

Curriculum Vitae

JEFF MOEHLIS

Department of Mechanical Engineering
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 Santa Barbara, CA 93106-5070

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Degrees

Ph.D. Physics, University of California, Berkeley, May 2000
 B.S. Physics and Mathematics, Iowa State University, May 1993

Dissertation

“Forced Symmetry-Breaking as a Mechanism for Bursting”
 Edgar Knobloch, Chair
 Examination Fields: Bifurcation Theory, Hydrodynamic Stability

Awards and Honors

- National Academy of Engineering, Frontiers of Engineering, 2009
- Kavli Fellow, National Academy of Sciences, Frontiers of Science, 2008
- Northrop Grumman Excellence in Teaching Award at UCSB, 2008
- National Science Foundation CAREER Award, 2006-2011
- Alfred P. Sloan Research Fellowship in Mathematics, 2005-2007
- University of California at Santa Barbara Regents’ Junior Faculty Fellowship, 2004-2005
- National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship, Princeton University, 2000-2003
- Bernard Friedman Memorial Prize in Applied Mathematics for Outstanding Doctoral Dissertation, University of California, Berkeley, 1999-2000
- Geophysical Fluid Dynamics Fellowship at Woods Hole Oceanographic Institution, Summer 1999
- Outstanding Graduate Student Instructor Award, University of California, Berkeley, 1994-1995
- Highest Graduating Senior in Physics, Iowa State University, 1993
- B.S. awarded With Distinction, With Honors, Iowa State University, 1993
- Phi Beta Kappa, elected 1992
- Marian Daniells Mathematics Scholarship, Iowa State University 1989-1992

Professional Experience

- Vice Chair of Mechanical Engineering, Fall 2008-present.
- Associate Professor, Department of Mechanical Engineering, University of California, Santa Barbara, Fall 2007-present
- Visiting Research Associate, Department of Engineering Mathematics, University of Bristol, England, Fall 2007
- Assistant Professor, Department of Mechanical Engineering, University of California, Santa Barbara, Fall 2003-Spring 2007
- Visiting Researcher, Fachbereich Physik der Philipps-Universität Marburg, Summer 2003
- Visiting Research Fellow, Program in Applied and Computational Mathematics, Princeton University, Fall 2000 - Spring 2003
- Graduate Student, Department of Physics, University of California, Berkeley, Fall 1993 - Spring 2000

Graduate Students Advised**Current Students**

- Per Danzl, PhD student
- Margot Kimura, PhD student
(MS received Summer 2007: Novel Vehicular Trajectories for Collective Motion from Coupled Oscillator Steering Control)
- Ali Nabi, PhD student
- Michael Busch, PhD student

Former Students

- Michael Schaus, MS received Summer 2005: Neural Oscillator Identification via Phase-Locking Behavior. Currently Product Development Engineer at Starfire Industries.
- Joseph Durham, MS received Summer 2007: Controlling Canards Using Ideas From The Theory of Mixed-Mode Oscillations. Currently a PhD student with Francesco Bullo at UCSB.
- Allison Kolpas, PhD received Spring 2008: Coarse-Grained Analysis of Collective Motion in Animal Groups. Currently a postdoctoral researcher at the University of Delaware.
- Barry DeMartini, PhD received Summer 2008 (co-advised with Kim Turner): Development of Nonlinear and Coupled Microelectromechanical Oscillators for Sensing Applications. Currently at Agilent Technologies.

- Lina Kim, PhD received Summer 2009: Characterizing the Edge of Chaos for Shear Flows. (MS received Summer 2005: Transient Growth for a Sinusoidal Shear Flow Model).

Postdoctoral Scholars Advised

- Gabor Orosz (Fall 2008-present): Dynamics and control of coupled oscillators

Undergraduate Research Projects Advised

- Robert Hansen (Winter Quarter 2005-Summer 2006): Response of oscillator populations to Poisson inputs.
- Ronald Votel (Summer Quarter 2005-Summer 2006): Computational analysis of a territorial model.
- Jess Theilmann (Fall Quarter 2006-Winter Quarter 2007): Response of neural oscillator populations to sinusoidal inputs.
- Suzanne Iwanicki (Summer 2008-Summer 2009): Territorial behavior of insects.
- Ashley Zavagno (Winter 2009-Summer 2009): Territorial behavior of insects.
- Tomasz Jagoda (Fall 2008-Winter 2009): Computational analysis of a territorial model.

Thesis/Dissertation Committees

- George Gilmore: The global resonance apparatus (MS Advisor: Igor Mezić)
- Shaunak D. Bopardikar: Pursuit strategies for autonomous vehicles (PhD Advisor: Francesco Bullo)
- Bryan Eisenhower: Targeted escape in large oscillator networks (PhD Advisor: Igor Mezić)
- Jagpal Gill (MS, Electrical and Computer Engineering)
- Sophie Loire: Manipulation of microsize to nanosize particles with AC electrokinetic forces (PhD Advisor: Igor Mezić)
- Brian Munsy: The finite state projection for the solution of the master equation and its applications to stochastic gene regulatory networks (PhD Advisor: Mustafa Khammash)

- Antoine du Chéné (MS advisor: Frederic Gibou)
- Vikram Siddavaram: The effects of gravity modulation on fluid mixing (PhD advisor: Bud Homsy)
- Zoran Levnajić: Ergodic theory in discrete dynamical systems (MS advisor: Igor Mezic)
- Chandrasekhar Samiappan: Maglev apparatus for artificial hearts (MS advisor: Brad Paden)

