Michael Hinczewski

Curriculum Vitae: August 2025

Address: Department of Physics
Case Western Reserve University
E-mail: mxh605@case.edu
Phone: 216-368-4240
Homepage: biotheory.case.edu

Education

1999 – 2005 Ph.D. in Physics, Massachusetts Institute of Technology
Area: Condensed Matter Theory, Advisor: Prof. A. Nihat Berker

1997 – 1999 Bachelor of Science (summa cum laude) in Physics, Yale University

1995 – 1997 Undergraduate studies, Bard College at Simon's Rock

Positions

2020 – now Warren E. Rupp Associate Professor, Department of Physics,
Case Western Reserve University

2017 – 2020 Warren E. Rupp Assistant Professor, Department of Physics,
Case Western Reserve University

2014 – 2017 Assistant Professor, Department of Physics,
Case Western Reserve University

2009 – 2014 Postdoctoral Researcher, University of Maryland
Advisor: Prof. Devarajan Thirumalai

2008 – 2009 Postdoctoral Researcher, Technical University of Munich
Advisor: Prof. Roland Netz

2005 – 2008 Postdoctoral Researcher, Feza Gürsey Institute
Advisor: Prof. A. Nihat Berker

1999 – 2005 Research / Teaching Assistant, Massachusetts Institute of Technology

Fellowships and Awards

2016 NSF CAREER Award:
"Molecular heterogeneity and the regulation of cell adhesion by force" (#1651560)

2015 Case Western Reserve UCITE Glennan Fellowship for teaching and scholarship

2011 National Institutes of Health Ruth L. Kirschstein Postdoctoral Award:
"Extraction of protein and RNA folding landscapes from force clamp experiments" (F32 GM 97756-01)

2007 Deutscher Akademischer Austausch Dienst (DAAD) Scholarship:
"Research Stays for University Academics and Scientists"

2005 Goodwin Medal, Massachusetts Institute of Technology:
For "a conspicuously effective young teacher who is also a graduate student"

2000 Buechner Teaching Prize, MIT Physics Department

1999 DeForest Pioneers Prize, Yale Physics Department, for senior thesis:
"A Numerical Model for Seismic Anisotropy in the Inner Core of the Earth"

1997 Barry M. Goldwater Scholarship for Math and Science

1995 Bard College at Simon's Rock Scholarship: Acceleration to Excellence Program

Publications

Superscripts indicate students directly supervised while at CWRU:
∗ undergraduate; † graduate; ‡ postdoc.

Research Articles

95. J. Scherer, M. Hinczewski, B. Nelms, "Quantitative and sensitive sequencing of somatic mutations induced by a maize transposon", *Proc. Natl. Acad. Sci.* **122**, e2426650122 (2025).

94. A. Van Horn‡, L. Smith, M. Mahmoud, M. McMaster, C. Pinchbeck, I. Martin, A. Lininger, A. Ingrisano, A. Lowe, C. Bayod, E. Bolman, K. Singer, M. Hinczewski, "PATCH: a deep learning method to assess heterogeneity of artistic practice in historical paintings" *arXiv* preprint, arXiv:2502.01912 (2025).

93. P. Chen†, N. Krishnan, A. Stacy, D.T. Weaver, R.J. Barker-Clarke, M. Hinczewski, J. Maltas, J.G. Scott, "Inverted topologies in sequential fitness landscapes enable evolutionary control", *bioRxiv* preprint, 2024.12.29.630702v2 (2025).

92. J.M. Gray†, J.G. Scott, R.J. Barker-Clarke, M. Hinczewski, "Asymmetric Interactions Shape Survival During Population Range Expansions", *bioRxiv* preprint, 2024.12.14.628506v2 (2025).

91. E. Ilker‡, M. Hinczewski, "Bioenergetic costs and the evolution of noise regulation by microRNAs", *Proc. Natl. Acad. Sci.* **121**, e2308796121 (2024).

90. J. Maltas, D.S. Tadele, A. Durmaz, C.D. McFarland, M. Hinczewski, J.G. Scott, "Frequency-dependent ecological interactions increase the prevalence and shape the distribution of pre-existing drug resistance", *PRX Life* **2**, 023010 (2024).
    Research higlight: cover of *PRX Life*, and highlighted in K. Korolev, "Drug-Resistance Mutations Find Strength in Small Numbers" *Physics* **17**, 90 (2024).

89. E.S. King, D.S. Tadele, B. Pierce, M. Hinczewski, J.G. Scott, "Diverse mutant selection windows shape spatial heterogeneity in evolving populations", *PLoS Comput. Biol.* **20**, e1011878 (2024).

88. Q. Taylor, G.D. Starkman, M. Hinczewski, D.P. Mihaylov, J. Silk, J. de Freitas Pacheco, "Extremal Kerr black hole dark matter from Hawking evaporation", *Phys. Rev. D* **109**, 104066 (2024).

87. R. Haider, B. Shipley†, K. Surewicz, M. Hinczewski, W.K. Surewicz, "Pathological C-terminal phosphomimetic substitutions alter the mechanism of liquid-liquid phase separation of TDP-43 low complexity domain", *Protein Science* **33**, e5179 (2024).

86. U. Goreke, A. Gonzales†, B. Shipley†, M. Tincher, O. Sharma, W.J. Wulftange, Y. Man, R. An, M. Hinczewski, U.A. Gurkan, "Motion blur microscopy", *Nature Commun.* **15**, 7058 (2024).

85. R.J. Barker-Clarke, J.M. Gray†, M.A.R. Strobl, D.S. Tadele, J. Maltas, M. Hinczewski, J.G. Scott, "The balance between intrinsic and ecological fitness defines new regimes in eco-evolutionary population dynamics", *bioRxiv* preprint, 2023.03.15.532871v3 (2024).

84. S. Adhikari†, A. Kabakçıoğlu, A. Strang, D. Yuret, M. Hinczewski, "Machine learning in and out of equilibrium", *arXiv* preprint, arXiv:2306.03521 (2023).

