

Jasper Phelps

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EDUCATION

Harvard University

2016 – 2021

Ph.D. in Neuroscience with Distinction in Computational Neuroscience

- Thesis: “The Structure of Motor Control Circuits in Adult *Drosophila*”
- Advisor: Dr. Wei-Chung Allen Lee
- Relevant coursework: Cellular Neurophysiology, Systems Neuroscience, Molecular and Developmental Neuroscience, Probabilistic Modeling for Neural Data

Washington University in St. Louis

2011 – 2015

B.A. in Neuroscience and Applied Mathematics

- Cumulative GPA: 3.97 / 4.00
- Relevant coursework: Neurophysiology Laboratory, Principles of the Nervous System, Principles in Human Physiology, Biochemistry I and II, Math for the Physical Sciences, Intermediate Statistics, Differential Equations, Engineering and Scientific Computing, Algorithms and Data Structures

PUBLICATIONS

* indicates co-first authorship

C. Chen, S. Agrawal, B. Mark, A. Mamiya, A. Sustar, **J. S. Phelps**, W.-C. A. Lee, B. J. Dickson, G. M. Card, J. C. Tuthill. “Functional architecture of neural circuits for leg proprioception in *Drosophila*.” *Current Biology* (2021).

<https://doi.org/10.1016/j.cub.2021.09.035>

J. S. Phelps*, D. G. C. Hildebrand*, B. J. Graham*, A. T. Kuan, L. A. Thomas, T. M. Nguyen, J. Buhmann, A. W. Azevedo, A. Sustar, S. Agrawal, M. Liu, B. L. Shanny, J. Funke, J. C. Tuthill, W.-C. A. Lee. “Reconstruction of motor control circuits in adult *Drosophila* using automated transmission electron microscopy.” *Cell* (2020).

<https://doi.org/10.1016/j.cell.2020.12.013>

A. T. Kuan*, **J. S. Phelps***, L. A. Thomas, T. M. Nguyen, J. Han, C.-L. Chen, A. W. Azevedo, J. C. Tuthill, J. Funke, P. Cloetens, A. Pacureanu, W.-C. A. Lee. “Dense neuronal reconstruction through X-ray holographic nano-tomography.” *Nat Neurosci* (2020).

<https://doi.org/10.1038/s41593-020-0704-9>

L. Cheadle, S. Rivera, **J. S. Phelps**, K. A. Ennis, B. Stevens, L. C. Burkly, W.-C. A. Lee, M. E. Greenberg. “Sensory experience shapes developing synapses through TWEAK-Fn14 cytokine signaling.” *Neuron* (2020).

<https://doi.org/10.1016/j.neuron.2020.08.002>

RESEARCH EXPERIENCE

Neuroengineering Lab

2022 – present

PI: Dr. Pavan Ramdya. *EPFL, Lausanne, Switzerland*

- Studying neuronal dynamics underlying coordination of limb movements in adult *Drosophila*.

High Throughput Electron Microscopy Lab

2016 – 2022

PI: Dr. Wei-Chung Allen Lee. *Harvard Medical School, Boston, MA*

- Developed X-ray and electron microscopy (EM) techniques for rapidly mapping the structure of neural circuits, and applied them to study motor control in adult *Drosophila melanogaster*.
- Generated the first connectomic dataset of an adult *Drosophila* ventral nerve cord, and described a monosynaptic reflex arc between the largest-diameter sensory and motor neurons.
- Performed X-ray imaging of an adult *Drosophila* leg to study the sensory receptors underlying proprioceptive input and the motor neurons, muscles, and tendons underlying motor output.

Cellular Quality Control Lab

Summer 2014

PI: Dr. Richard Morimoto. *Northwestern University, Evanston, IL*

- Generated transgenic *C. elegans* with improved survivability in intense heat, aiming to investigate how heat resistance influences lifespan and resistance to neurodegeneration.

Theoretical and Computational Biophysics Group

Summer 2012 & 2013

PI: Dr. Klaus Schulten. *University of Illinois at Urbana-Champaign, IL*

- Performed molecular dynamics simulations of the protein Synaptotagmin-1, aiming to investigate the structural transitions underlying its ability to bend membranes and oligomerize.

Network for Computational Nanotechnology

2010 – 2011

Advisor: Dr. Nahil Sobh. *University of Illinois at Urbana-Champaign, IL*

- Wrote software for data and image analysis in Java, MATLAB, C#, JavaScript, and Tcl.