Funding

- 2009-2010: (co-PI) Instructional Improvement Grant, UCSB, \$18,453.30; co-PI: Linda Petzold
- 2007-2009: (PI) A Theoretical, Numerical, and Experimental Study of Territorial Behavior, Council on Research and Instructional Resources Faculty Research Grant, UCSB, \$8,000.
- 2007-2009: (co-PI) Bio-inspired Stochastic Search and Decision Making for Robotic Networks, Institute for Collaborative Biotechnologies, \$300,000; co-PI: Francesco Bullo
- 2006-2011: (PI) Dynamics of Individual and Coupled Oscillators, National Science Foundation CAREER Award, \$400,000
- 2005-2007: (PI) Alfred P. Sloan Research Fellowship in Mathematics, \$45,000
- 2005-2006: (PI) Partial Synchronization due to Random Inputs, Council on Research and Instructional Resources Faculty Research Grant, UCSB, \$4,800
- 2004-2008: (PI) Equation-Free Modeling of Biological Self-Organization: Coarse Computational Swarming, National Science Foundation, \$230,000 (out of \$720,000 total); co-PIs: Daniel Grünbaum (Washington), Yannis Kevrekidis (Princeton), Simon Levin (Princeton)
- 2004-2007: (co-PI) Dynamics of Microbeam Sensor Arrays, National Science Foundation, \$400,000; PI: Kimberly Turner (UCSB), other co-PI: Steven Shaw (Michigan State)
- 2004-2005: (PI) UCSB Regents' Junior Faculty Fellowship, UCSB \$7544
- 2003-2004: (PI) UCSB Junior Faculty Research Incentive Award, UCSB \$5000

Publications (copies available from <http://www.me.ucsb.edu/~moehlis>)

Journal Articles

- H. Osinga and J. Moehlis. A continuation method for computing global isochrons. Submitted to *SIAM Journal on Applied Dynamical Systems*.
- P. Danzl, A. Nabi, and J. Moehlis. Charge-balanced spike timing control for phase models of spiking neurons. Submitted to *Discrete and Continuous Dynamical Systems*.
- M. Busch and J. Moehlis. Analysis of a class of symmetric equilibrium configurations for a territorial model. Submitted to *Numerical Mathematics: Theory, Methods, and Applications*.
- P. Danzl, J. Hespanha, and J. Moehlis. Event-based minimum-time control of oscillatory neuron models: phase randomization, maximal spike rate increase, and desynchronization. To appear in *Biological Cybernetics*.
- G. Orosz, J. Moehlis, and R. M. Murray. Controlling biological networks by time-delayed signals. To appear in *Philosophical Transactions of the Royal Society A*.
- P. Danzl and J. Moehlis. Weakly coupled parametrically forced oscillator networks: existence, stability, and symmetry of solutions. To appear in *Nonlinear Dynamics*.
- R. Votel, D.A.W. Barton, T. Gotou, T. Hatanaka, M. Fujita, and J. Moehlis. Equilibrium configurations for a territorial model. *SIAM Journal on Applied Dynamical Systems* **8**, 1234-1260, 2009.
- G. Orosz, J. Moehlis, and P. Ashwin. Designing the dynamics of globally coupled oscillators. *Progress in Theoretical Physics* **122**, 611-630, 2009.
- J. Moehlis, J. Porter, and E. Knobloch. Heteroclinic dynamics in a model of Faraday waves in a square container. *Physica D* **238**, 846-859, 2009.
- A. Kolpas and J. Moehlis. Optimal switching between collective motion states for two agents. *Applied Mathematics Letters* **22**, 600-604, 2009.
- H. Li, A.M. Kolpas, L. Petzold, and J. Moehlis. Parallel simulation for a fish schooling model on a general-purpose graphics processing unit. *Concurrency and Computation: Practice and Experience* **21**, 725-737, 2009.
- L. Kim and J. Moehlis. Characterizing the edge of chaos for a shear flow model. *Phys. Rev. E* **78**, 036315, 2008.
- M. Kimura and J. Moehlis. Novel vehicular trajectories for collective motion from coupled oscillator steering control. *SIAM Journal on Applied Dynamical Systems* **7**, 1191-1212, 2008.
- A. Kolpas, J. Moehlis, T.A. Frewen, and I.G. Kevrekidis. Coarse analysis of collective motion with different communication mechanisms. *Mathematical Biosciences* **214**, 49-57, 2008.

