# Jeffrey S. Seely

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## Education

**Columbia University**, New York, NY 2011 — 2017
*PhD*, March 2017
Neurobiology & Behavior
Advisors: Larry F. Abbott, Mark M. Churchland

**Colgate University**, Hamilton, NY 2004 — 2008
*Bachelor of Arts*, May 2008
Physics and Mathematics (double concentration)
*Magna Cum Laude*
*Honors in Physics*
*Honors in Mathematics*

**University of Texas at Arlington**, Arlington, TX 2003 — 2004
Physics and mathematics coursework

## Honors

**NSF Graduate Research Fellowship** 2012 — 2016
**Brains for Brains Young Researchers' Computational Neuroscience Award** September 2012
Bernstein Association for Computational Neuroscience, Munich, DE
**Osborne Mathematics Prize**, Colgate University April 2008
**Sisson Mathematics Prize**, Colgate University April 2005
**Dean's Award for Academic Excellence**, Colgate University
**Phi Eta Sigma National Honors Society**, Colgate University
**Sigma Pi Sigma Physics Honors Society**, Colgate University

## Activities

Reviewer for *COSYNE* 2016
Reviewer for *Neural Information Processing Systems* 2013, 2014
Reviewer for *The Journal of Computational Neuroscience* 2011

## Attended Workshops

**Deep Learning Summer School**, Montreal, Canada 2016
**Okinawa Computational Neuroscience Course**, Okinawa, Japan 2013

## Fellowships

**Postbaccalaureate Intramural Research Training Award** 2010 — 2011
Laboratory of Biological Modeling
National Institutes of Health, Bethesda, MD
Advisor: Carson C. Chow

## Talks

**Topological analysis of motor cortex** May 2016
*New York Applied Topology Seminar*, Columbia University

**Neural computation: visual cortex versus motor cortex** March 2016
*Applied Topology Seminar*, University of Pennsylvania

**Denoising neural signals with tensor decompositions** June 2014
*Noise Workshop*, NYU

**Tensor decompositions on neural data** June 2014
Shenoy group, Neural Prosthetic Systems Lab, Stanford University

**State-space models for cortical-muscle transformations** February 2014
*COSYNE*, Salt Lake City

**Neural dynamics of perceptual bistability** March 2011
Gatsby Computational Neuroscience Unit, UCL, London, UK

**Information rate optimization of the squid giant axon** April 2008
*Rochester Symposium for Undergraduate Physics Students*, Rochester, NY

## Presentations

A Miri, C Warriner, **JS Seely**, GF Elsayed, LF Abbott, JP Cunningham, MM Churchland, TM Jessell
**Motor cortex engages output circuits in a behaviorally-selective manner**
*COSYNE*, Salt Lake City, February 2017

AA Russo, SR Bittner, **JS Seely**, SM Perkins, BM London, AH Lara, A Miri, LF Abbott, TM Jessell, JP Cunningham, MM Churchland
**Changes in motor cortex population structure between movement types**
*SFN*, San Diego, November 2016

**JS Seely**, MT Kaufman, CJ Cueva, L Paninski, KV Shenoy, MM Churchland
**State-space models for cortical-muscle transformations**
*CSHL Symposium: Cognition*, Cold Spring Harbor Laboratory, May 2014

**JS Seely**, MT Kaufman, A Kohn, JA Movshon, NJ Priebe, SG Lisberger, SI Ryu, KV Shneoy, LF Abbott, JP Cunningham, MM Churchland
**Input-driven activity and internal dynamics in visual and motor cortex**
*Temporal Dynamics in Learning: Networks and Neural Data*, Janelia Farm Research Campus, May 2013

**JS Seely**, MT Kaufman, A Kohn, JA Movshon, NJ Priebe, SG Lisberger, SI Ryu, D Sussillo, KV Shenoy, LF Abbott, JP Cunningham, MM Churchland
**Quantifying representational and dynamical structure in visual and motor cortex responses**
*Neural Control of Movement*, Puerto Rico, April 2013

**JS Seely**, MT Kaufman, A Kohn, JA Movshon, NJ Priebe, SG Lisberger, SI Ryu, KV Shenoy, JP Cunningham, LF Abbott, MM Churchland
**Quantifying representational and dynamical structure in large neural datasets**
*COSYNE*, Salt Lake City, February 2013

**JS Seely**, JP Cunningham, MT Kaufman, D Sussillo, SI Ryu, KV Shenoy, MM Churchland
**Dimensionality in motor cortex: differences between models and experiment**
*COSYNE*, Salt Lake City, February 2012

**JS Seely**, CC Chow
**Mutual inhibition as a mechanism for normalization**
*SFN*, Washington DC, November 2011

**JS Seely**, CC Chow
**Response normalization in theoretical firing rate models**
*COSYNE*, Salt Lake City, February 2011

**JS Seely**, CC Chow
**A general characterization of binocular rivalry models**
*SFN*, San Diego, November 2010

P Crotty, **JS Seely**
**Effects of the axonal leak conductance on energy and information**
*Computational Neuroscience Meeting*, Portland, OR, July 2008

## Publications

**JS Seely**, MT Kaufman, SI Ryu, KV Shenoy, JP Cunningham, MM Churchland
**Tensor analysis reveals distinct population structure that parallels the different computational roles of areas M1 and V1**
*PLoS Computational Biology*, 12(11):e1005164 (2016)

MT Kaufman, **JS Seely**, D Sussillo, SI Ryu, KV Shenoy, MM Churchland
**The largest response component in motor cortex reflects movement timing but not type**
*eneuro* 3(4):ENEURO-0085 (2016)

**JS Seely**, CC Chow
**The role of mutual inhibition in binocular rivalry**
*Journal of Neurophysiology* 106(5):2136-50 (2011)

**JS Seely**, P Crotty
**Optimization of the leak conductance in the squid giant axon**
*Physical Review E* 82, 021906 (2010)

## In Progress

**JS Seely**, RM Memmesheimer, LF Abbott
**Propagating targets through noninvertible layers of deep networks**

A Miri, C Warriner, **JS Seely**, GF Elsayed, LF Abbott, JP Cunningham, MM Churchland, TM Jessell
**Motor cortex engages output circuits in a behaviorally-selective manner**
*Submitted*

AA Russo, SR Bittner, **JS Seely**, SM Perkins, BM London, AH Lara, A Miri, LF Abbott, TM Jessell, JP Cunningham, MM Churchland
**Motor cortical activity reflects a detangled version of muscle activity**

## Skills

Python, TensorFlow, MATLAB