

## **Curriculum Vitae - Nathaniel N. Urban**

### **Personal Information**

Date of Birth: 11 November 1968 (Asmara, Eritrea)  
Citizenship: USA  
Address: Department of Biological Sciences  
Carnegie Mellon University  
4400 5th Avenue  
Pittsburgh, PA 15213  
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<http://www.cmu.edu/bio/faculty/urban.html>

### **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**

2010- Professor and Head, Department of Biological Sciences  
2010- Fredrick A Schwertz Distinguished Professor of Life Sciences, Carnegie Mellon University  
2008 – Tenured Associate Professor in Department of Biological Sciences, Carnegie Mellon University, Pittsburgh, Pennsylvania.  
2007- Associate Professor in Department of Biological Sciences, Carnegie Mellon University, Pittsburgh, Pennsylvania.  
Adjunct Associate Professor, Department of Neuroscience, University of Pittsburgh.  
2006- Awarded of 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**

2009 Association for Chemoreception Sciences Young Investigator Award  
2007 Polak Young Investigator Award by Association for Chemoreception Sciences  
2006 -9 Eberly Family Faculty Development Chair 2006-9  
2005 Scientific American 50 Leaders in Science and Technology  
2005 Institutional Nominee for Howard Hughes Medical Institute Investigator award  
2005-8 Human Frontiers Science Program Young Investigator Award  
2001- 2 NRSA individual post-doctoral fellowship (NIDCD)  
1998-2001 Alexander von Humboldt Research Fellowship  
Max-Planck Institute für medizinische Forschung, Heidelberg, Germany  
1993-8 Howard Hughes Medical Institute Predoctoral Fellowship  
University of Pittsburgh, Pittsburgh, Pennsylvania, USA  
1991-3 Rhodes Scholarship  
Oxford University, Oxford, England  
1991 Bradler Award for Undergraduate Research  
University of Pittsburgh, Pittsburgh, Pennsylvania, USA  
1987-1991 Chancellor's Scholarship.  
University of Pittsburgh, Pittsburgh, Pennsylvania, USA

### **Publications:**

### *Book Chapters*

Margrie T.W. and Urban N.N. "Dendritic Neurotransmitter Release" in *Dendrites*, Stuart, Spruston and Häusser eds. Oxford University Press 2<sup>nd</sup> edition.2007.

Ermentrout, G.B. Galan, R.F. Urban, N.N. "Stochastic Synchrony" in *Coherent Behavior in Neural Networks*, Springer. 2009

### *Journal Articles Published or In Press*

- 1) Padmanabhan, K. and Urban, NN Intrinsic biophysical diversity decorrelates neuronal firing while increasing information content. *Nature Neuroscience*. In Press
- 2) Hovis, KR, Padmanabhan, K. and Urban NN. A Simple Method of In Vitro Electroporation Allows Visualization, Recording, and Calcium Imaging of Local Neuronal Circuits. *J. Neuroscience Methods*. 2010 Aug 15;191(1):1-10.
- 3) Castro JB and Urban NN. Functional polarity in neurons: what can we learn from studying an exception? *Current Opinion in Neurobiology*. In Press.
- 4) Castro JB Urban NN. (2009) Subthreshold Glutamate Release from Mitral Cell Dendrites. *J. Neurosci*. May 27;29(21):7023-30.
- 5) Arevian, A.C. and Urban, N.N. (2009) Computing with dendrodendritic synapses in the olfactory bulb. *Annals of the New York Academy of Sciences*. 1170 July 2009.
- 6) Ermentrout GB, Galán RF, Urban NN. (2008) Reliability, synchrony and noise. *Trends Neurosci*. Aug;31(8):428-34
- 7) Arevian, A.C. Kapoor, V. and Urban, N.N. (2008) Dynamic Gating of Lateral inhibition in the Olfactory Bulb. *Nature Neuroscience*. 11(1):80-7.
- 8) Galán, R.F, Ermentrout GB, Urban NN. (2008) Optimal time scale for spike-time reliability: Theory, simulations and experiments. *J Neurophysiol*. 99(1):277-83.
- 9) Ermentrout GB, Galán, R.F, Urban NN. (2007) Relating neural dynamics to neural coding. *Physical Review Letters*. *Physical Review Letters*. 99. 248103. Faculty of 1000 Must Read.
- 10) 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(5 Pt 2):056110.
- 11) Bagley, J, LaRocca, G, Jimenez, DA, and Urban, NN. (2007) Adult neurogenesis and specific replacement of interneuron subtypes in the mouse main olfactory bulb. *BMC Neuroscience*. 8(1):92
- 12) 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*. 27(21):5664-71.
- 13) 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
- 14) 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. Faculty of 1000 Recommended.
- 15) 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.
- 16) 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.
- 17) 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.

