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Curriculum Vitae

SCOTT J. CRUIKSHANK

EDUCATION

- Undergraduate - College of St. Thomas, St. Paul MN., B.A., Psychology (1988)
 - University of Edinburgh, Scotland, Non-degree student (1987)
- Graduate - U. C. Irvine, Ph.D., Biological Science (1997)

RESEARCH POSITIONS

- Research Assistant - Laboratory of Dr. Paul Mabry (1987-1988)
 College of St. Thomas, Department of Psychology, St. Paul MN
- Lab Technician - Laboratory of Dr. Thomas J. Carew (1988-1989)
 Yale University, Department of Psychology
- Graduate Student - Laboratory of Dr. Norman M. Weinberger (1989-1997)
 University of California Irvine, Department of Psychobiology and
 Center for the Neurobiology of Learning and Memory
- Post-Doctoral - Laboratory of Dr. Raju Metherate (1997-2001)
 University of California Irvine, Department of Neurobiology &
 Behavior
 - Laboratory of Dr. Barry W. Connors (2001-2006)
 Brown University, Department of Neuroscience
- Faculty - Assistant Professor, Research (2006-2016)
 - Associate Professor, Research (2016-present)
 Brown University, Department of Neuroscience

PUBLICATIONS

- Crandall, S.R., Patrick, S.L., Cruikshank, S.J. & Connors, B.W. (2017) Infrabarrels Are Layer 6 Circuit Modules in the Barrel Cortex that Link Long-Range Inputs and Outputs. *Cell Reports*, 21: 3065-78.
- *Crandall, S.R., Cruikshank, S.J. & Connors, B.W. (2015) A corticothalamic switch: controlling the thalamus with dynamic synapses. *Neuron*, 86(3): 768-782.
- *Cruikshank, S.J., Ahmed, O.J., Stevens, T.R., Patrick, S.L., Gonzalez, A.N., Elmaleh, M. & Connors, B.W. (2012) Thalamic control of layer 1 circuits in prefrontal cortex. *Journal of Neuroscience*, 32(49):17813-23.
- *Cruikshank, S.J., Urabe, H., Nurmikko, A.V., Connors, B.W. (2010) Pathway-specific feedforward circuits between thalamus and neocortex revealed by selective optical stimulation of axons. *Neuron*. 65(2): 230-245.
- *Lee, S-C., Cruikshank S.J. & Connors B.W. (2010) Electrical and chemical synapses between relay neurons in developing thalamus. *The Journal of Physiology*. 588: 2403-2415.
- *Parker, P.R.L., Cruikshank, S.J. & Connors, B.W. (2009) Stability of electrical coupling despite massive developmental changes of intrinsic neuronal physiology. *Journal of Neuroscience*. 29(31): 9761-9770.
- Cruikshank S.J. & Connors B.W. (2008) Neuroscience: State-sanctioned synchrony. *Nature*. 454(7206): 839-40.
- Cruikshank S.J., Lewis, T.J. & Connors B.W. (2007) Synaptic basis for intense thalamocortical activation of feedforward inhibitory cells in neocortex. *Nature Neuroscience*. 10(4): 462-468.
- Connors B.W. & Cruikshank S.J. (2007) Bypassing interneurons: do synaptic triads mediate inhibition in neocortex? *Nature Neuroscience*. 10(7): 808-810.
- Cruikshank S.J., Landisman, C.E., Mancilla, J.G. & Connors B.W. (2005) Connexon connexions in the thalamocortical system. *Progress in Brain Research*. 149: 41-58.
- Long, M.A., Cruikshank, S.J., Jutras, M.J., Connors, B.W. (2005) Abrupt maturation of a spike-synchronizing mechanism in neocortex. *Journal of Neuroscience*. 25(32): 7309 –7316.
- Cruikshank, S.J., Hopperstad M., Younger M., Connors B.W., Spray D.C., Srinivas M. (2004) Potent block of Cx36 and Cx50 gap junction channels by mefloquine. *Proc. Natl. Acad. Sci. USA*. 101(33): 12364-12369.
- Cruikshank, S.J., Rose, H.J., Metherate, R. (2002) Auditory thalamocortical synaptic transmission, *in vitro*. *Journal of Neurophysiology*. 87: 361-384.
- Cruikshank, S.J., Killackey, H.P., & Metherate, R. (2001) Parvalbumin and calbindin are differentially distributed within primary and secondary subregions of the mouse auditory forebrain. *Neuroscience*. 105(3): 553-569.
- Cruikshank, S.J., & Weinberger, N. M. (2001) *In vivo* hebbian and basal forebrain stimulation treatment in morphologically identified auditory cortical cells. *Brain Research*. 891: 78-93.
- *Hsieh, C.Y., Cruikshank, S.J. & Metherate, R. (2000) Differential modulation of auditory thalamocortical and intracortical synaptic transmission by cholinergic agonist. *Brain Research*. 880: 51-64
- Metherate, R. & Cruikshank, S.J. (1999) Thalamocortical inputs trigger a propagating envelope of gamma-band activity in auditory cortex, *in vitro*. *Experimental Brain Research*. 126: 160-174.
- Cruikshank, S.J. & Weinberger, N.M. (1996) Evidence for the hebbian hypothesis in experience-dependent physiological plasticity of neocortex: A critical review. *Brain Research Reviews*. 22: 191-228.

