



Channing Network Science Seminar

April 15, 2016, 11am @ 5th floor conference room



Babak Momeni, Ph.D.

Assistant Professor
Department of Biology
Boston College

<https://www.momenilab.org>

<http://www.bc.edu/schools/cas/biology/facadmin/momeni.html>

Modeling microbial communities as a network of chemically mediated interactions

Microbial communities are often modeled as a network of pairwise fitness (NPF) influences between species. Such pairwise models have limitations in capturing common interaction types among microbes. Yet, pairwise models are popular, because they have received empirical support in some cases and, not incorporating interaction mechanisms, are easy to construct. Here, we analyze the validity of NPF modeling for microbial communities. We build a reference model as a network of chemically mediated interactions (NMI) by explicitly incorporating interaction mediators. Comparing the predictions between this reference model and a pairwise model derived from it reveals the conditions under which NPF is a valid approximation. We find that NPF modeling may fail to capture community dynamics in many commonly encountered cases: for example, when a mediator is consumed by the recipient, when one species affects another via multiple mediators, or when a mediator is produced or consumed by multiple species. We further use NMI modeling to explore the network properties that promote coexistence of species in microbial communities.

Bio: Babak received his BSc in Electrical Engineering and MSc in Optical Engineering from Sharif University of Technology (Tehran, Iran). He obtained his MS in Physics and PhD in Electrical Engineering from Georgia Tech (Atlanta, GA), before moving to Fred Hutchinson Cancer Research Center for a postdoctoral position in Quantitative Biology in the lab of Wenying Shou. Babak has recently joined the Department of Biology at Boston College as an Assistant Professor. His work is at the intersection of Systems Biology and Microbial Community Ecology, with an interest to discover how cell-level interactions among microbes lead to emergent community-level properties. Combining mathematical modeling and experimentation, his lab searches for general principles that explain the formation and maintenance of microbial communities, with applications in environment, industry, and human health.

Hosted by Yang-Yu Liu