

Galen Lynch

Department of Brain and Cognitive Sciences
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EDUCATION

- 2020 **Massachusetts Institute of Technology**, Cambridge MA, USA
PhD Neuroscience, advisor: Michale Fee
Thesis: *The Distinct Neural Mechanisms Underlying the Production of Stereotyped and Exploratory Vocal Behavior in Songbirds*
- 2010 **The Pennsylvania State University**, University Park PA, USA
BS Biology *cum laude*, vertebrate physiology option
BS Mathematics *cum laude*, general option, minors in chemistry and Japanese
- 2008 **Meikai University**, Chiba, Japan
Language intensive study abroad

PUBLICATIONS

Articles in peer-reviewed journals

- 2016 **Lynch G.F.***, Okubo T.S.*, Hanuschkin A., Hahnloser R.H.R., and Fee M.S. “Rhythmic Continuous-Time Coding in the Songbird Analog of Vocal Motor Cortex.” *Neuron*, 90(4), 877–92. doi:10.1016/j.neuron.2016.04.021
- 2015 Okubo T.S., Mackevicius E.L., Payne H.L., **Lynch G.F.**, and Fee M.S. “Growth and splitting of neural sequences in songbird vocal development.” *Nature*, 528(7582), 352–7. doi:10.1038/nature15741

Patents

- 2013 Hall B., Lynch J.P., Reutzler E.W., **Lynch G.F.**, and Reinhardt B.T. *3D Laser Ablation Tomography*. United States patent US9437041B2.
- 2013 Hall B., Lynch J.P., Reutzler E.W., **Lynch G.F.**, and Reinhardt B.T. *3D laser Ablation Tomography And Spectrographic Analysis*. United States patent US9835532B2, Chinese patent CN104956202B.

Preprints

- 2020 Payne H.L., **Lynch G.F.**, and Aronov D. “Precise spatial representations in the hippocampus of food-caching birds.” *bioRxiv*. doi:10.1101/2020.11.27.399444

*Co-first author

Manuscripts in preparation

- 2020 **Lynch G.F.**, Sohal H.S., Scherrer J.R., Denisenko N.I., Duffy A., Boyden E.S., Fairhall A.L., and Fee M.S. “Neural Correlations in a Cortical Circuit that Generates Behavioral Variability.”
- 2020 Scherrer J.R. *, **Lynch G.F.** *, and Fee M.S. “An Ultra-Lightweight Fluorescence Microscope for Calcium Imaging in Awake Behaving Birds.”

CAMPUS TALKS

- 2018 “Rhythmic Continuous-Time Coding in the Songbird Analog of Vocal Motor Cortex.” Molecular and Cellular Neuroscience Student Symposium, MIT, Nov 16.

CONFERENCE PRESENTATIONS

- 2020 **Lynch G.F.**, Scherrer J.R., Sohal H.S., Denisenko N., Boyden E.S, and Fee M.S. “Neural Correlations in a Cortical Circuit that Generates Behavioral Variability.” Poster presented at Cosyne. Denver, Colorado. Feb 29.
- 2019 **Lynch G.F.**, and Fee M.S. “Neural Correlations in a Cortical Circuit that Generates Behavioral Variability.” Poster presented at Society for Neuroscience Meeting. Chicago, Illinois. Oct 19.
- 2017 **Lynch G.F.**, Sohal H.S., Boyden E.S., and Fee M.S. “Characterization of Neuron Dynamics in a Variability Generating Circuit.” Poster presented at Society for Neuroscience Meeting. Washington, District of Columbia. Nov 11.
- 2015 **Lynch G.F.**, Okubo T.S., Hanuschkin A., Hahnloser R.H.R., and Fee M.S. “Time Versus Gesture Coding in Songbird Motor Cortex.” Poster presented at Cosyne. Salt Lake City, Utah. Mar 5.
- 2013 **Lynch G.F.**, Okubo T.S., Lynn M.B., Hanuschkin A., Hahnloser R.H.R., and Fee M.S. “Experimental Evidence in Favor of a Clock Model and Against a Gesture Trajectory Extrema (GTE) Model of HVC Coding.” Poster presented at Society for Neuroscience Meeting. San Diego, California. Nov 12.

