5. Principal Investigator (50% responsibility, with H. Baskaran), NSF-DMS 0714897. *Signal Integration and Decision Making under Uncertainty during Eukaryotic Chemotaxis.* $694,391. Submitted 2006.
6. Principal Investigator (33% responsibility, with C. Beta and T. Shibata). Human Frontier Science Program. *Experimental, Computational and Theoretical Investigations of Eukaryotic Gradient Sensing* $350,000. Submitted 2007.
7. Principal Investigator (50% responsibility, with H. Baskaran), NSF-MCB 0744913. *Gradient Sensing in Eukaryotes.* $516,318.00. Submitted 2007.
8. Principal Investigator (50% responsibility, with H. Baskaran), NSF-DMS 0800052. *AMC-SS: Gradient Sensing in Eukaryotes.* $422,387. Submitted 2007.
9. Principal Investigator (25% responsibility, with K. Stiefel, A. Sawatari, K. Stiefel). Human Frontier Science Program. *Phase-delay synchrony and cortical information processing.* $450,000. Submitted 2008.
10. Principal Investigator (33% responsibility, with C. Wilson and K. Loparo), NSF-IIS 0827733. *Robust Respiratory Rhythm Development.* $1,214,848. Submitted 2008.
11. Principal Investigator (33% responsibility, with C. Wilson and K. Loparo), NSF-IIS 0904666. *Robust Respiratory Rhythm Development.* $1,490,508. Submitted 2008.
12. Principal Investigator (50% responsibility, with R. Snyder), NSF-DMS 0926595. *UBM-Group: Undergraduate research at the interface of mathematics and biology.* $239,998. Submitted 2009.
13. Principal Investigator (100% responsibility), NSF-DMS 1151532. *CAREER: Stochastic Neural Dynamics.* 06/01/12-05/31/17. $497,902 (TDC=$359,973). Submitted 2011.
14. Principal Investigator (100% responsibility), NSF-DMS 1151532. *CAREER: Stochastic Neural Dynamics.* 07/01/13-06/30/18. $532,100 (TDC=$348,719). Submitted 2012. (**Pending**)
15. Principal Investigator (100% responsibility), Core Fulbright Scholar Program. *Collaborative Investigation of the Effects of Noise on Neuronal Synchronization.* Sabbatical Support. 07/01/13-06/30/14. (**Pending**)
16. Principal Investigator (100% responsibility), Simons Fellows in Mathematics Program (Sabbatical Support). *Nonstationary Jump Markov Process Models for Neural Dynamics.* 07/01/13-06/30/14 (**Pending**)

# 9 Bibliography

Authorship in the mathematics literature is often, though not always, in alphabetical order (cf. items 20-22). In the biological literature authorship order may reflect seniority (most senior last). In interdisciplinary mathematical biology scholarship, ordering choices vary.

Asterisks (*) denote three articles selected for the tenure review package. *Italics* denote undergraduate coauthors.

## 9.1 Refereed Articles

1. J. Vincent Toups, Jean-Marc Fellous, **Peter J. Thomas**, Terrence J. Sejnowski, Paul H. Tiesinga, "Multiple Spike Time Patterns Occur at Bifurcation Points of Membrane Potential Dynamics." *PLoS Computational Biology*, **in press**.

2. **Edward K. Agarwala*, Hillel J. Chiel, **Peter J. Thomas**, "Pursuit of Food *versus* Pursuit of Information in Markov Chain Models of a Perception-Action Loop". *Journal of Theoretical Biology*, **304**:235-272, April 2012. doi:10.1016/j.jtbi.2012.02.016
`http://www.ncbi.nlm.nih.gov/pubmed/22381540`

3. *Kendrick M. Shaw, *Young-Min Park*, Hillel J. Chiel and **Peter J. Thomas**, "Phase Resetting in an Asymptotically Phaseless System: On the Phase Response of Limit Cycles Verging on a Heteroclinic Orbit." *SIAM Journal on Applied Dynamical Systems*, **11**(1):350-391, 2012. doi:10.1137/110828976
`http://epubs.siam.org/siads/resource/1/sjaday/v11/i1/p350_s1`

