DOMINIC J. SKINNER

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EDUCATION

2017-2022   Massachusetts Institute of Technology, Cambridge, MA

        PhD in mathematics advised by Professor Jörn Dunkel

2013-2017   Trinity Hall, University of Cambridge, Cambridge, UK

        Part III Mathematics (MMath), distinction

        Parts I & II Mathematics (BA), 1st class

EMPLOYMENT

2024-present   Flatiron Institute, New York, NY

        Associate Research Scientist in the Center for Computational Biology

2022-2024   Northwestern University, Evanston, IL

        NSF-Simons postdoctoral fellow in the Center for Quantitative Biology

AWARDS AND FELLOWSHIPS

Outstanding Referee, Communications Physics (2024).

Google Cloud Academic Research Grant (2023).

MathWorks Science Fellowship (2020-2021).

Princeton Center For The Physics of Biological Function Symposia Travel Award (2020).

NSF Mathematical Sciences Graduate Internship (2020). *Argonne National Laboratory.*

MIT Presidential Fellowship (2017-2018).

Mayhew Prize (2017). *Top honours in applied mathematics in Part III, University of Cambridge.*

Parks Prize For Mathematics (2017). *Trinity Hall, Cambridge.*

Wylie Prize For Mathematics (2016). *Trinity Hall, Cambridge.*

PUBLICATIONS

A. Tripathi, J. Dunkel, <u>D. J. Skinner</u>. Collective is different: Information exchange and speed-accuracy trade-offs in self-organized patterning. **PRX Life**, 4:013015 (2026).

<u>D. J. Skinner</u>, P. Lemaire, and M. Mani. Physical modeling of embryonic transcriptomes identifies collective modes of gene expression. **PRX Life**, 3:033028 (2025). Selected for the PRX Life invited symposium.

J. W. Zussman*, <u>D. J. Skinner</u>*, D. E. Wagner, S. Y. Shvartsman, and D. J. Laird. Evaluating Selective Quality Control in Mammalian Oogenesis: Evidence and Opportunities. **Annual Review of Genetics**, 59:237 (2025).

G. Stepaniants, A. D. Hastewell, <u>D. J. Skinner</u>, J. F. Totz, and J. Dunkel. Discovering dynamics and parameters of nonlinear oscillatory and chaotic systems from partial observations. **Physical**

Review Research, 6:043062 (2024).

T. Ohmura, <u>D. J. Skinner</u>, K. Neuhaus, G. P. T. Choi, J. Dunkel, and K. Drescher. In vivo microrheology reveals local elastic and plastic responses inside three dimensional bacterial biofilms. **Advanced Materials**, 36:2314059 (2024).

M. Salvalaglio, <u>D. J. Skinner</u>, J. Dunkel, and A. Voigt. Persistent homology and topological statistics of hyperuniform point clouds. **Physical Review Research**, 6:023107 (2024).

H. Jeckel, K. Nosho, K. Neuhaus, A. D. Hastewell, <u>D. J. Skinner</u>, D. Saha, N. Netter, N. Paczia, J. Dunkel and K. Drescher. Simultaneous spatiotemporal transcriptomics and microscopy of *Bacillus subtilis* swarm development reveal cooperation across generations. **Nature Microbiology**, 8:2378 (2023).

<u>D. J. Skinner</u>, H. Jeckel, A. C. Martin, K. Drescher, and J. Dunkel. Topological packing statistics of living and non-living matter. **Science Advances**, 9:eadg1261 (2023).

H. Jeckel*, F. Díaz-Pascual*, <u>D. J. Skinner</u>*, B. Song*, E. J. Siebert, E. Jelli, S. Vaidya, J. Dunkel, and K. Drescher. Shared biophysical mechanisms determine early biofilm architecture development across different bacterial species. **PLoS Biology**, 20:e3001846, (2022).

H. Kim, <u>D. J. Skinner</u>, D. Glass, A. Hamby, B. Stuart, J. Dunkel, and I. Riedel-Kruse. 4-bit adhesion logic enables universal multicellular interface patterning. **Nature**, 608:324, (2022). On the cover and featured in Nature News and Views.

<u>D. J. Skinner</u>, J. Dunkel. Estimating entropy production from waiting time distributions. **Physical Review Letters**, 127:198101 (2021). Editors' suggestion and featured in *Physics* magazine.

<u>D. J. Skinner</u>, J. Dunkel. Improved bounds on entropy production in living systems. **Proceedings of the National Acadamy of Sciences U.S.A.**, 118:e2024300118 (2021).

<u>D. J. Skinner</u>, B. Song, H. Jeckel, E. Jelli, K. Drescher, and J. Dunkel. Topological metric detects hidden order in disordered media. **Physical Review Letters**, 126:048101 (2021). Editors' suggestion and featured in *Physics* magazine.

