

**CURRICULUM VITAE**  
**Todd W. Troyer**

**PERSONAL INFORMATION**

**Employment**

2007-present: Assistant Professor  
Biology Department  
University of Texas at San Antonio  
One UTSA circle  
San Antonio, Texas 78249  
E-mail: todd.troyer@utsa.edu

2000-2007: Assistant Professor  
Department of Psychology  
Program in Neuroscience and Cognitive Science  
Applied Math and Scientific Computing Program  
University of Maryland, College Park

**Education**

Postdoctoral fellow: W.M. Keck Center for Integrative Neuroscience, University of California San Francisco, 1995-2000. Professor Allison J. Doupe, principal investigator.

Postdoctoral fellow: W.M. Keck Center for Integrative Neuroscience, University of California San Francisco, 1993-1995. Kenneth D. Miller, principal investigator.

Ph.D. in Mathematics: University of California Berkeley, 1985-1993.  
Morris W. Hirsch, dissertation supervisor.

B.A. in Math and Physics (*magna cum laude*): Washington University in St. Louis, 1981-1985.

**Scientific Summer Courses**

Neural Systems and Behavior, Marine Biological Lab, Woods Hole MA, Summer 1995.

Complex Systems Summer School, Santa Fe Institute, Santa Fe NM, Summer 1991.

## **SCHOLARLY ACTIVITIES**

### **Research Articles**

Christopher M. Glaze and Todd W. Troyer. Behavioral Measurements of a Temporally Precise Motor Code for Birdsong. *Journal of Neuroscience*, 27(29): 7631-7639, 2007

Todd W. Troyer. Factors Affecting Phase Synchrony in Integrate-and-Fire Oscillators. *Journal of Computational Neuroscience*. 20(10): 191-200, 2006.

Ping Du and Todd W. Troyer. A Segmentation Algorithm for Zebra Finch Song at the Note Level. *Neurocomputing*, 69(10-12): 1375-1379, 2006.

Joanna R. Pressley and Todd W. Troyer. Temporal Processing in the Exponential Integrate-and-Fire Model is Nonlinear. *Neurocomputing*, 69(10-12): 1076-1080, 2006.

David. L. Boothe, Avis H. Cohen, and Todd W. Troyer. Temporal Correlations in Stochastic Models of Double Bursting During Locomotion. *Journal of Neurophysiology*. 95(3):1556-70, 2006.

Christopher M. Glaze and Todd W. Troyer. Temporal Structure in Zebra Finch Song: Implications for Motor Coding. *Journal of Neuroscience*, 26(3):991-1005, 2006.

Todd W. Troyer, Anton E. Krukowski, and Kenneth D. Miller. LGN input to simple cells and contrast-invariant orientation tuning: An analysis. *Journal of Neurophysiology*, 87(6):2741-2752, 2002.

Kenneth D. Miller and Todd W. Troyer. Neural noise can explain expansive, power-law nonlinearities in neural response functions. *Journal of Neurophysiology*, 87(2):653-659, 2002.

Todd W. Troyer and Sarah W. Bottjer. Birdsong: Models and mechanisms. *Current Opinion in Neurobiology*, 11(6):721-6, 2001.

Anton E. Krukowski, Todd W. Troyer, and Kenneth D. Miller. A model of visual cortical temporal frequency tuning. *Neurocomputing*, 38:1379-1383, 2001.

Todd W. Troyer and Allison J. Doupe. An associational model of birdsong sensorimotor learning. I. Efference copy and the learning of song syllables. *Journal of Neurophysiology*, 84(3):1204-1223, 2000.

Todd W. Troyer and Allison J. Doupe. An Associational Model of Birdsong Sensorimotor Learning. II. Temporal hierarchies and the learning of song sequence. *Journal of Neurophysiology*, 84(3):1224-1239, 2000.

Todd W. Troyer, Anton E. Krukowski, Nicholas J. Priebe, and Kenneth D. Miller. Contrast-invariant orientation tuning in visual cortex: feedforward tuning and correlation-based intracortical connectivity. *Journal of Neuroscience*, 18(15): 5908-5927, 1998.