83. M. ElKabbash, N. Hoffman, A. Lininger†, S.A. Jalil, T. Letsou, M. Hinczewski, G. Strangi, C. Guo, "Fano Resonant Optical coatings platform for Full Gamut and High Purity Structural Colors", *Nature Commun.* **14**, 3960 (2023).

82. A. Lininger[†], A. Aththanayake, J. Boyd, O. Ali, M. Goel, J. Jizhe, M. Hinczewski, G. Strangi, "Machine Learning to Optimize Additive Manufacturing for Visible Photonics", *Nanophotonics* doi:10.1515/nanoph-2022-0815 (2023).

81. U. Goreke, S. Iram[†], G. Singh[*], S. Dominguez-Medina, Y. Man, A. Bode, R. An, J.A. Little, C.L. Wirth, M. Hinczewski, U.A. Gurkan, "Catch bonds in sickle cell disease: shear-enhanced adhesion of red blood cells to laminin", *Biophys. J.* **122**, 2564 (2023).

80. Y. Kiasat, M.G. Donato, M. Hinczewski, M. ElKabbash, T. Letsou, R. Saija, O.M. Marago, G. Strangi, N. Engheta, "Epsilon-Near-Zero (ENZ)-based Optomechanics", *Commun. Phys.* **6**, 69 (2023).

79. A. Lininger[†], G. Palermo and A. Guglielmelli, G. Nicoletta, M. Goel, M. Hinczewski, G. Strangi, "Chirality in Light-Matter Interaction", *Adv. Mater.* **35**, 2107325 (2023).

78. T-L. Wang[†], B. Kuznets-Speck[*], J. Broderick[*], M. Hinczewski, "The price of a bit: energetic costs and the evolution of cellular signaling", *bioRxiv* preprint (2022), under revision at *eLife*.

77. A.S. Moffett, P.J. Thomas, M. Hinczewski, A.W. Eckford, "Cheater suppression and spite through quorum sensing", PLoS Comput. Biol. **18**, e1010292 (2022).

76. E. Ilker[‡], Ö. Güngör, B. Kuznets-Speck[*], J. Chiel[*], S. Deffner, M. Hinczewski, "Shortcuts in Stochastic Systems and Control of Biophysical Processes", *Phys. Rev. X* **12**, 021048 (2022).

75. A. Lininger[†], M. Hinczewski, G. Strangi, "General Inverse Design of Thin-Film Metamaterials With Convolutional Neural Networks", *ACS Photonics* **8**, 3641 (2021).

74. F. Ji, M.S. McMaster, S. Schwab, G. Singh[*], L.N. Smith, S. Adhikari[†], M. O'Dwyer, F. Sayed, A. Ingrisano, D. Yoder, E.S. Bolman, I.T. Martin, M. Hinczewski, K.D. Singer, "Discerning the painter's hand: machine learning on surface topography", *Heritage Science* **9**, 152 (2021).
Research highlight: "The art critic in the machine tells forgeries from the real thing", *Nature* **599**, 534 (2021).
Media mentions: Cleveland Plain Dealer, The Telegraph, The Art Newspaper.

73. C. Weisenberger[†], D. Hathcock[*], M. Hinczewski, "Cellular signaling beyond the Wiener-Kolmogorov limit", *J. Phys. Chem. B* **125**, 12698 (2021).

72. M. ElKabbash, T. Letsou, S.A. Jalil, N. Hoffman, J. Zhang, J. Rutledge, C.-H. Fann, M. Hinczewski, G. Strangi, C. Guo, "Fano resonance in subwavelength thin-film optical coatings", *Nature Nanotechnol.* **16**, 440 (2021).

71. R. An, Y. Man, S. Iram[†], E. Kucukal, M.N. Hasan, Y. Huang, U. Goreke, A. Bode, A. Hill, K. Cheng, Z. Sekyonda, S.P. Ahuja, J.A. Little, M. Hinczewski, U.A. Gurkan, "Point-of-care microchip electrophoresis for integrated anemia and hemoglobin variant testing", *Lab Chip* **21**, 3863 (2021).

70. P.I. Zhuravlev, M. Hinczewski, D. Thirumalai, "Low force unfolding of a single-domain protein by parallel pathways" , *J. Phys. Chem. B* **125**, 1799 (2021).

69. §. Iram[†], E. Dolson, J. Chiel[*], J. Pelesko[*], N. Krishnan, Ö. Güngör, B. Kuznets-Speck[*], S. Deffner, E. Ilker[‡], J.G. Scott, M. Hinczewski, "Controlling the speed and trajectory of evolution with counterdiabatic driving", *Nature Physics* **17**, 135 (2021).
Research highlight: D.M. Weinreich, "Herding an evolving biological population with quantum control tools", News & Views, *Nature Physics* **17**, 17 (2021).

68. N. Praljak[*], S. Iram[†], U. Goreke, G. Singh[*], A. Hill, U.A. Gurkan, M. Hinczewski, "Integrating deep learning with microfluidics for biophysical classification of sickle red blood cells", *PLoS Comput. Biol.* **17**, e1008946 (2021).

67. R. An, Y. Man, S. Iram[†], E. Kucukal, M.N. Hasan, A. Solis-Fuentes, A. Bode, A. Hill, K. Cheng, Y. Huang, S. Ahuja, J.A. Little, M. Hinczewski, U.A. Gurkan, "Computer Vision and Deep Learning Assisted Microchip Electrophoresis for Integrated Anemia and Sickle Cell Disease Screening", Blood **136** (Supplement 1), 46 (2020).

66. G. Palermo, K.V. Sreekanth, N. Maccaferri, G.E. Lio, G. Nicoletta, F. De Angelis, M. Hinczewski, G. Strangi, "Hyperbolic Dispersion Metasurfaces for Molecular Biosensing", *Nanophotonics* **10** 295 (2020).

