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.
Chief Data Scientist, Marble Therapeutics (1 day/week), 2024–
Harvard University, NSF-Simons Independent Fellow, Quantitative Biology Initiative. 2019–2022.

Visits

Marble Therapeutics, Scientific Advisory Board 2024—
Max Planck Institute for the Physics of Complex Systems, visiting scientist, spring 2024
Osmosis Medical, content developer, 2018–2020
The University of Tokyo, visiting scholar, fall 2016.
Khan Academy, content developer, 2014 – 2016.

Awards

Scialog Fellow, 2024
Chan-Zuckerberg Investigator, 2023
Complex Systems Society Emerging Researcher Award, 2022
Texas Rising STARs Grant, 2022
Forbes 30 under 30 Scientists (North America), 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 of APS Gallery of Fluid Motion (2016) (vid) , Physics Today (2017) (url)
Graduate Fellowships: NSF GRFP, NDSEG, Stanford EDGE-STEM and H&S
NSF REU Fellowships: Harvard NNIN; Harvard NNIN; Mote Marine Laboratory
Undergraduate: Class of 1930 Scholarship, Shenstone Prize in Physics 2013, Sigma Xi 2014, Kusaka Memorial Prize in Physics 2014.

Preprints

W. Gilpin. Optimization hardness constrains ecological transients. (2024) (arXiv)

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

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

Publications

W. Gilpin. ***Nature Reviews Physics***. Generative learning for nonlinear dynamics. (2024) (pdf)

M. J. Falk, F. Roach, **W. Gilpin**, A. Murugan. ***Physical Review Research***. Curiosity-driven search for novel non-equilibrium behaviors. (2024) (pdf)

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

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)
Press: phys.org, Stanford homepage, KCBS, Futurity, 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)
Press: Nature Physics News & Views, New York Times, Nature, CBS, Popular Science, 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)
Press: 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

Fields Institute, Symposium on Machine Learning & Dynamical Systems, 2024 (vid)
CZI Theory in Biology Workshop Paros, 2024
Heidelberg University, seminar, 2024
Max Planck Institute for the Physics of Complex Systems, seminar, 2024
UTIG Earthquake Prediction Workshop, 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

Editorial Advisory Board, *Nature Reviews Physics*.
Research supervisor for four graduate students and three undergraduates. Previous undergraduate advisor to Yasa Baig (Duke University, Harvard QBio REU 2020-2022); next position: Marshall Scholar at Cambridge & PhD at Stanford
Search Committee Member. UT Theoretical Plasma Physics Faculty Search (2022-2023), UT Graduate Admissions (2022-2024).
Grant Referee for National Geographic Society (2019-2023), U.S. DOE (2023), European Research Council (2020).
Peer review for *Nature Physics*, *The Proceedings of the National Academy of Sciences*, *Nature Communications*, *eLife*, *NeurIPS*, *Physical Review Letters* / *E* / *Fluids* / *Research*, *Nature Reviews Physics*, *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: Jake McGrath, Jonas Smucker, Francis Cavanna, James Clarke (Alvarado Lab); Luke Pharr (Marder Group); Erik Hansen (Morrison Group); Yichen Guo (Florin Group); George Yeh (Truskett Group),

Outreach

REU Mentor. Code@TACC Code for Social Change REU Program. 2023–2024.
Open source. Sole developer for one open-source tool for bioinformatics, PyPDB, with 100,000 downloads and an active user community. All code produced by group is on GitHub. (url)
Invited contributor of scientific visualizations: National Geographic Society / Netflix documentary "One Strange Rock"
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. Newly-developed & fully open-source graduate course developed in Python, focusing on connections between classical numerical recipes and physical systems. UT Austin, Fall 2022 (17 students), Fall 2023 (28 students). (url)

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

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