

Jonathan P. Newman

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OBJECTIVES	A. Advance our understanding of neural encoding and memory formation/consolidation. B. Develop and disseminate open-source scientific tools.	
EDUCATION & TRAINING	Research Scientist Postdoctoral Fellow Massachusetts Institute of Technology Advisor: Matthew A. Wilson	Mar. 2018 - curr. Mar. 2014 - 2018
	PhD , Bioengineering Georgia Institute of Technology Advisor: Steve M. Potter	Dec. 2013
	BS , Bioengineering State University of New York at Binghamton	May 2007

AREAS of SPECIALITY

Experimental Neuroscience: patch/multichannel electrophysiology, rodent behavior, rodent colony management, neural histology, primary neural cell culture, viral techniques, optogenetics, freely-moving calcium-imaging, etc.

Instrumentation: real-time multichannel electrophysiology and optogenetics (hardware and software design), digital and analog electronics design, circuit simulation (SPICE*, ModelSim*), PCB layout (EAGLE*, KiCAD), API development, communication protocol development, FPGA development, CAD design (Solidworks*), basic optics, etc.

Programming Languages: C*, C++*, C#*, Python, Java, MATLAB* (Octave), Rust, Julia, Bash, among others. Assembly-level programming.

Hardware Description: VHDL*, verilog*, formal methods (SymbiYosys), ASIC design is WIP.

Mathematical Techniques: linear and nonlinear systems, controls, chaos theory, information theory, random processes.

Typesetting & Documentation: L^AT_EX*, Markdown*, Pandoc*, HTML*, reStructuredText, Sphinx*.

Version Control: git*, svn*, mercurial.

*Used to create widely distributed hardware or software

PUBLICATIONS *Journal Articles*

1. W. Gou, J. Zhang, **J.P. Newman**, M.A. Wilson. Latent learning drives sleep-dependent plasticity in distinct CA1 subpopulations **Submitted** PDF
2. **J.P. Newman**, J. Voigts, M. Borius, M. Karlsson, M.A. Wilson. Twister3: a simple and fast microelectrode twister. *J. Neural Eng.* 2020, **17**: 026040, doi: 10.1088/1741-2552/ab77fa PDF
3. J. Voigts, **J.P. Newman**, M.A. Wilson, M.T. Harnett. An easy-to-assemble, robust, and light drive implant for chronic tetrode recordings in freely moving animals *J. Neural Eng.* 2020, **17**: 026044, doi: 10.1088/1741-2552/ab77f9 PDF
4. J. Zhang, **J.P. Newman**, X. Wang, C.S. Thakur, J. Rattray, R. Etienne-Cummings, M.A. Wilson. A closed-loop, all-electronic pixel-wise adaptive imaging system for high dynamic range videography. *IEEE Transactions on Circuits and Systems* 2020, doi:10.1109/tcsi.2020.2973396 PDF
5. N. Cermak, M.A. Wilson, J. Schiller, **J.P. Newman**. Stimjim: open-source hardware for precise electrical stimulation *BioRxiv* 2019, doi: 10.1101/757716 PDF

6. **J.P. Newman**, M.-f. Fong, D.C. Millard, C.J. Whitmire, G.B. Stanley, S.M. Potter. Optogenetic feedback control of neural activity. *eLife* 2015, **4**: e07192, doi:10.7554/eLife.07192. PDF
7. M.-f. Fong, **J.P. Newman**, S.M. Potter, P. Wenner. Upward synaptic scaling is dependent on neurotransmission rather than spiking. *Nat. Commun.* 2015, **6(6339)**, doi:10.1038/ncomms7339. PDF
8. J.H. Siegle, G.J. Hale, **J.P. Newman**, J. Voigts. Neural ensemble communities: open-source approaches to hardware for large-scale electrophysiology. *Curr. Opin. Neurobiol.*, 2015 **32**: 53, doi: 10.1016/j.conb.2014.11.004. PDF
9. N.G. Laxpati, B. Mahmoudi, C.-A. Gutekunst, **J.P. Newman**, R. Zeller-Townson, R.E. Gross. Real-time in vivo optogenetic neuromodulation and multielectrode electrophysiology recording with NeuroRighter, *Front. Neuroeng.* 2014, **7(40)**, doi: 10.3389/fneng.2014.00040. PDF
10. (***co-first authors**) T. Tchumatchenko*, **J.P. Newman***, M.-f. Fong, S.M. Potter. Delivery of continuously-varying stimuli using channelrhodopsin-2, *Front. in Neural Circuits* 2013, **7(184)**, doi: 10.3389/fncir.2013.00184. PDF
11. **J.P. Newman**, R. Zeller-Townson. M.-f. Fong, S. Arcot Desai, S.M. Potter. (2013) Closed-loop, multichannel experimentation using the open-source NeuroRighter electrophysiology platform, *Front. in Neural Circuits* 2013, **6(98)**, doi: 10.3389/fncir.2012.00098. PDF
12. C.M. Hales, R. Zeller-Townson, **J.P. Newman**, J.T. Shoemaker, N.J. Killian, S.M. Potter. Stimulus induced high frequency oscillations are present in neuronal networks on microelectrode arrays, *Front. in Neural Circuits* 2012, **6(29)**, doi: 10.3389/fncir.2012.00029. PDF
13. **J.P. Newman**, R.J. Butera. Mechanism, dynamics, and biological existence of multistability in a large class of bursting neurons, *Chaos* 2010, **20(2)**: 023118, doi: 10.1063/1.3413995. PDF
14. **J.P. Newman**, H. Sayama. The Effect of Sensory Blind Zones on Milling Behavior in a Dynamic Self-Propelled Particle Model, *Phys. Rev. E* 2008, **78(1)**: 011913, doi: 10.1103/PhysRevE.78.011913. PDF
15. **J.P. Newman**, Fundamental Considerations for Biomaterial Selection. *IEEE Potentials* 2007, **26(1)**: 12, doi: 10.1109/mp.2007.343034 PDF

