

Curriculum Vitae - Nathaniel N. Urban, Ph.D.

Department of Biological Sciences and Center for the Neural Basis of Cognition
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Education

1998- 2002 Post-doctoral Fellow, Department of Physiology Max-Planck Institute for Medical Research, Heidelberg, Germany
Advisor: Prof. Bert Sakmann (Winner of Nobel Prize in Medicine, 1991)
1993-1998 Ph.D. *Neuroscience*, Univ. of Pittsburgh, Pittsburgh, PA, USA
Advisor: Dr. German Barrionuevo
1991-1993 B.A. *Mathematics and Philosophy*. Oxford University, Oxford, England
1987-1991 B.S. *Neuroscience and Mathematics and Philosophy* Univ. of Pittsburgh, Pittsburgh, PA, USA

Appointments

2007-. Associate Professor in Department of Biological Sciences, Carnegie Mellon University, Pittsburgh, Pennsylvania.
Adjunct Associate Professor, Department of Neuroscience, University of Pittsburgh.
2006- Awarded Eberly Family Faculty Development Chair
2002- 2007. Assistant Professor in Department of Biological Sciences, Carnegie Mellon University, Pittsburgh, Pennsylvania.
Adjunct Assistant Professor, Department of Neuroscience, University of Pittsburgh.
1998- 2002. Post-doctoral fellow in the Department of Cell Physiology at the Max-Planck Institute for Medical Research, Heidelberg, Germany.

Fellowships and awards

2007 Polak Young Investigator Award by Association for Chemoreception Sciences
2006 Eberly Family Faculty Development Chair 2006
2005 Scientific American 50 Leaders in Science and Technology
2005 Institutional Nominee for Howard Hughes Medical Institute Investigator award
2005-2008 Human Frontiers Science Program Young Investigator Award
2001- 2002 NRSA individual post-doctoral fellowship (NIDCD)
1998-2001 Alexander von Humboldt Research Fellowship
Max-Planck Institute for Medical Research, Heidelberg, Germany
1993-1998 Howard Hughes Medical Institute Predoctoral Fellowship
University of Pittsburgh, Pittsburgh, Pennsylvania, USA
1991-1993 Rhodes Scholar - Oxford University, Oxford, England
1991 Bradler Award for Undergraduate Research Univ. of Pittsburgh, Pittsburgh, Pennsylvania,
1987-1991 Chancellor's Scholarship. Univ. of Pittsburgh, Pittsburgh, Pennsylvania, USA

Research Interests

- Neurophysiology - *in vitro* and *in vivo* intracellular and extracellular recording and magneto-encephalography (MEG)
- Computational neuroscience – biologically-inspired algorithms, dynamical systems and spectral analysis of neuronal data
- Olfaction – physiological and anatomical analysis of olfactory system
- Neurobiology of attention and decision making

Publications

Author or co-author of 34 peer reviewed publications from 1991-2007. A sample listed here. A Complete list is available on my website.

Book Chapter

“Dendritic Neurotransmitter Release” in *Dendrites*, Stuart, Spruston and Häusser eds. Oxford University Press 2nd edition.2007.