4. * **Peter J. Thomas**, "A Lower Bound for the First Passage Time Density of the Suprathreshold Ornstein-Uhlenbeck Process". *Journal of Applied Probability* **48**(2):420-434, June 2011. doi:10.1239/jap/1308662636
`http://projecteuclid.org/euclid.jap/1308662636`

5. **Peter J. Thomas**, Jack D. Cowan, "Generalized Spin Models for Coupled Cortical Feature Maps Obtained by Coarse Graining Correlation Based Synaptic Learning Rules". *Journal of Mathematical Biology*, **in press**. 2011. (Epub 2011 Nov. 19). DOI: 10.1007/s00285-011-0484-7
`http://www.springerlink.com/content/x425j1397h04rv27/`

6. *David J. Meyer, Jason Messer, Tanya Singh,* **Peter J. Thomas**, Wojbor A. Woyczynski, Jeffrey Kaye, Alan J. Lerner. "Random Local Temporal Structure of Category Fluency Responses". *Journal of Computational Neuroscience*, **32**(2):213-231. [2011 Jul 8. Epub

ahead of print] DOI 10.1007/s10827-011-0349-5.
http://www.springerlink.com/content/d14832rj706pm131/

7. D. Michael Ackermann, Niloy Bhadra, Meana Gerges and **Peter J. Thomas**, "Dynamics and Sensitivity Analysis of High Frequency Conduction Block". *Journal of Neural Engineering*, **8**(6):065007. 2011. (Epub 2011 Nov. 4).
http://iopscience.iop.org/1741-2552/8/6/065007/

8. Céline Barnadas, *David Kent*, Lincoln Timinao, Jonah Iga, Laurie Gray, Peter Siba, Ivo Mueller, **Peter J. Thomas** and Peter A. Zimmerman, "A new high through-put method for simultaneous detection of mutations associated with *Plasmodium vivax* drug resistance in *pvdhfr*, *dhps* and *mdr1* genes." *Malaria Journal*, **10**:282 (2011).
http://www.malariajournal.com/content/10/1/282

9. J. Vincent Toups, Jean-Marc Fellous, **Peter J. Thomas**, Terrence J. Sejnowski, Paul H. Tiesinga, "Finding the event structure of neuronal spike trains". *Neural Computation*, 2011 Sep;**23**(9):2169-208. Epub 2011 Jun 14.
http://www.ncbi.nlm.nih.gov/pubmed/21671786

10. Jeana T. Da Re, *Drew P. Kouri*, Peter A. Zimmerman, **Peter J. Thomas**, "Differentiating *Plasmodium falciparum* Alleles by Transforming Cartesian X,Y Data to Polar Coordinates", *BMC Genetics*, **11**:57, 29 June 2010.
http://www.biomedcentral.com/1471-2156/11/57.

11. Klaus M. Stiefel, Jean-Marc Fellous, **Peter J. Thomas** and Terrence J. Sejnowski, "Intrinsic Sub-threshold Oscillations Extend the Influence of Inhibitory Synaptic Inputs on Cortical Pyramidal Neurons." *European Journal of Neuroscience* **31**(6):1019-26, March 2010. (Epub Mar 8, 2010).
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2862239/

12. A.J. Lerner, P.K. Ogrocki, **P.J. Thomas**, "A Network Graph Analysis of Category Fluency Testing", *Cognitive and Behavioral Neurology*, **22**(1):45-52, March 2009.

13. *E. Miraldi*, **P.J. Thomas**†, L. Romberg†, "Allosteric Models for Cooperative Polymerization of Linear Polymers", *Biophysical Journal* **95**(5): 2470-86, Sep 2008 (Epub 2008 May 23). †denotes equal author contributions.
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2517016

14. *P.B. Kruskal*, J.J. Stanis, B.L. McNaughton, **P.J. Thomas**, "A binless correlation measure reduces the variability of memory reactivation estimates", *Statistics in Medicine*, **26** (21): 3997-4008, Sep 20, 2007 (Epub June 26, 2007).
http://onlinelibrary.wiley.com/doi/10.1002/sim.2946/abstract

15. **P.J.Thomas**, J.D. Cowan, "Simultaneous constraints on pre- and post-synaptic cells couple cortical feature maps in a 2D geometric model of orientation preference", *Mathematical Medicine and Biology*, **23** (2):119-138, June 2006. (Epub April 20, 2006.)

