GEORGE RETSECK FOR THE SCIENTIST, JULY 2011

SMASHING CRYSTALS

Making high-quality crystals large enough to usefully diffract X-rays is a major headache when attempting to determine protein structures by X-ray crystallography. Researchers prefer crystals that are 100–200 microns in size, with 5 microns being the smallest crystals that can be examined using a synchrotron X-ray source. More powerful X-rays provide better diffraction, but damage the crystals. Henry Chapman and colleagues fed a stream of tiny crystals, as small as 0.2 microns, into an X-ray beam generated by the Linac Coherent Light Source (LCLS)—a billion times more powerful than a synchrotron beam—but toggled the beam on for only a few femtoseconds at a time. The crystals exploded under the intense beam, but not before Chapman and colleagues collected a single diffraction pattern from each crystal. This was enough, given tens of thousands of such images, to calculate the structure of the Photosystem I membrane complex. Thomas Meier from the Max Planck Institute of Biophysics says that using such nanocrystals offers "a new possibility" for examining the structure of membrane proteins. Ultimately, it may even be possible to use the LCLS to look at the smallest crystals possible—those of single molecules. (Nature, 470:73-77, 2011; http://bit.ly/femtolaser)