- P. Danzl, R. Hansen, G. Bonnet, and J. Moehlis. Partial phase synchronization due to random Poisson inputs. *J. Computational Neuroscience* **25**, 141-157, 2008.
- J. Durham and J. Moehlis. Feedback control of canards. *Chaos* **18**, 015110, 2008.
- B.E. DeMartini, H.E. Butterfield, J. Moehlis, and K.L. Turner. Chaos for a microelectromechanical oscillator governed by the nonlinear Mathieu equation. *J. MEMS* **16**, 1314-1323, 2007.
- B. DeMartini, J. Rhoads, K. Turner, S. Shaw, and J. Moehlis. Linear and nonlinear tuning of parametrically excited MEM oscillators. *J. MEMS* **16**, 310-318, 2007.
- A. Kolpas, J. Moehlis, and I. G. Kevrekidis. Coarse-grained analysis of stochasticity-induced switching between collective motion states. *Proc. Nat. Acad. Sci. USA* **104**, 5931-5935, 2007.
- J. Moehlis, E. Shea-Brown, H. Rabitz, Optimal inputs for phase models of spiking neurons. *ASME J. Comp. Nonlin. Dyn.* **1**, 358-367, 2006.
- R. Bogacz, E. Brown, J. Moehlis, P. Holmes, and J.D. Cohen. The physics of optimal decision making: A formal analysis of performance in two-alternative forced choice tasks. *Psych. Rev.* **113**, 700-765, 2006.
- L. Kim and J. Moehlis, Transient growth for streak-streamwise vortex interactions. *Phys. Lett. A* **358**, 431-437, 2006.
- J.F. Rhoads, S.W. Shaw, K.L. Turner, J. Moehlis, B.E. DeMartini, W. Zhang, Generalized parametric resonance in electrostatically-actuated microelectromechanical oscillators. *J. Sound Vibration* **296**, 797-829, 2006.
- J. Moehlis. Canards for a reduction of the Hodgkin-Huxley equations. *J. Math. Biology* **52**, 141-153, 2006.
- P. Holmes, E. Brown, J. Moehlis, R. Bogacz, J. Gao, P. Hu, G. Aston-Jones, E. Clayton, J. Rajkowski, and J.D. Cohen, Optimal decisions: from neural spikes, through stochastic differential equations, to behavior. *IEICE Trans. Fundamentals* **E88-A**, 2496-2503, 2005.
- T.R. Smith, J. Moehlis, and P. Holmes. Heteroclinic cycles and periodic orbits for the $O(2)$ -equivariant 0:1:2 mode interaction. *Physica D* **211**, 347-376, 2005.
- T.R. Smith, J. Moehlis, and P. Holmes, Low-dimensional models for turbulent plane Couette flow in a minimal flow unit. *J. Fluid Mech.* **538**, 71-110, 2005.
- T.R. Smith, J. Moehlis, and P. Holmes, Low-dimensional modelling of turbulence using the proper orthogonal decomposition: a tutorial. *Nonlinear Dynamics* **41**, 275-307, 2005.
- J. Moehlis, H. Faisst, and B. Eckhardt, Periodic orbits and chaotic sets in a low-dimensional model for shear flows. *SIAM Journal on Applied Dynamical Systems* **4**, 352-376, 2005.

- J. Moehlis, B. Eckhardt, and H. Faisst, Fractal lifetimes in the transition to turbulence. *Chaos* **14**, S11, 2004 (Gallery of Nonlinear Images).
- J. Moehlis, H. Faisst, and B. Eckhardt, A low-dimensional model for turbulent shear flows. *New Journal of Physics* **6**, Article No. 56, 2004.
- E. Brown, J. Moehlis, P. Holmes, E. Clayton, J. Rajkowski, and G. Aston-Jones, The influence of spike rate and stimulus duration on noradrenergic neurons. *J. Computational Neuroscience* **17**, 13–29, 2004.
- E. Brown, J. Moehlis, and P. Holmes. On the phase reduction and response dynamics of neural oscillator populations. *Neural Computation* **16**, 673–715, 2004.
- J. Moehlis, Canards in a surface oxidation reaction. *J. Nonlinear Sci.* **12**, 319–345, 2002.
- J. Moehlis, T.R. Smith, P. Holmes, and H. Faisst, Models for turbulent plane Couette flow using the proper orthogonal decomposition. *Phys. Fluids* **14**, 2493–2507, 2002.
- J. Moehlis, Effect of noise on excursions to and back from infinity. *Phys. Lett. A* **284**, 172–183, 2001.
- J. Moehlis and S.G. Llewellyn Smith, Radiation of mixed layer near-inertial oscillations into the ocean interior. *J. Phys. Oceanogr.* **31**, 1550–1560, 2001.
- J. Moehlis and E. Knobloch, Wrinkled tori and bursts due to resonant temporal forcing. *Physica D* **151**, 99–124, 2001.
- J. Moehlis and E. Knobloch, Bursts in oscillatory systems with broken D_4 symmetry. *Physica D* **135**, 263–304, 2000.
- E. Knobloch, A.S. Landsberg, and J. Moehlis, Chaotic direction-reversing waves. *Phys. Lett. A* **225**, 287–293, 1999.
- J. Moehlis and E. Knobloch, Forced symmetry breaking as a mechanism for bursting. *Phys. Rev. Lett.* **80**, 5329–5332, 1998.
- J. Moehlis and E. Knobloch, Eckhaus-Benjamin-Feir instability in systems with temporal modulation. *Phys. Rev. E* **54**, 5161–5168, 1996.

Book Chapters († = refereed)

- † E. Brown, P. Holmes, and J. Moehlis, Globally coupled oscillator networks, in *Perspectives and Problems in Nonlinear Science: A Celebratory Volume in Honor of Larry Sirovich*, ed. E. Kaplan, J. Marsden, and K.R. Sreenivasan, Springer, New York, 183–215, 2003.
- E. Knobloch and J. Moehlis, Burst mechanisms in hydrodynamics, in *Nonlinear Instability, Chaos and Turbulence, Volume II*, ed. L. Debnath and D. Riahi, Series: Advances in Fluid Mechanics, Computational Mechanics Publications, Southampton, 237–287, 2000.

