

Diffraction Imaging of the Yeast Cell: First Results

David Shapiro^a, Pierre Thibault^b, Tobias Beetz^a, Veit Elser^b, Malcolm Howells^c, Chris Jacobsen^a, Janos Kirz^c, Enju Lima^a, Huijie Miao^a, Aaron M. Neiman^d, David Sayre^a, ^a*Department of Physics and Astronomy, Stony Brook University, USA.* ^b*Department of Physics, Cornell University, USA.* ^c*Advanced Light Source, Lawrence Berkeley National Laboratory, USA.* ^d*Department of Biochemistry and Cell Biology, Stony Brook University, USA.* E-mail: dshapiro@xray1.physics.sunysb.edu

We have developed an apparatus for soft x-ray diffraction microscopy (XDM) of dry or frozen hydrated biological specimens. The microscope, stationed at beamline 9.0.1 of the Advanced Light Source, can collect nearly complete three-dimensional diffraction data to 10 nm resolution. Diffraction patterns, from eight angular orientations of a whole and unstained freeze-dried yeast cell, were recorded with the microscope and phased using the difference map algorithm. The resulting images portray the natural complex refractive contrast of the cell to 30 nm resolution and their agreement provides confidence in the accuracy of the imaging technique. New techniques for handling noisy and incomplete diffraction data were developed and improved the convergence of the algorithm. The effects of large doses on the structure of the cell were also investigated and it is determined that dry specimens suffer from shrinkage while frozen hydrated cells are stable with doses as large as 5×10^9 Gray.

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