16. **P.J. Thomas**, J.D. Cowan, "Symmetry induced coupling of cortical feature maps", *Physical Review Letters*, **92** (18):188101, May 7, 2004. (Epub May 2004.)

17. J.M. Fellous, P.H.E. Tiesinga, **P.J. Thomas** and T.J. Sejnowski, "Discovering Spike Patterns in Neuronal Responses", *Journal of Neuroscience*, **24** (12), 2989-3001, March 24, 2004.

18. **Peter J. Thomas**, Paul H. E. Tiesinga, Jean-Marc Fellous and Terrence J. Sejnowski, "Reliability and Bifurcation in Neurons Driven by Multiple Sinusoids", *Neurocomputing* **52-54**, 955-961, 2003.

19. Wouter-Jan Rappel, **Peter J. Thomas**, Herbert Levine and William F. Loomis, "Establishing Direction during Chemotaxis in Eukaryotic Cells", *Biophysical Journal* **83**, 1361-1367, September 2002.

20. P.C. Bressloff, J.D. Cowan, M. Golubitsky, **P.J. Thomas** and M.C. Wiener, "What geometric visual hallucinations tell us about the visual cortex", *Neural Computation* **14**, 473-491, 2002.

21. P.C. Bressloff, J.D. Cowan, M. Golubitsky, **P.J. Thomas** and M.C. Wiener, "Geometric visual hallucinations, Euclidean symmetry, and the functional architecture of striate cortex", *Phil. Trans. R. Soc. Lond. B* **356**, 299-330, 2001.

22. P.C. Bressloff, J.D. Cowan, M. Golubitsky and **P.J. Thomas**, "Scalar and pseudoscalar bifurcations motivated by pattern formation on the visual cortex", *Nonlinearity.* **14**, 739-775, 2001.

23. J.D. Hunter, J.G. Milton, **P.J. Thomas** and J.D. Cowan, "A Resonance Effect for Neural Spike Time Reliability", *J. Neurophysiol.* **80**, 1427-1438, 1998.

24. **P.J. Thomas**, B.E. Wendelburg, S.E. Venuti, G.M. Helmkamp Jr., "Mature rat testis contains a high molecular weight species of phosphatidylinositol transfer protein", *Biochim Biophys Acta* **982**(1):24-30, June 26, 1989

## 9.2 Refereed Conference Proceedings

1. Casey O. Diekman, Christopher G. Wilson, **Peter J. Thomas**, "Spontaneous Autoresuscitation in a Model of Respiratory Control", **accepted** (2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)).

2. *J.M. Kimmel*, R. M. Salter, **P.J. Thomas**, "An Information Theoretic Framework for Eukaryotic Gradient Sensing", *Advances in Neural Information Processing Systems 19*, MIT Press, pp 705-712, 2007.

3. **P.J. Thomas**, D.J. Spencer, *S.K. Hampton, P. Park* and J. Zurkus, "The Diffusion-Limited Biochemical Signal-Relay Channel", *Advances in Neural Information Processing Systems 16*, MIT Press, 2004.

### 9.3 Invited Reviews

1. **Peter J. Thomas**, "Cell Signaling: Every Bit Counts". *Science*. **334**:321-322, 21 Oct. 2011.
`http://www.sciencemag.org/content/334/6054/321.full.pdf`

2. Hillel J. Chiel and **Peter J. Thomas**, "Applied Neurodynamics: From Neural Dynamics to Neural Engineering". *Journal of Neural Engineering*. **8** (2011) 060201.
`http://iopscience.iop.org/1741-2552/8/6/060201`

### 9.4 Articles Submitted for Publication

1. Casey O. Diekman, Paulina Getsy, Christopher G. Wilson, **Peter J. Thomas**, "Experimental validation of a respiratory control model", **submitted Nov. 2012**.