Conference Proceedings († = refereed)

- † A. Nabi and J. Moehlis, Nonlinear hybrid control of phase models for coupled oscillators. Submitted to 2010 American Control Conference.
- † T. Stigen, P. Danzl, J. Moehlis, and T. Netoff, Linear control of neuronal spike timing using phase response curves. *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, pp. 1541-1544, 2009.
- † A. Nabi and J. Moehlis, Charge-balanced optimal inputs for phase models of spiking neurons. *Proceedings of 2009 ASME Dynamic Systems and Control Conference*, DSCC2009-2541, 2009.
- † J. Moehlis, B. E. DeMartini, J. L. Rogers, and K. L. Turner, Exploiting nonlinearity to provide broadband energy harvesting. *Proceedings of 2009 ASME Dynamic Systems and Control Conference*, DSCC2009-2542, 2009.
- † G. Orosz and J. Moehlis, Controlling neural clustering using delayed inputs, to appear in IFAC TDS09 Conference Proceedings.
- H. Li, A. Kolpas, L. Petzold, and J. Moehlis, Efficient parallel simulation of an individual-based fish schooling model on a graphics processing unit. To appear in Proceedings of the Grace Hopper Celebration of Women in Computing Conference, 2008.
- † J. Moehlis, On the dynamics of coupled parametrically forced oscillators. *Proceedings of 2008 ASME Dynamic Systems and Control Conference*, DSCC2008-2189, 2008.
- † P. Danzl and J. Moehlis, Spike timing control of oscillatory neurons using impulsive and quasi-impulsive charge-balanced inputs. *Proceedings of the 2008 American Control Conference*, 171-176, 2008.
- † P. Danzl and J. Moehlis, Event-based feedback control of nonlinear oscillators using phase response curves. *Proceedings of the 46th IEEE Conference on Decision and Control*, 5806-5811, 2007.
- B. E. DeMartini, H. E. Butterfield, J. Moehlis, and K. L. Turner, Prediction and validation of chaotic behavior in an electrostatically actuated microelectromechanical oscillator, 14th International Conference on Solid-State Sensors, Actuators and Microsystems, Vol. 2, 1697–1700, 2007.
- † M. J. Schaus and J. Moehlis, On the response of neurons to sinusoidal current stimuli: phase response curves and phase-locking, *Proceedings of the 45th IEEE Conference on Decision and Control*, 2376–2381, 2006.
- B. DeMartini, J. Moehlis, K. Turner, S. Shaw, J. Rhoads, and W. Zhang, Modeling of parametrically excited microelectromechanical oscillator dynamics with application to filtering, in *Proceedings of IEEE Sensors 2005*, 345–348, 2006.
- R. Bogacz, E. Brown, J. Moehlis, P. Holmes, J.D. Cohen, How a biological decision network can implement a statistically optimal test, in *Modelling Natural Action Selection: Proceedings of an International Workshop*, 3–8. AISB Press, Brighton, UK, 2005

- † J.F. Rhoads, S.W. Shaw, K.L. Turner, J. Moehlis, B.E. DeMartini, and W. Zhang, Nonlinear response of parametrically-excited MEMS, in *Proceedings of the ASME Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, Long Beach, California, Paper DETC2005-84603, 2005
- P. Holmes, E. Brown, J. Moehlis, R. Bogacz, J. Gao, P. Hu, G Aston-Jones, E. Clayton, J. Rajkowski, and J.D. Cohen, Optimal decisions: From neural spikes, through stochastic differential equations, to behavior, in *Proceedings of the International Symposium on Nonlinear Theory and its Applications (NOLTA2004)*, Fukuoka, Japan, 15–18, 2004.
- † T.R. Smith, J. Moehlis, and P.J. Holmes, Modeling and control of minimal flow unit turbulence in plane Couette flow, in *Proceedings of the 42nd IEEE Conference on Decision and Control*, 2322–2327, 2003.
- T.R. Smith, J. Moehlis, and P. Holmes, Minimal plane Couette flow turbulence: a low-dimensional, uncoupled model, in *Nonlinear Dynamics in Fluids*, ed. F. Marquès and A. Meseguer, International Center for Numerical Methods in Engineering (CIMNE), Barcelona, 111–114, 2003.
- J. Moehlis, T. Smith, and P. Holmes, A model for turbulent plane Couette flow using the proper orthogonal decomposition, in *Proceedings of the 12th International Couette-Taylor Workshop*, 2001. Available from <http://www.couette-taylor2001.nwu.edu/ct/program.htm>
- J. Moehlis, Effect of a simple storm on a simple ocean, in *Stirring and Mixing, 1999 Summer Study Program in Geophysical Fluid Dynamics*, Woods Hole Oceanog. Inst. Available from <http://gfd.who.edu/proceedings>
- E. Knobloch and J. Moehlis, Bursting mechanisms for hydrodynamical systems, in *Pattern Formation in Continuous and Coupled Systems: A Survey Volume*, ed. M. Golubitsky, D. Luss, and S.H. Strogatz, Series: IMA Volumes in Mathematics and its Applications, vol. 115, Springer-Verlag, New York, 157–174, 1999.
- E. Knobloch and J. Moehlis, Bursts, in *IUTAM Symposium on New Applications of Nonlinear and Chaotic Dynamics in Mechanics*, ed. F. C. Moon, Kluwer, Dordrecht, 51–60, 1999.

Technical Reports

- J. Moehlis, E. Brown, R. Bogacz, P. Holmes, and J.D. Cohen. Optimizing reward rate in two alternative choice tasks: Mathematical formalism. Princeton Technical Report #04-01, Center for the Study of Mind, Brain, and Behavior, 2004.

Book Reviews

- J. Moehlis. Review of “Dynamical Systems in Neuroscience: The Geometry of Excitability and Bursting” by E.M. Izhikevich. *SIAM Review* **50**, 397-401, 2008.

Scholarpedia (<http://www.scholarpedia.org>) , refereed

- J. Moehlis, K. Josic, and E.T. Shea-Brown. Periodic orbit. Scholarpedia, 1(7):1358, 2006.
- K. Josic, E.T. Shea-Brown, and J. Moehlis. Isochron. Scholarpedia, 1(8):1361, 2006.
- J. Moehlis and E. Knobloch. Equivariant dynamical systems. Scholarpedia, 2(10):2510, 2007.
- J. Moehlis and E. Knobloch. Equivariant bifurcation theory. Scholarpedia, 2(9):2511, 2007.