65. N. Praljak[*], B. Shipley[†], A. Gonzales[†], U. Goreke, S. Iram[†], G. Singh[*], A. Hill, U.A. Gurkan, M. Hinczewski, "A Deep Learning Framework for Sickle Cell Disease Microfluidic Biomarker Assays", Blood **136** (Supplement 1), 15 (2020).

64. E. Dolson, S. Iram[†], J. Chiel[*], J. Pelesko[*], N. Krishnan, Ö. Güngör, B. Kuznets-Speck[*], S. Deffner, E. Ilker[‡], J.G. Scott, M. Hinczewski, "An introduction to using counterdiabatic driving to eliminate genetic lag in changing environments", *Artificial Life Conference Proceedings*, 25 (2020).

63. N. Maccaferri, T. Isoniemi, M. Hinczewski, M. Iarossi, G. Strangi, and F. De Angelis, "Designer Bloch plasmon polariton dispersion in grating-coupled hyperbolic metamaterials", *APL Photonics* **5**, 076109 (2020).

62. M. ElKabbash, S.K. Valiyaveedu, A. Fraiwan, J. Cole, Y. Alapan, T. Letsou, N.D. Hoffman, C. Guo, R.M. Sankaran, U.A. Gurkan, M. Hinczewski, G. Strangi, "Ultrathin-film optical coating for angle independent remote hydrogen sensing", *Meas. Sci. Technol.* **31**, 115201 (2020).

61. S. Chatterjee, E. Shkondin, O. Takayama, A.V. Lavrinenko, M. Hinczewski, G. Strangi, "Generalized Brewster effect in aluminum-doped ZnO nanopillars", *Proc. SPIE 11345, Nanophotonics VIII*, 1134524 (2020).

60. D. Hathcock[*], R. Tehver, M. Hinczewski, D. Thirumalai, "Myosin V executes steps of variable length via structurally constrained diffusion", *eLife* **9**, e51569 (2020).

59. M.L Mugnai, C. Hyeon, M. Hinczewski, D. Thirumalai, "Theoretical Perspectives on Biological Machines", *Rev. Mod. Phys.* **92**, 025001 (2020).

58. E. Ilker[‡], M. Hinczewski, "Modeling the growth of organisms validates a general relation between metabolic costs and natural selection", *Phys. Rev. Lett.* **122**, 238101 (2019).

57. M. ElKabbash, K.V. Sreekanth, Y. Alapan, M. Kim, J. Cole, A. Fraiwan, T. Letsou, Y. Li, C. Guo, R.M. Sankaran, U.A. Gurkan, M. Hinczewski, G. Strangi, "Hydrogen Sensing Using Thin-Film Perfect Light Absorber", *ACS Photonics* **6**, 1889 (2019).

56. K.V. Sreekanth, M. ElKabbash, R. Medwal, J. Zhang, T. Letsou, G. Strangi, M. Hinczewski, R.S. Rawat, C. Guo, R. Singh, "Generalized Brewster-angle effect in thin-film optical absorbers and its application for graphene hydrogen sensing", *ACS Photonics* **6**, 1610 (2019).

55. R.C. Rockne *et al.*, "The 2019 Mathematical Oncology Roadmap", *Phys. Biol.* **16**, 041005 (2019).

54. K.V. Sreekanth, Q. Ouyang, S. Sreejith, S. Zeng, W. Lishu, E. Ilker[‡], W. Dong, M. ElKabbash, Y. Ting, C.T. Lim, M. Hinczewski, G. Strangi, K.-T. Yong, R.E. Simpson, R. Singh, "Phase-Change-Material-Based Low-Loss Visible-Frequency Hyperbolic Metamaterials for Ultrasensitive Label-Free Biosensing", *Adv. Opt. Mater.* 1900081 (2019).

53. T. Letsou, M. ElKabbash, S. Iram[†], M. Hinczewski, G. Strangi, "Heat-induced perfect light absorption in thin-film metasurfaces for structural coloring" (Invited), *Opt. Mater. Express* **9** 1386, (2019).

    Research highlight: Spotlight on Optics, Optica Publishing Group.

52. S. Adhikari[†], J. Moran[*], C. Weddle[*], M. Hinczewski, "Unraveling the mechanism of the cadherin-catenin-actin catch bond", *PLoS Comput. Biol.* **14**, e1006399 (2018).

51. A.W. Eckford, B. Kuznets-Speck[*], M. Hinczewski, P.J. Thomas, "Thermodynamic Properties of Molecular Communication", *2018 IEEE International Symposium on Information Theory (ISIT)*, 2545 (2018).

50. M. ElKabbash, S. Iram[†], T. Letsou, M. Hinczewski, G. Strangi, "Designer Perfect Light Absorption Using Ultrathin Lossless Dielectrics on Absorptive Substrates", *Adv. Opt. Mater.* **6**, 1800672 (2018).

49. M. ElKabbash, E. Ilker[‡], T. Letsou, N. Hoffman, A. Yaney, M. Hinczewski, G. Strangi, "Iridescence Free and Narrow Band Perfect Light Absorption in Critically Coupled Metal-High Index Dielectric Cavities", *Opt. Lett.* **42**, 3598 (2017).

48. H.S. Samanta, M. Hinczewski, and D. Thirumalai, "Optimal information transfer in enzymatic networks: A field theoretic formulation", *Phys. Rev. E* **96**, 012406 (2017).

47. H.S. Samanta, P.I. Zhuravlev, M. Hinczewski, N. Hori, S. Chakrabarti, D. Thirumalai, "Protein Collapse is Encoded in the Folded State Architecture", *Soft Matter* **13**, 3622 (2017).

46. K.V. Sreekanth, M. ElKabbash, Y. Alapan, E. Ilker[‡], M. Hinczewski, U.A. Gurkan, and G. Strangi, "Hyperbolic metamaterials-based plasmonic biosensor for fluid biopsy with single molecule sensitivity", *EPJ Appl. Metamat.* **4**, 1 (2017).

45. S. Chakrabarti, M. Hinczewski, and D. Thirumalai, "Phenomenological and microscopic theories for catch bonds", *J. Struct. Biol.* **197**, 50 (2017).

