

# CHEMICAL ENGINEERING

SEMINAR SERIES



**LYDIA CONTRERAS**

**Monday, April 08, 2019**

Associate Professor, Chemical Engineering  
University of Texas at Austin

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## **Understanding and engineering RNAs for programmable gene control**

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**ABSTRACT:** Regulatory RNAs enable bacteria to dynamically respond to stresses caused by changes in environmental conditions. Specifically, bacterial small RNAs, a class of RNA regulators, exert dynamic control on complex networks by regulating gene expression. Understanding their functions is a goal in both medicine and metabolic engineering given their relevance to pathogenesis and their potential to manage global regulatory networks that affect biological production of industrially-relevant compounds. Given the importance of molecular structure to RNA functioning, fundamental sRNA characterization and applied engineering efforts depend heavily on the understanding and design of their specific shapes. Specifically, knowledge of the RNA structural landscape supports identification of interfaces relevant to regulation. In this talk, we will describe the development of a high throughput tool that allows for the simultaneous in vivo characterization of thousands of potential interacting interfaces in RNA molecules, as determined based on their molecular accessibility. We will describe how RNA structural insights obtained from this synthetic probing approach can be used in the functional characterization of newly discovered RNAs and in the rational design of bacterial sRNAs to achieve a tunable gradient of global control for metabolic engineering applications.

**BIOGRAPHY:** Dr. Lydia M. Contreras is an Associate Professor and the and the Laurence E. McMakin Jr. Centennial Fellow in Chemical Chemical Engineering. She is a member of the Institute of Cell and Molecular Biology at the University of Texas-Austin, where she is also associated with the Institute for Cell and Molecular Biology (ICMB). She teaches Thermodynamics, Introduction to Chemical Engineering Analysis, and Fundamental and Applications of Cellular Regulation. Dr. Contreras obtained a B.S.E. in Chemical Engineering from Princeton University, where she graduated Cum Laude. She completed her PhD in Chemical Engineering from Cornell University, focusing on engineering bacterial cells for improved production of therapeutic proteins. As a postdoctoral associate at the Wadsworth Center (New York State Department of Health), she focused on understanding mechanisms of infection in pathogenic bacteria. She began her career at the University of Texas-Austin in 2011, where she leads a research team focused on RNA biochemistry to study gene regulation mechanisms associated with stress-responses for applications in health and biotechnology. She has received several academic, teaching and service awards including: the ACS Biotechnology and Bioengineering Daniel I.C. Wang Award, Department of Thrust Reduction Agency (DTRA) Young Investigator, Airforce Office of Scientific Research Young Investigator, NSF CAREER, Health and Environmental Institute (HEI) Walter E. Rosenblith New Investigator, Norman Hackerman Advanced Research Program (NHARP) Early Career, Society of Hispanic Professional Engineers (SHPE) Young Investigator Award, and an Innovative Early-Career Frontiers of Engineering Educator. She lives in Austin with her husband Chris and their twin toddlers Caysa and Riley.

**RECEPTION 3:30 • LECTURE 4:00 - 5:00**  
**PHYSICS ASTRONOMY BLDG. PAA A 114**



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