

## Andrew Alexander

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### Education

<b>Doctor of Philosophy in Cognitive Science</b> University of California, San Diego La Jolla, CA	2011-2016
<b>Bachelor of Science with Honors in Cognitive Science</b> University of California, San Diego La Jolla, CA	2004-2009

### Research Experience

<b>Postdoctoral Research</b> <b>Dr. Michael Hasselmo Laboratory</b> Boston University, Center for Systems Neuroscience Department of Psychological and Brain Sciences	2017-present
<b>Graduate Research</b> <b>Dr. Douglas Nitz Laboratory</b> University of California, San Diego <i>Spatial representations of the Retrosplenial cortex and Physiological dynamics of Basal Forebrain neurons in complex behavior</i> In vivo electrophysiology, complex analytics of spiking activity and LFP in relation to behavior, behavioral training, team management and mentoring, histology, surgery, manuscript preparation, grant writing, DREADDs, etc.	2009 – 2016
<b>Dr. Andrea Chiba Laboratory</b> University of California, San Diego <i>Encoding of context in the dentate gyrus of the hippocampus and Functional assessment of Basal Forebrain cholinergic projections in discrimination of temporally-modulated stimuli</i> Psychophysics, unbiased stereology, viral injections, immunochemistry	2008 - 2011

### Major Research Awards and Fellowships

NIH Postdoctoral Ruth L. Kirschstein National Research Service Award	2017 – 2020
NSF Graduate Research Fellow	2011 – 2016
Kavli Institute for Brain and Mind Innovative Research Grant PI	2014
Robert J. Glushko and Pamela Samuelson Graduate Fellowship	2011 – 2016

### Travel Awards and Honors

UCSD Dean of Social Sciences Travel Award	2016
GSA Travel Award	2016

Departmental Nominee for ORAU Nobel Laureate Meeting  
UCSD Cognitive Science Travel Award  
UCSD Outstanding Undergraduate Researcher

2014  
2013 - 2015  
2008 & 2009

## Publications

**Alexander, A. S.**, & Nitz, D. A. (2017, In press). Spatially periodic activation patterns of retrosplenial cortex encode route sub-spaces and distance travelled. *Current Biology*. 2017 Jun 5;27(11):1551-1560.e4. doi: 10.1016/j.cub.2017.04.036. Epub 2017 May 18.

Rounds, E.L., Scott, E.O., **Alexander, A.S.**, De Jong, K.A., Nitz, D.A., Krichmar, J.L. (2016). An evolutionary framework for replicating neurophysiological data and spiking neural networks. *International Conference on Parallel Problem Solving from Nature*, 537-547. Springer International Publishing.

**Alexander, A. S.**, & Nitz, D. A. (2015). Retrosplenial cortex maps the conjunction of internal and external spaces. *Nat. Neuro.*, 18(8), 1143-1151.

Tingley, D., **Alexander, A. S.**, Quinn, L. K., Chiba, A. A., & Nitz, D. A. (2015). Cell Assemblies of the Basal Forebrain. *J. Neurosci.*, 35(7), 2992-3000.

Tingley, D., **Alexander, A. S.**, Kolbu, S., de Sa, V. R., Chiba, A. A., & Nitz, D. A. (2014). Task-phase-specific dynamics of basal forebrain neuronal ensembles. *Front. Sys. Neuro.*, 8.

Rangel, L. M., **Alexander, A. S.**, Aimone, J. B., Wiles, J., Gage, F. H., Chiba, A. A., & Quinn, L. K. (2014). Temporally selective contextual encoding in the dentate gyrus of the hippocampus. *Nat. Comm.*, 5.

Minces, V. H., **Alexander, A. S.**, Datlow, M., Alfonso, S. I., & Chiba, A. A. (2013). The role of visual cortex acetylcholine in learning to discriminate temporally modulated visual stimuli. *Front. Behav. Neuro.*, 7.

