

## Andrew Alexander

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 @\_AndyAlexander

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### Education

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

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### Research Experience

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#### Postdoctoral Research

- 2017-present     **Dr. Michael Hasselmo Laboratory**  
Boston University, Center for Systems Neuroscience  
Department of Psychological and Brain Sciences  
*Egocentric vector representations of retrosplenial cortex*

#### Graduate Research

- 2011 – 2016     **Dr. Douglas Nitz Laboratory**  
University of California, San Diego  
*Spatial representations of the retrosplenial cortex*  
*Physiological dynamics of basal forebrain neurons in complex behavior*
- 2008 – 2011     **Dr. Andrea Chiba Laboratory**  
University of California, San Diego  
*Encoding of temporal context in the dentate gyrus of the hippocampus*

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### Major Research Awards and Fellowships

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- 2021 – 2025     K99/R00 NIH NINDS Pathway to Independence Award
- 2017 – 2021     F32 NIH NINDS Postdoctoral Ruth L. Kirschstein National Research Service Award
- 2011 – 2016     NSF Graduate Research Fellowship
- 2014             Kavli Institute for Brain and Mind Innovative Research Grant PI
- 2019 – 2024     R01 NIH NIMH MH120073 - PI Michael Hasselmo (assisted in writing)

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### Publications

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#### Experimental Articles

**Alexander, A.S.**, Tung, J.C., Chapman, G.W., Shelley, L.E., Hasselmo, M.E., Nitz, D.A. (2022). Adaptive integration of self-motion and goals in posterior parietal cortex. *Cell Reports*, 38(10), 110504

Carstensen, L. C., **Alexander, A. S.**, Chapman G W., Lee A.J., Hasselmo, M. E. (2021). Neural responses in retrosplenial cortex associated with environmental alterations., *iScience*, 24(11), 103377.

**Alexander, A. S.**, Carstensen, L. C., Hinman, J. R., Raudies, F, Chapman G W., Hasselmo, M. E. (2020). Egocentric boundary vector tuning of the retrosplenial cortex., *Science Advances*, 6(8).

**Alexander, A. S.**, Rangel, L. M., Tingley, D., & Nitz, D. A. (2018). Neurophysiological signatures of temporal coordination between retrosplenial cortex and the hippocampal formation. *Behavioral neuroscience*, 132(5), 453-468.

Tingley, D., **Alexander, A. S.**, Quinn, L. K., Chiba, A. A., & Nitz, D. (2018). Multiplexed oscillations and phase rate coding in the basal forebrain. *Science advances*, 4(8)

Rounds E.L., **Alexander, A.S.**, Nitz, D.A., Krichmar, J.L. (2018) Conjunctive Coding in an Evolved Spiking Model of Retrosplenial Cortex. *Behavioral Neuroscience*, 132(5), 430.

**Alexander, A. S.**, & Nitz, D. A. (2017). Spatially periodic activation patterns of retrosplenial cortex encode route subspaces and distance traveled. *Current Biology*, 27(11), 1551-1560.

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.

**Alexander, A. S.**, & Nitz, D. A. (2015). Retrosplenial cortex maps the conjunction of internal and external spaces. *Nature Neuroscience*, 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. Neuroscience*, 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. *Nature 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.

## Review & Commentary Articles

**Alexander, A.S.**, Robinson, J.C., Dannenberg, H., Kinsky, N.R., Levy, S.J., Mau, W., Chapman, G.W., Sullivan, D., Hasselmo, M.E. Neurophysiological coding of space and time in the hippocampus, entorhinal cortex and retrosplenial cortex. (2020). *Brain and Neuroscience Advances*.

Hasselmo, M.E., **Alexander, A.S.**, Hoyland, A., Robinson, J.C., Bezaire, M.J., Chapman, G.W., Saudargiene, A., Carstensen, L.C., Dannenberg, H. (2020). The Unexplored Territory of Neural Models: Potential Guides for Exploring the Function of Metabotropic Neuromodulation. *Neuroscience*.

Hasselmo, M.E., **Alexander, A.S.**, Dannenberg, H., Newman, E.L. (2020). Overview of computational models of hippocampus and related structures: Introduction to the special issue. *Hippocampus*, 30(4), 295-301.

Dannenberg, H, **Alexander, A. S.**, Robinson, J. C., Hasselmo, M. E. (2019). The Role of Hierarchical Dynamical Functions in Coding for Episodic Memory and Cognition. *J. Cognitive Neuro.* 31 (9), 1271-1289

**Alexander, A. S.**, & Hasselmo, M. E. (2018). Navigation: Shedding light on stellate cells. *eLife*, 7, e41041.

Hinman, J. R., Dannenberg, H., **Alexander, A. S.**, & Hasselmo, M. E. (2018). Neural mechanisms of navigation involving interactions of cortical and subcortical structures. *Journal of neurophysiology*, 119(6), 2007-2029.

**Alexander, A.S.**, & Shelley, L.E. (2018). Sleep-Stage-Dependent Hippocampal Coordination with Cingulate and Retrosplenial Association Cortices. *Journal of Neuroscience.*, 38(3), 512-514; DOI: 10.1523/JNEUROSCI.2781-17.2017

## Preprints/ In Review

Sheehan, D.J., Fordyce, B.A. **Alexander, A.S.**, Hasselmo, M.E., (2021). The Hippocampal Representation of Space is Modulated by the Availability of Visual Information. (In review).

Lian, Y., Williams, S., **Alexander, A.S.**, Hasselmo, M.E., Burkitt, A.N. (2022). Learning the Vector Coding of Egocentric Boundary Cells from Visual Data. (*Biorxiv*).

