
Objective

Despite beginning graduate school as a biochemist, I was quickly captured by a new question: How can the electrical connections between brain cells generate something as rich as memory or as flexible as perception? My graduate work incorporated circuit manipulations, electrophysiology, and behavioral training in the mouse somatosensory cortex to investigate how thalamic inputs drive cortical activity, and how these circuits are altered by learning. As a postdoc I use head-fixed and freely moving *in vivo* electrophysiology combined with immersive behaviors to investigate the cortical mechanisms that learn and implement motor-sensory predictions. In my own lab, I plan to work at the interface of these two topics to investigate how the cortex and thalamus work together dynamically to enable flexible sensory processing. My long-term goal is for these advances in our basic knowledge of central processing to help link specific circuit malfunctions with hearing deficit phenotypes to aid in diagnoses and treatment. Over the course of my career I will strive to employ best practices in student-centered education, promote equal access and opportunity in the sciences, and help build communication bridges between the scientific and non-scientific community.

Education and Research

Post-doctoral Fellow, New York University

NIH K99 Pathway to Independence Award

Post-doctoral research with Dr. David Schneider

Research Focus: Prediction and Error in the Mouse Auditory Cortex

Oct 2018 - Present

July 2023 - Present

Ph.D., Carnegie Mellon University, Department of Biological Sciences

Thesis Advisor: Dr. Alison Barth

Thesis Title: A translaminar cortical circuit driven by higher order thalamus initiates learning-related synaptic plasticity

2012-2018

B.S. Biochemistry, University of Delaware, Department of Chemistry

Undergraduate Research with Dr. Tatyana Polenova

Research Focus: NMR Investigation of Isotopically Labeled Actin Binding Protein Cofilin

2008-2012

2009-2011

Publications

Wang B, **Audette NJ**, Schneider DM, Aljadef J. *Desegregation of neuronal predictive processing*. In Review.

Audette NJ, Schneider DM. *Stimulus-specific prediction error neurons in mouse auditory cortex*. The Journal of Neuroscience 2023, <https://doi.org/10.1523/JNEUROSCI.0512-23.2023>

Audette NJ, Zhou W, La Chioma A, Schneider DM. *Precise Movement-based Predictions in the Mouse Auditory Cortex*. Current Biology 2022, <https://doi.org/10.1016/j.cub.2022.09.064>

Audette NJ, Bernhard S, Ray A, Stewart LT, Barth AL, *Rapid Plasticity of Higher-Order Thalamocortical Inputs during Sensory Learning*. Neuron 2019, [10.1016/j.neuron.2019.04.037](https://doi.org/10.1016/j.neuron.2019.04.037)

Audette NJ, Urban-Ciecko J, Matsushita M, Barth AL. *Pom thalamocortical input drives layer-specific microcircuits in somatosensory cortex*. Cerebral Cortex, 2017, [10.1093.cercor/bhx044](https://doi.org/10.1093/cercor/bhx044)

Chandrasekaran S, Navlakha S, **Audette NJ**, McCreary DD, Suhan J, Bar-Joseph Z, Barth AL. *Unbiased, high-throughput electron microscopy analysis of experience-dependent synaptic changes in the neocortex*. Journal of Neuroscience, 2015.

Jouhanneau J-S, Ferrarese L, Estebanez L, **Audette NJ**, Brecht M, Barth AL, and Poulet JFA. *Cortical fosGFP expression reveals broad receptive field excitatory neurons targeted by POM*. Neuron, 2014.

Presentations, Posters, and Workshops

Audette NJ. *Mechanisms of Predictive Processing in Auditory Cortex*. COSYNE 2024 (Invited Workshop Talk)

Audette NJ. *Stimulus-specific Prediction Errors in Mouse Auditory Cortex*. Systems, Behavioral, and Computational Neuroscience Journal Club, Hosted by Georgia Tech and Emory, 2023 (Invited Talk)

Audette NJ, Schneider DM. *Prediction and Error in the Mouse Auditory Cortex*. Sensation and Action Conference, Allen Institute and Basel-Neurocircuits, 2023 (Poster).

Audette NJ, Schneider DM. *Precise Movement-based Predictions in the Mouse Auditory Cortex*. Advances and Perspectives in Auditory Neuroscience, 2022 (Highlighted Poster).

Audette NJ, Schneider DM. *Precise movement-based predictions in the mouse auditory cortex*. Society for Neuroscience, 2022 (Poster)

Audette NJ. *The Structure and Specificity of Movement-based Predictions in Auditory Cortex*. Mechanisms of Cognitive Neuroscience by Janelia Research Campus 2021 (Workshop Talk)

Audette NJ. *Movement-based Predictions in Mouse Auditory Cortex*. Worldwide NeuRise 2021 (Invited Talk)

Audette NJ. *Movement-based Predictions in Mouse Auditory Cortex*. Electronic Auditory Research Seminars (EARS) by MindCORE, 2021 (Invited Talk)

Audette NJ, Schneider, DM. *Neural activity in mouse auditory cortex is influenced by context, behavior, and expectation*. Society for Neuroscience, 2019 (Poster)

Audette NJ, Matsushita M, Bernhard S, Myal SE., Grant R, Barth AL. *Automated sensory association training causes input-specific thalamocortical plasticity in mouse barrel cortex*. Society for Neuroscience 2017 (Poster)

