MAR05-2004-010036

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

The Folding of Ligands upon Protein Binding

ROBERT CALLENDER, Department of Biochemistry, Albert Einstein College of Medicine, Bronx, NY 10461

Enzymes bind their substrates and then catalyze the chemical transformation of substrate to product. We understand pretty well the structures of enzymes and other proteins with and without bound ligands. But just how do proteins bind ligands? What are the steps? And how do we describe the dynamics of this folding process? Recent advances in initiating and perturbing chemical reactions on very fast time scales, as short as picoseconds, make it feasible to study a large range of chemical kinetics problems that heretofore could not be studied. One such approach is the rapid heating of water solutions using laser excitation. Using laser induced temperature jump relaxation spectroscopy, it is possible to examine and characterize atomic motion in proteins over the picosecond to minute time scales. Some general issues will be discussed followed by specific examples of our studies of the dynamical nature of ligand binding to date, specifically in lactate dehydrogenase and triosephosphate isomerase, over a wide time range.