

# William de Almeida Gilpin

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## Education

Stanford University, PhD in Applied Physics, 2019  
Stanford University, MS in Applied Physics, 2016  
Princeton University, AB in Physics with High Honors, 2014

## Positions

The University of Texas at Austin, Assistant Professor of Physics 2022—  
Affiliated Faculty, The Oden Institute for Computational Engineering & Sciences.  
Harvard University, NSF-Simons Independent Fellow, Quantitative Biology Initiative. 2019–2022.  
Osmosis Medical, content developer, 2018–2020  
The University of Tokyo, Visiting scholar in applied mathematics. 2016.  
Khan Academy, content developer, 2014 – 2016.

## Honors & Awards

Complex Systems Society Emerging Researcher Award, 2022  
Texas Rising STARs Grant, 2022  
APS Prize for Outstanding Doctoral Thesis Research in Biological Physics, 2020.  
National Geographic Young Explorers Grant, 2017.  
Miller Fellowship at UC Berkeley, 2019–2021 (*declined*).  
Visualization Prizes: Nikon Small World Grand prize (2016) [vid], NSF “Vizzies” Grand prize (2017),  
Milton van Dyke Award, APS Gallery of Fluid Motion (2016) [vid], Physics Today (2017) [url],  
Graduate Fellowships: National Science Foundation Graduate Research Fellowship, NDSEG Fellowship,  
EDGE-STEM and H&S Fellowships, 2014-2019  
NSF REU Fellowships: Harvard SEAS/NNIN, 2012, 2013; Mote Marine Laboratory, 2011  
Undergraduate: Class of 1930 Scholarship, Shenstone Prize in Physics 2013, Sigma Xi 2014,  
Kusaka Memorial Prize in Physics 2014.

## Upcoming

**W. Gilpin.** Recurrences reveal shared causal drivers of complex time series. (2023) [arXiv]

M. J. Falk, F. Roach, **W. Gilpin**, A. Murugan. Curiosity-driven search for novel non-equilibrium behaviors. (2022) [arXiv]

The NeuroBench collaboration, incl. **W. Gilpin**. NeuroBench: Advancing Neuromorphic Computing through Collaborative, Fair and Representative Benchmarking. (2023) *under review*

## Publications

**W. Gilpin.** *Nature Reviews Physics*. Generative Learning for Nonlinear Dynamics. (2023) [arXiv]

**W. Gilpin.** *Physical Review Research*. Model scale versus domain knowledge in statistical forecasting of chaotic systems. (2023) [arXiv]

**W. Gilpin.** *Neural Information Processing Systems (NeurIPS)*. Chaos as an interpretable benchmark for forecasting and data-driven modelling. (2021) 21% acceptance rate, 9122 submissions [pdf].

**W. Gilpin.** *Physical Review Research*. Desynchronization of jammed oscillators by avalanches. (2021) [pdf]

**W. Gilpin.** *Neural Information Processing Systems (NeurIPS)*. Deep reconstruction of strange attractors from time series (2020). 20% acceptance rate, 9467 submissions. [pdf]

**W. Gilpin**, Y. Huang, D. Forger. *Current Opinion in Systems Biology*. Learning dynamics from large biological datasets: Machine learning meets systems biology. (2020) [pdf]

**W. Gilpin**, M. S. Bull, M. Prakash. *Nature Reviews Physics*. The multiscale physics of cilia and flagella. (2020) [pdf] [cover]

**W. Gilpin.** *Physical Review E*. Cellular automata as convolutional neural networks. (2019) [pdf]

- W. Gilpin.** *The Proceedings of the National Academy of Sciences*. Cryptographic hashing using chaotic hydrodynamics. (2018) [\[pdf\]](#)  
[phys.org](#) | [stanford homepage](#) | [kcbs](#) | [futuraity](#) | [scishow](#)
- W. Gilpin, M. W. Feldman.** *Theoretical Population Biology*. Cryptic selection forces and dynamic heritability in generalized phenotypic evolution. (2018) [\[pdf\]](#)
- W. Gilpin, M. W. Feldman.** *PLOS Computational Biology*. A phase transition induces chaos in a predator-prey ecosystem with a dynamic fitness landscape. (2017) [\[pdf\]](#)
- W. Gilpin, V. N. Prakash, M. Prakash.** *Journal of Experimental Biology*. Flowtrace: simple visualization of coherent structures in biological fluid flows. (2017) [\[pdf\]](#) [\[code\]](#) [\[cover\]](#)
- J. Y. Wakano\*, **W. Gilpin\*** (\*co-first), S. Kadowaki, M. W. Feldman, K. Aoki. *Theoretical Population Biology*. Ecocultural range-expansion scenarios for the replacement or assimilation of Neanderthals by modern humans. (2017) [\[pdf\]](#)
- W. Gilpin, V. N. Prakash, M. Prakash.** Rapid behavioral transitions produce chaotic mixing by a planktonic microswimmer. (2018) [\[arXiv\]](#)
- W. Gilpin, V. N. Prakash, M. Prakash.** *Nature Physics*. Vortex arrays and ciliary tangles underlie the feeding-swimming tradeoff in starfish larvae. (2017) [\[pdf\]](#)  
[nature physics news & views](#) | [new york times](#) | [nature](#) | [cbs](#) | [pop sci](#) | [business insider](#) | [scientific american](#)
- W. Gilpin, V. N. Prakash, M. Prakash.** *Physical Review Fluids*. Dynamic vortex arrays created by starfish larvae. (2017) [\[pdf\]](#) [\[aps feature\]](#)
- W. Gilpin, V. N. Prakash, M. Prakash.** *Nature Physics*. Boundary effects on currents around ciliated larvae. (2017) [\[pdf\]](#)
- W. Gilpin, M. W. Feldman, K. Aoki.** *The Proceedings of the National Academy of Sciences*. An ecocultural model predicts Neanderthal extinction through competition with modern humans. (2016) [\[pdf\]](#)  
[newsweek](#) | [science](#) | [daily mail](#) | [ars technica](#) | [huffington post](#) | [international business times](#)
- W. Gilpin.** *Bioinformatics*. PyPDB: A Python API for the Protein Data Bank. (2015) [\[pdf\]](#) [\[code\]](#)
- W. Gilpin, S. Uppaluri, C. P. Brangwynne.** *Biophysical Journal*. Worms under pressure: bulk mechanical properties of *C. elegans* are independent of the cuticle. (2015) [\[pdf\]](#) [\[video\]](#)
- K. Bayat, W. K. C. Sun, **W. Gilpin**, M. Baroughi, & M. Lončar. *CLEO: Science and Innovations*. Nitrogen vacancy center ensembles in diamond nanowires. (2014) [\[pdf\]](#)