### **Research Articles** (continued)

Todd W. Troyer and Kenneth D. Miller. Physiological gain leads to high ISI variability in a simple model of a cortical regular spiking cell. *Neural Computation*, 9(5):971-983, 1997.

Reprinted in L.F. Abbott and T.J. Sejnowski, editors, *Neural Codes and Distributed Representations: Foundations of Neural Computation*. MIT Press, pp.187-199, 1999.

Todd W. Troyer. Feedforward Hebbian learning with nonlinear output units: a Lyapunov approach. *Neural Networks*, 9(2):321-328, 1996.

Todd W. Troyer, Jacob E. Levin, and Gwen A. Jacobs. Construction and analysis of a database representing a neural map. *Microscopy Research and Technique*, 29:329-343, 1994.

### **Book Chapters**

Bill Baird, Todd W. Troyer, and Frank Eeckman. Attentional network streams of synchronized 40 Hz activity in a cortical architecture of coupled oscillating associative memories. In D. Levine, V. Brown, and T. Shirley, editors, *Oscillations in Neural Systems*. Laurence Erlbaum, 2000.

### **Other Articles**

Todd W. Troyer. A Mathematician's Road to Neuroethology. *International Society for Neuroethology Newsletter*, Nov 2003.

Todd W. Troyer. Computational Neuroscience: Trends in Research 2006, *Neurocomputing*, 69(10-12): 999-1000, 2006.

### **Conference Abstracts** (refereed)

Joanna R. Pressley and Todd W. Troyer. Resonant responses to variance modulation in stochastic integrate-and-fire neurons. Computational Neuroscience Meeting, Toronto Ontario CA, July 18-22, 2007.

Joanna R. Pressley and Todd W. Troyer. The PDF of the LIF Moves in a Low Dimensional Space. Computational Neuroscience Meeting, Edinburgh UK, July 18-22, 2006.

Christopher M. Glaze and Todd W. Troyer. Elasticity and Temporal Grouping in a Synfire Chain Model of Zebra Finch Song. Computational Neuroscience Meeting, Edinburgh UK, July 18-22, 2006.

Joanna R. Pressley and Todd W. Troyer. A-Currents Reduce Spike Synchrony Driven by Input Transients. Computational Neuroscience Meeting, Baltimore MD, July 18-22, 2004.

Todd W. Troyer. Rate Dynamics in Integrate-and-Fire Neurons: Two Regimes and Multiple Time Scales. Computational Neuroscience Meeting, Pacific Grove CA, July 1-6, 2001.

### **Conference Presentations** (unrefereed)

Christopher M. Glaze and Todd W. Troyer. Development of Timing in Zebra Finch Song. Society for Neuroscience Meeting, San Diego, CA. Nov 3-7, 2007.

**Conference Presentations** (unrefereed continued)

Christopher M. Glaze and Todd W. Troyer. Fine Temporal Structure in Zebra Finch Song: Evidence for Multiple Timescales. Society for Neuroscience Meeting, Atlanta GA. Oct 14-18, 2006.

David L. Boothe, David A. McCrea, Avis H. Cohen , and Todd W. Troyer. Burst Correlation Structure within the Locomotor Cycle of the Fictive Cat. Society for Neuroscience Meeting, Atlanta GA. Oct 14-18, 2006.

Beth A. Goldman and Todd.W. Troyer. A Fine-grained Analysis of Zebra Finch Song After Lesions in the LMAN Mid-way Through Sensorimotor Learning. Society for Neuroscience Meeting, Washington DC. Nov 12-16, 2005.

Christopher M. Glaze and Todd W. Troyer. Global and Local Temporal Structure in Zebra Finch Song. Society for Neuroscience Meeting, Washington DC. Nov 12-16, 2005.

Joanna R. Pressley and Todd W. Troyer. Temporal Processing in the Exponential Integrate-and-Fire Model is Nonlinear. Society for Neuroscience Meeting, Washington DC. Nov 12-16, 2005.

Ping Du and Todd W. Troyer. An Automated Segmentation Algorithm for Zebra Finch Song at the Note Level. Society for Neuroscience Meeting, Washington DC. Nov 12-16, 2005.

David L. Boothe, Todd W. Troyer and Avis H. Cohen. Temporally Distant Correlations in a Stochastic Model of the Spinal Central Pattern Generator. Society for Neuroscience Meeting, Washington DC. Nov 12-16, 2005.