### 9.5 Articles in Preparation or Under Revision (selected)

1. Deena Schmidt, Robin E. Snyder, **Peter J. Thomas**, "Optimal Complexity Reduction in Stochastic Network Models", **in preparation**.

2. **Peter J. Thomas**, Andrew W. Eckford, "On the Capacity of a Simple Intercellular Signal Transduction Channel", **in preparation**.

3. **Peter J. Thomas**, "Isochrons and Phaseless Sets for Deterministic and Stochastic Flows", **in preparation**.

## 10 Conference Presentations (Non-refereed)

- 2012 Mathematical Biosciences Institute Workshop on Mathematical Challenges in Neural Networks, Columbus, Ohio. Talk: *Stochastic Limit Cycles for Conductance-Based Neural Models: A Master Equation Approach.*

- 2012 SIAM Life Sciences Meeting, San Diego, Calif. Talk: *Stochastic Limit Cycles for Conductance-Based Neural Models: A Master Equation Approach.*
- 2012 New Jersey Institute of Technology's Frontiers in Applied and Computational Mathematics conference, Newark, New Jersey. Talk: *Phase Resetting in an Asymptotically Phaseless System: On the Phase Response of Limit Cycles Verging on a Heteroclinic Orbit.*
- 2011 Mathematical Biosciences Institute Workshop on Stochastic Processes in Cell and Population Biology, Columbus, Ohio. Poster: *Pursuit of Food versus Pursuit of Information in Markov Chain Models of a Perception-Action Loop.*
- 2011 CRCNS PI Meeting, Princeton, NJ. Poster: *Evidence for a heteroclinic network underlying feeding patterns in Aplysia californica.*
- 2011 Mathematical Biosciences Institute Workshop on New Directions in Probability Theory Inspired by Biology, Columbus, Ohio. Poster: *Effects of Fluctuations in a 2D Model of Gradient Sensing.*
- 2011 Mathematical Biosciences Institute Young Researcher's Workshop, Columbus, Ohio. Poster: *Evidence for a heteroclinic network underlying feeding patterns in Aplysia californica.*
- 2011 SIAM Dynamical Systems Meeting. Talk: *Phase Resetting in Phaseless Systems.*
- 2011 Gordon Research Conference on Stochastic Physics and Biology, Ventura, Calif. Poster: *Eukaryotic Gradient Sensing as a Statistical Estimation Problem.*
- 2011 American Mathematical Society Annual Meeting, New Orleans, La. Talk: *Synchronization of periodically forced Ornstein Uhlenbeck processes with reset.*
- 2010 Society for Neuroscience Annual Meeting, San Diego, Calif. Poster: *Evidence for a Stable Heteroclinic Channel Underlying a Central Pattern Generator*, with K. Shaw, H.J. Chiel, and others.
- 2010 MAA (Mathematical Association of America) Mathfest, Pittsburgh, Penna. Talk: *Synchronization of Noisy Integrate and Fire Neurons.*
- 2010 Society for Industrial and Applied Mathematics, Life Sciences Meeting, Pittsburgh, Penna.; Minisymposium on Stochastic Phenomena in Neural Dynamics. Talk: *Synchronization of Periodically Driven Noisy Integrate and Fire Neurons.*
- 2010 American Mathematical Society, Central Section Meeting, Notre Dame, In.; Special Session on Applications of Stochastic Processes in Cell Biology. Talk: *Gradient Sensing as a Statistical Estimation Problem: Comparison with Experimental Data.*

- 2010 Society for Industrial and Applied Mathematics, Great Lakes Regional Meeting, Dearborn, Mi. Talk: *Effects of Fluctuations in a 2D Model of Gradient Sensing.*

- 2010 COSYNE (**Co**mputational and **Sy**stems **Ne**uroscience) Meeting, Salt Lake City, Utah. Poster: *Evidence for a central pattern generator built on a heteroclinic channel instead of a limit cycle*, with K. Shaw, H. Chiel and others. Poster: *Multiple spike time patterns occur at bifurcation points of membrane potential dynamics*, with V. Toups, J-M Fellous, T. Sejnowski and P. Tiesinga.