Journal Articles Published or In Press

- 1) Arevian, A.C. Kapoor, V. and Urban, N.N. (2008) Dynamic Gating of Lateral inhibition in the Olfactory Bulb. In Press. *Nature Neuroscience*. January 2008 issue.
- 2) Ermentrout GB, Galán, R.F, Urban NN. (2007) Relating neural dynamics to neural coding. In Press. *Physical Review Letters*
- 3) Galán, R.F, Ermentrout GB, Urban NN. (2007) Stochastic dynamics of uncoupled neural oscillators: Fokker Planck studies with the finite element method. *Physical Review E*. 76 DOI: 10.1103/PhysRevE.76.056110
- 4) Galán, R.F, Ermentrout GB, Urban NN. (2007) Optimal time scale for spike-time reliability: Theory, simulations and experiments. *J Neurophysiol*. 2007 Oct 10; [Epub ahead of print]
- 5) Bagley, J, LaRocca, G, Jimenez, DA, and Urban, NN. (2007) Adult neurogenesis and specific replacement of interneuron subtypes in the mouse main olfactory bulb. In Press *BMC Neuroscience*
- 6) Castro JB, Hovis KR, Urban NN. (2007) Recurrent dendrodendritic inhibition of accessory olfactory bulb mitral cells requires activation of group I metabotropic glutamate receptors. *J. Neurosci*.
- 7) Roberto F. Galán, G. Bard Ermentrout and Nathaniel N. Urban (2007). Reliability and stochastic synchronization in type I vs. type II neural oscillators. *Neurocomputing*, 70: 2102-2106
- 8) Kapoor V. and Urban N.N., (2006) Glomerulus-specific, long latency activity in the olfactory bulb granule-cell network. *J. Neuroscience*. 26(45):11709-19.
- 9) Egger, V and Urban N.N. (2006) Dynamic lateral inhibition in the mitral cell-granule cell microcircuit. *Seminars in Cell and Developmental Biology* 17(4):424-32.
- 10) Galán,R.F. Ermentrout, G.B. and Urban, N.N. (2006). Reliability, discriminability and noise-induced synchronization of olfactory neurons. *Sensors and Actuators B: Chemical*. 116(1-2), p.168-173.
- 11) Galán, R.F., Ermentrout, G.B. and Urban N.N. (2006). Predicting synchronized neural assemblies from experimentally estimated phase-resetting curves. *Neurocomputing*, 69(10-12), p.1112-1115.
- 12) Galán, R.F., Fourcaud-Trocme, N., Ermentrout, G.B. and Urban N.N. (2006). Correlation-induced synchronization of oscillations in olfactory bulb neurons. *J. Neuroscience*, 26(14):3646-55.
- 13) Fernández Galán, R. Ermentrout, G.B. and Urban, N.N. (2005) Efficient estimation of phase-resetting curves in real neurons and its significance for neural-network modeling. *Phys Rev Lett*. Apr 22;94(15):158101.
- 14) Castro J. and Urban, N.N. (2005) Tuft calcium spikes in accessory olfactory bulb mitral cells. *J Neurosci*. 25(20):5024-8.
- 15) Gonzalez-Burgos G, Krimer L.S., Urban N.N., Barrionuevo G., Lewis D.A. (2004) Synaptic efficacy during repetitive activation of excitatory inputs in primate dorsolateral prefrontal cortex. *Cereb Cortex*. 2004 May;14(5):530-42.
- 16) Schoppa, N.S. and Urban, N. N. (2003) Dendritic processing within olfactory bulb circuits. *Sep;26(9):501-6. Trends in Neurosciences*.
- 17) Urban, N.N. (2002) Lateral inhibition in the olfactory bulb and in olfaction. *Physiol Behav*. Dec;77(4-5):607-12.
- 18) Gonzalez-Burgos G, Kroner S, Krimer L.S., Seamans J.K., Urban N.N., Henze D.A., Lewis D.A., Barrionuevo G. (2002) Dopamine modulation of neuronal function in the monkey prefrontal cortex. *Physiol Behav*. 77(4-5):537-43.

- 19) Urban, N.N. and Sakmann, B. (2002) Reciprocal intraglomerular excitation and intra and interglomerular lateral inhibition between olfactory bulb mitral cells. *J. Physiology.* 542.2: 355-367.
- 20) Urban N.N., Gonzalez-Burgos G., Henze D.A., Lewis D.A., Barrionuevo G. (2002) Selective reduction by dopamine of excitatory synaptic inputs to pyramidal neurons in primate prefrontal cortex. *J Physiol.* 539(Pt 3):707-12.
- 21) Margrie, T.W. Sakmann, B. Urban, N.N. (2001) Action potential propagation in mitral cell lateral dendrites is decremental and controls recurrent and lateral inhibition in the mammalian olfactory bulb. *PNAS*, Vol. 98, Issue 1, 319-324.
- 22) Urban, N.N., Henze, D.A. and Barrionuevo, G. Revisiting the role of the hippocampal mossy fiber synapse. *Hippocampus.* 11(4):408-17.
- 23) Henze, D.A., González-Burgos, G., Urban, N.N., Lewis, D.A., and Barrionuevo, G.. (2000) Dopamine increases excitability of pyramidal neurons in primate prefrontal cortex. *J Neurophysiol.* 84(6):2799-809.
- 24) Thiels, E., Urban, N.N., Gonzales-Burgos, G.R., Kanterewicz, B.I., Barrionuevo, G., Chu, C.T., Oury, T.D. and Klann, E. (2000) Impairment of long-term potentiation and associative memory in mice that overexpress extracellular superoxide dismutase. *Journal of Neuroscience.* 20: 7631-7639.
- 25) Kanterewicz*, B. I., Urban*, N. N., McMahon, D. B. T., Norman, E. D., Giffen, L. J., Favata, M. F., Scherle, P. A., Barrionuevo, G., and Klann, E. (2000) The Extracellular Signal-Regulated Kinase Cascade Is Required for NMDA Receptor-Independent LTP in Area CA1 But Not Area CA3 of the Hippocampus. *J. Neuroscience.* 20: 3057-3066
*indicates that these authors contributed equally to this work
- 26) Henze, D.A. Urban, N.N., and Barrionuevo, G. (2000) The multifarious hippocampal mossy fiber pathway: a review. *Neuroscience.* 98:407-427.
- 27) Urban, N.N., and Barrionuevo, G. (1998) Active summation of excitatory postsynaptic potentials in hippocampal CA3 pyramidal neurons. *PNAS.* 95(19):11450-5.
- 28) Urban, N.N., Henze, D.A., and Barrionuevo, G. (1998) Amplification of perforant-path EPSPs in CA3 pyramidal cells by LVA calcium and sodium channels. *J Neurophysiol.* 80(3):1558-61.
- 29) Berzhanskaya, J. Urban, N.N. and Barrionuevo, G. (1998) Electrophysiological and pharmacological characterization of the direct perforant path input to hippocampal area CA3. *J Neurophysiol.* 79(4):2111-8.
- 30) Henze, D.A., Urban, N.N., and Barrionuevo, G. (1997) Origin of the apparent asynchronous activity of hippocampal mossy fibers. *J Neurophysiol.* 78: 24-30.
- 31) Urban, N.N., Henze, D.A., Lewis, D.A., and Barrionuevo, G. (1996) Properties of LTP induction in area CA3 of the primate hippocampus. *Learning and Memory* 3:86-95.
- 32) Urban N.N., Barrionuevo G. (1996) Induction of Hebbian and non-Hebbian LTP at the hippocampal mossy fiber synapse by distinct patterns of high frequency stimulation. *J Neurosci.* 16(13): 4293-4299.
- 33) Chinestra P., Diabira D., Urban N.N., Barrionuevo G., Ben-Ari Y. (1994) Major differences between long-term potentiation and ACPD-induced slow-onset potentiation in hippocampus. *Neuroscience Letters* 182:177-180.
- 34) Coon, D.D., Sorar, E., Bandara, K.M.S.V., Urban, N. (1991) New degrees of freedom in resonant tunneling heterostructure devices. *Journal of Applied Physics*, 69(1):4344-8.

