Mark Goldman

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EDUCATION

2000	**Harvard University**, Cambridge, MA Ph.D., Physics Advisors: Dr. Laurence Abbott (Brandeis University) Dr. Charles Marcus
1989 - 1993	**Stanford University**, Stanford, CA B.S., Physics, with honors and distinction.

RESEARCH/TEACHING EXPERIENCE

Winter 2008 -	**Assistant Professor**, Center for Neuroscience, Section of Neurobiology, Physiology, and Behavior, and Department of Opthalmology and Visual Sciences, University of California at Davis
Fall 2003 -	**Visiting Research Collaborator**, Lewis-Sigler Institute for Integrative Genomics, Princeton University
2003 - 2007	**Assistant Professor**, Department of Physics and Program in Neuroscience, Wellesley College
Spring 2007	**Visiting Scholar**, Department of Neurobiology, Stanford University
Fall 2006	**Visiting Fellow,** Lewis-Sigler Institute for Integrative Genomics, Princeton University
2000 - 2003	**Postdoctoral Research Fellow**, Massachusetts Institute of Technology and Howard Hughes Medical Institute. Supervisor: Dr. Sebastian Seung
1994 - 2000	**Graduate Research and Teaching Fellow**, Harvard University and Brandeis University

HONORS AND AWARDS

- Certificate of Distinction in Teaching, Harvard University, 1998
- Phi Beta Kappa, election in junior year, Stanford University, 1992
- David S. Levine Award, Stanford University, 1992
  Prize given after junior year to outstanding student in physics.

OTHER INFORMATION

- Board of Directors, Computational Neuroscience Organization, 2003-present.
- Advisory Panel, NSF Computational Neuroscience Program, 2004 and 2006.
- Advised undergraduate and then Master's degree student at MIT, Joseph Levine. Joseph's thesis won the electrical engineering department award for best Master's thesis.
- Society for Neuroscience, Faculty for Undergraduate Neuroscience, and American Physical Society member.

RESEARCH SUPPORT RECEIVED

- Sloan Foundation Research Fellowship, 2007-2009
  Role: Principal Investigator
- NIH R01 MH069726-01A2, 2006-2010
  Project Title: Neural integration with active dendrites and inhibition
  Role: Principal Investigator
- NSF (received but declined due to overlap with NIH grant above)
  Project Title: RUI: Mechanisms underlying the generation of persistent neural activity
  Role: Principal Investigator
- Brachmann-Hoffman Fellowship, Wellesley College, 2005-2007
  Project Title: Biophysical modeling of persistent neural activity in the oculomotor neural integrator brain region
  Role: Principal Investigator
- Research Corporation, Cottrell College Science Award, 2005-2007
  Project Title: Computational modeling of the neural basis of a visual masking illusion
  Role: Principal Investigator

PUBLICATIONS AND PRESENTATIONS

(* indicates an author who contributed to this work as an undergraduate)

Research articles:

- Aksay E, Olasagasti I, Mensh BD, Baker R, Goldman MS [*co-corresponding author*], Tank DW (2007) Functional Dissection of Circuitry in a Neural Integrator, *Nature Neuroscience* 10:494-504.
- Butts DA, Goldman MS (2006) Tuning curves, neuronal variability, and sensory coding, *PLoS Biology* 4:e92.
- Goldman MS (2004) Enhancement of information transmission efficiency with unreliable synapses, *Neural Computation* 16:1137-1162.
- Goldman MS, Levine JH*, Major G, Tank DW, Seung HS (2003) Robust persistent neural activity in a model integrator with multiple hysteretic dendrites per neuron, *Cerebral Cortex* 13:1185-1195.
- Aksay E, Major G, Goldman MS, Baker R, Seung HS, Tank DW (2003) History dependence of rate covariation between neurons during persistent activity in an oculomotor integrator, *Cerebral Cortex* 13:1173-1184.
- Goldman MS, Kaneko CRS, Major G, Aksay E, Tank DW, Seung HS (2002) Linear regression of eye velocity on eye position and head velocity suggests a common oculomotor neural integrator, *Journal of Neurophysiology* 88:659-665.
- Golowasch J, Goldman MS, Abbott LF, Marder E (2002) Failure of averaging in the construction of a conductance-based neuron model, *Journal of Neurophysiology* 87:1129-1131.
- Goldman MS, Maldonado P, Abbott LF (2002) Redundancy reduction and sustained firing with stochastic depressing synapses, *Journal of Neuroscience* 22:584-591.
- Goldman MS, Golowasch J, Marder E, Abbott LF (2001) Global structure, robustness, and modulation of neuronal models, *Journal of Neuroscience* 21:5229-5238.
- Goldman MS (2000) Computational implications of activity-dependent neuronal processes, Harvard Univ. Ph.D. thesis.

