

# Brett Graham PhD

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## EXPERIENCE

### Harvard University, Cambridge MA — *Neuroengineer*

AUG 2017 - PRESENT

Serve 40+ labs at the Center for Brain Science consulting with scientists to understand instrument and analysis needs and leading the development of custom software, hardware, mechanical, electronic and full-stack solutions

- Designed and built custom embedded microcontroller solution along with Python analysis software for tracking 200+ mice for 250+ days
- Wrote Python and Bash software for capturing and recording 10+ terabytes of videos of 60 developing bumblebee colonies over 3 months

### Harvard Medical School, Boston MA — *Electron Microscopy Engineer*

AUG 2013 - AUG 2017

Developed instrumentation that accelerated collection of connectomics brain-circuit diagram datasets allowing for the first complete capture of a cortical column occupying over 1 cubic millimeter, imaged at 4 nanometer pixels producing a 2 petabyte image dataset acquired over 6 months

- Developed Python motor control and custom computer vision software for an automated closed-loop reel-to-reel laser marking machine that has produced hundreds of meters of product
- Added sensors to a commercial tissue slicing machine and wrote custom Python software to allow automated closed-loop collection of thousands of consecutive 40 nanometer thin sections of brain tissue
- Invented, designed, machined parts for and wrote software to control an automated electron microscope with robotic sample exchange, computer vision for image quality assessment and network system to coordinate over 20+ Python processes running on 6 computers able to acquire images at 160 MPix/s

### Rowland Institute, Cambridge MA — *Postdoctoral Researcher*

AUG 2009 - AUG 2013

Uncovered object recognition related neural signals in rodent cortex through the development of novel instrumentation and software

- Constructed hardware and wrote software for analysis of 3D surgical scans and robotic placement of electrodes
- Built custom electronics to modify audio recording hardware for use as a 32 channel low noise voltage digitizer for neural recordings
- Wrote Python code for denoising, thresholding, waveform decomposition and clustering of 10s of terabytes of neural time-series data

## PROGRAMMING LANGUAGES

10+ years Python (2, 3)

Bash, C/C++, Javascript, R, Matlab, LabVIEW

## SKILLS

Electrical engineering:  
PCB design (KiCad),  
embedded programming,  
test equipment use  
(oscilloscope, logic  
analyzer, DAQ)

Mechanical engineering:  
CAD (Fusion360), CAM  
(HSMWorks), CNC Mill  
and CNC Lathe operator

Realtime and offline  
image analysis: OpenCV,  
OpenCL, CUDA

Numeric signal analysis:  
NumPy, SciPy

Linux server, desktop  
and embedded systems  
administration

3D robotics and physics  
simulation: ROS,  
OpenGL, Bullet, Blender

## HOBBY PROJECTS

6+ year  
Somerville-Cambridge  
Elder Services Brown Bag  
Volunteer

4+ year Project Hexapod  
teammate:  
[projecthexapod.com](http://projecthexapod.com)

## EDUCATION

### University of Delaware, Newark DE — *PhD Neuroscience*

AUG 2004 - AUG 2009

Electrophysiology and computational modeling of fish vision for collision avoidance with applications to mobile robots and simulated unmanned aerial vehicles

### Millersville University, Millersville PA — *BA Psychology*

SEPT 2000 - MAY 2003

## SELECT PUBLICATIONS

Graham B\*, Phelps J\*, Hildebrand D\*, Kuan A, Thomas L, Nguyen T, Buhmann J, Azevedo A, Sustar A, Agrawal S, Liu M, Shanny B, Funke J, Tuthill J, Lee W (2021) Reconstruction of motor control circuits in adult *Drosophila* using automated transmission electron microscopy, *Cell*, 184(3) 759–774. (\* contributed equally)

Hildebrand D, Cicconet M, Torres R, Choi W, Quan T, Moon J, Wetzel A, Champion A, **Graham B**, Randlett O, Plummer G, Portuges R, Bianco I, Saalfeld S, Baden A, Lillaney K, Burns R, Vogelstein J, Schier A, Lee WC, Jeong WK, Lichtman J, Engert F (2017) Whole-brain serial-section electron microscopy in larval zebrafish. *Nature*, 545, 345–349.

Lee WC, Bonin V, Reed M, **Graham B**, Hood G, Glattfelder K & Reid RC (2016) Anatomy and function of an excitatory network in the visual cortex. *Nature*, 532(7599), 370–374.

## PATENTS

Hildebrand D, **Graham B** & Lee WC (2016) GridTape for Fast Nanoscale Imaging. US20200355583A1

## TEACHING AND MENTORSHIP

### Harvard University, Instructor — *Freshman Physics Seminar with Jene Golovchenko*

Spring & Fall 2017

### Harvard Medical School, Instructor — *Arduino Nanocourse*

Fall 2016, Spring & Fall 2017, Fall 2018, Fall 2019, Spring 2020

### Harvard Medical School, Manager — *Mentored 4 scientific programmers*

AUG 2013 - AUG 2017

### University of Delaware, Instructor — *Sensation & Perception*

Fall 2007, Spring 2008

References and CV available by request