

Anna C. Schapiro

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<http://sleepandcognition.org/anna-schapiro.html>

Department of Psychiatry
Harvard Medical School
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Education

- 2014 Princeton University – Ph.D. in Psychology and Neuroscience.
- 2011 Princeton University – M.A. in Psychology and Neuroscience.
- 2009 Stanford University – B.S. in Symbolic Systems, departmental honors, with distinction. Concentration in neuroscience.

Research positions

- 2015 – present Postdoctoral Fellow
Center for Sleep and Cognition, Harvard Medical School, P.I. Robert Stickgold
- 2009 – 2015 Graduate Student
Computational Memory Lab, Princeton University, P.I. Ken Norman
Botvinick Lab, Princeton University, P.I. Matt Botvinick
Turk-Browne Lab, Princeton University, P.I. Nick Turk-Browne
- 2006 – 2009 Research Assistant
PDP Lab, Stanford University, P.I. Jay McClelland
- 2008 Summer Research Assistant
Neuroscience and Aphasia Research Unit, University of Manchester,
P.I. Matthew Lambon Ralph
- 2006 Summer Research Assistant
Computational Cognitive Science Group, MIT, P.I. Josh Tenenbaum
TedLab, MIT, P.I. Ted Gibson
- 2005 Summer Research Assistant
Mass General Institute for Neurodegenerative Disease, P.I. Steven Reeves

Awards and honors

- 2018 Sleep Research Society Trainee Merit Based Award
- 2017 Inaugural Corkin Award, Memory Disorders Research Society
- 2016 Ruth L. Kirschstein National Research Service Award, Individual Postdoctoral Fellowship (NRSA F32), National Institute of Neurological Disorders and Stroke
- 2013 Letter of Commendation for Outstanding Teaching, Princeton University
- 2012 Rumelhart Memorial Travel Award, Neural Computation and Psychology Workshop, San Sebastian, Spain

2012	Summer Institute in Cognitive Neuroscience Fellow, Santa Barbara, CA
2010	National Science Foundation Graduate Research Fellowship
2009	Firestone Medal for Excellence in Undergraduate Research, Stanford University
2009	K. Jon Barwise Award for Distinguished Contributions to the Symbolic Systems Program, Stanford University
2009	Phi Beta Kappa, elected to Stanford chapter

Publications

Submitted

Schapiro, A.C., McDevitt, E.A., Rogers, T.T., Mednick, S.C., & Norman, K.A. (submitted). Human hippocampal replay during rest prioritizes weakly-learned information and predicts memory performance. bioRxiv: <https://doi.org/10.1101/173021>.

Peer-reviewed

Cox, R., **Schapiro, A.C.**, & Stickgold, R. (2018). Variability and stability of large-scale cortical oscillation patterns. *Network Neuroscience*.

Honey, C.J., Newman, E.L., & **Schapiro, A.C.** (2017). Switching between internal and external modes: a multi-scale learning principle. *Network Neuroscience*.

Schapiro, A.C.*, McDevitt, E.A.*, Chen, L., Norman, K.A., Mednick, S.C., & Rogers, T.T. (2017). Sleep benefits memory for semantic category structure while preserving exemplar-specific information. *Scientific Reports*.

Cox, R., **Schapiro, A.C.**, Manoach, D.S., & Stickgold, R. (2017). Individual differences in frequency and topography of slow and fast sleep spindles. *Frontiers in Human Neuroscience*.

Schapiro, A.C., Turk-Browne, N.B., Botvinick, M.M., & Norman, K.A. (2017). Complementary learning systems within the hippocampus: A neural network modeling approach to reconciling episodic memory with statistical learning. *Philosophical Transactions of the Royal Society B*.

Schapiro, A.C., Turk-Browne, N.B., Norman, K.A., & Botvinick, M.M. (2016). Statistical learning of temporal community structure in the hippocampus. *Hippocampus*.

Schlichting, M.L., Guarino, K.F., **Schapiro, A.C.**, Turk-Browne, N.B., & Preston, A.R. (2016). Hippocampal structure predicts statistical learning and associative inference abilities during development. *Journal of Cognitive Neuroscience*.

