

Benjamin Kuznets-Speck

Biophysics graduate group, University of California, Berkeley

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Education

University of California, Berkeley, Sep. 2018— present
Ph.D candidate, Biophysics graduate group & David Limmer group

Case Western Reserve University, Cleveland, OH Sep. 2014—May 2018
Bachelor of Science (**summa cum laude, honors**),
Mathematics and Physics, Michael Hinczewski group

Awards & Scholarships

- **Kavli Energy NanoScience Institute Philomathia Fellow**, 2022-2023:
sponsored by David Limmer and Carlos Bustamante.
- **Hertz Fellowship Finalist**, one of forty nation-wide, 2019
- **Barry Goldwater Scholar**, 2017-18
- **Donald A. Glaser Award** to an outstanding mathematics and physics student (CWRU), 2018
- **Albert A. Michelson Prize**, awarded upon completion of the junior year to a physics major who has demonstrated superior performance, 2017
- **Michelson-Morley STEM Scholarship**, CWRU
- **Jr & Sr Scholarship**, CWRU Alumni Association
- **Deans list high honors** (all terms at CWRU)

Research

David Limmer group, U.C. Berkeley, Chemistry, 2018-present. Speed limits on accelerating collective phenomena and the energetic cost to do so; design and control of complex random systems

Michael Hinczewski lab, Case Western Reserve University, Physics, 2015-18. Using non-equilibrium statistical mechanics to: 1) map trade-offs in speed, cost and information transfer in living cells; 2) steer evolution in heterogeneous clonal populations like those leading to drug resistance in cancer and bacterial infection.

Teaching, Mentoring and Outreach

- **Graduate student instructor**, Physical Chemistry CHEM120B (upper-division, undergraduate course), UC Berkeley, under David Limmer, Spring 2022.
- UC Berkeley **Biophysics graduate group admissions committee member**, one of two participating graduate students, 2021-2022.
- **Compass mentor** to 3 undergraduates, Dept. of Physics, UC Berkeley, Spring 2021-present
- Research facilitator: *Physical Biology of the Cell* summer course, Marine Biological Laboratory, Woods Hole MA, under Profs. Hernan Garcia (UC Berkeley) and Rob Philips (Caltech), Summer 2019
- **Undergraduate physics mentor** to 2 underclassmen: CWRU physics and astronomy club, September 2017—May 2018.
- **Teaching assistant**: Introduction to Biological Physics, PHYS320/420 [Co-taught Undergraduate/Graduate], CWRU, under Michael Hinczewski Fall 2017

Publications

- [6] A. Das*, **B. Kuznets-Speck*** and D. T. Limmer, “*Direct evaluation of rare events in active matter from variational path sampling*,” **arXiv:2108.05359**, *Physical Review Letters*, **128 (2)**, 028005. * indicates equal contribution.
- [5] E. Ilker, O. Güngr, **B. Kuznets-Speck**, J. Chiel, S. Deffner and M. Hinczewski “*Counter-diabatic control of biophysical systems*,” **arXiv:2106.07130** (in revision, Phys. Rev. X), 2021
- [4] **B. Kuznets-Speck** and D. T. Limmer, “*Dissipation bounds the amplification of transition rates far from equilibrium*,” **Proc. Natl. Acad. Sci.**, 2021, e2020863118
- [3] T. Wang, **B. Kuznets-Speck**, J. Broderick and M. Hinczewski, “The price of information transfer in living cells,” **biorxiv.2020.10.06.327700**, 2020
- [2] S. Iram, E. Dolson, J. Chiel, J. Pelesko, N. Krishnan, O. Güngr, **B. Kuznets-Speck**, S. Deffner, E. Ilker, J. G. Scott and M. Hinczewski, “Controlling the speed and trajectory of evolution with counter-diabatic driving,” **Nature Physics**, 08/20

- [1] A.W. Eckford, **B. Kuznets-Speck**, M. Hinczewski and P.J. Thomas “*Thermodynamic Properties of Molecular Communication*,” 2018 **IEEE International Symposium on Information Theory**, paper 1570424267.

Conferences and public speaking

- American Physical Society Annual Meeting, 2022.
- Biophysical Society Annual Meeting, Platform talk, 2022.
- Berkeley Statistical mechanics meeting, 2022. ‘Navigating the hidden dimensions of single molecules with dissipative speed limits and optimal control.’
- Compass Physics Lecture, UC Berkeley, Fall 2021.
- American Physical Society Annual Meeting, 2021.
- Second Workshop On Stochastic-thermodynamics (WOSTII), 2021, Santa Fe Institute. One of 3% of submitted talks accepted.
- Berkeley Statistical mechanics meeting, 2020. ‘Dissipation bounds the amplification of transition rates far from equilibrium.’
- Biophysics Graduate Group retreat, 2019. “Taking transition-state theory for a drive: controlling the rate of rare events in biophysical systems far from equilibrium,” (Berkeley, CA).
- Biophysical Society Annual Meeting, 2018. “The Price is Right: Fuel Economy, Fidelity and Speed in Cellular Signaling,” (San Francisco, CA)

Additional References

In addition to my primary research advisors, the following people will attest to my passion and drive for curiosity driven science, research and mentoring.

Carlos Bustamante: Professor, Physics, Chemistry and Molecular/Cell Biology,
UC Berkeley

Hernan Garcia: Asst. Professor, Physics and Molecular/Cell Biology,
UC Berkeley

Rob Phillips: Professor, Applied Physics, Caltech

Alison Feder: Asst. Professor, Genetics, University of Washington

Andrew Eckford: Professor, Computer Science, York University