Articles In Preparation

- E. Knobloch, A.S. Landsberg, and J. Moehlis. Triple-zero instability with circular symmetry.

Teaching Experience

Instructor

- Mechanical Engineering 225DS, Dynamical Systems with Symmetry, Winter 2008, University of California, Santa Barbara.
- Mechanical Engineering 215B, Applied Dynamical Systems II, Winter 2005, Winter 2006, Winter 2007, Winter 2009, University of California, Santa Barbara
- Mechanical Engineering 215A, Applied Dynamical Systems I, Fall 2004, Fall 2005, Fall 2006, Fall 2008, Fall 2009, University of California, Santa Barbara
- Mechanical Engineering 17, Mathematics of Engineering, Spring 2004, Spring 2005, Spring 2006, Spring 2007, Spring 2008, University of California, Santa Barbara.
- Mechanical Engineering 225BC, Introduction to Low-dimensional Modeling, Winter 2004, University of California, Santa Barbara.

Co-instructor/Course Teaching Assistant:

- Program in Applied and Computational Mathematics/Ecology and Evolutionary Biology/Molecular Biology 514, Biological Dynamics, Fall 2002, Princeton University.
- Program in Applied and Computational Mathematics 591, Special Topics in Biological Dynamics, Fall 2001, Princeton University.

Substitute/Guest Lectures:

- Geography 288, Complexity and Emergence, Winter 2005, University of California, Santa Barbara.
- Program in Applied and Computational Mathematics 571, Applied Dynamical Systems, Fall 2000, Fall 2002, Princeton University.
- Physics 205B, Advanced Dynamics, Spring 2000, University of California, Berkeley.

Graduate Student Instructor (at University of California, Berkeley):

- Physics 7A, Physics for Scientists and Engineers I, Spring 1994, Spring 1995, Summer 1995.
- Physics 7B, Physics for Scientists and Engineers II, Fall 1994.
- Physics 7C, Physics for Scientists and Engineers III, Fall 1993, Fall 1995.
- Physics 8A, Introductory Physics I, Summer 1994.
- Physics 105, Analytic Mechanics, Spring 1996.
- Physics 137A, Quantum Mechanics I, Fall 1996, Summer 1997.

Outstanding Graduate Student Instructor Award, University of California, Berkeley, 1994-1995

Professional Activities

- Program Director, Society for Industrial and Applied Mathematics Activity Group on Dynamical Systems, January 1, 2008 - December 31, 2009.
- Co-chair of Organizing Committee, SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2009.
- Co-organizer of Minisymposium on “Connecting Modeling with Experiments in Neuroscience,” SIAM Conference on Life Sciences, Montreal, Canada, August 4-7, 2008.
- Panelist, Forward Looking Panel Discussion, SIAM Conference on Applications of Dynamical Systems, 2007.
- Co-organizer of Minisymposium on “Mathematics of Parkinson’s Disease,” SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 28-June 1, 2007.
- Co-organizer of Minisymposium on “Individual and Collective Motion in Biology,” SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 28-June 1, 2007.
- Co-organizer of “International Workshop on Applied Dynamical Systems - Mechanics, Turbulence, Knots, Cockroaches, and Chaos: A Nonlinear and Poetic Path,” in honor of Philip Holmes’ 60th birthday, Centre de Recherches Mathématiques, Montreal, Canada, October 15-16, 2005.
- Co-organizer of Minisymposium on “Dynamics of MEMS,” SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 22-26, 2005.

- Scientific Committee, International Workshop on Hysteresis and Multi-Scale Asymptotics, University College Cork, Ireland, March 17-21, 2004.
- Co-organizer of Minisymposium on “Canards: Theory and Applications,” Seventh SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 27-31, 2003.
- Co-organizer of Minisymposium on “Reduced-Order Dynamics of Fluids and Flames,” Seventh SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 27-31, 2003.
- Organizer of Minisymposium on “Mechanisms for Intermittency and Bursting,” Sixth SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 20-24, 2001.
- Co-organizer of Dynamical Systems / Nonlinear Science Seminar, Program in Applied and Computational Mathematics, Princeton University, Fall 2000-Spring 2001.
- Staff member at Summer Program in Geophysical Fluid Dynamics at the Woods Hole Oceanographic Institution: The General Circulation of the Atmosphere, Woods Hole, Massachusetts, June 19 - August 25, 2000
- Member of Editorial Committee, *Discrete and Continuous Dynamical Systems - Series S*, 2007 - present
- Referee for
 - *AIAA Journal*
 - *American Control Conference proceedings*
 - *Applied Mathematics Letters*
 - *Applied Numerical Mathematics*
 - *ASME conference proceedings*
 - *Automatica*
 - *Biological Cybernetics*
 - *Canadian Journal of Physics*
 - *Chaos*
 - *Communications in Mathematical Sciences*
 - *Discrete and Continuous Dynamical Systems, Series B*
 - *Electronic Journal of Differential Equations*
 - *Fluid Dynamics Research*
 - *IEEE conference proceedings*
 - *International Conference on Hybrid Systems proceedings*
 - *International Journal of Non-Linear Mechanics*
 - *International Journal of Robust and Nonlinear Control*

