

ULTRA FAST IMAGING

Janos Hajdu, Beata Ziaja, David van der Spoel, Gösta Huldt, Abraham Szöke

Department of Biochemistry, Uppsala University, Box 576, Husargatan3, 75123 Uppsala, Sweden

The current bottleneck in the atomic resolution imaging of biological systems is a fundamental need for crystals. This limits the scope of detailed structural studies to macromolecules and macromolecular assemblies which can be crystallised. X-ray free-electron lasers have the potential of changing this picture. Theory predicts that with very intense and very short X-ray pulses, a single diffraction image could be recorded from a macromolecule, virus, or a protein cluster before damage-induced movements destroy the sample. This type of imaging would not require a crystal. Three-dimensional reconstruction of the structure may be possible with reproducible samples, using a new sample molecule for each shot. When a reproducible sample scatters a sufficiently large number of photons for its orientation to be determined, averaging techniques can be applied to extend the resolution in a redundant data set. The talk will describe concepts, models and progress with the project.