Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich
Laboratorium für Physikalische Chemie

Einladung zu einem Kolloquium

Hörsaal HCI J 3
ETH Zürich, Hönggerberg

Datum/Zeit: **Dienstag, 29. Mai 2012, 16.45 Uhr**

Referent: **Prof. Dr. Henry Chapman**
Forschungszentrum DESY, Hamburg, Deutschland

Thema: **Femtosecond protein nanocrystallography with an X-ray laser**

The ultrafast pulses from X-ray free-electron lasers (FELs) are of high enough intensity and of sufficiently short duration that individual single-shot diffraction patterns can be obtained from a sample before significant damage is apparent at the atomic scale. We have applied this "diffraction before destruction" method to determine the molecular structures of proteins in the form of micron to sub-micron crystals, with pulses up to 1018 W/cm² intensity. Using the Linac Coherent Light Source we recorded millions of diffraction patterns from a flowing stream of protein crystals. Our measurements show that sample destruction at 1.9 Å resolution can be avoided with pulses of 30 fs or shorter. For the structural biologist this style of macromolecular crystallography provides many advantages: data are collected from samples at room temperature, avoiding possible biases caused by cryogenic freezing of samples; sub-micron to micron sized crystals are more easily formed than macroscopic crystals, overcoming a major bottleneck in sample production; natural (in vivo) protein crystals can be studied; radiation-sensitive samples such as proteins with metal centers can be examined; and higher quality diffraction is obtained when the crystal size is comparable to the long-range order of the crystal (the mosaic block). The method also opens up the possibility of time-resolved measurements of reversible or irreversible reactions, either by stopped-flow techniques (actually continuous flow, but the short pulse freezes all motion) or by photo excitation.
We have measured diffraction from crystals of less than 1000 unit cells. Our experiments and models show that with even higher pulse intensities we could reduce the crystal size even further, perhaps all the way to the single molecule.
The experiments described were carried out as part of a large collaboration involving CFEL DESY, Arizona State University, SLAC, University of Hamburg, Uppsala University, LLNL, LBNL, the Max Planck Institute for Medical Research, and the Max Planck Advanced Study Group (ASG) at the CFEL.

Gäste sind willkommen.
Nach der Veranstaltung laden wir Sie herzlich zu einem Apéro ein.