- *Journal of Computational Neuroscience*
- *Journal of Fluid Mechanics*
- *Journal of Mathematical Analysis and Applications*
- *Journal of Micromechanics and Microengineering*
- *Journal of Nonlinear Science*
- *Journal of Physics A: Mathematical and General*
- *Journal of the Atmospheric Sciences*
- *Journal of Theoretical Biology*
- *Neural Computation*
- *Physica D*
- *Physical Review E*
- *Physical Review Letters*
- *Physics of Fluids*
- *Physics Letters A*
- *Proceedings of the National Academy of Sciences U.S.A.*
- *Proceedings of the Royal Society of London A*
- Scholarpedia (<http://www.scholarpedia.org>)
- *Science*
- *SIAM Journal on Applied Dynamical Systems*
- *SIAM Journal on Numerical Analysis*
- *Theoretical and Computational Fluid Dynamics*
- Guest Editor for *Journal of Nonlinear Science*
- Proposal Review for
 - National Science Foundation Ecosystem Science Cluster Division
 - National Science Foundation Division of Mathematical Sciences
 - National Science Foundation Division of Civil, Mechanical and Manufacturing Innovation
- Panel member for National Science Foundation Civil and Mechanical Systems Division, 2005, 2006
- Panel member for National Science Foundation Division of Civil, Mechanical and Manufacturing Innovation, 2008, 2009
- Book reviewer for McGraw-Hill, Cambridge University Press
- Member of American Physical Society, Society for Industrial and Applied Mathematics, American Society of Mechanical Engineers

University Service

- Co-Vice Chair of Mechanical Engineering, Fall 2008-present.
- Organizer of Department of Mechanical Engineering Departmental Colloquium, Spring 2008.
- Organizer of Center for Control, Dynamical Systems, and Computation Seminar Series, Spring 2007, Winter 2009.
- Member Graduate Admissions Committee, 2003-2008.
- Member Chancellor's Advisory Committee on Faculty and Staff Housing, 2005-present
- Coordinator for Programs in Dynamical Systems, Center for Control, Dynamical Systems, and Computation, 2005-present
- Organizer of Department of Mechanical Engineering 2005 Convocation.

Presentations

Talks † = invited

- “Exploiting nonlinearity to provide broadband energy harvesting,” 2009 ASME Dynamic Systems and Control Conference, October 12-14, 2009.
- † “Controlling neurons,” Seminar, École supérieure d'électricité, Paris, France, July 20, 2009.
- † “Coarse-grained analysis of collective motion,” Seminar, PMMH-ESPCI, Paris, France, July 17, 2009.
- † “Controlling neurons,” Workshop on Modeling, Estimation, and Control in Neuroscience at the 47th IEEE Conference on Decision and Control, Cancun, Mexico, December 8, 2008.
- “On the dynamics of coupled parametrically forced oscillators,” 2008 ASME Dynamic Systems and Control Conference, October 20-22, 2008.
- † “Coarse-grained analysis of collective motion,” Applied Mathematics Seminar, University of Michigan, October 3, 2008.
- † “Controlling neurons,” Department of Mechanical Engineering Colloquium, University of Michigan, October 3, 2008.
- † “Numerical computation of isochrons,” SIAM Annual Meeting, San Diego, California, July 7-11, 2008.
- † “Coarse-grained analysis of collective motion,” New York Academy of Sciences Bioactive Systems Symposium, Polytechnic University, New York City, June 12, 2008.
- † “Reduced order models for airflows in buildings,” Engineering Insights 2008, University of California, Santa Barbara, February 28-29, 2008.
- † “Coarse-grained analysis of collective motion,” Department of Mathematics Seminar, University of Surrey, England, November 30, 2007.
- † “Coarse-grained analysis of collective motion,” Computer Science Departmental Seminar, University of Bristol, England, November 15, 2007.

- † “Controlling neurons,” Theoretical Mechanics Seminar, University of Nottingham, England, November 14, 2007.
- † “Coarse-grained analysis of collective motion,” Bath Institute of Complex Systems Seminar, University of Bath, England, November 5, 2007.
- † “Coarse-grained analysis of collective motion,” Bristol Centre for Applied Nonlinear Mathematics Seminar, University of Bristol, England, November 2, 2007.
- † “Controlling neurons,” Applied Mathematics Seminar, University of Exeter, England, October 8, 2007.
- † “Coarse-grained analysis of stochasticity-induced switching between collective motion states,” BIOCAMP 2007, Vietri sul Mare, Italy, September 24-28, 2007.
- † “Controlling neurons,” Annual Meeting of the Theoretical Neuroscience Network, Bristol, England, September 10-14, 2007.
- “Equilibrium configurations for a territorial model,” SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 28-June 1, 2007.
- † “On the dynamics of coupled, non-autonomous oscillators,” Workshop on Coupled Nonlinear Oscillators and Applications in Nanosystems, Santa Barbara, California, May 25-27, 2007.
- “On the Response of Neurons to Sinusoidal Current Stimuli: Phase Response Curves and Phase-Locking,” 45th IEEE Conference on Decision and Control, San Diego, California, December 13-15, 2006.
- † “To stick or to swim? Well, well... An equation-free characterization of stick-slip dynamics for a model for schooling fish,” Center for Applied Mathematics Seminar, University of Southern California, March 20, 2006.
- “Key elements of individual behaviors causing diverse group and population-level dynamics in schooling,” joint talk with Daniel Grünbaum, Workshop on Swarming by Nature and by Design, Institute of Pure and Applied Mathematics, University of California at Los Angeles, February 27, 2006.
- † “Optimal Inputs for Phase Models of Spiking Neurons,” CIMMS Lunchtime Series Seminar, California Institute of Technology, February 15, 2006.
- † “Optimal Inputs for Phase Models of Spiking Neurons,” Applied Mathematics Colloquium, University of Arizona, February 10, 2006.
- † “Optimal Inputs for Phase Models of Spiking Neurons,” Applied Mathematics Colloquium, University of California at Los Angeles, January 11, 2006.
- “Transient Growth for a Shear Flow Model,” American Physical Society’s 58th Annual Meeting of the Division of Fluid Dynamics, Chicago, Illinois, November 20-22, 2005.

