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**Biological Photophysics with Small Photons: Terahertz measurements of the protein dynamical
Transition**
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Protein tertiary structural vibrations lay in the terahertz frequency range. These motions are associated with the large scale conformational motions necessary for function. Previously we have shown protein terahertz dielectric response is sensitive to protein conformation, hydration, oxidation state, ligand binding and folding. In this talk I will focus on our measurements of the 200 K dynamical transition and how these results fit into the slaved solvent model. Further I will discuss how these measurements along with hydration dependence measurements demonstrate the water beyond the first solvation shell continues to deviate from bulk water behavior. This work was supported by ACS grant PRF 39554-AC6, NSF CAREER grant PHY-0349256 and NSF IGERT grant DGE0114330.