Towards an era of RNA design for biology and global health

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Abstract

RNAs are emerging as a powerful substrate for engineering cellular behavior. As with all biomolecules, RNA function is intimately related to its structure, since RNA can adopt structures that selectively modulate gene expression. Central questions in biology and bioengineering then are: How do RNAs fold inside cells?; and How can we engineer these folds to control gene expression? In this talk, I will present our work at the interface of these two questions and share results that are beginning to uncover design principles for understanding natural RNAs and engineering RNAs for an array of applications in biomanufacturing and human health. I will focus on our recent work in understanding how riboswitch RNAs make regulatory decisions 'on the fly' during the process of transcription, how we can use riboswitches as biosensors, and our recent development of a new synthetic biology biosensing platform that allows rapid, field-deployable diagnostics for a range of compounds important to our health and the environment.

Biography

Julius B. Lucks is Professor of Chemical and Biological Engineering at Northwestern University. Research in the Lucks group seeks to uncover the molecular principles that enable biological systems to sense and adapt to changing environments, and to understand how we can use these principles to engineer synthetic biological systems that benefit humankind. His group recently pioneered new approaches to creating low-cost cell-free synthetic biology diagnostics to solve challenges in global water quality monitoring. He is also the PI of the first NSF NRT graduate training program in synthetic biology. For his research, Professor Lucks has been recognized with a number of awards including a DARPA Young Faculty Award, an Alfred P. Sloan Foundation Research Fellowship, an ONR Young Investigator Award, an NIH New Innovator Award, an NSF CAREER award, the ACS Synthetic Biology Young Investigator Award, a Camille-Dreyfus Teacher Scholar Award, and most recently was a finalist for the Blavatnik Awards for Young Scientists. He is a founding member of the Engineering Biology Research Consortium, and co-founded the Cold Spring Harbor Synthetic Biology Summer Course. He is also a co-founder of Stemloop, Inc. which aims to use cell free biosensing technology to empower people to make meaningful community health decisions. Please visit http://luckslab.org for more information.