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 Scientist2006
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
Dofflemyer 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

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
C. elegans 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. 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, Christpoher 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, Geroge 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.147â–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 Natural Sciences (co-PI with Shaevitz)
"All-neuron I/O in freely behaving animals"
Total Direct Costs: $200,000 ($100,000 to Leifer)