- † “A One-Dimensional Model for Fish Schooling,” Workshop on Swarming in Natural and Engineered Systems, Napa Valley, California, August 3-4, 2005.
- † “Periodic Orbits and Chaotic Sets in a Model for Turbulent Shear Flows,” SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 22-26, 2005.
- † “Canards for a Reduction of the Hodgkin-Huxley Equations,” SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 22-26, 2005.
- † “Response Dynamics of Neural Oscillator Populations,” American Mathematical Society Special Session on “Dynamical Systems in Neuroscience,” Santa Barbara, California, April 15-16, 2005.
- † “Low-Dimensional Models for Shear Flow Turbulence,” Mechanical and Industrial Engineering Seminar, University of Illinois at Urbana-Champaign, March 31, 2005.
- † “Response Dynamics of Neural Oscillator Populations,” Applied Mathematics Seminar, University of Michigan, February 2, 2005.
- “Low-dimensional Models for Shear Flow Turbulence,” Applied Mathematics Seminar, University of California, Santa Barbara, January 21, 2005.
- “A Low-dimensional Model for Turbulent Shear Flows” American Physical Society’s 57th Annual Meeting of the Division of Fluid Dynamics, Seattle, Washington, November 21-23, 2004.
- † “Response Dynamics of Neural Oscillator Populations,” Applied Mathematics Seminar, University of Washington, November 19, 2004.
- † “The Response Dynamics of Neural Oscillator Populations,” Kavli Institute for Theoretical Physics Seminar, Santa Barbara, California, September 29, 2004.
- † “Canards: Examples from Chemistry and Biology,” American Institute of Mathematical Sciences 5th International Conference on Dynamical Systems and Differential Equations, Pomona, California, June 16-19, 2004.
- † “Canards: Examples from Chemistry and Biology,” International Workshop on Hysteresis and Multi-Scale Asymptotics, University College Cork, Ireland, March 17-21, 2004.
- † “Low-dimensional Models for Shear Flow Turbulence,” Fluid Mechanics Seminar, University of California, San Diego, February 17, 2004.
- † “The Response Dynamics of Neural Oscillator Populations,” Chalk Talk Series, Sloan-Swartz Center for Theoretical Neurobiology, Salk Institute, San Diego, February 13, 2004.
- † “The Response Dynamics of Neural Oscillator Populations,” Center for Control Engineering and Computation Seminar, University of California, Santa Barbara, January 23, 2004.

- †“The Response Dynamics of Neural Oscillator Populations,” Interdisciplinary Seminar in Nonlinear Science, Northwestern University, January 16, 2004.
- †“Modeling and Control of Minimal Flow Unit Turbulence in Plane Couette Flow,” 42nd IEEE Conference on Decision and Control, Maui, Hawaii, December 9-12, 2003.
- “Low-dimensional Models for Turbulent Plane Couette Flow in the Minimal Flow Unit Constructed from Uncoupled Empirical Modes,” American Physical Society’s 56th Annual Meeting of the Division of Fluid Dynamics, Meadowlands, New Jersey, November 23-25, 2003.
- “A New Type of Heteroclinic Cycle Arising in a Model for Turbulent Plane Couette Flow,” American Physical Society’s 56th Annual Meeting of the Division of Fluid Dynamics, Meadowlands, New Jersey, November 23-25, 2003.
- †“A Low Dimensional Model for Shear Flows,” Dynamical Systems / Nonlinear Science Seminar, Princeton University, November 21, 2003.
- †“The Response Dynamics of Neural Oscillator Populations,” Workshop on Patterns in Physics, The Fields Institute, Toronto, Canada, November 14-18, 2003.
- “A Low Dimensional Model for Shear Flows,” Seminar der AG Komplexe Systeme, Fachbereich Physik der Philipps-Universität Marburg, Marburg, Germany, August 20, 2003.
- †“Response Dynamics and Phase Oscillators in the Brainstem,” Seminar der AG Komplexe Systeme, Fachbereich Physik der Philipps-Universität Marburg, Marburg, Germany, July 15, 2003.
- “Minimal Plane Couette Flow Turbulence: Low-Dimensional Models,” 13th International Couette Taylor Workshop, Barcelona, Spain, July 3-5, 2003.
- †“Symmetry and Synchrony for Globally Coupled Oscillator Networks: A Tutorial,” Workshop on Symmetry and Bifurcation in Biology, Banff, Canada, May 31 - June 5, 2003.
- “Canards in a Surface Oxidation Reaction,” Seventh SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 27-31, 2003.
- †“Response of Neurons in the Brain Region Locus Coeruleus to Stimuli,” Mathematics Colloquium, Lehigh University, February 12, 2003.
- †“Response of Neurons in the Brain Region Locus Coeruleus to Stimuli,” Colloquia Series in Applied Mathematics, The College of William and Mary, February 10, 2003.
- †“Response of Neurons in the Brain Region Locus Coeruleus to Stimuli,” Special Mathematics Seminar, North Carolina State University, January 27, 2003.
- †“Response of Neurons in the Brain Region Locus Coeruleus to Stimuli,” Mathematics Colloquium, Drexel University, January 22, 2003.