Funding

Current

NIH - NIDCD (R01 DC005798) Intraglomerular lateral inhibition in the Olfactory Bulb. Through 9/07. \$1,477,000 total costs. Renewal Pending. Percentile score 9.5. Funding almost assured.

Human Frontiers Science Program Young Investigators Award (with Troy Margrie University College London and Pavel Osten, Max Planck Institute, Heidelberg). Through 5/2008. (\$1,050,000 total costs, split 3 ways)

NIH - NIMH (R01 MH079504) Collaborative Research in Computational Neuroscience: Physiological and computational approaches to understanding neuronal synchronization. 09/06 through 08/10. (\$977,000 total costs, Bard Ermentrout is collaborator on the grant with the bulk of funds going to Urban lab.)

AFOSR (BAA06-028) Dynamic Decision Making in Complex Task Environments: Principles and Neural Mechanisms. Urban as co-investigator. Jay McClelland (Stanford University) as PI. Requested \$58,375 in year 1 to Urban. Approx \$700,000 total costs to Urban.

Completed

NIH - NIDCD (R21 DC006631) Synaptic Integration in the Accessory Olfactory Bulb. Through 02/06. \$383,000 total costs

NIH - NIDCD (R01 DC005798) Intraglomerular lateral inhibition in the Olfactory Bulb. Through 08/02-9/07. \$1,477,000 total costs. .

Reviewing of publications and research proposals:

Journals: Science, PloS, Nature Neuroscience, TINS, PNAS, Journal of Neuroscience, Journal of Neurophysiology, Journal of Physiology, European Journal of Neuroscience, Journal of Computational Neuroscience, Neurobiology of Learning and Memory, Experimental Brain Research, Neurocomputing.
Funding Agencies: NIH, NSF, Swiss National Science Foundation, Israeli Science Foundation, Hong Kong Council of Science and Technology

Leadership

2002-Present	Center for the Neural Basis of Cognition Executive and Education Committees.
2006-Present	Center for the Neural Basis of Cognition - Training grant in Computational Neuroscience steering committee
2007-Present	Chair - Department of Biological Sciences Undergraduate Curriculum Committee – Member since 2004,
2006- Present	Center for Neuroscience of the University of Pittsburgh Training Grant Steering Committee. (Summer 2006 – present)

Teaching

- Introduction to Neuroscience (Undergraduate course. I teach 50%.)
- Information, Entropy and Noise in the Brain (Undergraduate course. I developed and teach 100%.)
- Neural Plasticity in Sensory and Motor Systems (Graduate course. I developed and teach 33%.)
- Lecture in graduate courses in cellular and systems neuroscience at University of Pittsburgh