SBHSE SEMINAR

School of Biological and Health Systems Engineering

Engineering Multicellular Systems in Bacteria

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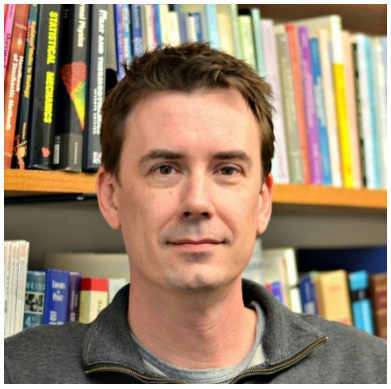
https://asu.zoom.us/j/98112983378

Abstract

Synthetic biologists have long sought to rationally engineer genetic regulatory networks for a variety of reasons. For instance, the basic science of understanding gene regulation has prospered due to our ability to intricately construct, perturb, and monitor gene networks in living cells. Further, synthetic biologists have designed a host of systems for practical biomedical and industrial applications. However, as synthetic biology pushes the limits of genetic engineering it is becoming increasingly clear that synthetic multicellular systems will be required to accomplish tasks that are difficult for single cells or homogeneous colonies. In this talk, I will describe our lab's recent efforts to better understand and engineer intercellular communication in multicellular bacterial systems. In particular, I will discuss how the network topologies of intercellular gene regulatory networks influence the spatiotemporal coordination of gene expression in synthetic microbial consortia. Further, I will present recent engineering work in which we designed and implemented a system that allows E. coli to asymmetrically and irreversibly differentiate into multiple cell types. Overall, our results point the way toward engineering synthetic "organisms" from the ground up.

Bio Sketch



Matthew Bennett is an associate professor in the departments of Biosciences and Bioengineering at Rice University. His research spans the boundary between theoretical and experimental synthetic biology. He is particularly interested in the dynamics of gene regulation – from small-scale interactions such as transcription and translation, to the large-scale dynamics of gene networks and synthetic microbial consortia. He uses an interdisciplinary approach to 1) uncover the underlying design principles governing gene networks and microbial consortia, 2) engineer novel synthetic gene circuits for practical applications, and 3) develop new mathematical tools to better describe gene networks. The ultimate goal of the work in his lab is to develop synthetic multicellular systems for biomedical and environmental applications.