DOMINIC J. SKINNER

Address
Office M-438, 2145 Sheridan Rd,
Evanston, IL

Email
dominic.skinner@northwestern.edu

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

2022-present Northwestern University, Evanston, IL
NSF-Simons postdoctoral fellow at the Center for Quantitative Biology

AWARDS AND FELLOWSHIPS

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

T. Ohmura, D. J. Skinner, K. Neuhaus, G. P. T. Choi, J. Dunkel, K. Drescher. In vivo microrheology reveals local elastic and plastic responses inside three dimensional bacterial biofilms. **Advanced Materials**, in press (2024).

M. Salvalaglio, D. J. Skinner, J. Dunkel, 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, D. J. Skinner, 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).

D. J. Skinner, 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*, D. J. Skinner*, 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, D. J. Skinner, 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.

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

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

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

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

PREPRINTS

G. Stepaniants, A. D. Hastewell, D. J. Skinner, J. F. Totz, and J. Dunkel. Discovering dynamics and parameters of nonlinear oscillatory and chaotic systems from partial observations. arXiv:2304.04818.

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

CONFERENCE PROCEEDINGS

D. J. Skinner, 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. Research, Phys. Rev. E, Soft Matter, Comput. Struct. Biotech., Commun. Phys.*, and *J. Chem. Phys.*

Organizer of the mathematics of life group meeting 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.

INVITED TALKS

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

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.

TEACHING EXPERIENCE

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.

PROGRAMMING LANGUAGES

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

INTERESTS

Studied double bass under Keala Kaumeheiwa 2019-2022 as Emerson Music Scholar. Principal bassist with MIT's Festival Jazz Ensemble 2017-2022. Member of the Darius Hampton small jazz ensemble at Bienen School of Music 2022-2023. Winner of the MIT Philip Loew Memorial Award (2022) and Everett Longstreth Jazz Award (2019).