

Curriculum Vitae

Aaron J. Gruber, Ph.D.

Address:

Department of Neuroscience
University of Lethbridge
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Education and Training:

- 2009 – present Assistant Professor
Department of Neuroscience
University of Lethbridge, Lethbridge, Alberta, Canada
- 2006 – 2009 *Postdoctoral Fellow*
Department of Anatomy and Neurobiology
University of Maryland School of Medicine, Baltimore, MD
Patricio O'Donnell Ph.D., mentor
- 2004 – 2006 *Postdoctoral Fellow*
Center for Neuropharmacology and Neuroscience
Albany Medical College, Albany, NY
Patricio O'Donnell Ph.D., mentor
- 2004 *Ph.D. Biomedical Engineering*
Northwestern University, Evanston, IL
Sara A. Solla Ph.D., Ferdinando Mussa-Ivaldi, Ph.D., Research Advisors
- 2003 *Visiting Scholar* February - April
Gatsby Computational Unit
University College London, London, UK
- 2000 *M.S. Biomedical Engineering*
Northwestern University, Evanston, IL
- 1992 – 1997 *B.S. Chemical Engineering*
University of Cincinnati, Cincinnati, OH

Awards:

- Competitive renewal (2006 – 2007) from the Tourette Syndrome Ass. Inc. for a research project titled “Control of cortical input to ventral striatum by dopamine and local inhibition”, \$33,000.
- Competitive award (2005 – 2006) from the Tourette Syndrome Ass. Inc. for a research project titled “Control of cortical inputs to the ventral striatum by dopamine: effects on weak and strong inputs”. \$38,000.
- NIDA NRSA Fellowship to Albany Medical College (2004) for experimental investigation of information processing in the nucleus accumbens.
- NSF IGERT Fellowship (2000-2004) for interdisciplinary research applying nonlinear dynamical techniques to models of neural circuits involved in motivation and motor control.
- Fellowship from the Spanish Government to attend the annual meeting of the Society for the Neural Control of Movement in Seville, Spain (2001).
- Competitive scholarship to attend the RIKEN summer program in Wako-Shi, Japan (2000).
- Murphy Fellowship (1997-1998), Northwestern University.
- Lubrizol Scholarship (1996-1997), University of Cincinnati.

Publications:

Gruber, A.J., Hussin, R., and O'Donnell, P. "Dynamic gating in the nucleus accumbens: Behavioral state-dependent synchrony with the prefrontal cortex and hippocampus". *PLoS ONE*, 4(4):e5062, 2009.

Gruber, A.J. Powell, E., and O'Donnell, P. "Inhibition shapes responses of accumbens spiny neurons to spatiotemporal aspects of bursting cortical activation". *J Neurophysiol* 101:1876-82, 2009.

Gruber, A.J. and O'Donnell, P. "Bursting activation of prefrontal cortex drives sustained up states in nucleus accumbens spiny neurons *in vivo*". *Synapse* 63:173-180, 2009.

Gruber, A.J., Dayan P., Gutkin B.S., and Solla, S.A. "Dopamine modulation in the basal ganglia locks the gate to working memory". *J Computational Neuroscience* 20(2): 153-166, 2006.

Gruber, A.J., Dayan P., Gutkin B.S., and Solla, S.A. Dopamine modulation in a basal ganglio-cortical network implements saliency-based gating of working memory. *NIPS* 16: 1271-1278, 2004.

Gruber, A.J., Solla, S.A., Surmeier, D.J., Houk, J.C. Modulation of striatal single units by expected reward: A model of spiny neurons displays dopamine-induced bistability. *J Neurophysiology* 90: 1095-1114, 2003.

Gruber, A.J., Solla, S.A., Houk, J.C. Dopamine induced bistability enhances signal processing in spiny neurons. *NIPS* 15: 181-188, 2003.

Manuscripts in preparation:

Gruber, A.J., Schoenbaum, G., O'Donnell, P., and Roesch, M. "Prefrontal cortical disinhibition during impaired decision making in a rat model of schizophrenia". *In preparation*.

Minae Niwa, Atsushi Kamiya, Rina Murai, Ken-ichiro Kubo, **Aaron J. Gruber**, Lingling Lu, Saurav Seshadri, Shuta Tomisato, Hideki Hiyama, Hanna Jaaro-Peled, Yukihiro Noda, Nicola Cascella, Kazuhisa, Koda, Patricio O'donnell, Kazunori Nakajima, Akira Sawa, and Toshitaka Nabeshima "Transient knockdown of DISC1 in the developing cerebral cortex leads to dopaminergic disturbance and schizophrenia-like deficits in young adult mice", *In preparation*.

Invited presentations:

"Poor choices and hyperactive PFC activity in a rat model of schizophrenia." 42nd Winter Conference on Brain Research, January 2009, Copper CO.

"Dynamic gating of signals in cortico-striatal circuits by dopamine and inhibition." Seminar, Human Neuroimaging Laboratory, Baylor College of Medicine, June 2007, Houston TX.

"A balance of excitation and inhibition shapes accumbens responses to bursting cortical activation." 40th Winter Conference on Brain Research, February 2007, Snowmass CO.

"The role of dopamine for learning and implementing salience-based gating of information in cortico-basal ganglia circuits". Seminar for Cognitive Neuroscience group, University of Massachusetts Amherst, December 2005, Amherst, MA.

"Dopamine modulation in the basal ganglia locks the gate to working memory", Seminar for multi-group meeting, Center for Neural Science, New York University, December 2004, New York, NY.

"Dopamine modulation enhances signal processing in a model of striatal spiny neurons", Seminar, National Institute of Health, January 2004, Bethesda, MD.

