

# CURRICULUM VITAE

**Andrew M. Leifer**

Assistant Professor of Physics and Neuroscience

## CONTACT INFORMATION

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## PROFESSIONAL EXPERIENCE

**Princeton University**, Princeton, NJ ..... 2016–present  
*Assistant Professor*, Department of Physics and Princeton Neuroscience Institute

**Princeton University**, Princeton, NJ ..... 2012–2016  
*Lewis-Sigler Fellow*, Lewis-Sigler Institute for Integrative Genomics

**Harvard University**, Cambridge, MA ..... 2007–2012  
*NSF Graduate Research Fellow*, Program in Biophysics and Department of Physics.

**JILA (NIST-University of Colorado)**, Boulder, CO ..... Summers 2005–2006  
*NSF Summer Undergraduate Research Fellow*.

**American Association for the Advancement of Science**, Washington, DC .... Spring 2006  
*Leonard Rieser Fellow*, Center for Science Technology and Security Policy.

**Natl. Telecommunications and Information Administration**, Boulder, CO . Summer 2004  
*Researcher*, Institute for Telecommunication Sciences, Theory Division.

**National Institute of Standards and Technology**, Boulder, CO ..... Summer 2003  
*Researcher*, Statistics Division.

## EDUCATION

**Ph.D. in Biophysics**, Harvard University, Cambridge, MA ..... May 2012  
Thesis Topic: “Optogenetics and computer vision for *C. elegans* neuroscience and other biophysical applications” Advisor: Professor Aravinthan D.T. Samuel

**B.S. in Physics**, Stanford University, Stanford, CA ..... June 2007

**B.A. in Political Science**, Stanford University, Stanford, CA ..... June 2007

Honors in International Security Studies, CISAC, Stanford University, Stanford, CA .. June 2007  
Thesis Topic: “International scientific engagement for mitigating emerging nuclear security threats” Advisor: Professor Michael May

**HONORS AND AWARDS**

National Institutes of Health Director's New Innovator Award ..... 2019  
 National Science Foundation CAREER Award ..... 2019  
 Lewis-Sigler Fellowship, Princeton University ..... 2012–2016  
 Emerging Leaders in Biosecurity Initiative Fellow, Johns Hopkins, Center for Health Security 2015  
 American Physical Society, Biological Physics Thesis Award: Certificate of Merit ..... 2013  
 National Science Foundation Graduate Research Fellowship ..... 2007–2011  
 Derek C. Bok Certificate of Distinction in Teaching, Harvard University. .... 2008  
 Leonard Rieser Fellowship in Science Tech & Global Security, Bulletin of the Atomic Scientist 2006  
 SPIE International Society for Optical Engineering Scholarship..... 2006  
 American Institute of Physics, Society of Physics Students, Leadership Award..... 2006  
 National Science Foundation, Summer Undergraduate Research Fellowship ..... 2005–2006  
 AAAS, Center for Science Technology and Security Policy, Intern of the Year Award..... 2006  
 Harry Press Journalism Award, Stanford University. .... 2006  
 Boothe Prize for Excellence in Writing, Stanford University ..... 2004  
 Robert C. Byrd Academic Merit Scholarship ..... 2003  
 Dofflemeyer Eagle Scout Scholarship ..... 2003  
 Awards for the author's independent research, "Fractals, Power-Laws and the Weibull Distribution:  
 Mathematically Modeling Crumpled Paper" ..... 2003  
     American Mathematical Society, Karl Menger Award.  
     Office of Naval Research, Naval Science Award.  
     Third Place Team Project, Intel International Science and Engineering Fair 2003.  
     First Place Team Project, Colorado Science and Engineering Fair.  
     Scientific American, Outstanding Achievement in Education.  
 Golden State Governor's Scholarship, State of California..... 2000

**DEPARTMENTAL SERVICE (CURRENT)**

Department of Physics:

Equity, Diversity and Inclusion Advisor Board Member; Chair of the Dicke Committee; Senior Committee Member; Biophysics Seminar Series organizer

Princeton Neuroscience Institute:

Retreat Co-organizer; Admissions Committee; Bezos Center Steering Committee

**DEPARTMENTAL SERVICE (PREVIOUS)**

Junior Committee; Rising Stars in Physics Program Committee;

**UNIVERSITY SERVICE**

Institutional Biosafety Committee, Princeton University ..... 2021–Present  
 Faculty Advisor, Mathey College, Princeton University ..... 2020–Present  
 Member, Council of the Princeton University Community ..... 2013–2014  
 Senior Staff Committee Member, Lowell House, Harvard College, ..... 2010–2012  
 Resident Tutor, Lowell House, Harvard College ..... 2009–2012