- 2009 American Institute of Chemical Engineers Annual Meeting, Nashville, Tenn. *Accuracy of chemotactic response to transient gradient signals studied in silico.* With H. Baskaran (presenting), S. Chuechote and others.

- 2009 American Mathematical Society Eastern Regional Meeting, State College, Penna. *The periodically forced Ornstein Uhlenbeck process with reset: Preliminary Report.*

- 2009 Society for Neuroscience Annual Meeting, Chicago, Ill. Posters: *A Dynamical Model of Feeding Neuromechanics in Aplysia californica* (with K. Shaw, H. Chiel and others). *On the relative contributions of nodal currents to conduction block of the mammalian axon using high frequency alternating currents* (with D.M. Ackerman and N. Bhadra).

- 2009 Society for Mathematical Biology Annual Meeting, Vancouver, BC. Session Chair, Systems Biology Session. Talk: *On the Information Capacity of Diffusion Mediated Signal Transduction.* Posters: *Food for Thought: When Infomax Fails to Optimize Utility* (with E.K. Agarwala); *Effects of Fluctuations in a 2D Model of Gradient Sensing* (with S. Chuechote); *Accuracy of Gradient Sensing Based on Maximum Likelihood* (with S.J. Fleming, H.F. McGinnis and H. Baskaran); *Precision of burst timing in conditional pacemakers of the pre-Botzinger complex studied in silico* (with W. Smith and others).

- 2009 American Academy of Neurology Seattle, Washington. *Using Category Fluency Data to Create Phylogenetic Trees of Cognitive Phenotypes*, A. Lerner, J. Messer, T. Singh, J. Leverenz, C. Zabetian, P.J. Thomas, W.A.Woyczynski. (Platform presentation, given by A. Lerner.)

- 2008 12th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS) San Diego, Calif. *PCM-Programmable Arbitrary Gradient Generator for Cell Chemotaxis*, Y.Xie, S. Sarkar, F. Azizi, P.J.Thomas, H. Baskaran and C.H. Mastrangelo. (Platform presentation, given by Y. Xie and C.H. Mastrangelo.)

- 2008 Society for Neuroscience Annual Meeting, Washington, DC. *Simulation of geometric hallucinations on the visual cortex*, A. Boxerbaum, S. Skentzos, P. J. Thomas. (Poster, presented by A. Boxerbaum.)

- 2008 Aspen Center for Physics Workshop on Decision Making in Single Cells (Aspen, Colo.): *Information Processing in Eukaryotic Chemotaxis.*

- 2007 Joint Okinawa – Salk Institute Neuroscience Workshop. *Information, Timing and Perception in Chemotaxis.*

- 2007 Society for Neuroscience Annual Meeting: P.J. Thomas and H. J. Chiel, *Noise Facilitated Transitions in a Model Central Pattern Generator Network* (poster).

- 2007 Society for Mathematical Biology and Japanese Society of Mathematical Biology joint meeting: *Information Theoretic Analysis of Eukaryotic Gradient Sensing.*

- 2007 Midwest Regional Meeting of the American Mathematical Society (Chicago, Ill.) Special Session on Networks. *Preliminary Report: Noise-induced limit cycle transitions in a coupled oscillator network.*

- 2007 Society for Industrial and Applied Mathematics (SIAM) and the International Council for Industrial and Applied Mathematics (ICIAM) joint meeting: *Information Theoretic Analysis of Eukaryotic Gradient Sensing.*

- 2007 Gordon Research Conference on Gradient Sensing and Directed Cell Migration: J.M.Kimmel, R.M.Salter, P.J.Thomas. *An Information Theoretic Framework for Eukaryotic Gradient Sensing* (poster).

- 2006 Society for Neuroscience Annual Meeting: J.V. Toups, J. Fellous, P.J. Thomas, P. Tiesinga and T.J. Sejnowski. *Stability of in vitro spike patterns under variation of stimulus amplitude.* Program No. 237.18.

