

# SPECIAL SEMINAR

Monday, December 11, 2017  
3:30 pm - Chemistry #1315



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## **Structure and Dynamics of Nucleic Acids by Nonlinear Spectroscopy and Single-Molecule Microscopy**

Nucleic acids play central roles in many aspects of biology, acting as genetic material, catalysts, regulatory signals and more, and advances in optical spectroscopy and microscopy have provided significant insight into these biological functions. I will first present my work utilizing two-dimensional fluorescence spectroscopy (2DFS) to investigate the local conformations of nucleic acids. I initially used 2DFS to determine the solution conformation of a dinucleotide of the fluorescent nucleic acid base analogue 2-aminopurine, and it is now being extended to more complex DNA systems. I will then present ongoing work in which I am using single-molecule fluorescence microscopy to study the conformational dynamics of RNA in transcription and splicing complexes. I will focus on my work on riboswitches, which are RNAs that regulate bacterial gene expression in response to environmental cues. In the cell, RNA folds during its transcription by RNA polymerase (RNAP), and certain riboswitches function primarily by regulating the outcome of transcription. I investigated the interplay between riboswitch folding and transcription, finding that interactions between a riboswitch and RNAP concurrently aid in folding of the nascent riboswitch and stabilization of a paused state of RNAP. The discovery of this cross-coupling highlights the necessity of performing detailed biophysical studies of RNAs in their native biological contexts, which is a central goal of the research I plan to pursue as an independent investigator.