44. D. Hathcock[*], J. Sheehy[*], C. Weisenberger[†], E. Ilker[‡], and M. Hinczewski, "Noise Filtering and Prediction in Biological Signaling Networks", *IEEE Trans. Mol. Biol. Multi-Scale Commun.* **2**, 16 (2016).

43. K.V. Sreekanth, Y. Alapan, M. ElKabbash, A.M. Wen, E. Ilker[‡], M. Hinczewski, U.A. Gurkan, N.F. Steinmetz, and G. Strangi, "Enhancing the angular sensitivity of plasmonic sensors using hyperbolic metamaterials", *Adv. Opt. Mater.* **4**, 1767 (2016).

42. M. Hinczewski, C. Hyeon, and D. Thirumalai, "Directly measuring single-molecule heterogeneity using force spectroscopy", *Proc. Natl. Acad. Sci.*, **113**, E3852 (2016).

41. H.T. Vu, S. Chakrabarti, M. Hinczewski, and D. Thirumalai, "Discrete step sizes of molecular motors lead to bimodal non-Gaussian velocity distributions under force", *Phys. Rev. Lett.* **117**, 078101 (2016).

40. K.V. Sreekanth, Y. Alapan, M. ElKabbash, E. Ilker‡, M. Hinczewski, U.A. Gurkan, A. De Luca, and G. Strangi, "Extreme sensitivity biosensing platform based on hyperbolic metamaterials", *Nature Mater.*, **15**, 621 (2016).

39. M. Hinczewski and D. Thirumalai, "Noise control in gene regulatory networks with negative feedback", *J. Phys. Chem. B* **120**, 6166 (2016).

38. P.I Zhuravlev, M. Hinczewski, S. Chakrabarti, S. Marqusee, and D. Thirumalai, "Force-dependent switch in protein unfolding pathways and transition-state movements", *Proc. Natl. Acad. Sci.* **113**, E715 (2016).

37. M. Hinczewski and D. Thirumalai, "Cellular signaling networks function as generalized Wiener-Kolmogorov filters to suppress noise", *Phys. Rev. X* **4**, 041017 (2014).

36. B. Ramm, J. Stigler, M. Hinczewski, D. Thirumalai, H. Herrmann, G. Woehlke, and M. Rief, "Sequence-resolved free energy profiles of stress-bearing vimentin intermediate filaments", *Proc. Natl. Acad. Sci.* **111**, 11359 (2014).

35. S. Chakrabarti, M. Hinczewski, and D. Thirumalai, "Plasticity of hydrogen bond networks regulates mechanochemistry of cell adhesion complexes", *Proc. Natl. Acad. Sci.* **111**, 9048 (2014).

34. C. Hyeon, M. Hinczewski, and D. Thirumalai, "Evidence of disorder in biological molecules from single molecule pulling experiments", *Phys. Rev. Lett.* **112**, 138101 (2014).

33. M. Hinczewski, R. Tehver, and D. Thirumalai, "Design principles governing the motility of myosin V", *Proc. Natl. Acad. Sci.* **110**, E4059 (2013).
    Research highlight: A. Klopper, "Walk the line", *Nature Physics* **9**, 692 (2013).

32. M. Hinczewski, J.C.M. Gebhardt, M. Rief, and D. Thirumalai, "From mechanical folding trajectories to intrinsic energy landscapes of biopolymers", *Proc. Natl. Acad. Sci.* **110**, 4500 (2013).

31. O.S. Sariyer, M. Hinczewski, and A.N. Berker, "Phase separation and charge-ordered phases of the d=3 Falicov-Kimball model at nonzero temperature: Temperature-density-chemical potential global phase diagram from renormalization-group theory", *Phys. Rev. B* **84**, 205120 (2011).

30. Y. von Hansen, F. Sedlmeier, M. Hinczewski, and R.R. Netz, "Friction contribution to water-bond breakage kinetics", *Phys. Rev. E* **84**, 051501 (2011).

29. M. Hinczewski and R.R. Netz, "Anisotropic Hydrodynamic Mean-Field Theory for Semiflexible Polymer Dynamics under Tension", *Macromolecules* **44**, 6972 (2011).

28. Y. von Hansen, M. Hinczewski, and R.R. Netz, "Hydrodynamic screening near planar boundaries: Effects on semiflexible polymer dynamics", *J. Chem. Phys.* **134**, 235102 (2011).

27. I. Sorar, D. Saygin-Hinczewski, M. Hinczewski, and F.Z. Tepehan, "Optical and structural properties of Si-doped ZnO thin films", *App. Surf. Sci.* **257**, 7343 (2011).

26. G. Morrison, C. Hyeon, M. Hinczewski, and D. Thirumalai, "Compaction and tensile forces determine the accuracy of folding landscape parameters from single molecule pulling experiments", *Phys. Rev. Lett.* **106**, 138102 (2011).

25. M. Hinczewski, Y. von Hansen, and R.R. Netz, "Deconvolution of dynamic mechanical networks", *Proc. Natl. Acad. Sci.* **107**, 21493 (2010).

24. C. Güven, M. Hinczewski, A. Nihat Berker, "Tensor renormalization group: Local magnetizations, correlation functions, and phase diagrams of systems with quenched randomness", *Phys. Rev. E* **82**, 051110 (2010).

23. M. Hinczewski, Y. von Hansen, J. Dzubiella, and R.R. Netz, "How the diffusivity profile reduces the arbitrariness of protein folding free energies", *J. Chem. Phys.* **132**, 245103 (2010).

22. M. Hinczewski and R.R. Netz, "Dynamics of DNA: Experimental controversies and theoretical insights", *Physica A* **389**, 2993 (2010). Proceedings of the Nihat Berker 60th Birthday Symposium.

21. C. Güven and M. Hinczewski, "The tensor renormalization group for pure and disordered two-dimensional lattice systems", *Physica A* **389**, 2915 (2010). Proceedings of the Nihat Berker 60th Birthday Symposium.