- 2005 American Society for Cell Biology Meeting: A. Bartholomew, R. Ganetzky, E. Miraldi, P.J. Thomas and L. Romberg. *Creation of a Computational Model to Study Cooperativity in Single-stranded Polymers* (poster).

- 2005 Society for Neuroscience Meeting: P. B. Kruskal,J. J. Stanis, B.L. McNaughton and P.J. Thomas. *A binless correlation measure reduces the variability of memory reactivation estimates* (poster).

- 2003 Fields Institute Workshop on Patterns in Physics: *Pattern Formation in the Development of Primary Visual Cortex* (talk).

- 2003 Society for Neuroscience Meeting: *Experimental Characterization of Spike-Time Patterns*, and *Information Capacity of a Single Ligand-Receptor Signal-Transduction Relay* (poster).

- 2003 Banff International Research Station Conference on Symmetry and Bifurcation in Biology: *Symmetry-Induced Coupling of Cortical Feature Maps* (talk).

- 2003 American Physical Society March Meeting: *Spike-Time Attractors in Cortical Neurons* (talk).
- 2002 Gordon Research Conference on Theoretical Biology and Biomathematics: *Fast Directional Sensing Using a Rapidly Diffusing Inhibitor* (poster).

## 11 Invited Talks (selected):

- June 5, 2012: Principal Investigators' meeting, National Science Foundation's Collaborative Research in Computational Neuroscience (CRCNS) program (St. Louis, Missouri). *Grand Challenges.* Joint talk with H. Chiel.
- December 2, 2011: University of Wisconsin, Applied and Computational Mathematics Seminar (Madison, Wisc.). *Phase Resetting in an Asymptotically Phaseless System: On the Phase Response of Limit Cycles Verging on a Heteroclinic Orbit.*
- November 30, 2011: Guest lecture for Prof. Dawes (Ohio State University), Molecular Genetics 660: Integrated Molecular and Cellular Biology for Non-biologists I (Columbus, Ohio). *Information Theory and Signal Transduction.*
- October 18, 2011: Ohio State University RUMBA (Undergraduate Mathematical Biology Research) Seminar (Columbus, Ohio). *Applications of Dynamical Systems Theory in Neuroscience: Insights into Robust Control of Central Pattern Generators.*
- October 3, 2011: Boston University Dynamical Systems Seminar (Boston, Mass.). *Phase resetting in an asymptotically phaseless system: on the phase response of limit cycles verging on a heteroclinic orbit.*
- September 21, 2011: Oberlin College Neuroscience Seminar (Oberlin, Ohio). *Applications of Dynamical Systems Theory in Neuroscience: Insights into Robust Control of Central Pattern Generators.*
- May 22, 2010: University of Notre Dame Center for Biocomplexity Colloquium (South Bend, Indiana). *Fluctuation Effects in 2D Models of Gradient Sensing.*
- May 14, 2009: Ohio Supercomputer Center Statewide User's Group meeting, keynote address (Columbus, Ohio). *Two Perspectives on Computational Biology.*
- April 28, 2009: New Jersey Institute of Technology (New Brunswick, NJ). *Stochastic Phenomena in Chemotaxis.*

- April 21, 2009: Baldwin Wallace College speakers series on Careers in Mathematics (Berea, Ohio). *Mathematics and Biology.* This was a public outreach talk for an audience of 70 junior high, high school and college students.
- October 15, 2008: Mathematical Biosciences Institute (Columbus, Ohio). *Stochastic Phenomena in Chemotaxis.*
- December 3, 2007: Okinawa Institute of Science and Technology Seminar Series (Okinawa, Japan). *The Mathematical Biology of Hallucination.*
- November 29, 2007: Okinawa Institute of Science and Technology Seminar Series (Okinawa, Japan). *An Information Theoretic Framework for Eukaryotic Gradient Sensing.*
- October 29, 2007: Mathematical Biosciences Institute (Ohio State University). *Noise-induced limit cycle transitions in coupled oscillator networks.*
- May 8, 2007: The University of Chicago Center for Integrative Neuroscience and Neuroengineering Research Seminar Series (hosts: Committee on Computational Neuroscience). *Spike Time Patterns.*