

Diffraction Microscopy of Biological Specimens: Imaging of a Freeze-Dried Yeast Cell

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In our experiment, the X-ray diffraction pattern of a freeze-dried yeast cell was collected at 750 eV and phasing was performed using the difference map algorithm [1]. Data collection made use of an undulator beamline at the Advanced Light Source [2], and a specially designed apparatus [3]. The freeze-dried yeast cell was 3 microns in diameter and its exit wave was complex-valued at 750 eV. The reconstruction of complex valued objects has been found to be particularly challenging [4,5], and the success of the reconstruction illustrates a step forward in this technique. The reconstructed image shows the nucleus and cell membrane clearly in 30 nm resolution. The reconstruction of a freeze-dried yeast cell gives us confidence that the phasing algorithm would work when one has diffraction data from frozen hydrated biological samples, which most resemble the living biological state.

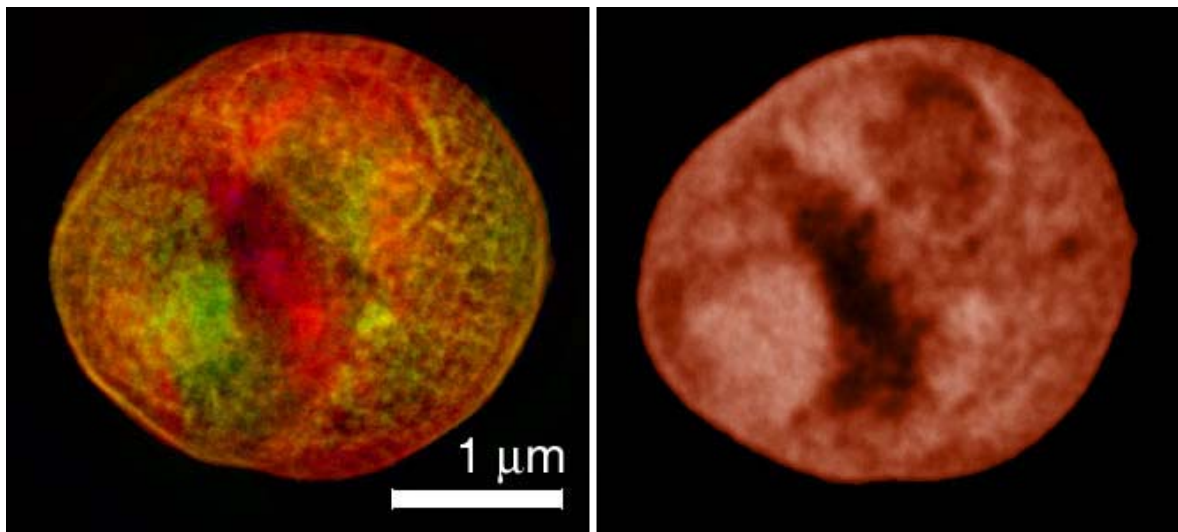


Figure 1: diffraction microscopy reconstruction (left) and scanning transmission x-ray micrograph (right, made with a 45 nm outermost zone width zone plate) of a freeze-dried yeast cell.

References

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