Cruikshank, S. J., & Weinberger, N. M. (1996) Receptive field plasticity in adult auditory cortex induced by hebbian covariance. *Journal of Neuroscience*. 16: 861-875.

Cruikshank, S.J., Edeline, J.M. & Weinberger, N.M. (1992) Stimulation at a site of auditory-somatosensory convergence in the medial geniculate nucleus is an effective unconditioned stimulus for fear conditioning. *Behavioral Neuroscience*. 106: 471-483

* Asterisk indicates papers for which I share first authorship

ABSTRACTS

Martinez-Garcia, R., Voelcker, B, Patrick, S.L., Stevens, T., Connors, B.W., Cruikshank, S.J. (2018) Primary and higher order inputs are differentially integrated by distinct classes of thalamic reticular neurons. *Society for Neuroscience Abstracts*, 392.14

Pucci, F, Cruikshank, S.J., Connors, B.W. (2018) Differential optogenetic modulation of parvalbumin and somatostatin inhibitory interneuron activity downregulates seizure activity in the mouse temporal neocortex. *Society for Neuroscience Abstracts*, 040.24

Martinez-Garcia, R., Voelcker, B, Patrick, S.L., Connors, B.W., Cruikshank, S.J. (2016) The neurochemistry of thalamic reticular cells and its relationship with cell physiology and synaptic connectivity. *Society for Neuroscience Abstracts*, 429.01

Crandall, S.R., Patrick, S.L., Cruikshank, S.J. & Connors, B.W. (2016) Infrabarrels: Ensembles of structurally and functionally distinct neurons in layer 6a of mouse somatosensory cortex. *Society for Neuroscience Abstracts*, 429.02

*Crandall, S.R., Cruikshank, S.J. & Connors, B.W. (2014) The corticothalamic switch: controlling the thalamus with dynamic synapses. *Society for Neuroscience Abstracts*, 64.07

Connors, B.W., Neske, G.T., Sugden, A.U., Crandall, S.R., Cruikshank, S.J. (2014) Roles of electrical synapses in gamma-band activity of sensory and association cortex. *Society for Neuroscience Abstracts*, 38.04

*Crandall, S.R., Cruikshank, S.J. & Connors, B.W. (2013) Dynamic effects of corticothalamic activity on the excitability of thalamic neurons. *Society for Neuroscience Abstracts*, 72.10

Cruikshank, S.J., Ahmed, O.J., Stevens, T.R., Patrick, S.L., Elmaleh, M. & Connors, B.W. (2011) Thalamic matrix projections drive layer 1 inhibitory cells in prefrontal cortex. *Society for Neuroscience Abstracts*, 512.09

Ahmed, O.J., Cruikshank, S.J., Stevens, T.R., Patrick, S.L., Gonzalez, A., Hur, E. & Connors, B.W. (2011) Layer 1 inhibitory interneurons of the prefrontal cortex are physiologically diverse, spatially stratified, and densely interconnected. *Society for Neuroscience Abstracts*, 512.10