Editorial Board Member, Stanford Daily, Stanford University .....2006–2007

## PROFESSIONAL SERVICE

Program Committee member, CoSyNe .....2019-2022

Founding project leader, Princeton Open Ventilation Monitor Collaboration .....2020

Scientific Program Committee member, International *C. elegans* Conference .....2019

Organizer, Simons Foundation, Workshop on Unbiased Quantification of Behavior .....2016

Grant reviewer for funding agencies and foundations including:

Agence Nationale de la Recherche (France), European Research Commission (EU), Israel Science Foundation (Israel), Medical Research Council (UK), National Institutes of Health (USA), National Science Foundation (USA), NASA (USA), Sir Henry Dale Wellcome Trust (UK), W. M. Keck Foundation (USA)

Scientific content reviewer for peer-reviewed journals including:

Journal of Physical Biology, Nature Methods, Neuron, Philosophical Transactions of the Royal Society B, PLOS Biology, PLOS Computational Biology, PNAS

Ad-hoc Reviewing Editor for the journal eLife

## TEACHING

Princeton University, *Faculty*:

PHY 101 Introductory Physics I ..... Fall 2018, 2020-21

NEU 457 (557) Measurement and Analysis of Neural Dynamics ..... Spring 2017, 2021

PHY 103 General Physics I ..... Fall 2016, 2019

NEU 422 Neural Dynamics of Cognition ..... Fall 2017

ISC 233-234 An Integrated, Quantitative Intro to the Natural Sciences II, .....2013–2016

ISC 231-232 An Integrated, Quantitative Intro to the Natural Sciences I, ..... 2012–2015

Neurotechnologies and Analysis of Neural Datasets, .....Summers 2015–2019

Princeton University, *Guest Lecturer*:

NEU 501,502 Neuroscience: from molecules to systems and behavior .....2017–2021

SPIA 548, Weapons of Mass Destruction and International Security .....2017–2019

SPIA 353, Science and Global Security, .....2015, 2017

NEU 301 Cellular Neurobiology .....2016

QCB 551 Intro to Genomics & Computational Molecular Biology, .....2014

Elsewhere:

Stanford University, CS 379C, Computational Models of the Neocortex, *Guest Lecturer*.....2016

Marine Biological Laboratory, Woods Hole, Neural Systems & Behavior, *Faculty* ... Summer 2014

Harvard University, BIOPHYS 242R, Brain & Behavior, *Guest Lecturer*.....2013

Harvard University, MCB 199, Statistical Thermodynamics for Quantitative Biology, *T.A.* .. 2008

## ADVISING

PhD Students (current):

Xinwei Yu (PHY), Kevin Chen (NEU, joint w/ Pillow), Sophie Dvali, (PHY), Sandeep Kumar (NEU).

PhD Students (past):

Ashley Linder (Neuroscience, joint w/ Shaevitz), Mochi Liu (QCB, joint w/ Shaevitz)

Undergraduate Students (current):

Tori Edington (PHY, Senior Thesis)

Undergraduate Students (past):

Milena Chakraverti-Wuerthwein (PHY, JP and Senior Thesis), John Li (NEU, Senior Thesis), Alicia Castillo (NEU, Senior Thesis), Xiaoting Sun; David Mazumder (MOL); Kevin Mizes (PHY, Senior Thesis; Treiman Fellow; Sanda & Jeremiah Lambert '55 Undergraduate Neuroscience Research Award Recipient), Peter Johnson (PHY, Junior Project); Jose Rico Chinchilla; Lukas Novak.

## INVITED LECTURES

Neuro 2022, Japan Neuroscience Society, Okinawa, Japan (expected) .....	2022
Washington University of St. Louis, Department of Physics Colloquium .....	2021
Society for Neuroscience Short Course, Quantifying Behavior .....	2019
Rockefeller University .....	2019
National Institutes of Health BRAIN Initiative Investigators Meeting .....	2019
Vanderbilt University, Department of Physics and Astronomy Colloquium .....	2019
Columbia University, Center for Theoretical Neuroscience .....	2018
SAND8, Statistical Analysis of Neuronal Data, Keynote Lecturer .....	2017
Rowen University School of Osteopathic Medicine, Department of Cell Biology .....	2017
APS March Meeting, Patterns & Control in Animal Behavior .....	2017
CUNY, The Graduate Center, Initiative for the Theoretical Sciences .....	2016
Cornell University, NBB, Perry Gilbert Lecture, Invited by Grad Students .....	2016
ICFO, Institute of Photonic Sciences, Light for Health Seminar .....	2016
Simons Foundation, Simons Collaboration on the Global Brain Annual Meeting .....	2016
Frontiers in Applied & Computational Mathematics .....	2016
Mid-Atlantic Society for Developmental Biology Regional Meeting .....	2016
Yale University School of Medicine, Department of Neuroscience Seminar .....	2016
Princeton University, Princeton Neuroscience Institute Seminar .....	2016
Yale University, Dept. of Molecular Cellular & Developmental Biology Seminar .....	2016
Google, Inc. ....	2016
Stanford University School of Medicine, Department of Neurobiology Seminar .....	2016
Ludwig Maximilians Universitat, Munchen, Center for Nanoscience Colloquium .....	2015
Northeastern University, Center for Complex Network Research .....	2015
Princeton University, Woodrow Wilson School, Science and Global Security Seminar .....	2015
Simons Foundation, Simons Collaboration on the Global Brain Annual Meeting .....	2015
Rockefeller University, Center for Studies in Physics and Biology Seminar .....	2015
Stanford University, Stanford Neurosciences Institute & Department of Bioengineering .....	2015
New York University, Center for Soft Matter Research .....	2015
Delaware Center for Neuroscience Research .....	2014
Brandeis University, Computational & Systems Neuroscience Journal Club .....	2014
Columbia University, Grossman Center, Quantifying Structure in Large Neural Datasets ....	2014