Audette NJ, Bernhard S, Grant R, Barth AL. *Thalamocortical plasticity induced by sensory experience*. Carnegie Mellon Biological Sciences Retreat, 2017 (Invited Talk)

Audette NJ, Urban-Ciecko J, Matsushita M, Barth AL. *Pom thalamocortical input drives layer-specific microcircuits in somatosensory cortex*. Society for Neuroscience, 2016 (Poster)

Audette NJ, Matsushita M, Barth AL. *Pom thalamic input drives distinct cortical circuits in deep and superficial layers of the cortex*. Gordon Research Conference on Thalamocortical Interactions, 2016 (Poster)

Audette NJ, Matsushita M, Barth AL. *Layer- and cell-type specific segregation of thalamocortical input from Pom in somatosensory cortex*. Society for Neuroscience, 2015 (Poster)

Audette NJ, Jouhanneau JS, Poulet JFA, Barth AL. *Superficial Barrel Cortex Neurons Receive Direct Synaptic Input from Pom of the Thalamus*. Society for Neuroscience, 2014 (Poster)

Grants, Honors, Awards

NIH K99 Pathway to Independence Award, NIDCD	2023
Research Featured in NIH Director Blog	2022
Poster Award, Advances and Perspectives in Auditory Neuroscience	2022
Janelia Research Group Mechanisms of Cognitive Neuroscience Workshop	2021
NIMH T32 Training Fellowship in Learning Memory, Development, and Plasticity	2018
Henry L. Hillman Presidential Fellowship from Carnegie Mellon University	2016
Department Travel Award for Gordon Research Conference	2016

Carnegie Foundation sponsored visit to Boyden Lab at MIT	2015
Carnegie Foundation Prize in Mind and Brain Sciences Graduate Fellowship	2015
Carl A. von Frankenberg Undergraduate Award in Chemistry Education	2012
ASBMB Competitive Travel Award	2012
Science and Engineering Research Scholar Award	2011
Howard Hughes Medical Institute Summer Scholar Research Program	2010
Eugene DuPont Memorial Full Academic Scholarship, University of Delaware	2008-2012

Technical Skills

In vivo multi-unit electrophysiology during head-fixed behaviors
In vivo multi-unit wireless electrophysiology in freely moving animals
 Intrinsic signal imaging-based targeting of brain regions
 Spike sorting and computational analysis of multi-unit responses
 Intrinsic signal imaging-based targeted recordings
 Head-fixed behavioral paradigm design, construction, and data analysis
 Freely-moving behavioral paradigm design, construction, and data analysis
 Targeted simultaneous *in vitro* dual whole-cell patch clamp recording
 Electrophysiological equipment maintenance, trouble shooting, and grounding
 Optogenetic stimulation and neuron identification techniques
 Rodent survival surgery and targeted viral gene expression
 Stereotaxic targeting of cortical and subcortical targets
 Proficient with Microsoft Office, Origin, Photoshop, ImageJ, Matlab
 Some experience with Python, Igor, Pymol, Arduino
 Some PCR, Western Blot, and knock-in construct experience
 Prototype Design and 3D Printing

Teaching Experiences and Training

Teaching Assistant, Carnegie Mellon University 2014-2016
 Molecules to Mind, Fall 2016
 Honors Modern Biology, Fall 2015
 Molecules to Mind, Spring 2015
 Cellular Neuroscience, Spring 2014

Responsibilities: Generating lesson plans, giving lectures, moderating class discussions, producing interactive class activities, producing problem sets, producing test material, administering test material, grading class material, leading review sessions, hosting office hours, meeting with students individually

Chemistry Workshop Leader for High Risk Students, University of Delaware 2011
 Helped conceptualize, organize, and personally taught chemistry work-shops
 Developed active-learning teaching materials and lesson plans
 Trial program funded by HHMI grant targeting students identified as high-risk in STEM fields

Peer Facilitator, Introductory Biochemistry, University of Delaware 2011
 Daily teaching responsibilities leading problem based group work
 Worked with professor and other peer facilitators to develop and improve curriculum

ASBMB Conference: Student-Centered Education in Molecular Life Sciences II 2011

Service and Outreach

Brain Hub High School Program 2017
 Pilot program designed to provide under-served high school students with the opportunity to interact with primary research and data. Students visit CMU and work on a project using real neuroscience data and present their findings, under the guidance of researchers.
 Designed data set and experimental problem

Hosted student group at CMU and multiple visits in their school
Provide guidance and assistance throughout project

President, Co-founder of Mellon FIT, Carnegie Mellon University 2013-2017

College-wide organization that created and maintains a gym facility, provides free exercise classes, and advocates for other health-related issues on behalf of graduate students and researchers.

Raised over \$40,000 through grants, university organizations, and general fundraising

Managed budget and strategic planning from creation to present

Gained experience navigating university offices and financial structures

Ballots for Patients 2016

Non-partisan organization that provides emergency absentee ballots to recently admitted hospital patients in state and national elections.

Professional Affiliations

Center for the Neural Basis of Cognition (CNBC)

2013-2018

Society for Neuroscience (SFN)

2013-Pres.