20. Y. von Hansen, R.R. Netz, and M. Hinczewski, "DNA-protein binding rates: Bending fluctuation and hydrodynamic coupling effects", *J. Chem. Phys.* **132**, 135103 (2010).

19. M. Hinczewski and R.R. Netz, "Global cross-over dynamics of single semiflexible polymers", *EPL* **88**, 18001 (2009).

18. A.N. Berker, M. Hinczewski, and R.R. Netz, "Critical percolation phase and thermal Berezinskii-Kosterlitz-Thouless transition in a scale-free network with short-range and long-range random bonds", *Phys. Rev. B* **80**, 041118 (2009).

17. C. Nadir Kaplan, M. Hinczewski, and A.N. Berker, "Infinitely robust order and local order-parameter tulips in Apollonian networks with quenched disorder", *Phys. Rev. E* **79**, 061120 (2009).

16. M. Hinczewski, X. Schlagberger, M. Rubinstein, O. Krichevsky, and R.R. Netz, "End-Monomer Dynamics in Semiflexible Polymers", *Macromolecules* **42**, 860 (2009).

15. C. Nadir Kaplan, A.N. Berker, and M. Hinczewski, "Frustrated further-neighbor antiferromagnetic and electron-hopping interactions in the d=3 t−J model: Finite-temperature global phase diagrams from renormalization group theory", *Phys. Rev. B* **80**, 214529 (2009).

14. M. Hinczewski and A.N. Berker, "Finite-temperature phase diagram of nonmagnetic impurities in high-temperature superconductors using a d=3 tJ model with quenched disorder", *Phys. Rev. B* **78**, 064507 (2008).

13. C. Güven, A.N. Berker, M. Hinczewski, and H. Nishimori, "Reentrant and Forward Phase Diagrams of the Anisotropic Three-Dimensional Ising Spin Glass", *Phys. Rev. E* **77**, 061110 (2008).

12. M. Hinczewski and A.N. Berker, "High-Precision Thermodynamic and Critical Properties from Tensor Renormalization-Group Flows", *Phys. Rev. E* **77**, 011104 (2008).

11. D. Saygin-Hinczewski, M. Hinczewski, I. Sorar, F.Z. Tepehan, and G.G. Tepehan, "Modeling the Optical Properties of WO3 and WO3-SiO2 Thins Films", *Solar Energy Mater. Solar Cells* **92**, 821 (2008).

10. O.S. Sariyer, A.N. Berker, and M. Hinczewski, "Excitation Spectrum Gap and Spin-Wave Stiffness of XXZ Heisenberg Chains: Global Renormalization-Group Calculation", *Phys. Rev. B* **77**, 134413 (2008).

9. M. Hinczewski, "Griffiths singularities and algebraic order in the exact solution of an Ising model on a fractal modular network", *Phys. Rev. E* **75**, 061104 (2007).

8. D. Saygin-Hinczewski, K. Koc, I. Sorar, M. Hinczewski, F.Z. Tepehan, and G.G. Tepehan, "Optical and Structural Properties of Ta2O5-CeO2 Thin Films", *Solar Energy Mater. Solar Cells* **91**, 1726 (2007).

7. M. Hinczewski and A.N. Berker, "$d = 3$ Anisotropic and $d = 2$ tJ Models: Phase Diagrams, Thermodynamic Properties, and Chemical Potential Shift", *Eur. Phys. J. B* **51**, 461 (2006).

6. M. Hinczewski and A.N. Berker, "Inverted Berezinskii-Kosterlitz-Thouless Singularity and High-Temperature Algebraic Order in an Ising Model on a Scale-Free Hierarchical-Lattice Small-World Network", *Phys. Rev. E* **73**, 066126 (2006).

5. M. Hinczewski and A.N. Berker, "Two Superconducting Phases in the $d = 3$ Hubbard Model: Phase Diagram and Specific Heat from Renormalization-Group Calculations", *Eur. Phys. J. B* **48**, 1 (2005).

4. M. Hinczewski and A.N. Berker, "Multicritical Point Relations in Three Dual Pairs of Hierarchical-Lattice Ising Spin-Glasses", *Phys. Rev. B* **72**, 144402 (2005).

3. D. Saygin Hinczewski, M. Hinczewski, F.Z. Tepehan, and G.G. Tepehan, "Optical Filters from SiO2 and TiO2 Multilayers Using Sol-Gel Spin Coating Method", *Solar Energy Mater. Solar Cells* **87**, 181 (2005).

2. M.I. Bergman, L. Giersch, M. Hinczewski, and V. Izzo, "Elastic and attenuation anisotropy in directionally solidified (hcp) zinc, and the seismic anisotropy in the Earth's inner core", *Phys. Earth Planet. Int.* **117**, 139 (2000).

1. M. Hinczewski and J.C.W. Rogers, "The response of a damped pendulum to a large driving force", *Eur. J. Appl. Math.* **9**, 105 (1998).

Other Publications

2. S. Iram, M. Hinczewski, "A molecular motor for cellular delivery and sorting" (news & views), *Nature Physics* (2023).

1. M. Hinczewski, "Control Theory for Physicists by John Bechhoefer" (book review), *The Biophysicist* **3**, 85 (2022).

Patents

Granted:

G. Strangi, K.V. Sreekanth, U. Gurkan, M. Hinczewski, M. ElKabbash, A. De Luca, "Optical sensor platform employing hyperbolic metamaterials", US 10533941 B2 (2020).

Pending:

M. ElKabbash, C. Guo, M. Hinczewski, G. Strangi, "Fano resonant optical coating", US 20220308264A1 (2022).

N. Praljak, S. Iram, U. Goreke, M. Hinczewski, A. Hill, U. Gurkan, G. Singh, "Classification of Blood Cells", US US20230221239A1 (2023).

U. Gurkan, M. Hinczewski, S. Iram, R. An, "Methods and systems for analyzing sample properties using electrophoresis", US 20230266270A1 (2023).