<i>C. elegans</i> topic meeting: Neuronal Development, Synaptic Function & Behavior .....	2014
Rutgers University, Multi Group Worm Meeting .....	2013
INSERM, University of Paris Descartes, Optics and Photonics Seminar .....	2012
Princeton University, Lewis-Sigler Institute for Integrative Genomics .....	2011
Rutgers University, Molecular Biology and Biochemistry .....	2010
Harvard University, Rowland Institute .....	2010

## PEER-REVIEWED PUBLICATIONS

1. Princeton Open Ventilation Monitor Collaboration, Philippe Bourrienne, Stanley Chidzik, Daniel J Cohen, Peter Elmer, Thomas Hallowell, Todd J Kilbaugh, David Lange, Andrew M. Leifer, Daniel R. Marlow, Peter D. Meyers, Edna Normand, Janine Nunes, Myungchul Oh, Lyman Page, Talmo Pereira, Jim Pivarski, Henry Schreiner, Howard A Stone, David W Tank, Stephan Thiberge, Christopher Tully. Inexpensive multi-patient respiratory monitoring system for helmet ventilation during COVID-19 pandemic. *ASME Journal of Medical Devices*. Mar 16(1): 011003 (2022).
2. Mochi Liu, Sandeep Kumar, Anuj K Sharma, Andrew M. Leifer. “A high-throughput method to deliver targeted optogenetic stimulation to moving *C. elegans* populations.” *PLoS Biol* 20(1): e3001524. (2022)
3. Anne E. Urai, Brent Doiron, Andrew M. Leifer, Anne K. Churchland. “Large-scale neural recordings call for new insights to link brain and behavior.” *Nature Neuroscience*, 3 January (2022).
4. Kelsey M. Hallinen\*, Ross Dempsey\*, Monika Scholz\*, Xinwei Yu, Ashley N Linder, Francesco Randi, Anuj K Sharma, Joshua W. Shaevitz and Andrew M Leifer, “Decoding locomotion from population neural activity in moving *C. elegans*.” *eLife*, 10:e66135, 29 July (2021).
5. Xinwei Yu, Matthew S. Creamer, Francesco Randi, Anuj K. Sharma, Scott W. Linderman, Andrew M. Leifer, “Fast deep neural correspondence for tracking and identifying neurons in *C. elegans* using semi-synthetic training.” *eLife*, 10:e66410, 14 July (2021).
6. Francesco Randi and Andrew M. Leifer, “Nonequilibrium Green’s functions for functional connectivity in the brain.” *Phys Rev Lett*, **126**, 118102 (2021).
7. Francesco Randi and Andrew M. Leifer. “Measuring and modeling whole-brain neural dynamics in *Caenorhabditis elegans*.” *Current Opinion in Neurobiology*. Vol 65, Pages 157-167 (2020).
8. Robert Datta, David Anderson, Kristen Branson, Pietro Perona, and Andrew Leifer, “Computational neuroethology: a call to action.” *Neuron*, 104:1, (2019).
9. Xiaowen Chen, Francesco Randi, Andrew M Leifer and William Bialek, “Searching for collective behavior in a small brain.” *Phys Rev E* **99**, 052418 (2019).
10. Mochi Liu, Anuj K. Sharma, Joshua W. Shaevitz, Andrew M. Leifer, “Temporal processing and context dependency in *C. elegans* mechanosensation.” *eLife*, 7:e36419 (2018).
11. Jeffrey Nguyen, Ashley N. Linder, George Plummer, Joshua W. Shaevitz, Andrew M. Leifer, “Automatically tracking neurons in a moving and deforming brain” *Plos Computational Biology*, 13(5): e1005517 (2017).