Lichtman, A., Connors, B.W. & Cruikshank, S.J. (2009) Inhibition evoked by single action potentials of pyramidal cells: Effects of presynaptic Cs⁺, and the roles of distinct interneuron subtypes. *Society for Neuroscience Abstracts*, 315.16

Cruikshank, S.J., Urabe, H., Xu, H., Zhang, J., Nurmikko, A.V. & Connors, B.W. (2008) Investigating thalamocortical circuitry with channelrhodopsins. *Society for Neuroscience Abstracts*, 370.9

Lee, S.C., Patrick, S.L., Cruikshank, S.J., Zheng, A. & Connors, B.W. (2008) Spatial patterns and connexin36-dependence of gap junction coupling in thalamic reticular nucleus. *Society for Neuroscience Abstracts*, 734.6

- Ahmed, O.J., Cruikshank, S.J., Connors, B.W. & Mehta, M.R. (2007) Phase precession: in vivo, in silico, in vitro. *Society for Neuroscience Abstracts*, 935.3
- Parker, P.R.L., Cruikshank, S.J. & Connors B.W. (2007) Development of electrical synapses in the thalamic reticular nucleus *Society for Neuroscience Abstracts*, 581.15
- Lee, S.C., Cruikshank, S.J. & Connors, B.W. (2006) Role of connexin36 in the electrical synapses between relay neurons in young developing thalamus. *Society for Neuroscience Abstracts*, 132.12
- Cruikshank, S.J. & Connors, B.W. (2005) Thalamocortical responses in layer 4: why do inhibitory interneurons spike more readily than excitatory cells? *Society for Neuroscience Abstracts*, 174.14
- Lee, S.C., Cruikshank, S.J. & Connors, B.W. (2005) Electrical synapses between thalamic relay neurons. *Society for Neuroscience Abstracts*, 985.8
- Cruikshank, S.J. & Connors, B.W. (2002) Serotonin reduces synaptic inhibition and its short-term depression in identified neurons of barrel cortex. *Society for Neuroscience Abstracts*, 450.6
- Cruikshank, S.J., Rose, H.J., Metherate, R. (1999) *In vitro* physiological comparison of MGv inputs to layer 3/4 of auditory cortex vs. nonlemniscal inputs to layer 1. *Society for Neuroscience Abstracts*, 1665.
- Killackey, H.P., Cruikshank, S.J., Metherate, R. (1999) Complementary distributions of parvalbumin and calbindin in subregions of mouse auditory thalamus. *Society for Neuroscience Abstracts*, 1419.
- Hsieh, C.Y., Cruikshank, S.J. & Metherate, R. (1998) Cholinergic agonist differentially suppresses auditory thalamocortical and intracortical transmission. *Society for Neuroscience Abstracts*, 1879.
- Cruikshank, S.J. & Weinberger, N.M. (1995) Hebbian induction of auditory cortical receptive field plasticity: Effect of number of trials and cortical state. *Society for Neuroscience Abstracts*, 1927.
- Cruikshank, S.J. (1995) Excerpts from the professional correspondence of Ralph Waldo Gerard. *Society for Neuroscience Abstracts*, 245.
- Cruikshank, S.J. & Weinberger, N.M. (1993) Induction of auditory cortical receptive field plasticity: Hebb rules? *Society for Neuroscience Abstracts*, 164.
- Cruikshank, S.J., Edeline, J.M. & Weinberger, N.M. (1991) Microstimulation of a specific region of the medial geniculate serves as an unconditioned stimulus for autonomic fear conditioning to a tone. *Society for Neuroscience Abstracts*, 658.
- South, D.A., Cruikshank, S.J. & Weinberger, N.M. (1990) Classical conditioning selectively alters thresholds in the auditory cortex of the guinea pig. *Society for Neurosci Abstracts*, 762.
- Kuenzi, F.M., Cruikshank, S., Storer, A. & Carew, T.J. (1989) Identification of neural pathways mediating positive phototaxis in *Aplysia*. *Society for Neuroscience Abstracts*, 1285.

INVITED TALKS

- “Spotlight on the Searchlight: The Thalamic Reticular Nucleus and Corticothalamic Interactions”
University of Wyoming, November 29, 2017
- “Neocortical Control of the Thalamus” **Brown Institute for Brain Science**. Mar 12, 2017.