Teaching

[U = undergraduate course, G = graduate course]

Spring 2015-2025	Statistical Mechanics, PHYS414 [G], CWRU
Fall 2015-2024	Introduction to Biological Physics, PHYS320/420 [U/G], CWRU
Spring 2023-2025	Introduction to Biological Physics, PHYS329 reading course [U], CWRU
Spring 2023	The Mathematical Structure of Evolution, PHYS539 reading course [G], CWRU
Fall 2022	Mathematical Methods of Classical Mechanics, PHYS539 reading course [G], CWRU
Spring 2017	Coding, Coherence, and Control: Information Theory and Thermodynamics in Quantum Systems, PHYS539 reading course [G], CWRU
Fall 2010	Guest lecturer, Honors Chemistry I [U], University of Maryland
Summer 2008	Course lecturer, Statistical Field Theory of Biopolymers [G], Institute of Theoretical and Applied Physics Summer School, Turunç, Turkey
Summer 2007-2008	Lecturer/recitation instructor, Phase Transitions and Renormalization-Group Theory [G], Feza Gürsey Institute
Fall 2006	Course lecturer, Renormalization-Group Methods in Statistical Field Theory [G], Feza Gürsey Institute
Winter 2005	Recitation instructor, Statistical Mechanics II [G], MIT
Fall 2004	Recitation instructor, Quantum Theory I [G], MIT
Summer 2004	Head Physics Instructor, MIT Project Interphase [U]
Spring 2004	Recitation instructor, Quantum Field Theory I [G], MIT
	Writing tutor, Quantum Mechanics III [U], MIT
Fall/Spring 2003	Lecturer, Modern Physics [U], Istanbul Technical University
Fall 2002	Recitation instructor, Physics II [U], MIT
Spring 2002	Lecturer, Modern Physics [U], Istanbul Technical University
Fall 2001	Recitation instructor, Quantum Mechanics II [U], MIT
Summer 2001	Recitation instructor, Phase Transitions and Renormalization-Group Theory [G], Feza Gürsey Institute
Spring 2001	Writing tutor, Quantum Mechanics III [U], MIT
Fall 2000	Recitation instructor, Quantum Mechanics II [U], MIT
Spring 2000	Recitation instructor, Physics II [U], MIT
Fall 1999	Recitation instructor, Physics I [U], MIT

Students

Supervised in Ph.D. research:

2024 – now Aavash Shakya
2023 – now Peng Chen (*co-supervised with Jacob Scott*)
2022 – now Noushin Ranjkesh
2021 – 2025 Jason Gray (*co-supervised with Jacob Scott*)
2020 – 2025 Ayesha Gonzales
2019 – 2024 Brandon Shipley
2019 – 2024 Andrew Lininger (*co-supervised with Giuseppe Strangi*)
2015 – 2021 Tenglong Wang
2016 – 2020 Shamreen Iram
2014 – 2020 Casey Weisenberger
2014 – 2019 Shishir Adhikari

Supervised in master's research:

2022 – 2023 Asher Payton
2022 – 2023 Yuan Zhou

Supervised in postdoctoral research:

2025 – now Jonathan Pachter (*co-supervised with Jacob Scott*)
2022 – now Andrew Van Horn
2015 – 2017 Efe Ilker

Supervised in undergraduate research [SP = also mentored senior project research]:

2024 – now Daniel Passmore
2024 – 2025 Chengling Zhuge [SP]
2024 – 2025 Julia Gumina [SP]
2023 – 2024 Jonathan Willcutt [SP]
2023 – 2024 Kevin Kennelly [SP]
2022 – 2023 Adam Ketchum [SP]
2021 – 2023 Richard John [SP]
2019 – 2020 Niksa Praljak
2019 – 2020 Akshata Rudrapatna
2019 – 2020 Jake Trookman [SP]
2019 – 2020 Joshua Holmes [SP]
2018 – 2020 Joshua Chiel
2018 – 2020 Gundeep Singh [SP]
2018 – 2019 Julia Pelesko
2017 – 2018 Hannah Goldberg
2017 – 2018 Bradley Schissel [SP]
2017 – 2018 Yuta Hozumi
2017 – 2018 Calvin Pozderac

2016 – 2018 Jacob Moran
2015 – 2018 Benjamin Kuznets-Speck [SP]
2015 – 2017 David Hathcock [SP]
2015 – 2016 James Sheehy [SP]
2015 – 2016 Christopher Weddle [SP]
2015 – 2016 Joseph Broderick [SP]
2014 – 2017 Nicholas Hazen

Supervised in high school research projects:
2021 – 2022 Raaghav Malik
Summer 2019 Saechow Yap

Co-advised in graduate research projects:
2013 – 2014 Shaon Chakrabarti, University of Maryland
2008 – 2009 Yann von Hansen, Technical University of Munich
2007 – 2008 Can Güven, Koç University
2007 – 2008 Cihan Nadir Kaplan, Koç University
2006 – 2008 Ozan Sariyer, Istanbul Technical University

Editorial Board Service

May 2023 – now Main editor (biophysics), Physica A: Statistical Mechanics and its Applications

Peer Review Activities

Journal: Science, Proceedings of the National Academy of Sciences, Physical Review Letters, Nature Physics, Biophysical Journal, PLOS Computational Biology, Physical Review E, Physical Review B, Journal of Chemical Physics, Soft Matter, EPL, European Physical Journal B, Journal of Physics A: Mathematical and Theoretical, Physica A, IEEE Transactions on Molecular, Biological, and Multi-Scale Communications, Journal of Physical Chemistry, Communications Chemistry, Mathematical Biosciences and Engineering, eLife, Physical Review X
Grant: NSF, Netherlands Foundation for Fundamental Research on Matter, Netherlands Organisation for Scientific Research

Conference Organization

January 2012 Chair, Gordon Research Seminar, Ventura, CA
”Protein Folding Dynamics: Topics in Protein Folding and Aggregation”
2016 – now Member of International Scientific Advisory Board, Istanbul Statistical Physics Days conference
2020, 2022 Co-organizer, Banff International Research Station workshop
”Mathematical Models in Biology: from Information Theory to Thermodynamics”

