

Ilya Kolb, PhD

Research & Innovation Manager
Janelia Research Campus
Howard Hughes Medical Institute
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EARNED DEGREES

Degree	Year	University	Specialty
Doctor of Philosophy	2017	Georgia Institute of Technology	Biomedical Engineering
Master of Science	2013	Case Western Reserve University	Biomedical Engineering
Bachelor of Science	2012	Case Western Reserve University	Biomedical Engineering

EMPLOYMENT

GENIE project team

Howard Hughes Medical Institute, Janelia Research Campus, Ashburn, VA

- **Research and Innovation Manager (2019-Present):** Management of high throughput protein screening pipeline, data analysis, and new screening technologies
- **Research Specialist (2017-2019):** Responsible for high-throughput screening technologies for genetically encoded sensor development

jET (Janelia Experimental Technologies) project team, Research Specialist (2017-2019)

Howard Hughes Medical Institute, Janelia Research Campus, Ashburn, VA

Director: Anthony Leonardo, Ph.D.

- Electronics and software development for novel multichannel micromanipulation system (25% time commitment)

Neuromatic Devices, Inc., Lead Engineer (2014-Present)

Atlanta, GA

- Lead engineer in a spinoff company focused on in-vivo neuro-robotics
- Contacting potential customers, creating custom hardware and software solutions suited for customers' particular experiments
- Conducting on-site installation and demonstration of technology in four neuroscience laboratories in the United States (including Cold Spring Harbor Laboratories, Max Planck Florida Institute for Neuroscience)

Precision Biosystems Laboratory, Graduate Research Assistant (2012-2017)

Georgia Institute of Technology, Atlanta, GA

Principal investigator: Craig R Forest, Ph.D.

- Ph.D. dissertation title: *Walk-away automation of in-vitro patch-clamp electrophysiology*
- Designed devices and software algorithms for automation of single-cell neuroscience experiments *in-vitro* and *in-vivo*
- Invented patent-pending method to clean pipettes for increasing throughput of patch-clamp electrophysiology

Allen Institute for Brain Science, Visiting Scientist (2014)

Seattle, WA

Principal investigator: Hongkui Zeng, Ph.D.

- 7-month internship
- Developed and deployed free, open-source software (*Autopatcher IG*) for high-throughput single-cell neuroscience experiments

Synthetic Neurobiology Group, Visiting Student (2013)

Massachusetts Institute of Technology, Cambridge, MA

Principal investigator: Edward S Boyden, Ph.D.

- Used high-performance computing to detect and characterize patterns of electrical activity in single cells

Functional Neural Interface Lab, Research Assistant (2009-2012)

Case Western Reserve University, Cleveland, OH

Principal investigator: Dustin J Tyler, Ph.D.

- Designed and tested novel electrodes for recording from peripheral nerves
- Performed *in-vivo* experiments to validate novel electrode for stimulation of nerves in the larynx

CREATE, Lead Design Engineer (2009-2010)

Case Western Reserve University, Cleveland, OH

- Worked in a team to design and build a 3 degree-of-freedom robotic arm
- Featured as a permanent exhibit at the Great Lakes Science Center in Cleveland, OH

HONORS / AWARDS

Society for Neuroscience Trainee Professional Development Award	2017
Purdue Prospective Faculty Workshop	2017
Barry M. Goldwater Scholarship	2011
Choose Ohio First (COF) Scholarship	2009, 2010

FUNDING

Neural Engineering Center Seed Grant	2015, 2016
National Institute of Health (NIH) Computational Neuroscience Training Grant	2012-2015

INVITED PRESENTATIONS

1. **I. Kolb**, Walk-away automation of patch-clamp electrophysiology. Janelia Research Campus, Ashburn, VA. May 26, 2017
2. **I. Kolb**, Automation of in-vitro patch-clamp electrophysiology. Emory University. Atlanta, GA. May 9 2017.

REFEREED PUBLICATIONS ([Google scholar profile](#))

1. L. Zarowny, A. Aggarwal, V. Rutten, **I. Kolb**, The GENIE Project, R. Patel, H. Huang, et al. "A Bright and High-Performance Genetically Encoded Ca²⁺ Indicator Based on MNeonGreen Fluorescent Protein." BioRxiv, January 17, 2020, 2020.01.16.909291.

