

WENPING CUI

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EDUCATION

PhD in Biophysics , Boston College, United States PhD Thesis: Statistical Mechanics of Microbiomes	Aug 2014 - April 2021 Advisor: Pankaj Mehta
MS in Statistical Physics , Universität Bonn, Germany Master Thesis: A variational study of two and three dimensional melting	Aug 2011 - Feb 2014 Advisor: Thomas Nattermann
BS in Astrophysics , University of Science and Technology of China Bachelor Thesis: Transient Accelerating Scalar Models with Exponential Potential	Aug 2007 - Jul 2011 Advisor: Yang Zhang

AWARDS

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

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

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*, [arXiv:1904.02610](#) (in submission)

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

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