## Invited Talks

- UTIG Simons Planning Meeting, 2023
- SIAM Applied Dynamical Systems, Minisymposium, 2023
- Emory-NSF Multiscale Complex Systems Workshop, 2023
- University of Amsterdam, soft matter seminar, 2023
- Kungfu AI Inc. machine learning seminar, 2023
- U Chicago, Computations in Science seminar, 2022
- Pitt-Berkeley-KTH, joint seminar on scientific machine learning, 2022
- Ecole Normale Supérieure de Paris, biophysics seminar, 2022
- Mila Quebec AI Institute, Université de Montréal, dynamical systems seminar, 2022
- Johns Hopkins Physics, research seminar, 2021
- Flatiron Institute, research seminar, 2021
- APS March Meeting, Biological physics Dissertation Prize Talk, 2021
- UC Santa Cruz Applied Mathematics, research seminar, 2021
- UT Austin Physics, Center for Nonlinear Dynamics and Biophysics Seminar, 2021
- Emory Biology, research seminar, 2021
- University of British Columbia Mechanical Engineering, research seminar, 2021
- Brandeis Mathematics, research seminar, 2021
- Caltech Computing & Mathematical Sciences, CMS Frontiers Colloquium, 2021

UC Berkeley Physics, research seminar, 2021  
University of Waterloo Applied Mathematics, research seminar, 2021  
UC Berkeley Chemical and Biomolecular Engineering, research seminar, 2021  
University of Chicago Physics, research seminar, 2021  
UC Irvine Mathematics, research seminar, 2021  
UCLA Mathematics, Applied Math Colloquium, 2021  
Princeton University Bioengineering, “Rising Stars” Colloquium, 2020  
Microsoft Research New England, 2020  
Vrije Universiteit, Stephens group meeting, 2020  
MIT Physics, seminar, 2018  
Princeton University Physics, PCTS & CPBF Symposium, 2018  
Harvard University Quantitative Biology, symposium, 2018  
Meiji University, mathematical biology seminar, 2016  
Tokyo University of Agriculture and Technology, 2016  
National Nanotechnology Infrastructure Network Symposium, 2012  
Mote Marine Laboratory, 2011.

## Service & Advising

**Research supervisor** for two graduate students and one undergraduate. Previous advisor to one undergraduate student (Duke University, Harvard QBio REU 2020-2022); next position: Marshall Scholar at Cambridge

**Search Committee Member.** UT Theoretical Plasma Physics Faculty Search (2022-2023), UT Graduate Admissions (2022-2023).

**Grant Referee** for National Geographic Society (2019-2023), European Research Council (2020).

**Peer review** for *Nature Physics*, *The Proceedings of the National Academy of Sciences*, *Nature Communications*, *eLife*, *NeurIPS*, *PLOS Computational Biology*, *Bioinformatics*, *IEEE Transactions on Artificial Intelligence*, *Journal of Experimental Biology*, *Journal of Theoretical Biology*, *Theoretical Population Biology*, *Chaos*, *International Journal of Bifurcation and Chaos*, and *Journal of Archaeological Science*

**Dissertation Committees:** Jonas Smucker, Jake McGrath, James Clarke (Alvarado Lab); Luke Pharr (Marder Group), Erik Hansen (Morrison Group), Yichen Guo (Florin Group).

## Outreach

**Open source.** Sole developer for one open-source tool for bioinformatics, PyPDB, with 70,000 downloads and an active user community. All code produced by group is on GitHub [\[url\]](#).

**Invited contributor** of scientific visualizations to the 2021–2022 Neal visualization shows in Shenzhen and Hangzhou.

**Educational content developer.** Developed educational videos for the non-profit education startups Khan Academy (2014–2016), and Osmosis (2018–2020).

**Invited judge** for the 2018 American Physical Society “Gallery of Fluid Motion” competition

**EDGE-STEM mentor.** Mentor and advise early-career doctoral students at Stanford (2015–2019).

## Teaching

Computational Physics. A fully open-source graduate course developed in Python, focusing on connections between classical numerical recipes and physical systems (newly developed for Fall 2022). UT Austin, Fall 2022, Fall 2023. [\[url\]](#)

General Physics for pre-medical majors. 128 students, single instructor. UT Austin, Fall 2023.

Guest lecturer for Modern Physics. UT Austin, Spring 2023.