## Presentations and Posters

### Talks

*Behavioral and Neurophysiological Correlates of a Novel Rodent Spatial Insight Paradigm.*

Kavli Institute for Brain and Mind Innovative Research Symposium, UCSD, May 2015

*Retrosplenial cortex activity integrates across spatial frames of reference.*

Neurobiology of Learning and Memory, Park City, January 2014

*Basal forebrain neuronal activity reflects probabilistic uncertainty in a visual attention task.* UCSD Cognitive Science Wa Talk, January 2013

*Basal forebrain neuronal activity reflects probabilistic uncertainty in a visual attention task.* Society for Neuroscience, New Orleans, October 2012

*Auditory perception, attention, and the cholinergic neuromodulatory system.*

Cognitive Science Honors Thesis Defense, UCSD, 2009

*Auditory perception, attention, and the cholinergic neuromodulatory system.*  
Undergraduate Research Conference, UCSD, 2009

### **Conference Posters**

*Representation of self-motion, target position, and place in hippocampus and posterior parietal and retrosplenial cortices during pursuit behavior.*  
Society for Neuroscience, San Diego, November 2016

*Hippocampal and posterior parietal cortex spatial encoding during pursuit.*  
FENS Forum 2016, Copenhagen, Denmark, July 2016

*Retrosplenial cortex spatial firing patterns represent sub-spaces within broader routes*  
1<sup>st</sup> Interdisciplinary Navigation Symposium (iNav), Bad Gastein, Austria, June 2016

*Route versus environment-centered properties in the spatial firing patterns of retrosplenial cortex neurons.*  
Society for Neuroscience, Chicago, October 2015

*Retrosplenial cortex and Hippocampus share modulation of firing activity by allocentric space and the Hippocampal theta rhythm.*  
Society for Neuroscience, Washington D.C., November 2014

*Cell Assemblies of the Basal Forebrain.*  
Joint Symposium on Neural Computation, UC Irvine, May 2014

*Retrosplenial cortex activity integrates allocentric, route-centric, and egocentric spatial frames of reference.*  
Society for Neuroscience, San Diego, November 2013

*Cell Assemblies of the Basal Forebrain.*  
Society for Neuroscience, San Diego, November 2013

*Firing of basal forebrain and posterior parietal cortex neurons maps multiple distinct task phases in a selective attention task.*  
Society for Neuroscience, New Orleans, October 2012

*Basal forebrain neuronal activity predicts trial outcome subsequent to cue detection in a selective attention task.*  
Society for Neuroscience, Washington DC, November 2011

### **Technical Skills**

Animal Behavior: rat handling and training on track running, visuospatial attention tasks, and psychophysical paradigms, behavioral scoring, design of novel behavioral tasks to investigate the function of the basal forebrain, spatial systems, and association cortices.

In vivo Electrophysiology: Microdrive/ hyperdrive construction and design for targeting of multiple brain regions simultaneously, surgical microdrive implantation, single unit recordings in awake-behaving rats (Plexon SortClient, Neuralynx), spike sorting (Plexon Offline Sorter).

In vivo optogenetics

MATLAB for analysis of electrophysiological data

Tissue preparation, staining, and immunohistochemistry

Unbiased Stereology

Viral methods (192-IgG-Saporin, DREADDs, etc.)

## Teaching

### ***Instructor***

Systems Neuroscience, UCSD, Winter 2015

Systems Neuroscience, UCSD, Summer 2015

### ***Teaching Assistant***

Hands-On Computing, UCSD, 2015

Cognitive Neuroscience, UCSD, 2014

From Sleep to Attention, UCSD, 2014

Systems Neuroscience, UCSD, 2011-2013

Neuroanatomy, UCSD, 2008

## Volunteer/Outreach

San Diego Brain Bee Judge

UCSD Triton Day Outreach

Preuss School Student Mentor

UCSD Neuroscience Outreach Program

UCSD Undergraduate Honors Student Advisor (David Tingley, Shelby Cohantz)

## Professional Society Memberships

Society for Neuroscience

## Research Interests

Mechanisms of anchoring and interrelating spatial representations generated in distinct brain regions and reference frames.

The function of oscillatory dynamics in the coordination of information processing between cortical and subcortical structures.

Learning and memory and interactions between the basal forebrain projection system and the amygdala, hippocampus, and prefrontal cortex.