- Goldman MS, Golowasch J, Marder E, Abbott LF (2000) Dependence of firing pattern on intrinsic ionic conductances: sensitive and insensitive combinations, *Neurocomputing* 32-33:141-146.
- Goldman MS, Nelson SB, Abbott LF (1999) Decorrelation of spike trains by synaptic depression, *Neurocomputing* 26-27:147-153.

Review articles:
- Goldman MS, Compte A, Wang XJ (in press) Theoretical and computational neuroscience: Neural integrators: recurrent mechanisms and models, in Squire et al. (eds.) *New Encyclopedia of Neuroscience.*

Abstracts:
- Goldman MS (2007) Integration without feedback in a neural network, *Soc. Neurosci. Abs.* 637.10.
- Goldman MS, Olasagasti I, Aksay E, Major G, Tank DW (2006) A model of persistent neural activity in the oculomotor neural integrator with realistic tuning curves and bistable excitatory inputs, *Soc. Neurosci. Abs.* 345.8.
- Olasagasti I, Aksay E, Major G, Tank DW, Goldman MS (2005) Persistent neural activity in a bilateral neural integrator model with threshold nonlinearities, *Soc. Neurosci. Abs.* 744.20.
- Goldman MS, Olasagasti I, Hafer VK*, Martinez-Conde S, Macknik SL (2004) Strength and timing of inhibition underlies a visual masking illusion *Soc. Neurosci. Abs.* 717.1.
- Goldman MS, Butts DA (2003) The best encoded stimuli in a sensory neuron's tuning curve are determined by the amount of neuronal variability, *Soc. Neurosci. Abs.* 485.22.
- Goldman MS, Levine JH*, Major G, Aksay E, Tank DW, Seung HS (2002) Dendritic bistability increases the robustness of persistent neural activity in a model oculomotor neural integrator, *Soc. Neurosci. Abs.* 266.14.
- Goldman MS, Kaneko CRS, Tank DW, Major G, Baker RG, Seung HS (2001) Do the VOR and saccades share a common neural integrator?, *Soc. Neurosci. Abs.* 405.16.
- Goldman MS, Golowasch J, Marder E, Abbott LF (2000) Inadequacy of averaged or uncorrelated measurements in the construction of conductance-based neuronal models, *Soc. Neurosci. Abs.* 26:1999.
- Goldman MS, Golowasch J, Abbott LF, Marder E (1999) Sensitivity of intrinsic firing on conductance densities, *Soc. Neurosci. Abs.* 25:1645.
- Goldman MS, Abbott LF (1999) Synapses as stochastic filters, *Bull. Am. Phys. Soc.* 44:1493.
- Goldman MS, Sugino K, Nelson SB, Abbott LF (1998) Decorrelation of spike trains by synaptic depression, *Soc. Neurosci. Abs.* 24:2095.