**Alexander, A.S.**, Place, R., Starrett, M.J., Chrastil, E.R., Nitz, D.A. (2022). Rethinking retrosplenial cortex: Perspective and predictions. (In review).

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## Invited Presentations & Conference Posters

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### Talks

- 2022 Temple University, Department of Psychology
- 2022 University of Illinois, Chicago, Department of Psychology
- 2021 Massachusetts Institute of Technology, Department of Brain and Cognitive Sciences
- 2020 Neuromatch 3.0, (Virtual)
- 2019 Spring Hippocampal Research Conference, Taormina, Italy
- 2018 Brain Behavior and Cognition Seminar Series, BU, Boston, MA
- 2015 Kavli Institute for Brain and Mind Innovative Research, San Diego, CA
- 2014 Neurobiology of Learning and Memory, Park City, UT
- 2012 Society for Neuroscience, New Orleans, LA
- 2009 UCSD Undergraduate Research Conference, San Diego, CA

### Selected conference abstracts (first author only)

- 2021 Laminar calcium imaging of spatial memory related retrosplenial cortex dynamics in freely moving rats. Soc. Neuro. Abs., Virtual
- 2019 Egocentric boundary vector tuning of the retrosplenial cortex. Soc. Neuro. Abs., Chicago, IL
- 2018 Retrosplenial and entorhinal cortical representation during visually-based triangulation. Soc. Neuro. Abs., San Diego, CA
- 2018 Spatial correlates of the retrosplenial cortex during free exploration. iNAV, Mont Tremblant, CAN
- 2017 Representation of navigational distance in the Retrosplenial cortex. Soc. Neuro. Abs., Washington D.C.
- 2016 Representation of self-motion, target position, and place in hippocampus and posterior parietal and retrosplenial cortices during pursuit behavior. Soc. Neuro. Abs., San Diego, CA
- 2016 Hippocampal and posterior parietal cortex spatial encoding during pursuit. FENS Forum, Copenhagen, Denmark
- 2016 Retrosplenial cortex spatial firing patterns represent sub-spaces within broader routes. iNAV, Bad Gastein, Austria
- 2015 Route versus environment-centered properties in the spatial firing patterns of retrosplenial cortex neurons. Soc. Neuro. Abs., Chicago, IL
- 2014 Retrosplenial cortex and Hippocampus share modulation of firing activity by allocentric space and the Hippocampal theta rhythm. Soc. Neuro. Abs., Washington D.C.
- 2014 Cell Assemblies of the Basal Forebrain. Joint Symposium on Neural Computation, UC Irvine
- 2013 Retrosplenial cortex activity integrates allocentric, route-centric, and egocentric spatial frames of reference. Soc. Neuro. Abs., San Diego, CA
- 2013 Cell Assemblies of the Basal Forebrain. Soc. Neuro. Abs., San Diego, CA
- 2012 Firing of basal forebrain and posterior parietal cortex neurons maps multiple distinct task phases in a selective attention task. Soc. Neuro. Abs., New Orleans, LA
- 2011 Basal forebrain neuronal activity predicts trial outcome subsequent to cue detection in a selective attention task. Soc. Neuro. Abs., Washington D.C.

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## Teaching

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### Instructor

- 2015 Systems Neuroscience, UCSD, Winter
- 2015 Systems Neuroscience, UCSD, Summer

### Teaching Assistant

- 2015 Hands-On Computing, UCSD
- 2014 Cognitive Neuroscience, UCSD
- 2014 From Sleep to Attention, UCSD
- 2013 Systems Neuroscience, UCSD
- 2012 Systems Neuroscience, UCSD

2011 Systems Neuroscience, UCSD  
2008 Neuroanatomy, UCSD

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## Mentorship

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### Graduate students (BU)

2017-current 3 graduate students

### Undergraduate students (BU)

2017-present 7 undergraduate research assistants, 3 UROP Fellows

### Undergraduate students (UCSD)

2013-2017 7 undergraduate research assistants, 2 honors thesis students

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## Awards and Honors

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2018 Society for Neuroscience Trainee and Professional Development Award  
2016 UCSD Dean of Social Sciences Travel Award  
2016 UCSD GSA Travel Award  
2014 Departmental Nominee for ORAU Nobel Laureate Meeting  
2011 Robert J. Glushko and Pamela Samuelson Graduate Fellowship  
2009 UCSD Outstanding Undergraduate Researcher  
2008 UCSD Outstanding Undergraduate Researcher

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## Volunteer/Outreach

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San Diego Brain Bee Judge  
Preuss School Student Mentor  
UCSD Neuroscience Outreach Program

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## Professional Society Memberships and Service

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2017 Boston University Brain Behavior and Cognition Seminar Co-organizer  
2013 UCSD "Wa" Talk Series Coordinator  
2011-present Society for Neuroscience

Ad hoc reviewer:

Cerebral Cortex, Journal of Neurophysiology, Behavioral Neuroscience, Frontiers in Psychology, European Journal of Neuroscience, Journal of Neuroscience, Neuron\*, Current Biology, eLife, PNAS, Journal of Comparative Neurology, Communications Biology, COSYNE, Science Advances, Nature, Cell Reports, Animal Cognition

\*Assisted

## Technical Skills

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- Animal Behavior
- In vivo electrophysiology
- In vivo optogenetics
- In vivo calcium imaging (w/ one photon microendoscopes)
- MATLAB for analysis of electrophysiological data
- Tissue preparation, staining, and immunohistochemistry.
- Arduino and methods for behavioral paradigm automation
- 3D design for fabrication of recording devices

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## References

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Professor Michael E. Hasselmo  
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