Department and University Committee Service

2024 – 2025	Faculty search committee for AI-related assistant professor in the College of Arts and Sciences
2024 – 2025	Graduate Admissions committee
2023 – now	Associate director, Center for AI in Discovery and Disease Biology (AI2DB)
2023 – 2024	Chair of faculty search committee for experimental biophysics position
2023 – 2024	Screening committee for AI faculty search in College of Arts and Sciences
2023	AI taskforce for evaluating impact of AI on university education
2022 – now	Co-director of Interschool Quantitative Biosciences Program
2022	Chair of faculty search committee for three visiting assistant professor positions
2021	Faculty search committee for visiting assistant professor / lecturer
2021 – now	Michelson Postdoctoral Prize Lecture committee
2021 – now	Biophysics Colloquium committee
2019 – now	Marketing and Communication, Strategic Planning committees
2018 – 2020	University Advisory Committee on Research Computing
2018 – 2020	Undergraduate Curriculum committee
2017 – 2018	Chair of faculty search committee for experimental biophysics
2015 – 2016	Faculty search committee for particle/astrophysics theory
2014 – 2019	Graduate Admissions, Graduate Program, and Computing committees
2014 – now	Qualifier Exam committee, undergraduate advising for physics majors

Invited Seminars

Apr. 30, 2025	"The price of evolution: how thermodynamics shapes gene regulation", Memory of Rare and Non-equilibrium Events workshop, Tashkent
Mar. 18, 2025	"The price of evolution: how thermodynamics shapes gene regulation", invited talk at DBIO Delbruck Prize session, APS Global Physics Summit
Mar. 13, 2025	"The price of evolution: how thermodynamics shapes gene regulation", physics colloquium, UC Davis
Jan. 21, 2025	"The price of evolution: how thermodynamics shapes gene regulation", Ankara Condensed Matter colloquium [virtual]
Dec. 11, 2024	"The price of evolution: how energy and ecology influence complex adaptations", biophysics seminar, Max Planck Institute for the Physics of Complex Systems, Dresden
Oct. 23, 2024	"The price of evolution: how thermodynamics shapes gene regulation", physics colloquium, Howard University
May 6, 2024	"The price of evolution: how thermodynamics shapes gene regulation", biophysics seminar, Princeton University
Feb. 22, 2024	"The price of evolution: how thermodynamics shapes gene regulation", physics colloquium, Case Western Reserve University
May 24, 2023	"Controlling stochastic biophysical processes, from protein folding to evolution", Workshop on Stochastic Thermodynamics – WOST IV, ICTP (virtual)
Mar. 14, 2023	"Controlling stochastic biophysical processes, from protein folding to evolution", Center for the Study of Complex Systems colloquium, University of Michigan
Jul. 29, 2022	"Machine learning in and out of equilibrium", Information Engines at the Frontiers of Nanoscale Thermodynamics workshop, Telluride

Apr. 15, 2022	"Controlling stochastic biophysical processes, from protein folding to evolution", physics colloquium, Denison University
Apr. 6, 2022	"Counterdiabatic control of stochastic biophysical processes", Joint Mathematics Meetings
Nov. 2, 2021	"Enhancing adaptive therapies by using techniques from quantum physics", Rosetrees Interdisciplinary Workshop on Metastasis
Jul. 28, 2021	"Counterdiabatic control of biophysical processes", Information Engines at the Frontiers of Nanoscale Thermodynamics workshop, Telluride
Nov. 11, 2020	"Steering evolution: shortcuts to adiabaticity in cellular populations", Korea Institute of Advanced Study, School of Computational Sciences colloqium
Oct. 1, 2020	"Data Science in Art: Discerning the Painter's Hand", CWRU Physics colloquium (co-presenting with K. Singer and E. Bolman)
Aug. 2, 2019	"Controlling protein dynamics through counterdiabatic driving", Information Engines at the Frontiers of Nanoscale Thermodynamics workshop, Telluride
Nov. 9, 2018	"Steering evolution: what can pulling proteins teach us about population genetics", Oesper Symposium, University of Cincinnati
Jul. 23, 2018	"Steering evolution: shortcuts to adiabaticity in population genetics", Information Engines at the Frontiers of Nanoscale Thermodynamics workshop, Telluride
Jul. 9, 2018	"The ties that bind us together: the statistical mechanics of adhesion proteins", Biophysical Dynamics workshop, Telluride
Mar. 14, 2018	"Microeconomics: The Price of Information Transfer in Living Cells", physics colloquium, University of Maryland, Baltimore County
Mar. 13, 2018	"Microeconomics: The Price of Information Transfer in Living Cells", Informal Statistical Physics seminar, University of Maryland, College Park
Aug. 5, 2017	"Thermodynamic costs and the evolution of noise regulation by microRNAs", Information Engines at the Frontiers of Nanoscale Thermodynamics workshop, Telluride
Jun. 13, 2017	"Microeconomics: the price of information transfer in living cells", 2017 Canadian Workshop on Information Theory, Quebec City
Dec. 1, 2016	"Microeconomics: non-equilibrium thermodynamics and the price of information transfer in living cells", CWRU Physics colloquium
Jun. 24, 2016	"The price of information: thermodynamics and the limits of signaling in living systems", keynote seminar (part 2/2), 23rd Istanbul Statistical Physics Days, Istanbul Technical University
Jun. 23, 2016	"The ties that bind us together: the statistical mechanics of cell adhesion proteins", keynote seminar (part 1/2), 23rd Istanbul Statistical Physics Days, Istanbul Technical University
Mar. 7, 2016	"The price of information: thermodynamics and the limits of signaling in living systems", colloquium, Center for Nonlinear Studies, Los Alamos National Laboratory
Nov. 12, 2015	"Cellular telephone games: how biological networks cope with noisy signal transmission", physics colloquium, Oakland University
Sep. 17, 2015	"Cellular telephone games: how biological networks cope with noisy signal transmission", Center for Proteomics and Bioinformatics, CWRU Medical School