Schapiro, A.C., Gregory, E., Landau, B., McCloskey, M., Turk-Browne, N.B. (2014). The necessity of the medial temporal lobe for statistical learning. *Journal of Cognitive Neuroscience*.

Schapiro, A.C., Rogers, T.T., Cordova, N.I., Turk-Browne, N.B., & Botvinick, M.M. (2013). Neural representations of events arise from temporal community structure. *Nature Neuroscience*.

Schapiro, A.C., McClelland, J.L., Welbourne, S.R., Rogers, T.T., & Lambon Ralph, M.A. (2013). Why bilateral damage is worse than unilateral damage to the brain. *Journal of Cognitive Neuroscience*.

Gershman, S.J., **Schapiro, A.C.**, Hupbach, A., Norman, K.A. (2013). Neural context reinstatement predicts memory misattribution. *Journal of Neuroscience*.

Schapiro, A.C., Kustner, L.V., & Turk-Browne, N.B. (2012). Shaping of object representations in the human medial temporal lobe based on temporal regularities. *Current Biology*.

Schapiro, A.C. & McClelland, J.L. (2009). A connectionist model of a continuous developmental transition in the balance scale task. *Cognition*.

Chapters

Schapiro A.C., & Turk-Browne N.B. (2015) Statistical Learning. In: Arthur W. Toga, editor. Brain Mapping: An Encyclopedic Reference. Academic Press: Elsevier. pp. 501-506.

Diuk, C., **Schapiro, A.C.**, Cordova, N.I., Ribas-Fernandes, J., Niv, Y., & Botvinick, M.M. (2013). Divide and conquer: Task decompositions and hierarchical reinforcement learning in humans. In *Computational and Robotic Models of the Hierarchical Organization of Behavior* (pp. 271-291). Springer Berlin Heidelberg.

Thomas, M.S.C., McClelland, J.L., Richardson, F.M., **Schapiro, A.C.**, & Baughman, F. (2009). Dynamical and Connectionist Approaches to Development: Toward a Future of Mutually Beneficial Co-evolution. In J.P. Spencer, M. S. C. Thomas, & J. L. McClelland, (Eds). *Toward a unified theory of development: Connectionism and dynamic systems theory re-considered*. New York: Oxford.

Invited workshop and seminar talks

University of Iowa, *Iowa Neuroscience Institute seminar*, April 2018

Park City Winter Conference on the Neurobiology of Learning and Memory, *Representation of Contextual Spaces by Cortico-Hippocampal Networks*, January 2018

Stanford University, *Department of Psychology colloquium*, November 2017

Haskins Laboratories, *McDonnell Foundation Workshop: The Future of Statistical Learning*, November 2017

Boston University, *Brain, Behavior, and Cognition seminar*, October 2017

Tufts University, *Cognitive and Brain Science colloquium*, October 2017

Brown University, *Cognition Seminar*, April 2017

UC San Diego, *Temporal Dynamics of Learning Center seminar*, March 2017

COSYNE, *'Perception and Learning of Temporal Structure in Sensory Streams' workshop*, February 2017

UC Riverside, *Riverside Enhanced Memory & Sleep meeting*, November 2016

University College London, *Affective Brain Lab seminar*, October 2016

Weill Cornell Medical College, *Sackler Institute seminar*, April 2015

COSYNE, *'What Can Sleep Tell Us About Memory Consolidation' workshop*, March 2015

Reviewing

Ad hoc reviewing for:

<i>Cerebral Cortex</i>	<i>Journal of Experimental Psychology:</i>
<i>Cognition</i>	<i>Learning, Memory, and Cognition</i>
<i>Cognitive Psychology</i>	<i>Journal of Neuroscience</i>
<i>Cognitive Science</i>	<i>Learning and Memory</i>
<i>Cortex</i>	<i>Learning and Motivation</i>
<i>Current Biology</i>	<i>Nature Communications</i>
<i>eLife</i>	<i>Nature Human Behaviour</i>
<i>Experimental Brain Research</i>	<i>Neuropsychologia</i>
<i>Hippocampus</i>	<i>Open Mind</i>
<i>Human Brain Mapping</i>	<i>PLOS Computational Biology</i>
<i>Journal of Cognitive</i>	<i>Psychonomic Bulletin and</i>
<i>Neuroscience</i>	<i>Review</i>
<i>Journal of Experimental Psychology:</i>	<i>Scientific Reports</i>
<i>General</i>	<i>Sleep</i>
	<i>Trends in Cognitive Sciences</i>

