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## Channing Microbiome Seminar

October 9 (Friday), 2020, 11am (ET) @ Zoom: <https://zoom.us/j/579497999>



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### Statistical Mechanics of Microbiomes

In 1972, Robert May triggered a worldwide research program studying ecological communities using random matrix theory. Yet, it remains unclear if and when we can treat real communities as random ecosystems. Here, we draw on recent progress in random matrix theory and statistical physics to extend May's approach to generalized consumer-resource models. We show that in diverse ecosystems adding even modest amounts of noise to consumer preferences results in a transition to "typicality" where macroscopic ecological properties of communities are indistinguishable from those of random ecosystems, even when resource preferences have prominent designed structures. We test these ideas using numerical simulations on a wide variety of ecological models and simulations using experimentally measured plan-pollination networks. Our work naturally explains the success of random consumer resource models in reproducing experimentally observed ecological patterns in microbial communities and highlights the difficulty of scaling up bottom-up approaches in synthetic ecology to diverse communities.

*Bio: Wenping Cui is a PhD student in the Department of Physics at Boston College and currently supervised by Prof. Pankaj Mehta at Boston University. He is originally from Liaoning, China, and got his Undergraduate degree in Astrophysics at University of Science and Technology of China. Following that, he got a M.Sc. in Physics at University of Bonn, Germany. His Ph.D. research primarily focused on building new theoretical, computational, and numerical tools for modeling microbial ecosystems. In addition to ecology, he has also worked on projects seeking to understand the thermodynamics of kinetic proofreading and the statistical physics of machine learning.*

Hosted by Yang-Yu Liu