Christopher M. Glaze and Todd W. Troyer. Control of Global Timing in Zebra Finch Song. Society for Neuroscience Meeting, San Diego CA. Oct 23-27, 2004.

Todd W. Troyer. Rate Dynamics in Integrate-and-Fire Neurons: Two Regimes and Multiple Time Scales. International Joint Conference on Neural Networks, Washington DC. July 14-19, 2001.

Todd W. Troyer. Rate Dynamics in Integrate-and-Fire Neurons: Two Regimes and Multiple Time Scales. . Neural Information and Coding Workshop, Big Sky MT. Mar 17-20, 2001.

Todd W. Troyer, Allison J. Doupe and Kenneth D. Miller. An associational model for sensorimotor learning of birdsong. Society for Neuroscience Meeting, Washington DC. Nov 16-21, 1996.

Todd W. Troyer and Kenneth D. Miller. A simple model of cortical excitatory cells linking NMDA-mediated currents, ISI variability, spike repolarization and slow AHPs. Society for Neuroscience Meeting, San Diego CA. Nov 11-16, 1995.

Todd W. Troyer. Topographic map formation in two layer neural networks. In *American Mathematical Society Abstracts*, 1993. [Invited paper in special session]

## **Invited Lectures**

Neuroscience Seminar, University of Texas at San Antonio, “A Behavioral Analysis of the Motor

Code for Birdsong” March 26, 2007.

Conte Center Seminar, University of California at San Francisco, “A Behavioral Analysis of the Motor Code for Birdsong” March 22, 2007.

Physiology Seminar, Georgetown University, Washington, DC. “Behavioral Analysis of the Neural Code for Birdsong” Nov 27, 2006.

Center for Theoretical Neuroscience, Columbia University, NY, NY. “Temporal Variability and the Structure of the Vocal Pattern Generator in Zebra Finches” Feb 24, 2006.

Sigma Xi lecture, Lake Forest College, Lake Forest IL. “The Neurobiology of Birdsong: A Lucrative Business?” Apr 17, 2005.

Psychology colloquium, Rutgers University, Newark NJ. “Multiple Representations of Song During Vocal Learning: Questions and Hypotheses.” Mar 12, 2004.

Psychological Round Table, Villanova University, Villanova PA. “Behavioral Neuroscience Goes Digital: Fine-grained Analysis of Song Learning.” Feb 20-22, 2004.

Bodian Mind-Brain Lecture, Johns Hopkins University, Baltimore MD. “Multiple Representations of Song During Learning: Questions and Hypotheses.” Feb 2, 2004.

Mathematical Biosciences Institute, Ohio State University, Columbus OH. Workshop on Sensory-Motor Systems. “Multiple Representations of Song During Learning: Questions and Hypotheses.” June 9-13, 2003.

Cognitive Neuroscience Symposium, Cornell University, Ithaca NY. “The Functional Anatomy of Song Learning: A Computational Approach.” Jan 14, 2003.

University of Maryland, Baltimore County MD. “The Functional Anatomy of Song Learning: A Computational Approach.” Nov 14, 2002.

National Institutes of Health, Bethesda MD. “The Functional Anatomy of Song Learning: A Computational Approach.” Oct 11, 2002.

Neuroscience lunch, Princeton University, Princeton NJ. “An Associational Model for the Sensorimotor Learning of Birdsong.” Nov 1, 2001.

Washington-Baltimore Computational Neuroscience Interest Group. University of Maryland, Baltimore. “Rates and Spikes: Exploring the Temporal Response Properties of Simple Model Neurons.” Oct 31, 2001.

Biomedical Engineering Department, Johns Hopkins University, Baltimore MD.

“An Associational Model for the Sensorimotor Learning of Birdsong.” Mar 9, 2001.

Biological Information Processing and Systems Workshop, Clemson University, Clemson SC. Sponsored by NSF and DOE. “Information Processing in Cortical Circuits: Temporal Multiplexing and the Search for the Canonical Microcircuit.” Jan 19-20, 2001.

Washington University, St. Louis MO. “An Associational Model of Sensorimotor Learning of Birdsong.” Feb 20, 1998.