Teaching

2016	Co-instructor for <i>Conscious States: Waking, Sleeping, and Dreaming</i> (MBB 980A) at Harvard College
2015	Completed Princeton's Teaching Transcript Program – https://www.princeton.edu/mcgraw/gs/transcript/
2012	Teaching Assistant for <i>Introduction to Connectionist Models: Bridging Between Brain and Mind</i> (PSY/NEU 330) at Princeton.
2007	Taught Student Initiated Course on philosophy of mind at Stanford.

Academic advising and service

2016	Served on the first postdoctoral steering committee for Harvard's Mind Brain Behavior program (http://mbb.harvard.edu/). Organized talk series and social events for postdocs from different schools and departments of Harvard with a common interest in mind, brain, and behavior.
2013	Co-organizer of the first annual Manhattan Area Memory Meeting.
2013	Graduate student committee member for the neuroscience Ph.D. track at Princeton. Acted as liaison between the faculty and graduate student body.
2011	Served on organizing committee for Department of Psychology graduate student visiting day at Princeton.

- 2010 Served on organizing committee for Department of Psychology graduate student orientation at Princeton.
- 2007 – 2009 Invited and introduced speakers for the Symbolic Systems weekly forum, organized events to expose undergraduates to research and career opportunities, and advised undergraduates on course selection and degree requirements as an Advising Fellow for the Symbolic Systems Program at Stanford.
- 2008 Chaired sessions at the PsyPAG annual conference, University of Manchester.
- 2006 – 2008 Organized debates, discussions, and dinners with faculty and social gatherings for Stanford Symbolic Systems majors as Focus Assistant and Resident Assistant for the Symbolic Systems theme house.

Undergraduate advisees:

- Olivia Manickas-Hill (Harvard '18)
- Daniel Toker (Princeton '13)
- Kaitlin Henderson (Princeton '12)
- Aaron Trippe (Princeton '12)
- Omoshalewa Bamkole (Princeton '11)
- Lauren Kustner (Princeton '11)

Conference talks

- Schapiro, A.C.**, Turk-Browne, N.B., Botvinick, M.M., & Norman, K.A. (2017, June). Complementary learning systems within the hippocampus: reconciling episodic memory with statistical learning. *Talk delivered at the BCBL Conference on Interdisciplinary Advances in Statistical Learning, Bilbao, Spain.*
- Schapiro, A.C.**, McDevitt, E.A., Mednick, S.C., Rogers, T.T., Norman, K.A. (2017, May). Enhancement and prioritization of structured information over sleep and wake. *Talk delivered at the Context and Episodic Memory Symposium, Philadelphia.*
- Schapiro, A.C.**, Turk-Browne, N.B., Botvinick, M.M., & Norman, K.A. (2016, August). Complementary learning systems within the hippocampus. *Talk delivered at the 15th Neural Computation and Psychology Workshop, Philadelphia.*
- Schapiro, A.C.**, Rogers, T.T., McDevitt, E.A., Mednick, S.C., & Norman, K.A. (2015, May). Human hippocampal replay prioritizes weakly-learned information and predicts memory performance. *Data blitz delivered at the Manhattan Area Memory Meeting, Princeton.*
- Schlichting, M.L., Guarino, K.F., **Schapiro, A.C.**, Turk-Browne, N.B., & Preston, A.R. (2015, April). Structural development of hippocampal subfields is related to statistical learning and inference. *Talk delivered at the Austin Conference on Learning and Memory biannual meeting, Austin.*
- Schapiro, A.C.**, Norman, K.A., Turk-Browne, N.B., & Botvinick, M.M. (2014, November). Rapid learning of complex temporal regularities in the hippocampus: Evidence from fMRI and a neural network model. *Talk delivered at the Society for Neuroscience Meeting, Washington, D.C.*

