

# Schrag Analytical Seminar

PROFESSOR  
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*“STUDIES OF STRUCTURES AND DYNAMICS  
OF PROTEIN-DNA COMPLEXES BY SINGLE  
MOLECULE AND TWO-DIMENSIONAL  
FLUORESCENCE SPECTROSCOPY”*

THURSDAY

OCT. 23, 2014

12:15 PM

1315

CHEMISTRY

The properties of biological macromolecules are greatly influenced by local interactions between proteins, nucleic acids, sugars and lipids. Such interactions affect the stability of biomolecular complexes, as well as the barriers that must be surmounted for molecular motions to occur. In this talk, I will present fluorescence based nonlinear spectroscopic measurements that determine the three-dimensional shapes, or local conformations, adopted by electronically coupled molecular dimers in biological environments. I will describe studies of the assembly of dimers of square-shaped metal tetraphenyl porphyrin (TPP) molecules embedded in a phospholipid bilayer membrane. Similar experiments performed on dimers of fluorescent nucleic acid bases, which may be substituted for natural bases within model DNA constructs, reveal the structures of local base stacking conformations, and provide information about the balance of thermodynamic forces that contribute to nucleic acid stability. I will also describe single-molecule fluorescence experiments to investigate DNA ‘breathing’ fluctuations, in which nucleotide residues near single-stranded (ss) – doublestranded (ds) DNA forks and junctions temporarily adopt local conformations that depart from their most stable structures. Such fluctuations may comprise important mechanistic steps on the reaction pathways of a number of biological reactions central to DNA replication and RNA transcription.