Hormonal Modulation of Neuroplasticity Lab

Summer 2009

PI: Dr. Donna Korol. *University of Illinois at Urbana-Champaign, IL*

- Assisted in managing rat colony through handling animals, performing ovary-removal surgeries, and running maze-learning behavioral tasks.

RESEARCH SKILLS

Experimental / data generation

- *Drosophila melanogaster* husbandry, crosses, and nervous system dissections
- Sample preparation for EM (tissue fixation, heavy metal staining, resin embedding)
- Cutting and collecting thin sections of resin-embedded tissue for transmission EM
- Automated section collection and automated transmission EM imaging using GridTape
- Sample preparation for X-ray microscopy
- Imaging neural tissue using synchrotron X-ray beamlines

Software / data analysis

- Python, MATLAB, and Bash; Git and GitHub; Linux and computing clusters
- 2D and 3D elastic image alignment
- Convolutional neural networks for image segmentation

From pre-PhD research experiences, familiarity with

- Microelectrode recordings from neurons (extracellular) and muscles (intracellular)
- *C. elegans* handling; Microinjection for gene delivery in *C. elegans*
- Molecular dynamics simulations
- Programming and data analysis in Java, R, and Tcl
- Rat handling and surgeries

TEACHING AND MENTORING

Teaching assistant for course “Probabilistic Models for Neural Data” 2020

Dept. of Neurobiology, Harvard Medical School, Boston, MA. Instructor: Dr. Jan Drugowitsch.

- Designed and implemented modeling exercises using Jupyter notebooks.
- Assisted students with preparing presentations on modeling theory.

Training and managing research assistants 2019

Dept. of Neurobiology, Harvard Medical School, Boston, MA

- Designed and implemented a group training program for 8 Northeastern University students working as full-time research assistants in my PhD thesis lab.
- Managed 4 such students working full-time on my projects.

Math fellow for SAGA Innovations 2015 – 2016

Kelvyn Park High School, Chicago, IL

- Trained in techniques for effective small-group tutoring sessions.
- Served as a math tutor and role model for 10 high school students at risk of dropping out.

Math tutor for the Department of Mathematics 2011 – 2015

Washington University in St. Louis, MO

- Organized and led review sessions for groups of 2 to 15 students in 6 different math subjects.
- Hired as a 1-on-1 math tutor by 4 different students.

PRESENTATIONS

J. S. Phelps et al. “A seventeen lab collaboration to reconstruct the connectome of the adult *Drosophila* ventral nerve cord.” Poster presentation at *Neurobiology of Drosophila*. Cold Spring Harbor Laboratory (virtual). October 2021.

J. S. Phelps, L. A. Thomas, W.-C. A. Lee. “Reconstruction of motor control circuits in adult *Drosophila* using automated transmission electron microscopy.” Poster presentation at *Max Plank / HHMI Connectomics Conference*. Berlin, Germany. April 2019.

J. S. Phelps, W.-C. A. Lee. “Toward connectomic analysis of sensorimotor circuitry in the adult *Drosophila* ventral nerve cord.” Poster presentation at *Neural Circuits of the Insect Ventral Nerve Cord*. Janelia Research Campus, Ashburn, VA. April 2018.

J. S. Phelps, L. Chauve, R. Morimoto. “Production of novel *C. elegans* strains to investigate *hsf-1* functions; Analysis of autism-linked proteins using aggregation propensity calculations.” Oral presentation at *Conte Center for Computational Neuropsychiatric Genomics REU Symposium*. The University of Chicago, IL. August 2014.

J. S. Phelps, J. Jacobs, J. Leigh, N. Sobh, U. Ravioli, G. Popescu. “Novel ImageJ plugins for quantitative image analysis.” Poster presentation at *Imaging Without Boundaries Conference*. University of Illinois at Urbana-Champaign, IL. October 2010.

GRANTS AND AWARDS

Awarded 4 days of imaging time at The European Synchrotron	2022
Awarded 6 days of imaging time at The European Synchrotron	2018
Travel Grant from the Harvard Brain Science Initiative	2018
Community Resource Award from the Harvard Brain Science Initiative	2018
NSF GRFP Honorable Mention	2018
Awarded 3 days of imaging time at The European Synchrotron	2017
National Merit Scholarship	2011 – 2015
Summer Research Grant from the Chicago Center for Systems Biology	2014

INVOLVEMENT

Harvard University Table Tennis Club – Coach	2016 – 2022
Graduate Program in Neuroscience – Interview Weekend Lead Organizer	2017
Washington University Table Tennis Club – President & Coach	2012 – 2015
Washington University Math Club	2013 – 2015
Washington University Representation Project (Feminism Club)	2014 – 2015

Last updated May 19th, 2022