Schapiro, A.C., Norman, K.A., Turk-Browne, N.B., & Botvinick, M.M. (2014, June). Rapid learning of complex events in the hippocampus: Evidence from fMRI and neural network modeling. *Talk delivered at the Manhattan Area Memory Meeting, New York City.*

Schapiro, A.C., Gregory, E., Landau, B., McCloskey, M., Turk-Browne, N.B. (2013, May). The necessity of the medial temporal lobe for statistical learning. *Data blitz delivered at the Context and Episodic Memory Symposium, Philadelphia.*

Schapiro, A.C., Rogers, T.T, Cordova, N.I., Turk-Browne, N.B., & Botvinick, M.M. (2012, July). Neural representations of events arise from temporal 'community' structure. *Talk delivered at the Neural Computation and Psychology Workshop, San Sebastian, Spain.*

Botvinick, M.M, **Schapiro, A.C.**, Cordova, N.I., Turk-Browne, N.B., & Rogers, T.T. (2012, April). Events as categories. *Talk delivered at the Cognitive Neuroscience Society Meeting, Chicago.*

Schapiro, A.C., Kustner, L.V., & Turk-Browne, N.B. (2011, November). Multi-voxel object representations in the human medial temporal lobe are shaped by incidental learning of temporal regularities. *Talk delivered at the Society for Neuroscience meeting, Washington, D.C.*

Schapiro, A.C., McClelland, J.L., Welbourne, S.R., Rogers, T.T., & Lambon Ralph, M.A. (2009, November). A computational account of the differences between unilateral and bilateral damage. *Talk delivered and poster presented at the Computational Cognitive Neuroscience Conference, Boston.*

Conference posters

Schapiro, A.C., Bayda, M., Cho, E., Cox, R., & Stickgold, R. (2018, March). Generalization in an object category learning paradigm is better in the morning than the evening. *Poster presented at the Cognitive Neuroscience Society Meeting, Boston, MA.*

Pudhiyidath, A., **Schapiro, A.C.**, Preston, A.R. (2018, March). Neural representations of temporal statistics can predict subsequent reasoning. *Poster presented at the Cognitive Neuroscience Society Meeting, Boston, MA.*

Schapiro, A.C., Bayda, M., Cho, E., Cox, R., & Stickgold, R. (2017, November). The role of sleep in generalizing across disjointly presented information. *Poster presented at the Society for Neuroscience Meeting, Washington, D.C.*

Cox, R., Van Bronkhorst, M., Gomillion, H., **Schapiro, A.C.**, & Stickgold, R. (2017, November). Sleep selectively enhances associative aspects of emotional memories. *Poster presented at the Society for Neuroscience Meeting, Washington, D.C.*

Cohen, J.D., Lesnick, M., Keller, B., Baldassano, C., **Schapiro, A.C.**, & Ellis, C.T. (2017, November). Using realistic, synthetic fMRI data to validate Topological Data Analysis as a tool for fMRI. *Poster presented at the Society for Neuroscience Meeting, Washington, D.C.*

Cox, R., **Schapiro, A.C.**, & Stickgold, R. (2017, June). Oscillatory network dynamics of non-rapid eye movement sleep. *Poster presented at Network Neuroscience, Indianapolis.*

Schapiro, A.C., McDevitt, E.A., Chen, L., Norman, K.A., Mednick, S.C., & Rogers, T.T. (2017, June). Sleep benefits memory for semantic category structure while preserving individual

exemplars. *Poster presented at SLEEP, Boston.*

Cox, R., van Bronkhorst, M., Gomillion, H., **Schapiro, A.C.**, Stickgold, R. (2017, June). Sleep selectively enhances associative aspects of emotional memories. *Poster presented at SLEEP, Boston.*

Schapiro, A.C., Turk-Browne, N.B., Botvinick, M.M., & Norman, K.A. (2016, November). Complementary learning systems within the hippocampus: A neural network modeling approach to reconciling episodic memory and statistical learning. *Poster presented at the Society for Neuroscience Meeting, San Diego.*