PhD Dissertation

J.P. Newman. *Optogenetic feedback control of neuronal activity.* (2014) PhD Dissertation, Georgia Institute of Technology, Atlanta, GA. Advisor: Steve M. Potter. PDF

Selected Presentations

1. **J.P. Newman** (2020) High-performance hardware standards for closed-loop, freely-moving neuroscience experiments. Invited talk, *Allen Institute for Brain Science*, Virtual presentation due to COVID-19.
2. Open Ephys & Miniscope Exhibitor Booth (2019) *SfN Meeting Planner*. Chicago, IL. [exhibit site](#)
3. **J.P. Newman**, J. Voigts (2019) Open Ephys++: next generation open-source tools for freely moving electrophysiology. Invited talk, *UMass Interdisciplinary Neurosciences Conference*, Amherst, MA.
4. **J.P. Newman** (2019) Making closed-loop experiments commonplace in vivo. Invited talk, *NYU*, New York, NY.
5. **J.P. Newman** (2018) Making the use of feedback control commonplace in neuroscience experiments. Invited talk, *NSF/BU Workshop on Integrating Neurophotonics, Statistical Physics, and Control Theory for Advancing Neuroscience*, Washington, DC.

6. **J.P. Newman**, J. Zhang, J. Voigts, M.T. Harnett, M.A. Wilson (2018) Open Ephys++: High performance open-source protocols, APIs, and hardware for closed-loop neuroscience experiments *SfN Meeting Planner* **431.24** PDF
7. **J.P. Newman** (2016) Real-time optical feedback to control and study neural dynamics. Invited talk, *GeneExpression Systems & Appasani Research Conferences: Precision Medicine Symposia-2016*, Burlington, MA.
8. **J.P. Newman** (2016) Feedback Control in Electrophysiology for Great Good. Invited talk, *French American Innovation Days*, MIT, Cambridge, MA.
9. S.M. Potter *in conversation with* **J.P. Newman**, A. Garten, G. Gage, C. Russomanno, J. Siegle, J. Tyler (2015) Neural interfaces for makers and biohackers. Invited panel discussion, *MakerCon*, Palace of Fine Arts, San Francisco, CA.
10. **J.P. Newman**, Y.A. Patel, S.M. Potter., R.J. Butera (2013) Puggle: a miniature, real-time data acquisition system for electrophysiology that's cheaper than your smartphone, *SfN Meeting Planner* **783.27** (online).
11. **J.P. Newman**, M.F. Fong, N. Laxpati, R. Zeller-Townson, U. Ghosh, U. T. French, S.M. Potter. (2012) Optogenetic Feedback Control Decouples Network Spiking From Other Forms Of Neural Activity, *FENS Forum Abstr.* **071.27** (online).
12. **J.P. Newman**, M.F. Fong, N. Laxpati, R. Zeller-Townson, U. Ghosh, U. T. French, S.M. Potter. (2011) Methods for long-term, non-pharmacological control of network firing levels in cortical cultures, *SfN Meeting Planner* **870.05** (online).
13. **J.P. Newman**, M.F. Fong, N. Laxpati, R. Zeller-Townson, U. Ghosh, U. T. French, S.M. Potter. (2011) An optogenetic feedback controller to stabilize unbalanced cortical networks, *Georgia Tech Libraries: Blended Research Series*, Atlanta, GA. (**2nd place, \$500 award**)
14. **J.P. Newman**, R.J. Butera. (2009) General Mechanism for Multistability in Single Bursting Neurons, *SfN Meeting Planner* **321.9** (online).