P. Pearce, B. Song, <u>D. J. Skinner</u>, R. Mok, R. Hartmann, P. K. Singh, H. Jeckel, J. S. Oishi, K. Drescher, and J. Dunkel. Flow-induced symmetry breaking in growing bacterial biofilms. **Physical Review Letters**, 123:258101 (2019).

J. R. Lister, <u>D. J. Skinner</u>, and T. M. J. Large. Viscous control of shallow elastic fracture: Peeling without precursors. **Journal of Fluid Mechanics**, 868:119 (2019).

PREPRINTS

H. Lee, E. Koskelo, S. Gokhale, J. Li, C. Fei, C.-W. J. Liu, L. Lin, J. Dunkel, <u>D. J. Skinner</u>, N. Fakhri. Topological flowscape reveals state transitions in nonreciprocal living matter. arXiv:2511.11815.

C. Rackauckas, Y. Ma, J. Martensen, C. Warner, K. Zubov, R. Supekar, <u>D. J. Skinner</u>, A. Ramadhan, and A Edelman. Universal Differential Equations for Scientific Machine Learning. arXiv:2001.04385.

CONFERENCE PROCEEDINGS

<u>D. J. Skinner</u>, R. Maulik. Meta-modeling strategy for data-driven forecasting. Tackling Climate Change with Machine Learning workshop, NeurIPS 2020. arXiv:2012.00678.

ACADEMIC AND COMMUNITY SERVICE

Referee for *PNAS, Phys. Rev. Lett., Nat. Commun., Phys. Rev. Res., Phys. Rev. E, PRX Life,*

Soft Matter, PLoS Comp. Biol., Comput. Struct. Biotech., Commun. Phys., and *J. Chem. Phys.*

Session chair, APS Global Physics Summit, 2025.

Organizer of the mathematics of life seminar, Northwestern, 2023-2024.

Organizer of the physical applied math group meeting seminar, MIT, 2020-2022.

Organizer of MIT math music recital, 2022.

Volunteer mentor for the graduate-undergraduate math mentoring initiative, MIT, 2020-2021.

TEACHING EXPERIENCE

Summer at Simons Intership mentor, Flatiron Institute, Summer 2025.

Simons-NSBP Scholars Program mentor, Flatiron Institute, Summer 2025.

Mentor for the Center for Quantitative Biology REU, Northwestern, Summer 2023.

Instructor for computational science and engineering 18.085, MIT, Summer 2021.

Teaching assistant for differential equations 18.03, MIT, Fall 2019 and Spring 2020.

Mentor for directed reading program, MIT, Winter 2020, 2021, 2022.

Mentor for the research science institute high school program, MIT, Summer 2018, 2019.

Mentor for the Cambridge entrance exam study school, Cambridge, UK, Spring 2015.

OTHER EXPERIENCE

Research intern at Argonne National Laboratory working with Dr Romit Maulik, Summer 2020.
Research intern at Microsoft Research, Cambridge UK, Summer 2015.

INVITED TALKS

APS Global Physics Summit, PRX Life Invited Symposium, 2026 (upcoming).
University of California San Diego, Math Bio Seminar, 2026 (upcoming).
University of Oxford, SoftBio Theory Seminar, 2025.
University of Tokyo, International Symposium on Physics of Intelligence 2024.
SIAM Conference on the Life Sciences 2024.
National Institute for Theory and Mathematics in Biology, Emerging Directions Workshop 2024.
Northwestern University, Theoretical Chemistry Seminar 2024.
Rockefeller University, Center for Studies in Physics and Biology Seminar 2024.
MIT, Physical Math Seminar 2023.
Georgia Tech, BLaST seminar 2022 (virtual).
Boston University, Dynamics and PDEs Seminar 2022.
University of Pennsylvania, Mathematical Biology Seminar 2022 (virtual).
NORDITA, Soft Matter Seminar 2022 (virtual).
Memorial University of Newfoundland, Department of Physics 2021 (virtual).

CONTRIBUTED TALKS AND POSTERS

APS Global Physics Summit 2025.
Information Networks in Biological Systems, CENTURI 2023.
APS March Meeting 2023.
Physics of Morphing Matter, Princeton 2022.
APS March Meeting 2022.
Greater Boston Area Statistical Mechanics Meeting 2021.

Stochastic Physics in Biology, Gordon Research Conference 2021.
Physics of Life Symposium, Princeton 2021 (virtual).
Workshop on Stochastic Thermodynamics II 2021 (virtual).
APS March Meeting 2021 (virtual).
Tackling Climate Change with Machine Learning workshop, NeurIPS 2020 (virtual).
APS March Meeting 2020 (virtual).
Theory in Living Systems Meeting, Boston University 2019.

PROGRAMMING LANGUAGES
Extensive experience with MATLAB, Julia, and spectral PDE solver Dedalus. Working knowledge
of C, CUDA, python, bash.