

# HENRY L. HALLOCK, PH.D.

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## RESEARCH STATEMENT

I am a behavioral neuroscientist interested in how the brain encodes memory, attention, and decision-making. My long-term research goal is to identify circuits (groups of connected neurons) in the brain that regulate these processes, and to understand how these circuits function at the molecular and systems levels. To accomplish this goal, my research uses a variety of techniques, including *in vivo* calcium imaging and electrophysiology, chemogenetic manipulation, *in situ* hybridization and RNA-sequencing, and translational touchscreen-based cognitive testing in rodents. I believe that a fundamental understanding of how memory, attention, and decision-making circuits function will be critical for precision medicine approaches to treating cognitive symptoms in neuropsychiatric disorders, including schizophrenia, post-traumatic stress disorder, major depressive disorder, and attention-deficit hyperactivity disorder.

## EDUCATION/TRAINING

### **2016-Present**                      **Postdoctoral Fellow**

The Lieber Institute for Brain Development, Johns Hopkins School of Medicine, Baltimore, MD  
Advisor: Keri Martinowich, Ph.D.

### **2010-2016**                      **Graduate Student Researcher**

University of Delaware, Newark, DE

Advisor: Amy L. Griffin, Ph.D.

Dissertation Title: "Prefrontal-thalamo-hippocampal circuit contributions to spatial working memory"

Ph.D. in Psychology, Behavioral Neuroscience concentration: 2016

### **2007-2010**                      **Undergraduate Researcher**

Millersville University of Pennsylvania, Millersville, PA

Advisors: Shaun P. Cook, Ph.D. & Shawn P. Gallagher, Ph.D.

B.A. in Psychology, Biology minor: 2010

*Magna cum laude*

## FUNDING AS PRINCIPAL INVESTIGATOR

### **CURRENT**

**2021-2023**                      NARSAD Young Investigator Award, Brain and Behavior Research Foundation  
*'Neural correlates of sustained attention during touchscreen-based cognitive testing'*  
Award total: \$70,000

**2019-2022**                      NIH Ruth L. Kirschstein National Research Service Award (NRSA) for Individual  
Postdoctoral Fellows (F32), National Institute of Mental Health  
*'Regulation of fear expression by activity-dependent BDNF in direct hippocampal-to-prelimbic projections'*  
Award total: \$206,000

## PAST

**2018-2019** Mission Forward Award, Lieber Institute for Brain Development  
'*Molecular signatures of prefrontal-projecting hippocampal neurons*'  
Award total: \$100,000

## AWARDS/HONORS

**2019** Society for Biological Psychiatry "Rising Star"  
**2018** Gordon Research Seminar "Amydala" Meeting Poster Prize  
**2018** Johns Hopkins Postdoctoral Retreat Best Poster (\$1,000 Travel Award)  
**2014** Society for Neuroscience, Delaware Chapter Best Poster (also in 2011)  
**2013** University of Delaware Graduate Student Travel Award (also in 2012 and 2011)  
**2013** University of Delaware Graduate Research Fellowship  
**2012** NSF Graduate Research Fellowship Honorable Mention  
**2009** Millersville University Intramural Grant for Undergraduate Research  
**2009** Psi Chi National Honor Society in Psychology

## PUBLICATIONS (\* DENOTES UNDERGRADUATE/POST-BAC MENTEE)

12. **Hallock, H.L.**, \*Quillian, H.M., Maynard, K.R., \*Mai, Y., Chen, H-Y., Hamersky, G.R., Shin, J.H., Maher, B.J., Jaffe, A.E., & Martinowich, K. (2020). Molecularly-defined hippocampal inputs regulate population dynamics in the prelimbic cortex to suppress context fear memory retrieval. *Biological Psychiatry*, <https://doi.org/10.1016/j.biopsych.2020.04.014>
11. Maynard, K.R., Kardian, A., Hill, J.L., \*Mai, Y., Barry, B., **Hallock, H.L.**, Jaffe, A.E., & Martinowich, K. (2020). TrkB signaling influences gene expression in cortistatin-expressing interneurons. *eNeuro*, **7**: 10.1523/ENEURO.0310-19.2019
10. **Hallock, H.L.**, \*Quillian, H.M., \*Mai, Y., Maynard, K.R., & Martinowich, K. (2019). Manipulation of a genetically and spatially defined sub-population of BDNF-expressing neurons potentiates learned fear and decreases hippocampal-prefrontal synchrony in mice. *Neuropsychopharmacology*, **44**: 2239-2246
9. Hill, J.L., Jimenez, D.V., \*Mai, Y., Maynard, K.R., Hardy, N.F., **Hallock, H.L.**, Ren, M., Chen, H-Y., Yang, F., Maher, B.J., Schloesser, R.J., & Martinowich, K. (2018). Cortistatin interneurons require TrkB signaling to prevent brain hyper-excitability. *Brain Structure and Function*, **224**: 471-483
8. **Hallock, H.L.**, Garman, H.D., Cook, S.P., & Gallagher, S.P. (2017). Recognition without words: Using taste to explore survival processing. *The Journal of Undergraduate Neuroscience*, **15**: A1-A5
7. **Hallock, H.L.**, Wang, A., & Griffin, A.L. (2016). Ventral midline thalamus is critical for hippocampal-prefrontal synchrony and spatial working memory. *The Journal of Neuroscience*, **36**: 8372-8389 -- \*featured article
6. \*Layfield, D., \*Patel, M.M., **Hallock, H.L.**, & Griffin, A.L. (2015). Inactivation of the nucleus reuniens/rhomboid causes a delay-dependent impairment of spatial working memory. *Neurobiology of Learning and Memory*, **125**: 163-167