FELLOWSHIPS AND AWARDS

- 2015–18 Henry E. Singleton Fellowship
- 2016 James R. Killian Fellowship
- 2015–16 William McClelland Fellowship
- 2013–15 National Institute of Mental Health Neurobiology of Learning and Memory Training Grant

- 2012 National Science Foundation Graduate Research Fellowship: Honorable Mention
- 2011–13 National Institute of General Medical Sciences Integrative Neuronal Systems Training Grant
- 2010 *Cum laude* graduation honors, biology (The Pennsylvania State University)
- 2010 *Cum laude* graduation honors, mathematics (The Pennsylvania State University)
- 2007 Gold medal at International Genetically Engineered Machines (iGEM) Championship

FUNDING

- 2018–19 Contributor to grant McKnight Technological Innovations in Neuroscience Award

RESEARCH EXPERIENCE

- 2020– **Postdoctoral associate**
Laboratory of Michale Fee, McGovern Institute of Brain Research
Massachusetts Institute of Technology, Cambridge, MA
- 2011–20 **Graduate student**
Laboratory of Michale Fee, McGovern Institute of Brain Research
Massachusetts Institute of Technology, Cambridge, MA
- 2011 **Genetics discovery research intern**
Trait Discovery and Technologies Department
DuPont Pioneer, Wilmington, DE
- 2011 **Research assistant**
Laboratory of Jonathan Lynch, Department of Plant Science
The Pennsylvania State University, University Park, PA
- 2009–11 **Undergraduate researcher**
Laboratory of Tim Reluga, Center for Infectious Disease Dynamics
The Pennsylvania State University, University Park, PA
- 2008–09 **Undergraduate researcher**
Laboratories of Wayne Curtis and Ming Tien, Departments of Chemical Engineering and Biochemistry and Molecular Biology
The Pennsylvania State University, University Park, PA
- 2007–08 **Undergraduate researcher and iGEM team member**
Laboratories of Tom Richard and Patrick Cirino, Department of Agricultural and Biological Engineering
The Pennsylvania State University, University Park, PA

2006 **Laboratory assistant**
Laboratory of Jonathan Lynch, Department of Plant Science
The Pennsylvania State University, University Park, PA

SERVICE

Service to department

2014–16 Brain and Cognitive Science Graduate Advocates, Massachusetts Institute of Technology

Member, co-chair of academic events committee

2014–15 Student representative on departmental Education Committee

Service to field

Ad-hoc reviewer for *BMC Biology*.

Open source software

Developed and maintains *OpenEphysLoader.jl*, a software package to work with neuroscience data in the programming language Julia.

Maintains *DSP.jl*, a software package to perform digital signal processing in the programming language Julia.

TEACHING EXPERIENCE

Massachusetts Institute of Technology

Teaching assistant: Introduction to Neuroscience (fall 2013)

Teaching assistant: Animal Behavior (fall 2012)

RESEARCH EXPERTISE

Neuroscience

In-vivo extracellular electrophysiology and calcium imaging in awake freely behaving animals, antidromic identification, behavioral analysis, anatomical tracing, and full-stack data acquisition device design.

Statistical and computational methods

Developed GUIs to visualize and tools to analyze hours of continuous multi-channel electrophysiological recordings containing seven billion samples.

Created a Postgres database for subjects, behavior, extracellular electrophysiology, and calcium imaging. Created GUIs for controlling hardware to remotely position recording electrodes, and to acquire electrophysiological data.

Skills include computational statistics and advanced digital signal processing.

Proficient in Julia, MATLAB, Python, Postgres, embedded C (AVR, Thread-X), C++ (MFC, JUCE), R, Bash, SLURM, git.

Circuit design and device manufacturing

Built a 64 channel extracellular electrophysiology headstage and microdrive with remotely positionable electrodes that weighs under 1.6 grams, as well as the circuitry to allow free behavior of the animal and to interface with a computer data acquisition system.

Additionally built the electronics and wrote the firmware for a 1.2 gram head-mounted fluorescence microscope with two channels of 40 kS/s analog input.

Designs have included precision amplifiers, low supply voltages, high-speed data buses, RF signals, chip-on-board assembly, ball grid arrays, on rigid, flexible, and flex-rigid PCBs.

Proficient in EAGLE, Onshape, CircuitMaker, Altium, KLayout.

Updated November 2020