PROBING STRUCTURES, ENVIRONMENTS AND DYNAMICS WITH 2D INFRARED SPECTROSCOPY

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Over the past few decades, the fundamental relationships between infrared spectra and molecular structures, environments, and dynamics has been explored using many gas and condensed phase systems. This body of work has established infrared spectroscopy has a very sensitive and powerful tool for studying molecular dynamics. Our research has been to extend our understanding of molecular vibrations to large biomolecular systems using 2D IR spectroscopy, isotope labeling, and ab initio calculations. This talk will focus on how the carbonyl frequencies in model DNA oligomers are related to helical secondary structures and how the backbone vibrations of membrane peptides depend on their environment. Our studies have helped established the fundamental underpinnings behind the structure/spectrum relationships in these systems, thereby providing a new means for investigating the structures, environments, and folding kinetics of DNA and membrane proteins.