5. **Hallock, H.L.**, Wang, A., \*Shaw, C.L., & Griffin, A.L. (2013). Transient inactivation of the thalamic reuniens and rhomboid nuclei produces deficits of a working memory-dependent tactile-visual conditional discrimination T-maze task. *Behavioral Neuroscience*, **127**: 860-866
4. **Hallock, H.L.**, \*Arreola, A.C., \*Shaw, C.L., & Griffin, A.L. (2013). Dissociable roles of the dorsal striatum and dorsal hippocampus in conditional discrimination and spatial alternation T-maze tasks. *Neurobiology of Learning and Memory*, **100**: 108-116
3. \*Shaw, C.L., \*Watson, G.D.R., **Hallock, H.L.**, Cline, K.M., & Griffin, A.L. (2013). The role of the medial prefrontal cortex in the acquisition, retention, and reversal of a tactile visuospatial conditional discrimination task. *Behavioural Brain Research*, **236**: 94-101
2. **Hallock, H.L.**, & Griffin, A.L. (2013). Dynamic coding of dorsal hippocampal neurons between tasks that differ in structure and memory demand. *Hippocampus*, **23**: 169-186
1. Griffin, A.L., & **Hallock, H.L.** (2013). Hippocampal signatures of episodic memory: Evidence from single-unit recording studies. *Frontiers in Behavioral Neuroscience*, <https://doi.org/10.3389/fnbeh.2013.00054>

## TALKS/SEMINARS

- 2020** “From circuits to molecules: How the anterior cingulate cortex regulates cognitive domains affected in mental illness”, Staying Connected Post-Doc Seminar Series, Virtual (**selected to present**).
- 2020** “Molecularly-defined hippocampal inputs regulate population dynamics in the prelimbic cortex to suppress context fear memory retrieval”, Pavlovian Society meeting, Virtual.
- 2019** “Molecular targeting in a spatially-localized context fear memory circuit”, Inscopix seminar, the National Institutes of Health (NIH), Bethesda, MD (**invited speaker**).
- 2019** “Molecular targeting in a spatially-localized context fear memory circuit”, Baltimore Brain Series, University of Maryland Medical School, Baltimore, MD (**selected to present**).
- 2019** “Regulation of fear expression by activity-dependent BDNF in direct hippocampal-to-prelimbic projections”, Society for Biological Psychiatry (SOBP) Rising Star Symposium, Chicago, IL (**selected to present**).
- 2017** “The molecular logic of fear extinction circuitry: Implications for psychiatry”, PaPC conference, Millersville University, Millersville, PA (**invited speaker; keynote talk**)
- 2015** “Prefrontal-thalamo-hippocampal circuit contributions to spatial working memory”, Harvey lab, Harvard University, Cambridge, MA (**invited speaker**)
- 2015** “Prefrontal-thalamo-hippocampal circuit contributions to spatial working memory”, Gordon lab, Columbia University, New York City, NY (**invited speaker**)
- 2014** “Prefrontal-thalamo-hippocampal circuit contributions to spatial working memory”, Jacobs lab, Drexel University, Philadelphia, PA (**invited speaker**)
- 2014** “Spatial working memory deficits accompany reductions in hippocampal-prefrontal synchrony following inactivation of the ventral midline thalamic reuniens and rhomboid nuclei”, Nanosymposium, Society for Neuroscience, Washington, D.C. (**selected to present**)

- 2013** “Early life adversity and function of the medial prefrontal cortex throughout the lifespan”, Development Seminar Series, University of Delaware, Newark, DE (**invited speaker**)
- 2012** “Memory demand and task structure differentially modulate spatial representations of hippocampal neurons in dorsal CA1”, Data Blitz, Neurobiology of Learning and Memory Conference, Park City, UT
- 2011** “Charles Bonnet and the clinical significance of insight”, History of Psychology Symposium, Eastern Psychological Association, Cambridge, MA
- 2011** “Attentional set shifting as an interspecies tool for probing prefrontal cortex function”, Development Seminar Series, University of Delaware, Newark, DE (**invited speaker**)