- “How synaptic dynamics can invert the sign of corticothalamic influence” **Allen Institute for Brain Science**. Apr 7, 2014
- “Optogenetic dissection of cortical-thalamic circuit dynamics”
- **Florida State University**, Department of Biological Science. Feb 25, 2014
- **Purdue University**, Department of Biological Sciences, Mar 4, 2014
- “Dynamic shifts in valence of corticothalamic influence” **University of Connecticut**, Behavioral Neuroscience Research Seminar. Feb 6, 2014
- “Slice models, viruses and opsins to study cells and circuit operation in postrhinal cortex” **DARPA REPAIR Meeting**, San Diego, CA. Nov 9, 2013
- “Some corticothalamic effects on relay and reticular nucleus neurons” **Cosyne** workshop on thalamic reticular microcircuits, Snowbird, Utah. Mar 5, 2013
- “Pathway-specific feedforward circuits between thalamus and neocortex revealed by selective optogenetic stimulation of axons” **Université Paris Sud**, Centre de Neurosciences, France. Mar 28, 2012.
- “Selective axonal stimulation with channelrhodopsin exposes processing differences in thalamocortical and corticothalamic circuits”
- **Georgia Health Sciences University**. BBD Institute. Apr 14, 2011.
- **University of Oregon**, Department of Biology. Feb 11, 2011.
- **University of Colorado**, Denver, Department of Physiol. & Biophys. Feb 2, 2011.
- “Pathway-specific feedforward circuits between thalamus and neocortex revealed by selective optical stimulation of axons” **Vanderbilt University**. Dec 16, 2010
- “Selective stimulation using channelrhodopsins reveals some fundamental features of corticothalamic physiology” **Brown University** Neuroscience. Apr 5, 2009.
- “Using channelrhodopsins to investigate thalamocortical connectivity” **Brown University** Neuroscience. May 5, 2008.
- “Synaptic mechanisms allow inhibitory interneurons to dominate thalamocortical responses.” **New York University Medical Center**. Nov 29, 2006.
- “Synaptic mechanisms allow inhibitory interneurons to dominate thalamocortical responses.” Presented as a special seminar to the **Brown University** Neuroscience Dept., for promotion to Assistant Professor of Neuroscience, Research. Sep 13, 2006.
- “Results from an *in vitro* auditory thalamocortical preparation.” **New York University**, Center for Neural Science. Jul 11, 2002.

TEACHING AND ADVISING

Lecture Courses:

- Gap junctions lecture for undergraduate course on cellular physiology and biophysics (BI 1100) Brown University MPPB department (2013)
- An introduction to optogenetics for graduate course in Neuroscience, Université Paris Sud, Centre de Neurosciences, France (2012)
- Guest faculty, undergraduate seminar on neural basis of cognition (CLPS1400) Brown University CLPS department (2012)
- Synaptic inhibition lectures for undergraduate course on principles of neurobiology (BN 102) Brown University Neuroscience department (2008, 2012, 2017, 2018)

- Gap junctions lectures for graduate course in cellular neuroscience (BN203) Brown University Neuroscience department (2006, 2007)
- Electrical synapse lectures for undergraduate course on principles of neurobiology (BN 102) Brown University Neuroscience department (2006, 2007)
- Auditory system lecture to medical students (BN260), Brown Medical School. (2005)
- Trigeminal system lecture to medical students (BN260), Brown Medical School. (2004)

Laboratory Courses:

- *In vitro* neurophysiology and optogenetics instructor with full responsibility, Neuropracticum course at Woods Hole MBL for Brown University graduate students (2015, 2016, 2017, 2018)
- Psychobiology laboratory; primary instructor with full responsibility for 3 semesters (105L) UC Irvine (1990-1992)
- Director of physiology section for 2 semesters (105L) UC Irvine (1991-1992)

Teaching Assistant:

- Psychobiology lecture course for 3 semesters (105) UC Irvine (1990-1992)
- Psychoneuroendocrinology lecture course for 1 semester, UC Irvine (1991)

Research Advising:

- Faculty co-advisor to Arthur Sugden (Ph.D. 2015, MCB Dept., Brown)
- Faculty co-advisor to Rosa Martinez-Garcia (Ph.D. candidate, MCB Dept., Brown)
- Faculty advisor to Tina Voelcker, Junior researcher 2015-2017; I supervised and trained her while she gained experience for a PhD program in Neuroscience at NYU, starting 2017.
- Secondary laboratory advisor to five graduate students at Brown (their official primary advisor was Barry Connors, Department of Neuroscience):
 - Elizabeth McDonnell (Ph.D candidate)
 - Rachel Stevenson (Ph.D. candidate)
 - Garrett Neske, (Ph.D. 2015)
 - Timothy Zolnik, Ph.D. (Ph.D. 2011)
 - Sueng-Chan Lee, Ph.D. (Ph.D. 2010)
- Supervisor to 5 undergraduates in the laboratory of Barry Connors, Brown department of Neuroscience, advising on independent study and honors research:
 - Amalia Gonzalez - independent study and honors thesis (2010-2012)
 - Margot Elmaleh - independent study and honors thesis (2010-2012)
 - Amos Lichtman – independent study and honors thesis (2007-2009)
 - Philip Parker – independent study and honors thesis (2006-2007)
 - Michael Klein – independent study (2003-2004)
- Research supervisor to six undergraduate students at UC Irvine (1990-2001)

OTHER PROFESSIONAL EXPERIENCE, MEMBERSHIPS & HONORS

- Peer reviewer for numerous professional journals including, *Nature*, *Science*, *PNAS*, *Neuron*, *Nature Neuroscience*, *Journal of Neuroscience*, *Journal of Neurophysiology*, *Journal of Physiology and Cerebral Cortex*

- Grant reviewer for the BBSRC, United Kingdom (2011-2012)
- Grant reviewer for the FIRST Program, Israel Science Foundation (2010)
- Director, Brown University Optogenetics Journal Club (2007-2008)
- Director, Brown University In-House Seminar Series (2006-2007)
- Director, Brown University Neuroscience Journal Club (2004-2005)
- Neuroscience Seminar Series Committee, Brown University (2003-2006)
- Member, Society for Neuroscience (1990-present)
- Member, Center for the Neurobiology of Learning & Memory (1989-2001)
- Ralph Waldo Gerard Prize in the History of Neuroscience (1996)
- Magna Cum Laude Graduate (1988)

GRANTS (Ongoing and Recently Completed)

- NIH R01NS100016, 7/17-6/22 “Neocortical control of the thalamus” Role = **PI** (a dual-PI grant with Barry Connors as second PI). I generated the ideas and wrote the application in collaboration with Connors. I collected the preliminary data with two postdocs.
- NSF 1738633, 9/17 to 9/19 “Acquiring and propagating expertise in closed-loop precision optical control of neuronal activity using spatial light modulation (SLM) combined with multiphoton imaging” Role = **PI**. I generated the ideas and wrote the application in collaboration with Omar Ahmed (U. Michigan).
- NIH R01NS050434-06, 2/14-1/18 (currently in NCE), “Functions of electrical synapses in inhibitory networks” Role = **Co-Investigator**; Barry Connors is PI. I generated the ideas and wrote the application in collaboration with Connors. I collected most of the preliminary data with a postdoc.
- NIH P20GM103645 COBRE Center Pilot Project, 9/16-9/17 “Neocortical Control of the Thalamus” Role = **PI**, I generated the ideas, collected most of the preliminary data and wrote the application.
- Brown OVPR Grant Resubmission Award, 8/16 to 8/17, “Neocortical control of the thalamus” Role = **PI** (a dual-PI submission with Barry Connors as second PI). This award provided support to improve our R01 proposal for re-submission to NIH. We used it successfully, receiving a fundable score (above).
- Keck Foundation, 7/15-6/18 “Bioluminescent Optogenetics to Autoregulate Excitable Cells” Role = **Key personnel**; Christopher Moore as PI. I investigate “luminopsins” using whole cell recording.
- NIH R01NS082511 application, “Impact of nonspecific thalamocortical projections to layer 1 of sensory cortex.” Role = **PI**. The grant was discussed and scored. Council did not fund it. I am collecting additional data for revision and resubmission.