- †“Response of Neurons in the Brain Region Locus Coeruleus to Stimuli,” Mathematics Colloquium, Rensselaer Polytechnic Institute, January 15, 2003.
- “Models for Turbulent Plane Couette Flow Using the Proper Orthogonal Decomposition: Moderate Aspect Ratio,” American Physical Society’s 55th Annual Meeting of the Division of Fluid Dynamics, Dallas, Texas, November 24-26, 2002.
- †“Low Dimensional Models of Turbulent Plane Couette Flow Using the Proper Orthogonal Decomposition,” Department of Mechanical and Environmental Engineering Seminar Series, University of California, Santa Barbara, October 28, 2002.
- †“Low Dimensional Models of Turbulent Plane Couette Flow Using the Proper Orthogonal Decomposition” Applied and Interdisciplinary Mathematics Seminar, University of Michigan, October 4, 2002.
- †“Response of Neurons in the Brain Region Locus Coeruleus to Stimuli,” Applied and Interdisciplinary Mathematics Seminar, University of Michigan, October 3, 2002.
- “Response of Neurons in the Brain Region Locus Coeruleus to Stimuli,” Dynamical Systems / Nonlinear Science Seminar, Princeton University, September 20, 2002.
- †“Phase Models for Coupled Neurons, with Application to the Brain Region Locus Coeruleus,” Applied Mathematics and Statistics Seminar, University of California, Santa Cruz, March 5, 2002.
- “Models for Turbulent Plane Couette Flow Using the Proper Orthogonal Decomposition,” American Physical Society’s 54th Annual Meeting of the Division of Fluid Dynamics, San Diego, California, November 18-20, 2001.
- “Canards (French Ducks): Examples from Chemistry and Biology,” Dynamical Systems / Nonlinear Science Seminar, Princeton University, October 26, 2001.
- “A Model for Turbulent Plane Couette Flow using the Proper Orthogonal Decomposition,” 12th International Couette-Taylor Workshop, Evanston, Illinois, September 6-8, 2001.
- “Bursts: Excursions To (and Back From) Infinity,” Sixth SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 20-24, 2001.
- “Wrinkled Tori, Bursts, and Supergluing Bifurcations Due to Resonant Temporal Forcing,” Sixth SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 20-24, 2001.
- “Bifurcations With Symmetry: An Overview,” Dynamical Systems / Nonlinear Science Seminar, Princeton University, March 5, 2001.

- “Radiation of Mixed Layer Near-Inertial Oscillations into the Ocean Interior,” American Physical Society’s 53rd Annual Meeting of the Division of Fluid Dynamics, Washington D.C., November 19-21, 2000.
- “Bursts: Excursions To (And Back From) Infinity,” Dynamical Systems / Nonlinear Science Seminar, Princeton University, October 16, 2000.
- “Bursts in Binary Fluid Convection,” 2000 Summer Study Program in Geophysical Fluid Dynamics, Woods Hole, Massachusetts, June 19-August 25, 2000.
- “Wrinkled Tori and Bursts due to Resonant Temporal Forcing,” Special Seminar, Program in Applied and Computational Mathematics, Princeton, New Jersey, April 18, 2000
- “Global Bifurcations of Parametrically Excited Surface Waves in a Square Container,” American Physical Society’s 52nd Annual Meeting of the Division of Fluid Dynamics, New Orleans, Louisiana, November 21-23, 1999.
- “Effect of a Simple Storm on a Simple Ocean,” 1999 Summer Study Program in Geophysical Fluid Dynamics, Woods Hole, Massachusetts, June 21-August 27, 1999.
- “Bursts in Oscillatory Systems with Broken D_4 Symmetry,” Fifth SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 23-27, 1999.
- “Chaotic Direction-Reversing Waves in Triple Convection,” American Physical Society’s 51st Annual Meeting of the Division of Fluid Dynamics, Philadelphia, Pennsylvania, November 22-24, 1998.
- “A New Mechanism for Bursting,” American Physical Society’s 50th Annual Meeting of the Division of Fluid Dynamics, San Francisco, California, November 23-25, 1997.
- “A Dynamical Systems Approach to Neural Networks,” Kamp Chaos 1995, Lake Arrowhead, California, May 19-21, 1995.

Posters

- “Controlling neurons,” National Academy of Sciences 20th Annual Kavli Frontiers of Science Symposium, November 6-8, 2008.
- “Equilibrium configurations for a territorial model,” SIAM Conference on Life Sciences, Montreal, Canada, August 4-7, 2008.
- “Neural Oscillator Identification via Phase-Locking Behavior,” International Workshop on Applied Dynamical Systems: Mechanics, Turbulence, Knots, Cockroaches, and Chaos, Montreal, Canada, October 15-16, 2005.
- “Models for Turbulent Plane Couette Flow using the Proper Orthogonal Decomposition,” Dynamics Days 2002, Baltimore, Maryland, January 4-7, 2002.

- “Chaotic Direction-Reversing Waves,” Michigan Interdisciplinary Mathematics Meeting III, Fluid Dynamics: Theory, Computation & Application, Ann Arbor, Michigan, September 22-24, 2000.
- “Chaotic Direction-Reversing Waves,” 15th Annual University of California Conference on Nonlinear Science, Yountville, California, April 16-18, 1999.
- “Bursts in Oscillatory Systems with Broken D_4 Symmetry,” Dynamics Days 1999, Atlanta, Georgia, January 6-9, 1999.
- “Bursts,” 14th Annual University of California Conference on Nonlinear Science, Los Alamos, New Mexico, February 20-21, 1998.
- “The Eckhaus-Benjamin-Feir Instability in Systems with Temporal Modulation,” 13th Annual University of California Conference on Nonlinear Science, San Diego, California, February 22-23, 1997.