## TEACHING EXPERIENCE

- 2020-2021** Johns Hopkins University Teaching Academy, Certificate of Completion
- 2015** Instructor of Record, “Measurement and Statistics”, University of Delaware
- 2013** Graduate Student, “Teaching Practicum” course – wrote syllabus/lesson plans/activities for “Research Methods” class, University of Delaware
- 2013** Guest Lecturer, “Introduction to Neuroscience”, *Multiple Memory Systems*, University of Delaware
- 2013** Guest Lecturer, “Spatial Cognition”, *Grid Cells in Memory and Navigation*, University of Delaware
- 2013** Guest Lecturer, “Introduction to Neuroscience”, *Structure and Function of the Nervous System*, University of Delaware
- 2013** Guest Lecturer, “Advanced Neurophysiology”, *The Action Potential*, University of Delaware
- 2011** Guest Lecturer, “Brain and Behavior”, *Multiple Memory Systems*, University of Delaware
- 2011** Guest Lecturer, “Introduction to Psychology”, *Reinforcement Learning*, University of Delaware
- 2010-2013** Graduate Student Teaching Assistant, “Brain and Behavior”, University of Delaware (graded exams, prepared lectures, held review sessions, helped students during office hours)

## TRAINEE MENTORSHIP

- 2016-Present** 4 post-baccalaureate research assistants, 4 undergraduate research assistants, 3 graduate students, direct supervision of 1 undergraduate grant application/letter of recommendation (Johns Hopkins University)
- 2010-2016** 2 masters students, 7 undergraduate research assistants, direct supervision of 2 undergraduate honors theses, 1 letter of recommendation for undergraduate research scholarship, 3 letters of recommendation for graduate school (University of Delaware)

## SERVICE/OUTREACH

*Ad hoc* reviewer for *Cerebral Cortex*, *Neuroscience*, *Developmental Cognitive Neuroscience*, *Molecular Psychiatry*, *European Journal of Neuropharmacology*, *Frontiers in Behavioral Neuroscience*, *Scientific Reports*

**2019** Mentor/letter writer, Letters to a Pre-Scientist  
**2016** University of Delaware Neuroscience Outreach Program (Project BrainLight)  
**2016** Organizer, Oscillations journal club, University of Delaware  
**2013-2016** Big Brother, Big Brothers/Big Sisters, Newark, DE  
**2011-2015** Graduate recruitment, University of Delaware

## PROFESSIONAL MEMBERSHIPS

**2010-Present** Society for Neuroscience  
**2010-2013** Eastern Psychological Association  
**2016-Present** Society for Biological Psychiatry

## CONFERENCE ABSTRACTS (\* DENOTES UNDERGRADUATE/POST-BAC MENTEE)

- 2020** Hallock, H.L., \*Valerino, Jessica, DeBrosse, A.C., Noback, M., \*Quillian, H.M., Barrow, J.C., Jaffe, A.E., Carr, G.V., & Martinowich, K. *Molecular and circuit-specific analysis of locus coeruleus-prefrontal networks during a touchscreen rodent continuous performance test*. American College of Neuropsychopharmacology, Virtual.
- 2020** Hallock, H.L., \*Quillian, H.M., Maynard, K.R., \*Mai, Y., Chen, H.Y., Hamersky, G.R., Shin, J.H., Maher, B.J., Jaffe, A.E., & Martinowich, K. *Molecularly-defined hippocampal inputs regulate population dynamics in the prelimbic cortex to suppress context fear memory retrieval*. Pavlovian Society, Virtual.
- 2019** Hallock, H.L., DeBrosse, A.C., Noback, M., \*Quillian, H.M., Barrow, J.C., Carr, G.V., & Martinowich, K. *Involvement of a locus coeruleus-to-prefrontal (LC-mPFC) circuit in a touchscreen variant of the continuous performance test (CPT) in mice*. Society for Neuroscience, Chicago, IL.
- 2019** Hallock, H.L., \*Quillian, H.M., \*Mai, Y., Chen, H-Y., Hamersky, G.R., Maher, B.J., Jaffe, A.E., & Martinowich, K. *A molecularly and anatomically-defined hippocampal-prelimbic circuit for the regulation of context fear suppression*. GRC Amygdala, Easton, MA.
- 2019** Hallock, H.L., \*Quillian, H.M., \*Mai, Y., Chen, H-Y., Hamersky, G.R., Maher, B.J., Jaffe, A.E., & Martinowich, K. *Regulation of fear expression by activity-dependent BDNF in direct hippocampal-to-prelimbic projections*. Society for Biological Psychiatry, Chicago, IL.
- 2018** Hallock, H.L., \*Mai, Y., Hill, J.L., Chen, H-Y., Hamersky, G.R., Maher, B.J., & Martinowich, K. *Regulation of fear expression by activity-dependent BDNF in direct hippocampal-to-prelimbic projections*. American College of Neuropsychopharmacology, Hollywood, FL.
- 2018** \*Quillian, H.M., Hallock, H.L., \*Mai, Y., Hill, J.L., Maynard, K.R., & Martinowich, K. *Selective manipulation of Bdnf promoter IV-expressing cells in the hippocampus modulates fear expression and hippocampal-prefrontal synchrony in mice*. Society for Neuroscience, San Diego, CA.
- 2018** Hallock, H.L., \*Mai, Y., \*Quillian, H.M., Hill, J.L., Chen, H-Y., Hamersky, G.R., Maher, B.J., & Martinowich, K. *Regulation of fear expression by activity-dependent BDNF in direct hippocampal-to-prelimbic projections*. Society for Neuroscience, San Diego, CA.
- 2018** Hallock, H.L., \*Mai, Y., Hill, J.L., Chen, H-Y., Hamersky, G.R., Maher, B.J., & Martinowich, K. *Regulation of fear expression by activity-dependent BDNF in direct hippocampal-to-prelimbic projections*. Johns Hopkins Postdoctoral Retreat, Baltimore, MD.
- 2017** Hallock, H.L., \*Mai, Y., Hill, J.L., & Martinowich, K. *Fear extinction deficits are associated with altered hippocampal-prefrontal function in mice with impaired activity-dependent BDNF signaling*. American College of Neuropsychopharmacology, Palm Springs, CA.
- 2015** Maisson, D.J., \*Emanuel, B., Hallock, H.L., Gemzik, Z., Donahue, M., & Griffin, A.L. *Distinct contributions of hippocampal and prefrontal afferents to nucleus reuniens during spatial*

