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
Associated Faculty, Bioengineering Initiative and Lewis Sigler Institute for Integrative Genomics

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
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 SERVICE (CURRENT)

Department of Physics:
Chair of the Dicke Committee; Senior Committee Member; Biophysics Seminar Series organizer
Princeton Neuroscience Institute:
Retreat Co-organizer; Admissions Committee; Bezos Center Steering Committee
Bioengineering Initiative:
Faculty Search Committee Member

DEPARTMENTAL SERVICE (PREVIOUS)

Equity, Diversity and Inclusion Advisor Board Member (PHY); Junior Committee (PHY); Rising Stars in Physics Program Committee;

UNIVERSITY SERVICE

Institutional Biosafety Committee, Princeton University 2021–Present
Freshman & Sophomore Undergrad 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), 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, PLOS Biology, PLOS Computational Biology, PNAS
Ad-hoc Reviewing Editor: 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
CPBF Physics of Life ..... Summers 2018-19, 2022

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):
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):
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

Memorial Sloan Kettering Cancer Center, Developmental Biology Seminar (expected) 2023
Yale University, Quantitative and Computational Biology Seminar (expected) 2022
Johns Hopkins University (expected) 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

MANUSCRIPTS UNDERGOING PEER REVIEW

1. Francesco Randi, Anuj K. Sharma, Sophie Dvali, Andrew M. Leifer, "A functional connectivity atlas of C. elegans measured by neural activation." *arXiv*, 2208.04790 Aug 9 (2022).

PEER-REVIEWED PUBLICATIONS

1. 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*, in press (2022)

2. 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).

3. 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)

4. 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).

5. 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).

6. 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).

7. Francesco Randi and Andrew M. Leifer, "Nonequilibrium Green's functions for functional connectivity in the brain." *Phys Rev Lett*, **126**, 118102 (2021).

8. Francesco Rand and Andrew M. Leifer. "Measuring and modeling whole-brain neural dynamics in Caenorhabditis elegans." *Current Opinion in Neurobiology.* Vol 65, Pages 157-167 (2020).

9. Robert Datta, David Anderson, Kristen Branson, Pietro Perona, and Andrew Leifer, "Computational neuroethology: a call to action." *Neuron*, 104:1, (2019).

10. Xiaowen Chen, Francesco Randi, Andrew M Leifer and William Bialek, "Searching for collective behavior in a small brain." *Phys Rev E* **99**, 052418 (2019).

11. Mochi Liu, Anuj K. Sharma, Joshua W. Shaevitz, Andrew M. Leifer, "Temporal processing and context dependency in *C. elegans* mechanosensation." *eLife*, 7:e36419 (2018).

12. 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).

13. 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).

14. 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).

15. 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).

16. 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).

17. 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).

18. 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).

19. 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) .

20. 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, 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)