Jul. 13, 2015	"Cellular telephone games: optimizing information transfer through nonlinear, stochastic biological networks", Thermodynamics and Nonlinear Dynamics in the Information Age workshop, Telluride
May 27, 2015	"Cellular telephone games: how biological networks cope with noisy signal transmission", Sabanci University
May 16, 2015	"Gripping tales of cellular adhesion: design principles of catch bonds", Biomolecules and Nanostructures 5 conference, Jaroszowice, Poland
Apr. 2, 2015	"Stepping and gripping: how proteins generate and respond to mechanical forces in the cell", physics colloquium, Kent State University
Nov. 3, 2014	"Noise filtering in cellular signaling networks", Mathematics of the Life Sciences seminar series, CWRU
Oct. 9, 2014	"A gripping tale of cellular adhesion: design principles of catch bonds", 110th International Titisee Conference, Titisee-Neustadt, Germany
Jul. 9, 2014	"Searching, stepping, and stomping: how force regulates the dynamics of the motor protein Myosin V", 7th World Congress of Biomechanics, Boston
Jun. 2, 2013	"Interpreting single molecule optical tweezer data: sketching the energy landscape of biomolecules", Protein Folding Consortium Workshop, U.C. Berkeley
Dec. 11, 2012	"Searching, stepping, and stomping: what polymer theory can teach us about the molecular motor Myosin V", University of Maryland, College Park
Jun. 5, 2012	"Understanding the Stepping Dynamics of Myosin V using Polymer Models", Biopolymers Gordon Research Conference, Salve Regina University
Jul. 26, 2011	"Understanding the Stepping Dynamics of Myosin V using Polymer Models", 1st KIAS Conference on Subcellular Dynamics, Korea Institute for Advanced Study
May 19, 2009	"Dynamics of DNA: experimental controversies and theoretical insights", Forschungszentrum Jülich
May 12, 2009	"Hydrodynamic effects on the kinetics of DNA: experimental controversies and theoretical insights", Johannes Gutenberg-Universität Mainz
May 20, 2008	"Connection between Geometry and Thermal Correlations: Small-World and Community Effects in Scale-Free Hierarchical Networks", 3rd Bilateral Workshop on Novel Materials, Koç University
Oct. 4, 2007	"Unusual Phase Transitions in Complex Networks: Algebraic Order and Griffiths Singularities in Small-world, Fractal Hierarchical Lattices", Tokyo Institute of Technology
Jun. 5, 2007	"Unusual Phase Transitions in Complex Networks: Algebraic Order and Griffiths Singularities in Small-world, Fractal Hierarchical Lattices", Technical University of Munich
Dec. 12, 2006	"Unusual Phase Transitions in Complex Networks: Berezinskii-Kosterlitz-Thouless Singularities in Scale-Free, Small-World and Modular Hierarchical Lattices", University of Michigan
Oct. 5, 2006	"Statistical Mechanics on Complex Networks: Unusual Magnetic Orderings on a Scale-Free, Small-World Hierarchical Lattice", Koç University
Aug. 25, 2006	"Renormalization-Group Theory of Electronic Models: Finite-Temperature Phase Diagrams and the Effects of Spatial Anisotropy and Quenched Disorder", 6th International Conference of the Balkan Physical Union, Istanbul University

May 22, 2006 "Inverted Berezinskii-Kosterlitz-Thouless Singularity and High-Temperature Algebraic Order in an Ising Model on a Scale-Free Hierarchical-Lattice Small-World Network", Service de Physique Theorique de Saclay

Mar. 23, 2006 "New Phases, Superfluid Weights, and Free Carrier Densities: Renormalization-Group Theory of Electronic Models", Rutgers University

Dec. 8, 2005 "New Phases, Superfluid Weights, and Free Carrier Densities: Renormalization-Group Theory of Electronic Models", ETH Zürich

Dec. 7, 2005 "The Ising Model on a Scale-Free, Small-World Hierarchical Lattice Network", Technical University of Munich

Dec. 6, 2005 "The Ising Model on a Scale-Free, Small-World Hierarchical Lattice Network", Ludwig-Maximilians-Universitat Munich

Dec. 1, 2005 "Phase Diagrams of Electronic Systems in 3D: Effects of Spatial Anisotropy and Quenched Impurities", Feza Gürsey Institute

Jul. 3, 2003 "Finite-Temperature Phase Diagram of the Hubbard Model in d=3 from Renormalization-Group Theory", 10th International Statistical Physics Days, Istanbul Technical University

Public Talks

May 6 & 20, 2025 "John Hopfield and Geoffrey Hinton: 2024 Nobel Prizes in Physics" [parts 1 and 2], *Origins Science Scholars*

Oct. 14, 2024 "The signal and the noise: the promise and challenges of AI in personalized medicine", *Association for Continuing Education Lecture Day*

Apr. 30, 2024 "Evolution, randomness, and beauty: biology through the lens of statistical physics", *Origins Science Scholars*

Nov. 22, 2022 "Maxwell's Demon and the Thermodynamics of Computing", *Origin Science Scholars* lecture program, Institute for the Science of Origins

Mar. 14, 2022 "Discerning the painter's hand: using machine learning on the surface topography of art", *Science Café Cleveland* seminar series

Feb. 23, 2021 "Proteins, evolution, and machine learning: exploring the beauty of analogies in physics", *Life, the Universe, and Hotdogs* seminar series, Institute for the Science of Origins

May 14, 2019 "Thermodynamics and the origin of life", *Origin Science Scholars* lecture program, Institute for the Science of Origins

Dec. 9, 2015 "Cellular telephone games: coping with noise in biology", *Life, the Universe, and Hotdogs* seminar series at the Happy Dog, Institute for the Science of Origins

Aug. 25, 2015 "Cellular telephone games: coping with noise in biology", *Life, the Universe, and Hotdogs* seminar series at the Happy Dog, Institute for the Science of Origins