*working memory*. Society for Neuroscience, San Diego, CA.

- 2014** Hallock, H.L., & Griffin, A.L. *Spatial working memory deficits accompany reductions in hippocampal-prefrontal synchrony following inactivation of the ventral midline thalamic reuniens and rhomboid nuclei*. Society for Neuroscience, Washington, D.C.
- 2014** Hallock, H.L., & Griffin, A.L. *Spatial working memory deficits accompany reductions in hippocampal-prefrontal synchrony following inactivation of the ventral midline thalamic reuniens and rhomboid nuclei*. Pavlovian Society, Seattle, WA.
- 2013** \*Patel, M.M., Hallock, H.L., Wang, A., \*Layfield, D.M., \*Shaw, C.L., & Griffin, A.L. *Transient inactivation of the thalamic nucleus reuniens and rhomboid nucleus produces deficits of a working memory-dependent tactile-visual conditional discrimination task*. Society for Neuroscience, San Diego, CA.
- 2013** Hallock, H.L., & Griffin, A.L. *Different modes of communication in the hippocampal-prefrontal micro-circuit during memory-guided decision making*. Spring Hippocampus Conference, Taormina, Sicily.
- 2013** Hallock, H.L., & Griffin, A.L. *Working memory modulates hippocampal-prefrontal synchrony across mnemonically distinct T-maze tasks*. Neurobiology of Learning and Memory, Park City, UT.
- 2012** \*Arreola, A.C., Hallock, H.L., \*Shaw, C.L., \*Patel, M.M., Amos, S.M., Chandrasekhar, V., \*Watson, G.D.R., & Griffin, A.L. *Dissociable roles of the dorsal striatum and dorsal hippocampus in the performance of mnemonically distinct T-maze tasks*. Society for Neuroscience, New Orleans, LA.
- 2012** Hallock, H.L., & Griffin, A.L. *The effect of delay-dependent working memory demand on hippocampal-prefrontal synchrony during awake behavior and sleep*. Society for Neuroscience, New Orleans, LA.
- 2012** Hallock, H.L., & Griffin, A.L. *Memory demand and task structure differentially modulate spatial representations of hippocampal neurons in dorsal CA1*. Neurobiology of Learning and Memory, Park City, UT.
- 2011** Hallock, H.L., Cline, K.M., & Griffin, A.L. *Dynamic coding of dorsal hippocampal neurons between tasks that differ in structure and memory demand*. Society for Neuroscience, Washington, D.C.
- 2011** \*Shaw, C.L., \*Watson, G.D.R., Hallock, H.L., Cline, K.M., & Griffin, A.L. *Effects of mPFC inactivation on acquisition, performance, and reversal of a tactile visuospatial conditional discrimination task*. Society for Neuroscience, Washington, D.C.
- 2011** Cook, S.P., Gallagher, S.P., Hallock, H.L., & Garman, H. *Survival processing in flavor memory*. Eastern Psychological Association, Cambridge, MA.