2. C.F. Lewallen, W. Wan, A. Maminishkis, W.A. Stoy, **I. Kolb**, N. Hotaling, K. Bharti, and C.R. Forest. “High-Yield, Automated Intracellular Electrophysiology in Retinal Pigment Epithelia.” *Journal of Neuroscience Methods* 328 (December 1, 2019): 108442.
3. J.S. Marvin, Y. Shimoda, V. Magloire, M. Leite, T. Kawashima, T.P. Jensen, **I. Kolb**, E.L. Knott, O. Novak, K. Podgorski, N.J. Leidenheimer, D.A. Rusakov, M.B. Ahrens, D.M. Kullman, L.L. Looger. (2019). A genetically encoded fluorescent sensor for in vivo imaging of GABA. *Nat Methods* 16, 763–770.
4. **I. Kolb**, C.R. Landry M.C. Yip, C.F. Lewallen, W.A. Stoy, J. Lee, A. Felouzis, B. Yang, E.S. Boyden, C.J. Rozell, C.R. Forest (2019). PatcherBot: a single-cell electrophysiology robot for adherent cells and brain slices. *J. Neural Eng.* 16, 046003.
5. G.L. Holst, W. Stoy, B. Yang, **I. Kolb**, S.B. Kodandaramaiah, L. Li, U. Knoblich, H. Zeng, B. Haider, E.S. Boyden, C.R. Forest, Autonomous patch clamp robot for functional characterization of neurons in vivo: development and application to mouse visual cortex. *Journal of Neurophysiology* 121, 2341–2357.
6. **I. Kolb***, G.T. Franzesi*, M. Wang, S.B. Kodandaramaiah, C.R. Forest, E.S. Boyden, and A.C. Singer (2018). Evidence for Long-Timescale Patterns of Synaptic Inputs in CA1 of Awake Behaving Mice. *J. Neurosci.* 38, 1821–1834. *contributed equally
7. J. Lee, **I. Kolb**, C.R. Forest, C.J. Rozell (2018). Cell Membrane Tracking in Living Brain Tissue Using Differential Interference Contrast Microscopy. *IEEE Transactions on Image Processing* 27, 1847–1861.
8. W.A. Stoy, **I. Kolb**, G.L. Holst, Y. Liew, A. Pala, B. Yang, E.S. Boyden, G.B. Stanley, C.R. Forest. Robotic navigation to subcortical neural tissue for intracellular electrophysiology in vivo. *Journal of Neurophysiology*. 2017 Aug 4; 118, 1141–1150.
9. **I. Kolb**, W. A. Stoy, E. B. Rousseau, O. A. Moody, A. Jenkins, C. R. Forest. Cleaning patch-clamp pipettes for immediate reuse. *Scientific Reports*. 2016 Oct 11;6:35001. *Featured on EurekAlert, Phys.org, Scicasts, and other news sources. Top 5% of all research outputs scored by Altmetric*
10. R. Wu*, **I. Kolb***, B. M. Callahan, Z. Su, W. A. Stoy, S. B. Kodandaramaiah, R. Neve, H. Zeng, E. S. Boyden, C. R. Forest, A.A. Chubykin. Integration of autpatching with automated pipette and cell detection in vitro. *Journal of Neurophysiology*. 2016 Oct 1;116(4):1564–78. * contributed equally
11. R. R. Harrison, **I. Kolb**, S. B. Kodandaramaiah., A. A. Chubykin., A. Yang, M. F. Bear, E. S. Boyden, C. R. Forest. Microchip amplifier for in vitro, in vivo, and automated whole cell patch-clamp recording. *Journal of Neurophysiology*. 2015 Feb 15;113(4):1275–82.
12. A.J. Hadley, P. Thompson, **I. Kolb**, E. C. Hahn, D. J. Tyler, “Targeted Transtracheal Stimulation for Vocal Fold Closure,” *Dysphagia*, pp. 1–9, Feb. 2014.
13. A. J. Hadley, **I. Kolb**, and D. J. Tyler, “Laryngeal elevation by selective stimulation of the hypoglossal nerve,” *J. Neural Eng.*, vol. 10, no. 4, p. 046013, Aug. 2013.
14. D. J. Tyler, **I. Kolb**, P. Thompson, A. Hadley, “Electrical stimulation for the management of aspiration during Swallowing,” in *2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2012, pp. 2509–2512.

PATENTS

1. **I. Kolb**, W. A. Stoy, E.B. Rousseau, C. R. Forest. Systems And Methods Enabling Patch-Clamp Re-Use. US Patent Application US20170038364. Issued February 09, 2017. *Licensed to Sensapex Oy; Oulu, Finland*

