

# 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  
*Faculty*, Center for Physics of Biological Function  
*Associated Faculty*, Lewis-Sigler Institute for Integrative Genomics  
*Associated Faculty*, Bioengineering Initiative (2021–present)

**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  
 Emerging Leaders in Biosecurity Initiative Fellow, Johns Hopkins, Center for Health Security 2015  
 Simons Investigator, Simons Collaboration on the Global Brain, Simons Foundation .....2014  
 American Physical Society, Biological Physics Thesis Award: Certificate of Merit .....2013  
 Lewis-Sigler Fellowship, Princeton University ..... 2012–2016  
 Derek C. Bok Certificate of Distinction in Teaching, Harvard University. .... 2008  
 National Science Foundation Graduate Research Fellowship ..... 2007–2011  
 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 OR UNIT-LEVEL SERVICE (CURRENT)

Department of Physics:

Equity, Diversity, and Inclusion (EDI) Advisor Board Member; Chair of the Dicke Fellows Committee

Princeton Neuroscience Institute:

Website Committee Chair; Neuroscience Grad Admissions Committee

Center for Physics of Biological Function:

Chair of Seminar Series Committee; Biophysics Grad Admissions Committee; CPBF Fellow Search Committee

Bioengineering Initiative:

Faculty Search Committee

**DEPARTMENTAL SERVICE (PREVIOUS)**

Senior Committee (PHY); Junior Committee (PHY); Rising Stars in Physics Program Committee; Retreat Co-Organizer (NEU)

**UNIVERSITY SERVICE**

Institutional Biosafety Committee, Princeton University ..... 2021–Present  
 Freshman & Sophomore Undergrad Advisor, Mathey College, Princeton University ... 2020–2023  
 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

**PROFESSIONAL SERVICE**

Program Committee member, CoSyNe ..... 2019–2022  
 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), NASA (USA), National Institutes of Health (USA), National Science Foundation (USA), NWO (Netherlands), Sir Henry Dale Wellcome Trust (UK), W. M. Keck Foundation (USA)  
 Scientific content reviewer for peer-reviewed journals including:  
     Current Biology, eLife, Nature Methods, Neuron, Philosophical Transactions of the Royal Society B, Physical Review Letters, PLOS Biology, PLOS Computational Biology, PNAS  
 Ad-hoc Reviewing Editor: eLife

**TEACHING**

Princeton University, *Faculty*:

NEU 457 (557) Measurement and Analysis of Neural Dynamics ..... Spring 2017, 2021, 2023  
 PHY 101 Introductory Physics I ..... Fall 2018, 2020–22  
 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  
 CPBF Physics of Life ..... Summers 2018–19, 2022–23

Princeton University, *Guest Lecturer*:

NEU 501,502 Neuroscience: from molecules to systems and behavior ..... 2017–2022  
 Warrior Scholar Project, Physics ..... 2023  
 SPIA 548, Weapons of Mass Destruction and International Security ..... 2017–2019, 2020  
 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):

Wayan Gauthey (NEU, joint w/ Murthy), Emily Osborne (PHY), Kevin Chen (NEU, joint w/ Pillow), Sophie Dvali, (PHY), Sandeep Kumar (NEU).

PhD Students (past):

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

Undergraduate Students (current):

Andrew Tan (NEU, Senior Thesis), Abdul-Bassit Fijabi (NEU, JP)

Undergraduate Students (past):

Tori Edington (PHY, Senior Thesis), 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

Allen Institute of Neural Dynamics (scheduled) ..... 2023

Harvard University, Department of Physics Colloquium (scheduled) ..... 2023

Memorial Sloan Kettering Cancer Center, Developmental Biology Seminar (scheduled) ..... 2023

APS March Meeting (delivered by Sophie Dvali) ..... 2023

University of Chicago, Neuroscience Seminar ..... 2023

New York Area Worm Meeting, Plenary speaker ..... 2023

Yale University, Quantitative Biology Seminar ..... 2022

Google Research ..... 2022

Syracuse University, Department of Physics ..... 2022

UCSF ..... 2022

CalTech, Neuroscience Seminar ..... 2022

Stanford University, Wu Tsai Neurosciences Institute ..... 2022

Johns Hopkins University, Biology Seminar ..... 2022

Kavli Institute for Theoretical Physics, Neurophysics of Locomotion Workshop ..... 2022