Other Writing

1. P. Challa, M. Fong, A. Hughes, **J.P. Newman**. Controlling chaotic bursting in distributed, in-vitro neuronal networks, 2009 PDF
2. **J.P. Newman**. Chaotic bursting in single neurons, 2008 PDF

MENTORING

Undergraduate theses

- Helena Yan (Wellesley class of 2018) PDF 2018

Undergraduate research assistants

- Helena Yan (Wellesley '18, with support from a Wellesley Summer Research Award) 2015-2018
- Ananya Bahadur (Amrita University '18, 2016 Google Summer of Code Mentee) Summer 2016
- Alex Chen (MIT '18, with support from the Center for Brains Minds and Machines) 2015
- Emma Costa (MIT '18, with gift from the Lord Foundation) 2014
- Ted French (Georgia Tech '12, with grant from PURA Presidents Undergraduate Research Awards program) 2010-2012
- Will Schweitzer (Brown University '12, with grant from SURE Summer Undergraduate Research Experience program) 2011
- Ushnik Ghosh (Georgia Tech '11, with grant from Petit Scholars program) 2010

Teaching

- Transylvanian Experimental Neuroscience Summer School (TENSS), Pike Lake, Romania. Neuroscience techniques, chaos, and love. 2016-curr.
- Neural Systems and Behavior at the Marine Biological Laboratory, Woods Hole, MA. Somatosensory Unit. Section Lead: Chris Deister. Summer 2016
- BMED3110, Quantitative Engineering Physiology Laboratory (Lecturer and laboratory teaching assistant) 2009

Other

- Mentor at Rainbow Village Inc., Norcross, GA. (provides educational services to under-privileged and homeless children) 2008-2009

SELECTED DESIGN PROJECTS

Stimjim Programmable, isolated electrical stimulator

- project advisor 2019-curr.
- <https://bitbucket.org/natecermak/stimjim/>

Open Ephys 2.0 Successor to the wildly used Open Ephys project

- creator/project lead 2016-curr.
- this is the “next generation” of open-ephys tools
- <https://jonnew.github.io/open-ephys-pcie/>

Twister3 Simple and fast stepper-based twisted wire probe twister

- creator/project lead 2017-curr.
- <https://github.com/jonnew/twister3>

Piezofilm Simple piezofilm amplifier for freely-moving rodent whisker detection.

- creator 2018.
- <https://github.com/jonnew/piezofilm>

Oat: Real-time, distributed image processing suite for behavioral tracking.

- creator/project lead 2016-2018.
- <https://github.com/jonnew/Oat>

Puggle: Ultra low-cost, real-time data acquisition and processing tool for electrophysiology

- creator/project lead 2012-2014.
- <https://github.com/PuggleBoard>

Cyclops: Ultra-precise, optical-feedback assisted LED driver for use in optogenetics

- creator/project lead 2014-curr.
- <https://github.com/jonnew/cyclops>

NeuroRighter: Low-cost data acquisition platform for multielectrode electrophysiology

- project lead 2009-2014
- <https://sites.google.com/site/neurorightier/>

PROFESSIONAL ACTIVITIES

Reviewer: BMC Biology, Frontiers in Neuroscience, Neurophotonics, eNeuro
Board Member: Open Ephys Organization

PATENTS

J.P. Newman, J. Zhang. (2019) Apparatus and methods for all CMOS compressive sensing (patent pending).

**GRANTS &
AWARDS**

NIH R21: Integrated compressive sensing microscope for high-speed functional biological imaging	2017 - 2019
– Grant Number: 1R21EY028381-01 (NIH)	
– Recipient Investigators: S. Chin, E.S. Boyden, M.A. Wilson	
– Proposal Preparation: J.P. Newman (50%), J. Zhang (50%)	
NIH Postdoctoral Ruth L. Kirschstein National Research Service Award (NRSA) (1F32MH107086-01)	2015 - 2018
Georgia Tech Bioengineering, Most Outstanding PhD Thesis (\$1000 cash prize)	2014
NIH R01: Optogenetic Population Clamp to Study Long-Term Plasticity <i>In Vitro</i>	2012 - 2017
– Grant Number: 1R01NS079757 - 01 (NIH); NS079757 (NINDS)	
– Recipient Investigator: S.M. Potter	
– Proposal Preparation: J.P Newman (40%), M.F. Fong (40%), S.M Potter (20%).	
NSF Graduate Research Fellowship (NSF 08-593)	2009 - 2012
NSF Integrative Graduate Education and Research Traineeship (DGE-0333411)	2007 - 2009
RH Nagel Award: Nationwide, most improved chapter of Tau Beta Pi	2007
Special Recognition for Outstanding Service Leadership and Commitment to IEEE-USA and the Profession	2007
Student speaker for the graduating class; SUNY Binghamton	2007
Member - Tau Beta Pi	2006 - curr.