CONFERENCE PUBLICATIONS

1. C. F. Lewallen, Q. Wan, A. Maminishkis, W Stoy, **I. Kolb**, N. Hotaling, K Bharti, C.R. Forest. "Towards automated intracellular electrophysiology of retinal pigment epithelium," *The Association for Research in Vision and Ophthalmology (ARVO)*. Vancouver, BC, Apr 28 – May 2.
2. **I. Kolb**, G. Talei Franzesi, M. Wang, S.B. Kodandaramaiah, C.R. Forest, E.S. Boyden, A. Singer. Repeated membrane potential patterns in the hippocampus of awake mice are related to spiking. *COSYNE 2017 Annual Meeting*. Salt Lake City, UT, Feb 23-26 2017.
3. **I. Kolb**, W.A. Stoy, E. Rousseau, O.A. Moody, A. Jenkins, C.R. Forest, Cleaning patch-clamp pipettes enables their reuse, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2016), San Diego, CA, Nov 12-16, 2016.
4. **I. Kolb**, W.A. Stoy, E. Rousseau, O. A. Moody, A. Jenkins, C. R. Forest. Cleaning patch clamp pipettes enables their reuse. *60th Annual Meeting of the Biophysical Society*, Los Angeles, U.S.A, Feb 27-Mar 2, 2016.
5. G. Holst, W. Stoy, **I. Kolb**, L. Li, U. Knoblich, S.B. Kodandaramaiah, S. Sorenson, G. Harminder, T. Jarsky, J. Waters, A. Singer, B. Yang, G.T. Franzesi, E. Boyden, H. Zeng, C. Forest, Progress towards high throughput, in vivo cell-type identification using coupled electrophysiological and morphological properties, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2015), Chicago, IL, Oct 17-21, 2015.
6. A.A. Chubykin, **I. Kolb**, B.M. Callahan, C.R. Forest, E.S. Boyden, M.F. Bear, Automated image-guided whole-cell patch clamp technology for mapping functional neuronal circuitry, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2014), Washington DC, Nov 15-19, 2014.
7. G.Talei Franzesi, A. Singer, **I. Kolb**, S. Sharma, S. Kodandaramaiah, M. Tsitsiklis, I. Wickersham, G. Holst, D. Bozic, S. Batir, C. Forest, C. Borgers, N. Kopell, E.S. Boyden, Automated exploration of intracellular mechanisms of in vivo neural computation, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2014), Washington DC, Nov 15-19, 2014.
8. **I. Kolb***, G. Holst*, S. B. Kodandaramaiah, W. A. Stoy, E. S. Boyden, C. R. Forest. Linear Micro-Actuation System for Patch-Clamp Recording. *Proceedings of the 29th Annual Meeting of the American Society for Precision Engineering*. Boston, MA, Nov 9-14, 2014. * contributed equally
9. **I. Kolb**, G. Holst, B. Goldstein, S.B. Kodandaramaiah, E.S. Boyden, E. Culurciello, C.R. Forest, Automated, in-vivo, whole-cell electrophysiology using an integrated patch-clamp amplifier, *Proceedings of the 22nd Annual Computational Neuroscience Meeting (CNS 2013)*, Paris, France, July 13-18, 2013.
10. W.A. Stoy, C. Shephard, **I. Kolb**, G. Holst, S. Kodandaramaiah, D. Ollerenshaw, D. Millard, E.S. Boyden, G.B. Stanley, C. Forest, Multiple, in vivo patch clamp recordings along the mouse vibrissae pathway, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2013), San Diego, CA, Nov 9-13, 2013.
11. J. Go, A. Fan, C. Lu, S.B. Kodandaramaiah, G.L. Holst, W. Stoy, **I. Kolb**, E.S. Boyden, C.R. Forest, Fully-automated, in-vivo, single cell electrophysiology, *Proceedings of the 28th Annual Meeting of the American Society for Precision Engineering*, Saint Paul, MN, Oct 20-25, 2013.

MENTORSHIP

1. Patel, Dhara (2016-2017)
Undergraduate student (Biomedical Engineering)

Awards: President's Undergraduate Research Award (PURA)
Project: *Optimization of Detergent Solution for Patch-Clamp Pipette Cleaning*
Current position: engineering consultant at IBM

2. Felouzis, Amanda (2016-2017)
Undergraduate student (Biomedical Engineering)
Awards: President's Undergraduate Research Award (PURA)
Project: *Brain slice recording techniques for automated electrophysiology*
Current position: intern at CryoLife, Inc
3. Wang, Michael (2016-2017)
Undergraduate student (Computer Science)
Awards: COSYNE Undergrad. Travel Award, President's Undergraduate Research Award (PURA)
Project: *Repeated Membrane Potential Fluctuations in the Hippocampus of Awake, Behaving Mice*
4. Rousseau, Erin (2015)
National Nanotechnology Infrastructure Network (NNIN) REU student
Awards: National Science Foundation Graduate Research Fellowships Program (GRFP)
Project: *Pipette characterization for patch-clamp electrophysiology*
Current position: PhD student at Harvard-MIT Division of Health Sciences and Technology
5. Tsai, Leonard (2015)
Undergraduate student (Computer Science)
Awards: President's Undergraduate Research Award (PURA)
Project: *Open-source software package for automated whole-cell electrophysiology in vitro*
Current position: Master's student in Computer Science, Georgia Institute of Technology