12. Jeffrey Nguyen\*, Frederick B. Shipley\*, Ashley N. Linder, George Plummer, Mochi Liu, Sagar U. Setru, Joshua W. Shaevitz, Andrew M. Leifer, “Whole-brain calcium imaging with cellular resolution in freely behaving *Caenorhabditis elegans*.” *Proceedings of the National Academy of Sciences*, vol. 113 no. 8, E1074-E1081 (2016).
13. Frederick B. Shipley, Christopher M. Clark, Mark J. Alkema, Andrew M. Leifer, “Simultaneous optogenetic stimulation and calcium imaging in freely moving *C. elegans*.” *Frontiers in Neural Circuits* 8:28 (2014).
14. Steven J. Husson, Alexander Gottschalk, Andrew M. Leifer, “Optogenetic manipulation of neural activity in *C. elegans*: from synapse to circuits and behavior” *Journal of Biology of the Cell*, 105, 1–16 (2013).
15. Jamie L. Donnelly, Christopher M. Clark, Andrew M. Leifer, Marian Haburacak, Jennifer K. Pirri, Michael M. Francis, Aravinthan D. T. Samuel, and Mark J. Alkema. “Monoaminergic orchestration of motor programs in a complex behavior in *C. elegans*.” *PLoS Biology* 11(4): e1001529 (2013).
16. Quan Wen, Michelle Po, Elizabeth Hulme, Sway Chen, Xinyu Liu, Sen Wai Kwok, Marc Gershow, Andrew M. Leifer, Victoria Butler, Christopher Fang-Yen, Taizo Kawano, William R. Schafer, George Whitesides, Matthieu Wyart, Dmitri Chklovskii, Mei Zhen, Aravinthan D T Samuel, “Proprioceptive coupling within motor neurons drives *C. elegans* forward locomotion.” *Neuron*, 76, 750–761 (2012).
17. Chenxiang Lin, Ralf Jungmann, Andrew M. Leifer, Chao Li, Daniel Levner, Gero M. Church, William M. Shih, Peng Yin. “Sub-micrometer geometrically encoded fluorescent barcodes self-assembled from DNA.” *Nature Chemistry*, 4, 832–839 (2012).
18. Andrew M. Leifer\*, Christopher Fang-Yen\*, Marc Gershow, Mark Alkema, Aravinthan D.T. Samuel, “Optogenetic manipulation of neural activity in freely moving *Caenorhabditis elegans*,” *Nature Methods*, 8(2), p.147–152 (2011) .
19. Kevin J. Coakley, David S. Simons, Andrew M. Leifer. “Secondary Ion Mass Spectrometry Measurements of Isotopic Ratios: Correction for Time Varying Count Rate.” *International Journal of Mass Spectrometry*, 204, 107–120 (2005).

## ACTIVE GRANTS

9/18/2019–3/21/2024 National Institute of Health, 1DP2NS116768, (PI: Leifer)

“Probing brain-wide functional connectivity during behavior.”

Total Direct & Indirect Costs: \$2,430,000

6/2019–5/2024 National Science Foundation, 1845137, (PI: Leifer)

“CAREER: Neural mechanisms of flexible sensorimotor processing in *C. elegans*”

Total Direct & Indirect Costs: \$800,000

7/2017–7/2023, Simons Foundation, Simons Collaboration on the Global Brain, SCGB #543003 (co-PI Leifer; contact PI is Zimmer)

“Neural Dynamics of a Multi-timescale Social Behavior”

Total Direct & Indirect Costs: \$900,000

**COMPLETED GRANTS**

5/15/2020–4/30/2021 National Science Foundation, 2013509, (co-PI: Leifer; PI: Elmer)  
RAPID: Open Research Infrastructure for COVID-19 Ventilator Data Total Direct & Indirect Costs:  
\$200,000

7/2014–7/2017, Simons Foundation, Simons Collaboration on the Global Brain, SCGB (PI: Leifer)  
“Whole brain calcium imaging in freely behaving nematodes”  
Total Direct & Indirect Costs: \$320,000

9/2017–8/2019 National Institute of Health, 1R21NS101629, (PI: Murray, U Penn)  
“Multicolor labeling for cell identification in the *C. elegans* nervous system”  
Total Direct & Indirect Costs: \$500,000 (\$250,000 to Leifer)

9/2014–8/2016, Princeton University, Inaugural Dean’s Innovation Fund for New Ideas in the Nat-  
ural Sciences (co-PI with Shaevitz)  
“All-neuron I/O in freely behaving animals”  
Total Direct Costs: \$200,000 (\$100,000 to Leifer)