

# WENPING CUI

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## EMPLOYMENT

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**Postdoctoral Fellow**, Kavli Institute for Theoretical Physics, UC Santa Barbara June 2021

## EDUCATION

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**PhD in Biophysics**, Boston College, United States Aug 2014 - April 2021  
PhD Thesis: Statistical Mechanics of Microbiomes Advisor: [Pankaj Mehta](#)

**MS in Statistical Physics**, Universität Bonn, Germany Aug 2011 - Feb 2014  
Master Thesis: A variational study of two and three dimensional melting Advisor: [Thomas Nattermann](#)

**BS in Astrophysics**, University of Science and Technology of China Aug 2007 - Jul 2011  
Bachelor Thesis: Transient Accelerating Scalar Models with Exponential Potential Advisor: [Yang Zhang](#)

## AWARDS

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Best poster award, The Future of Quantitative Biology Symposium, Harvard University 2019

Bonn and Cologne Graduate Scholarship, Universität Bonn 2011- 2013

Bonn International Graduate Scholarship, Universität Bonn 2011

National Astronomical Observatories Scholarship, Chinese Academy of Science 2010

## SKILLS

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**Computational skills:** Strong proficiency in Python, Pytorch, TensorFlow, Matlab, Linux, C/C++, Git

**Machine Learning:** Deep Learning, Deep Reinforcement Learning, Belief Propagation, Convex Optimization.

**Theory:** Biophysics, Theoretical Ecology, Statistical Physics, Random Matrices, Spin Glass Theory, Information Theory.

## PUBLICATIONS

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**W Cui**, J. W Rocks, P Mehta, *The Perturbative Resolvent Method: spectral densities of random matrix ensembles via perturbation theory*, [arXiv:2012.00663](#) (in submission)

**W Cui**, R Marsland III, P Mehta, *Diverse communities behave like typical random ecosystems*, [Phys. Rev. E 104, 034416 \(2021\)](#)

R Marsland III, **W Cui**, P Mehta, *The Minimum Environmental Perturbation Principle: A New Perspective on Niche Theory*, [The American Naturalist 196.3 \(2020\): 291-305](#).

**W Cui**, R Marsland III, P Mehta, *Effects of resource dynamics on species packing in diverse ecosystems*, [Phys. Rev. Lett. 125.4 \(2020\): 048101](#). Editor's Suggestion, See also the synopsis in Physics Magazine: [Resource Dynamics Dictate Diversity](#).

O Howell, **W Cui**, R Marsland III, P Mehta, *Machine Learning as Ecology*, [J. Phys. A: Math. Theor. 53 \(2020\): 334001](#).

R Marsland III, **W Cui**, P Mehta, J Goldford, *The Community Simulator: A Python package for microbial ecology*, [Plos one 15, no. 3 \(2020\): e0230430](#).

- R Marsland III, **W Cui**, P Mehta, *A minimal model for microbial biodiversity can reproduce experimentally observed ecological patterns*, [Sci Rep 10, 3308 \(2020\)](#)
- R Marsland III, **W Cui**, J Horowitz, *The Thermodynamic Uncertainty Relation in Biochemical Oscillations*, [Journal of the Royal Society Interface 16.154 \(2019\)](#). [Highlight](#) by Nature Physics.
- P Mehta, **W Cui**, CH Wang, R Marsland III, *Constrained optimization as ecological dynamics with applications to random quadratic programming in high dimensions*, [Phys. Rev. E 99.5 \(2019\): 052111](#).
- R Marsland III, **W Cui**, J Goldford, A Sanchez, K Korolev, P Mehta, *Available energy fluxes drive a phase transition in the diversity, stability, and functional structure of microbial communities*, [PLoS Comput Biol 15.2 \(2019\): e1006793](#).
- W Cui**, P Mehta, *Identifying feasible operating regimes for early T-cell recognition: The speed, energy, accuracy trade-off in kinetic proofreading and adaptive sorting*, [PloS one 13.8 \(2018\): e0202331](#).
- M Li, **W Cui**, MS Dresselhaus, G Chen, *Electron energy can oscillate near a crystal dislocation*, [New Journal of Physics. 19,1 \(2017\)](#)
- Li, Mingda, et al. , *Proximity-Driven Enhanced Magnetic Order at Ferromagnetic-Insulator–Magnetic-Topological-Insulator Interface*, [Phys. Rev. Lett. 115, 087201 \(2015\)](#)
- M Li, **W Cui**, J Yu, Z Dai, Z Wang, F Katmis, W Guo, J Moodera, *Magnetic Proximity Effect and Interlayer Exchange Coupling of Ferromagnetic/Topological Insulator/Ferromagnetic Trilayer*, [Phys. Rev. B. 91, 014427 \(2015\)](#)
- W Cui**, M Li, Z Dai, Q Meng, Y Zhu, *Near-Field Optical Effect of a Core-Shell Nanostructure In Proximity to a Flat Surface*, [J. Chem. Phys. 140, 044109 \(2014\)](#)
- M Li, Z Dai, **W Cui** Z Wang, F Katmis, P Le, J Wang, L Wu, Y Zhu, *Tunable THz Surface Plasmon Polariton based on Topological Insulator-Layered Superconductor Hybrid Structure*, [Phys. Rev. B. 89, 235432 \(2014\)](#)
- M Li, **W Cui**, L Wu, Q Meng, Y Zhu, Y Zhang, W Liu, Z Ren, *Topological Effect to Surface Plasmon Excitation in Topological Insulator Nanowires*, [Canadian Journal of Physics. 10, 1139 \(2014\)](#)
- W Cui**, Y Zhang, Z Fu, *Transient Accelerating Scalar Models with Exponential Potential*, [Res. Astron. Astrophys. 13, 629 \(2013\)](#)

## CONFERENCE / WORKSHOP PRESENTATIONS

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- The effect of resource dynamics on species packing in diverse ecosystems**  
Poster at MIT Quantitative Ecology Meeting, Boston, United States Jan, 2020
- Diverse communities behave like typical random ecosystems**  
Poster at Boulder School for Condensed Matter and Materials Physics Jul, 2019  
Talk at APS March Meeting 2019, Boston, United States Mar, 2019  
Poster at Stochastic Physics in Biology, Gordon Research Conference, Ventura CA, United States Jan, 2019  
Poster at Bridging Theory and Experiment in Microbial Communities, PCTS, Princeton University Dec, 2018
- Why it is difficult to engineer diverse, synthetic microbial communities?**  
Talk and Poster at The Future of Quantitative Biology Symposium, Harvard University May, 2019  
Talk at Biological Design Center Symposium, Boston University May, 2019
- Invasion dynamics in generalized MacArthur’s consumer resource models**  
Talk at APS March Meeting 2018, Los Angeles, United States Mar, 2018
- Identifying optimal operating regimes for early T-cell recognition**  
Talk at APS March Meeting 2017, New Orleans, United States Mar, 2017  
Poster at Boston Physics of Living Systems Hangout, Boston University Oct, 2016