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Department of Medicine
Channing Division of Network Medicine

Channing Microbiome Seminar

Dec 9 (Friday), 2016, 11am @ 5th floor conference room



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Synthetic Ecology: Building Microbial Communities from the Bottom Up

Ecosystems are arguably the most complex but least understood level of biological organization. Microbial communities, composed of numerous interacting species, are of particular importance due to the recent realization that they play key roles in shaping natural ecosystems and determining human health and wellbeing. Although much progress has been made in characterizing these complex communities, the lack of tractable model systems has made it challenging to identify unifying principles governing community assembly and function. In this talk I describe my recent experimental efforts to develop a predictive understanding of microbial community structure. I first proposed a simple, qualitative assembly rule that predicts community structure from the outcomes of pairwise competitions. To evaluate the rule's accuracy, I quantified the network of pairwise competitive outcomes among species within a model microbial community. The assembly rule was surprisingly successful in predicting the outcome of three-species competition, indicating that higher-order interactions among species can often be neglected. However, when trio competitions resulted in unexpected outcomes, it was necessary to incorporate this information to predict the outcome of competitions between more diverse species collections. These results illustrate how a bottom-up approach of characterizing individual interactions can explain the emergent behavior within complex multi-species communities.

Bio: Jonathan is a postdoctoral researcher at the Physics of Living Systems center at MIT, working with Dr. Jeff Gore, where he studies the emerging field of synthetic ecology by combining theory with experiments in model microbial communities. Prior to that, he has completed a PhD in computational and systems biology with Dr. Eric Alm and Dr. Daniel Rothman at MIT, during which he focused on leveraging high-throughput sequencing data to study natural microbial communities, and especially the human microbiome.

Hosted by Yang-Yu Liu