- 18) 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.
- 19) 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.*
- 20) Castro J. and Urban, N.N. (2005) Tuft calcium spikes in accessory olfactory bulb mitral cells. *J Neurosci.* 25(20):5024-8.
- 21) 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.
- 22) Schoppa, N.S. and Urban, N. N. (2003) Dendritic processing within olfactory bulb circuits. *Sep;26(9):501-6. Trends in Neurosciences.*
- 23) Urban, N.N. (2002) Lateral inhibition in the olfactory bulb and in olfaction. *Physiol Behav. Dec;77(4-5):607-12.*
- 24) 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.
- 25) 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.
- 26) 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.
- 27) 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.
- 28) Urban, N.N., Henze, D.A. and Barrionuevo, G. Revisiting the role of the hippocampal mossy fiber synapse. *Hippocampus.* 11(4):408-17.
- 29) 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.
- 30) 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.
- 31) 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
- 32) Henze, D.A. Urban, N.N., and Barrionuevo, G. (2000) The multifarious hippocampal mossy fiber pathway: a review. *Neuroscience.* 98:407-427.
- 33) Urban, N.N., and Barrionuevo, G. (1998) Active summation of excitatory postsynaptic potentials in hippocampal CA3 pyramidal neurons. *PNAS.* 95(19):11450-5.
- 34) 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.
- 35) 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.

- 36) 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.
- 37) 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.
- 38) 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.
- 39) 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.
- 40) 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.

### ***Invited Talks***

2002 - University of Pittsburgh Department of Neurobiology

2002 - Duke University Department of Neurobiology

2002 - University of Pittsburgh Department of Neuroscience Annual Retreat Invited Speaker

2002 – CNBC Annual Retreat Speaker

2004 - Computational Neuroscience Society Annual Meeting – Featured contributed talk

2006 - Invited speaker at “The Sense of Smell” meeting at the Institute of Advanced Study at the Hebrew University of Jerusalem

2006 - CNBC annual retreat speaker

2007 - Invited speaker at Gordon Conference on “Dendrites”

2007 – Association for Chemoreception Sciences Annual Meeting – Sarasota Florida

2007 - Invited talk at “Synaptic Transmissions” farewell symposium for Prof. Bert Sakmann - Max Planck Institute for Medical Research, Heidelberg, Germany.

2007 - University of Texas San Antonio Department of Biological Sciences. (September)

2007 – “Coherent Behavior in Neuronal Networks” meeting Mallorca, Spain. (October).

2008 – Invited talk at UCSD Institute for Nonlinear Science MURI Winter School on Chemical Discrimination

2009 - University of Maryland School of Medicine

2009 - AChemS Meeting Symposium on Adult Neurogenesis, Sarasota Florida

2009 - Cold Spring Harbor Lab (June 2009)

2009 - Collaborative Research in Computational Neuroscience PI’s meeting

2009 - HHMI Janelia Farm Research Campus (September 2009)

2010 - Columbia University

2010 - Case Western Reserve University

2010 - HHMI Janelia Farm Research Campus

**Membership in Professional Societies**

Society for Neuroscience 1993-

Association for Chemoreception Sciences 2002-

AAAS 2007-

## **Funding**

### *Current*

#### **Urban PI**

##### **Intraglomerular lateral inhibition in the olfactory bulb.**

NIDCD R01 DC005798

Award period 8/02 – 02/13

#### **Urban PI, Ermentrout (Univ Pittsburgh) co-PI**

Collaborative Research in Computational Neuroscience: Physiological and computational approaches to understanding neuronal synchronization.

