BRIGHAM AND WOMEN'S HOSPITAL
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Department of Medicine
Channing Division of Network Medicine

Channing Microbiome Seminar

February 16 (Friday), 2024, 9AM (ET)

MCP 5th-floor conference room & Zoom:
https://us02web.zoom.us/j/81070959105?pwd=RFJNd3dSZmR6dXJZNjJiYVVzQ3NEQT09
Meeting ID: 810 7095 9105; Passcode: 984617

Jie Deng
MIT

The development of ecological systems along paths of least resistance

Abstract: A long-standing question in biology is whether there are common principles that characterize the development of ecological systems, regardless of organismal diversity and environmental context. Classic ecological theory holds that these systems develop following an orderly sequenced process that proceeds from fast-growing to slow-growing taxa and is linked to life-history trade-offs. It is also possible that this assembly process is simply the path with the least environmental resistance and hence favored by probability alone. Here, we use theory and data to show that assembly from fast- to slow-growing taxa is the most feasible (probable) assembly path for diverse systems minimizing environmental resistance. First, we demonstrate theoretically that a sequenced assembly is more feasible than a simultaneous one, at least until the number of iterations becomes so large as to be ecologically implausible. We then show that a higher diversity of taxa and life histories is associated with greater development feasibility when following an orderly sequenced assembly from fast- to slow-growing taxa. Finally, using data from bacterial and metazoan systems, we present evidence that empirical development processes move along the most feasible assembly paths---paths of least resistance. The existence of general development processes paves the way to an enhanced understanding of the persistent collective features characterizing the diversity of life on Earth.

Bio: Jie Deng is a PhD candidate working on theoretical ecology at MIT Systems Ecology Group under the supervision of Serguei Saavedra. She is interested in developing testable theories to understand the likelihood of community changes within ecological systems, such as invasion and assembly processes. In particular, she has focused on how species interactions shape community structures under environmental uncertainty. She received an MPhil in Applied Mathematics from Hong Kong Polytechnic University and a BSc in Statistics from Zhejiang University.

Hosted by Yang-Yu Liu