Neuro 2022, Japan Neuroscience Society, Okinawa, Japan ..... 2022

CoSyNe Workshop, Lisbon, Portugal..... 2022

Simons Foundation, Simons Collaboration on the Global Brain Annual Meeting ..... 2022

NSF Workshop: Functional Logic of Neural Circuits, San Juan, PR ..... 2022

Washington University of St. Louis, Department of Physics Colloquium ..... 2021

Society for Neuroscience Short Course, Quantifying Behavior .....	2019
Workshop on the Aging Brain, Simons Foundation .....	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

## MANUSCRIPTS UNDERGOING PEER REVIEW

1. Anuj Kumar Sharma, Francesco Randi, Sandeep Kumar, Sophie Dvali, Andrew M. Leifer, "TWISP: A Transgenic Worm for Interrogating Signal Propagation in *C. elegans*." *bioRxiv* 2023.08.03.551820; 5 August (2023).

**PEER-REVIEWED PUBLICATIONS**

1. Francesco Randi, Anuj K. Sharma, Sophie Dvali, Andrew M. Leifer, “Neural signal propagation atlas of *C. elegans*.” *Nature*, in press (2023).
2. Sandeep Kumar, Anuj K. Sharma, Andrew Tran, Andrew M. Leifer, “Inhibitory motor signals gate mechanosensory processing in *C. elegans*” *PLOS Biology*, in press (2023).
3. Kevin S. Chen\*, Rui Wu\*, Marc H. Gershow, and Andrew M. Leifer. “Continuous odor profile monitoring to study olfactory navigation in small animals.” *eLife*, 12:e85910 , 25 July (2023).
4. Matthew S. Creamer, Kevin S. Chen, Andrew M. Leifer, Jonathan W. Pillow, “Correcting motion induced fluorescence artifacts in two-channel neural imaging.” *PLOS Computational Biology*, 18(9): e1010421 Sept 28 (2022)
5. Princeton Open Ventilation Monitor Collaboration, Philippe Bourrianne, 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).
6. 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 Biology* 20(1): e3001524. (2022)
7. 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). [Invited Review]
8. 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).
9. 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).
10. Francesco Randi and Andrew M. Leifer, “Nonequilibrium Green’s functions for functional connectivity in the brain.” *Phys Rev Lett*, **126**, 118102 (2021).
11. 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). [Invited Review]
12. Robert Datta, David Anderson, Kristen Branson, Pietro Perona, and Andrew Leifer, “Computational neuroethology: a call to action.” *Neuron*, 104:1, (2019). [Review]
13. Xiaowen Chen, Francesco Randi, Andrew M Leifer and William Bialek, “Searching for collective behavior in a small brain.” *Phys Rev E* **99**, 052418 (2019).

14. Mochi Liu, Anuj K. Sharma, Joshua W. Shaevitz, Andrew M. Leifer, “Temporal processing and context dependency in *C. elegans* mechanosensation.” *eLife*, 7:e36419 (2018).
15. 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).
16. 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).
17. 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).
18. 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). [Invited Review]
19. 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 motorprograms in a complex behavior in *C. elegans*.” *PLoS Biology* 11(4): e1001529 (2013).
20. 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).
21. 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).
22. 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) .
23. 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).

## BOOKS UNDER CONTRACT

1. Ross Dempsey and Andrew M. Leifer. *Undergraduate Physics in a Hurry*. Princeton University Press. Expected 2026.

## ACTIVE OR AWARDED GRANTS

7/2024–7/2026, Simons Foundation, Simons Collaboration on the Global Brain, SCGB #3196-03 (PI Leifer; spokesperson PI is Zimmer)

“Neuromodulatory interactions the control of long-time scale behaviors”

Total Direct & Indirect Costs: \$436,400

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

7/2017–7/2024, Simons Foundation, Simons Collaboration on the Global Brain, SCGB #543003  
(PI Leifer; spoksepserson PI is Zimmer)

“Neural Dynamics of a Multi-timescale Social Behavior”

Total Direct & Indirect Costs: \$1,080,000

10/1/2017–9/30/2017 National Science Foundation, PHY-1734030 (PI: Bialek, co-PI: Shaevitz,  
named investigator: Leifer)

“Physics Frontier Center: Center for the Physics of Biological Function”

Total Direct & Indirect Costs: \$14,700,000

## COMPLETED GRANTS

5/15/2020–4/30/2021 National Science Foundation, PHY-2031509, (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)