

Watching Proteins as they Function: Real-Time Observations at Atomic Resolution using Picosecond X-ray Crystallography

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Proteins are engaged in a myriad of tasks that are essential to life. To understand in mechanistic detail how a protein functions, it is crucial to know the time ordering of events that give rise to its designed function. Recent advances in time-resolved x-ray crystallography at the ESRF have paved the way to probe structural changes in photoactive proteins with ~ 150 ps time resolution. Exploited this capability, we have probed the structural changes associated with ligand translocation in myoglobin with atomic resolution. Correlated motions are observed which provide new mechanistic insights into the function of this model protein. Some of the opportunities and challenges that will arise with the dawning of intense femtosecond x-ray sources will be discussed.