**NIMH R01 MH079504**

09/06 through 08/15.

#### **Urban co-PI, McClelland (Stanford) PI**

Dynamic Decision Making in Complex Task Environments: Principles and Neural Mechanisms **AFOSR BAA06-028**

**05/07-04/12**

### *Completed*

#### **Urban PI**

Synaptic integration in the accessory olfactory bulb.

**NIDCD R21 DC006631**

Award period 03/04 – 03/06

#### **Urban co-PI, Troy Margrie (Univ College London) PI**

Defining the function of a single glomerular module in the mammalian olfactory bulb.

**Human Frontiers Science Program RGY70/2005**

05/05 - 02/09.

#### **Urban PI on subcontract. Rich Griffey (SAIC) PI for Prime Contractor**

**Trace Odorant Perception with Dynamic Olfactory Gathering (TOPDOG)**

**DARPA BAA 07-21 Addendum 8-** PI Richard Griffey.

10/08-12/10

#### ***Reviewing of publications and research proposals:***

Ad hoc reviewer: Science, Nature, PLoS Biology, Nature Neuroscience, Trends in Neuroscience, PNAS, Journal of Neuroscience, Physical Review E, FASEB Journal, Neurobiology of Learning and Memory, Journal of Neurophysiology, Journal of Physiology, European Journal of Neuroscience, PLoS Computational Biology, Journal of Computational Neuroscience, Experimental Brain Research, Neurocomputing.

Reviewer for NIDCD, NIMH, NSF, Hong Kong Science and Technology Research Grants, MRC, Swiss National Science Foundation, European Research Council,

## **Graduate/postdoctoral student mentoring**

### **Current Graduate Students**

Daniel Jimenez (Pitt, CNUP graduate program , expected graduation 2009+)

Ken Hovis (CMU (CMU Biological Sciences, expected graduation 2010)

Sonya Polson (Pitt, CNUP graduate program , expected graduation 2011)

Shreejoy Tripathy (CMU Program in Neural Computation Ph.D. program)

### **Current Postdoctoral Associates**

Rick Gerkin  
Anne-Marie Oswald  
Krishnan Padmanabhan  
Elli Kanal

**Former Postdocs**

Nicolas Fourcaud (with Bard Ermentrout, Pitt) – Currently tenured scientist, CNRS Lyon France  
Roberto Fernandez Galan (with Bard Ermentrout, Pitt ) O Currently Assistant Professor Department of Neuroscience Case Western Reserve  
Zhengping Ji- Current at Los Alamos National Lab  
Sameer Walawalker

**Former Students:**

Vikrant Kapoor (CMU Biological Sciences) – current position postdoc in lab of Venki Murthy Harvard  
Jason Castro (Pitt, CNUP graduate program) – current position postdoc in lab of Karl Kandler U. Pitt.  
Armen Arevian (Pitt, CNUP MD/PhD program) – current position Medical Student, U. Pitt.

**Fellowships and awards of trainees:**

Rick Gerkin  
NRSA (F32) from NIDCD

Shreejoy Tripathy  
NSF Graduate Research fellowship

Sonya Giridhar  
NSF IGERT fellowship

Jason Castro  
NSF IGERT fellowship  
NRSA fellowship (F31) from NIDCD

Armen Arevian  
ARCS foundation fellowship  
NSF IGERT fellowship  
NRSA fellowship (F30) from NIDCD

Daniel Jimenez  
NSF short-term IGERT fellowship  
NRSA fellowship (F31) from NIDCD

Ken Hovis  
NRSA fellowship (F31) from NIDCD

Aushra Abouzeid (Pitt Math) Had year long IGERT fellowship to work in my lab as part of a collaboration with Bard Ermentrout.

Krishnan Padmanabhan (CMU Bio) Had year long IGERT fellowship to work in my lab as part of a collaboration with Justin Crowley.

Josh Bagley  
NIMH undergraduate fellowship in mental health research  
Bradler Award for undergraduate research

Seda Avetisian  
NIH Undergraduate Research Fellowship in Computational Neuroscience

Geoff Dixon-Ernst  
Undergraduate computational neuroscience summer fellowship