American Mathematical Society Annual Meeting, San Antonio TX. Session on Dynamics in Neural Networks. “Topographic map formation in two layer neural networks.” Jan 13-16, 1993.

## **Software**

Todd W. Troyer and Ping Du. SongBrowser.

- Suite of MATLAB programs for view, labeling, and analyzing birdsongs.

### **Contracts and Grants**

NIMH R21, "Fine-Grained Analysis of Vocal Learning," 2002-2005.

(\$100K/year for two years, direct costs.)

Alfred P. Sloan Research Fellow, 2002-2005. (\$40K total.)

### **Fellowships, Prizes and Awards**

2002-2005	Alfred P. Sloan Foundation Research Fellowship
1999-2000	National Research Service Award Postdoctoral Fellowship
1995-1998	McDonnell-Pew Cognitive Neuroscience Postdoctoral Fellowship
1993-1995	National Science Foundation Mathematical Sciences Research Fellowship
1990-1, 1991-2	Dept. of Ed. Graduate Assistance in Areas of National Need Fellowship
1984-1988	Beinecke Memorial Scholarship
1985	Phi Beta Kappa, Washington University

### **Editorships**

Computational Neuroscience: Trends in Research 2006. Special issue of *Neurocomputing*.

Co-editor with Erik De Schutter. Elsevier, 2006.

### **Reviewing Activities** (Last five years)

Nature; Nature Neuroscience; PNAS; Journal of Neuroscience; Neuron; Journal of Neurophysiology; Journal of Computational Neuroscience; Neural Computation; Vision Research; Computational Neuroscience (CNS) meeting;

## **TEACHING, MENTORING AND ADVISING**

### **Courses Taught** (last five years)

NACS 728N/PSYC 798A, Computational Neuroscience, Fall 2000-2003, Spring 2005, 2006.  
- Graduate core course for Neuroscience and Cognitive Science Program, Univ. of Maryland.

PSYC 200, Statistical Methods in Psychology. Spring, 2002,2003,2004, Fall 2005, 2006.

### **Curriculum Development**

Computational Neuroscience, NACS 728N/PSYC 798A. Developed course. Wrote course notes in book form (currently 171 pages), including numerous exercises.

### **Other Contributions**

Computational Neuroscience Research Interaction Team (RIT)

- Led informal weakly graduate reading seminars, integrated with structures in the Applied Math and Scientific Computing program. Stochastic spiking models, Spring 2003; Population density models of spiking, Fall 2003; Sequence learning, Spring 2004.

Applied Math Scientific Computation Program Mini Course, Spring 2003, 2004.

- Series of three lectures; in collaboration with Avis Cohen and Jose Contreras-Vidal.

Guest Lectures

- Howard Hughes Medical Institute Catalyst seminar, Spring 2002-2005.
- NACS 728Y, Introduction to Cognitive Science, Spring 2003, Fall 2004.
- PSYC789A/BIOL646, Hearing, Spring 2002, 2004.
- University Honors program, Feb 2002.

### **Research Advising**

Doctoral: Beth Vernaleo, Christopher Glaze, David Boothe (joint with Avis Cohen),  
Neuroscience and Cognitive Science;

Joanna Pressley, Applied Math and Scientific Computation.

Undergraduate: David Sivakoff, currently, Applied Math Ph..D. student, UC Davis;

Christopher Glaze, currently Neuroscience and Cognitive Science Ph..D. student,

U. Maryland, College Park; Christina Johnson, currently research technician, Walter Reed.

Additional Committees (current/past): Undergrad. honors (0/1); Masters (0/2); Doctoral (7/2).

## **SERVICE**

### **Professional Organizations**

Computational Neuroscience Organization. Organization runs annual international Computational Neuroscience (CNS) Conference.

- Advisory Board, 2006-present; Vice-President, 2002-2006; Program Committee, 2001-2003.

### **Reviewing for National Agencies**

Panel member, Joint NIH and NSF program in Collaborative Research in Computational Neuroscience, spring 2006.

Grant reviews, NSF Applied Mathematics Directorate.

- April 2001 (2), May 2002 (2), May 2004 (2), May 2005 (2).

Panel member, NSF initiative in Learning and Intelligent Systems, Apr 2001.