“Dopamine modulation enhances signal processing in a model of striatal spiny neurons”, Seminar, Albany Medical Center, January 2004, Albany, NY.

”Dopamine induced bistability in medium spiny neurons enhances the detection of temporally correlated input signals”, Joint IGERT workshop (Cornell University, Northwestern University, University of Arizona), October 2002, Oak Brook, IL.

"Bifurcations in the brain: How might nonlinearities in neural systems help guide behavior?", IGERT Graduate Student Seminar Series, Northwestern University, September 2000, Evanston, IL.

“Neuromodulatory effects of dopamine on striatal spiny neurons”, RIKEN summer program, July 2000, Wako-Shi, Japan.

Extramural course participation:

Invited tutor, Okinawa Computational Neuroscience Course “Computing neurons”, Okinawa, Japan, July 2006.

Invited tutor, Okinawa Computational Neuroscience Course “Predictions and decisions”, Okinawa, Japan, July 2005.

Workshop participation:

Organizer and chair of panel session titled: “Mesocortical processing of decisions in health and mental disease”, 42nd Winter Conference on Brain Research, January 29, 2009, Copper CO.

Organizer and chair of panel session titled: “Control your inhibitions: local circuit processing in the striatum”, 40th Winter Conference on Brain Research, February 2, 2007, Snowmass CO.

Invited participant, Computational Models of the Basal Ganglia workshop, Computational neuroscience annual meeting, July 2004. Talk title: “Effects of dopamine modulation on information processing in the striatum”.

Principal organizer of the 2002 inter-collegiate IGERT workshop with Northwestern University, Cornell University and the University of Arizona. Responsibilities included arranging the academic program, scheduling the presentation equipment and facility, and arranging for meals, activities, and lodging for 46 attendees over 3 days.

Abstracts:

Gruber, A.J., Schoenbaum, G., O’Donnell, P., and Roesch, M. “Poor choices and altered medial prefrontal cortical neural activity in a developmental rat model of schizophrenia”. Society for Neuroscience Annual Meeting, November 15-19, 2008, Washington DC.

Gruber, A.J., O’Donnell, P. “Dynamic gating of cortical and hippocampal inputs in the nucleus accumbens”. Society for Neuroscience Annual Meeting, November 3-7, 2007, San Diego CA.

Gruber, A.J., O’Donnell, P. “Spatial and temporal processing of cortical input by ventral striatal spiny neurons”. 40th Winter Conference on Brain Research, January 23-28, 2006, Steamboat Springs CO.

Gruber, A.J., O’Donnell, P. “Multiphasic excitation and inhibition of ventral striatal spiny neurons by tetanic prefrontal cortical stimulation”. Society for Neuroscience Annual Meeting, November 12-16, 2005, Washington DC.

Gruber, A.J., Solla, S.A. “Enhanced detection of temporally-correlated signals through dopaminergic modulation”. Cognitive and Systems Neuroscience Annual Meeting, December 9-14, 2002, Cold Spring Harbor, NY.

Gruber, A.J., Dayan P., Gutkin B.S., and Solla, S.A. “Dopamine modulation in a basal ganglio-cortical network implements saliency-based gating of working memory”. Neural Information Processing Systems Annual Meeting, December 8-11, 2003, Vancouver, Canada.

Gruber, A.J., Dayan P., Gutkin B.S., and Solla, S.A. “Dopaminergic enhancement of spatial working memory through single unit modulation in a basal ganglio-cortical network model”. Society for Neuroscience Annual Meeting, November 8-12, 2003, New Orleans.

Gruber, A.J., Solla, S.A., Houk, J.C. “Dopamine induced bistability enhances signal processing in spiny neurons”. Neural Information Processing Systems Annual Meeting, December 9-14, 2002, Vancouver, Canada.

Gruber, A.J., Surmeier, D. J., and Houk, J. C. “Bistability induced by dopamine neuromodulation: a cellular mechanism for explaining why striatal neuron responses can be enhanced or depressed by reward expectation”, The Society for Neural Control of Movement Annual Meeting, March 25-31, 2001, Seville, Spain.

Gruber, A.J., and Houk, J.C. “A computational study of D1 induced modulation of medium spiny neuron response properties”, Society for Neuroscience Annual Meeting, November 4-9, 2000, New Orleans.

Teaching experience:

- Summer 2006 Project tutor, Okinawa Computational Neuroscience Course: “Computing neurons”. Okinawa Japan.
- Winter 2006 Lecturer, Neuroscience unit of medical student training
Albany Medical College
- Summer 2005 Project tutor, Okinawa Computational Neuroscience Course: “Predictions and Decisions”. Okinawa Japan.
- Fall 1999 Teaching Assistant, *Systems Physiology: Neuroscience*
Department of Biomedical Engineering, Northwestern University: combined graduate and undergraduate course (9 hours lecture and 12 hours laboratory).

Academic activities:

Meeting organization

Program committee for the Organization for Computational Neurosci. annual meeting 2005-2007

Journal referee

Ad hoc reviewer for the *Journal of Neurophysiology*, *European Journal of Neuroscience*, *Journal of Computational Neuroscience*, *Journal of Cognitive Neuroscience*, *Behavioral Brain Research*, *Neuroscience* and *Biological Cybernetics*.

Professional membership

Society for Neuroscience
American Physiological Society

Seminar and Journal club organization

Principal organizer of the Neural Engineering journal club for the Chicago campus (2003-2004).
Principle organizer of the Northwestern IGERT student seminar series (2000-2001).

Scientific technical skills

Multiunit extracellular recording in behaving rodents, patch-clamp recording in slice, in vivo intracellular recording, histological sectioning and immunohistochemistry, fluorescence microscopy, NEURON simulation package, Matlab, C++.