Schapiro, A.C., Rogers, T.T., McDevitt, E.A., Mednick, S.C., & Norman, K.A. (2016, June). Human hippocampal replay prioritizes weakly-learned information and predicts memory performance. *Poster presented at SLEEP, Denver.*

Schapiro, A.C., Rogers, T.T., McDevitt, E.A., Mednick, S.C., & Norman, K.A. (2015, October). Human hippocampal replay prioritizes weakly-learned information and predicts memory performance. *Poster presented at the Society for Neuroscience Meeting, Chicago.*

Guarino, K.F., Schlichting, M.L., **Schapiro, A.C.**, Turk-Browne, N.B., & Preston, A.R. (2015, October). Development of medial prefrontal cortex is related to statistical learning and inference. *Poster presented at the Society for Neuroscience Meeting, Chicago.*

Schlichting, M.L., Guarino, K.F., **Schapiro, A.C.**, Turk-Browne, N.B., & Preston, A.R. (2014, November). Structural development of hippocampal subfields is related to statistical learning and inference. *Poster presented at the Society for Neuroscience Meeting, Washington, D.C.*

Schapiro, A.C., Norman, K.A., Turk-Browne, N.B., & Botvinick, M.M. (2014, May). Learning of complex event structure in the hippocampus. *Poster presented at the Context and Episodic Memory Symposium, Philadelphia.*

Schapiro, A.C., Gregory, E., Landau, B., McCloskey, M., Turk-Browne, N.B. (2013, November). The necessity of the medial temporal lobe for statistical learning. *Poster presented at Society for Neuroscience meeting, San Diego.*

Schapiro, A.C., Rogers, T.T., Norman, K.A., Chen, L., McDevitt, E.A., Mednick, S.C. (2013, June). The role of sleep in consolidating semantic knowledge. *Poster presented at SLEEP, Baltimore.*

Schapiro, A.C., Rogers, T.T., Norman, K.A., Chen, L., McDevitt, E.A., Mednick, S.C. (2013, May). The role of sleep in consolidating semantic knowledge. *Poster presented at the Vision Sciences Society Meeting, Naples, FL.*

Schapiro, A.C., Norman, K.A., & Rogers, T.T. (2012, October). The role of sleep in consolidating semantic knowledge. *Poster presented at the Society for Neuroscience meeting, New Orleans.*

Gershman, S.J., **Schapiro, A.C.**, Hupbach, A., & Norman, K.A. (2012, October). Neural context reinstatement predicts memory misattribution. *Poster presented at the Society for Neuroscience meeting, New Orleans.*

Diuk, C., Yee, D., Ribas-Fernandes, J., Cordova, N.I., **Schapiro, A.C.**, Niv, Y., & Botvinick, M.M. (2012, October). Divide and conquer: Task decomposition in humans. *Poster presented at the Society for Neuroscience meeting, New Orleans.*

Schapiro A., Herd, S., Trippe, A., O'Reilly, R., Rogers, T., & Norman, K. (2012, July). The computational mechanisms underlying learning during sleep. *Poster presented at the Neural Computation and Psychology Workshop, San Sebastian, Spain.*

Schapiro, A.C., Kustner, L.V., & Turk-Browne, N.B. (2011, May). Contributions of visual and temporal similarity to statistical learning. *Poster presented at the Vision Sciences Society Meeting, Naples, FL.*

Schapiro, A.C., Kustner, L.V., & Turk-Browne, N.B. (2011, May). Visual similarity affects statistical learning of temporal regularities: Evidence from familiarity, implicit biases, and MTL pattern correlations. *Poster presented at the Context and Episodic Memory Symposium, Philadelphia.*

Schapiro, A.C., Rogers, T.T., & Botvinick, M. (2010, August). The structure of event representations: behavioral, imaging, and computational investigations. *Poster presented at the Cognitive Science Society Conference, Portland.*

Schapiro, A.C., McClelland, J.L., Welbourne, S.R., & Lambon Ralph, M.A. (2009, March). Modeling lateralization of semantic knowledge in the anterior temporal lobes. *Poster presented at the Cognitive Neuroscience Society Meeting, San Francisco.*