Galen Lynch

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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

2021 Payne H.L., **Lynch G.F.**, and Aronov D. "Neural representations of space in the hippocampus of a food-caching bird." ***Science**, 373*(6552), 343–8. doi:10.1126/science.abg2009

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

2021 Scherrer J.R., Fee M.S., and **Lynch G.F.** *Miniature Fluorescence Microscopes* United States provisional patent (63/226,036)

2013 Hall B., Lynch J.P., Reutzel E.W., **Lynch G.F.**, and Reinhardt B.T. *3D Laser Ablation Tomography*. United States patent US9437041B2.

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*Co-first author

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

Preprints

2021   Scherrer J.R.*, **Lynch G.F.***, Zhang J.J., and Fee M.S. "A Novel Optical Design Enabling Lightweight and Large Field-Of-View Head-Mounted Microscopes " ***bioRxiv***. doi:10.1101/2021.09.03.458947

Manuscripts in preparation

2021   **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."

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

2021   Scherrer J.R.*, **Lynch G.F.***, Sohal H.S., Denisenko N., Boyden E.S, and Fee M.S. "Ultra-lightweight and Large Field-Of-View Head-Mounted Microscopes for in vivo Neural Recording" Poster to be presented at Society for Neuroscience Meeting. Chicago, Illinois. Nov (abstract accepted).

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

2021– **Scientist I**
Allen Institute for Neural Dynamics
Allen Institute, Seattle, WA

2020–21 **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 electropysiology 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 September 2021