Recent Refereed Conference Presentations (2003-present):
- Goldman MS, Integration as sequence processing in a feedforward neural integrator, poster given at Computational Neuroscience Meeting, Toronto, Canada, 2007.
- Goldman MS, A feedforward model of a neural integrator, poster given at Computational and Systems Neuroscience Meeting, Salt Lake City, UT, 2007.
- Olasagasti I, Goldman MS, A methodology for tuning nonlinear network models of parametric memory, poster given at Computational Neuroscience Meeting, Edinburgh, Scotland, 2006.
- Olasagasti I, Aksay E, Major G, Tank DW, Goldman MS, Implications of threshold nonlinearities on mechanisms underlying persistent neural activity in a bilateral neural integrator, poster given at Computational and Systems Neuroscience Meeting, Salt Lake City, UT, 2006.

- Olasagasti I, Aksay E, Major G, Tank DW, Goldman MS, Persistent neural activity in a bilateral neural integrator model, talk given at Computational Neuroscience Meeting, Madison, WI, 2005.
- Olasagasti I, Aksay E, Major G, Tank DW, Goldman MS, Persistent neural activity in a bilateral neural integrator model, poster given at Computational and Systems Neuroscience Meeting, Salt Lake City, UT, 2005.
- Goldman MS, Olasagasti I, Hafer V, Martinez-Conde S, Macknik SL, Strength and timing of inhibition can explain a visual masking illusion, poster given at Computational and Systems Neuroscience Meeting, Cold Spring Harbor, NY, 2004.
- Butts DA, Goldman MS, Which are the best-encoded stimuli in a sensory neuron's tuning curve?, talk given at Computation and Neural Systems Meeting, Alicante, Spain, 2003.
- Goldman MS, Dendritic bistability increases the robustness of persistent neural activity in a model oculomotor neural integrator, poster given at Workshop on Neural Information and Coding, Snowbird, Utah, 2003.

Recent Invited Talks (2003-present):

- Dissecting the mechanisms underlying memory-related neural activity, talk given at Brandeis University, 2007.
- Persistent activity in the oculomotor system: a model for short-term memory, talk given at Cold Spring Harbor Laboratories, 2007.
- Linear networks and how neurons do integrals, and Robustness in neural networks, lectures given at Biophysics Summer School, University of Colorado, Boulder, CO, 2007.
- Persistent neural activity: experiment and theory, lecture given at Methods in Computational Neuroscience Course, Marine Biological Laboratory, Woods Hole, MA, 2007.
- Persistent activity in the oculomotor system: a model for short-term memory, talk given at UC Davis, 2007.
- The oculomotor integrator as a model for short-term memory: a computational investigation, talk given at Neurological Sciences Institute, Oregon Health & Science University, 2007.
- Persistent activity in the oculomotor system: a model for short-term memory, talk given at Stanford University, 2007.
- Dissecting the mechanisms underlying persistent activity in a neural integrator, talk given at Washington University in St. Louis, 2007.
- Dissecting the mechanisms underlying persistent activity in a neural integrator, talk given at Columbia University, 2006.
- Dissecting the mechanisms underlying persistent activity in a neural integrator, talk given at Neural Information Processing Systems (NIPS) Conference Workshop on Continuous Attractors, 2006.
- Persistent neural activity: theory, lecture given at Methods in Computational Neuroscience Course, Marine Biological Laboratory, Woods Hole, MA, 2006.
- Models of short-term memory -or- How neurons do integrals, talk given at Amherst College, Amherst, MA, 2005.
- Persistent neural activity: experiments and theory, lecture given at Methods in Computational Neuroscience Course, Marine Biological Laboratory, Woods Hole, MA, 2005.
- Persistent neural activity in a bilateral neural integrator model, talk given at Gordon Research Conference on Neural Circuits and Plasticity, Newport, RI, 2005.
- Possible neural mechanisms underlying robust persistent neural activity, talk given at Barrow Neurological Institute, Phoenix, AZ, 2004.
- Dendritic hysteresis increases the robustness of fixations in a model neural integrator, talk given at SIAM Conference, Snowbird, Utah, 2003.