

Supplementary Information

Visualization of a Mammalian Mitochondrion by Coherent X-ray Diffractive Imaging

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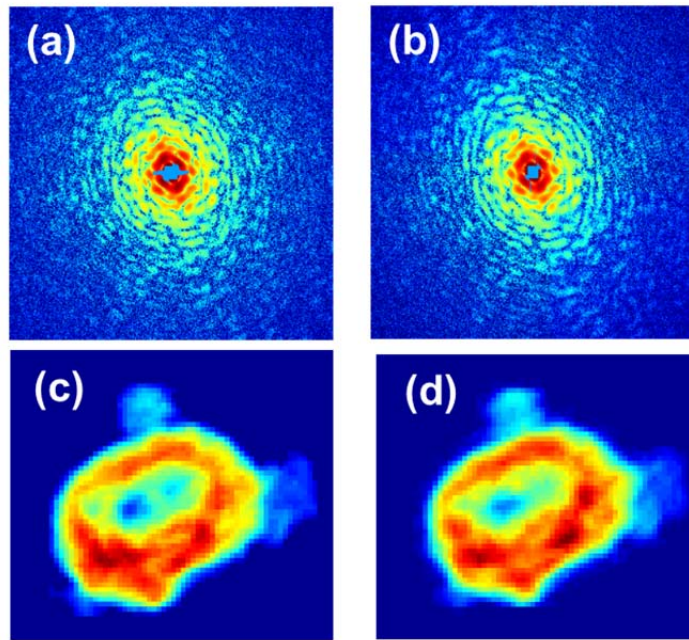
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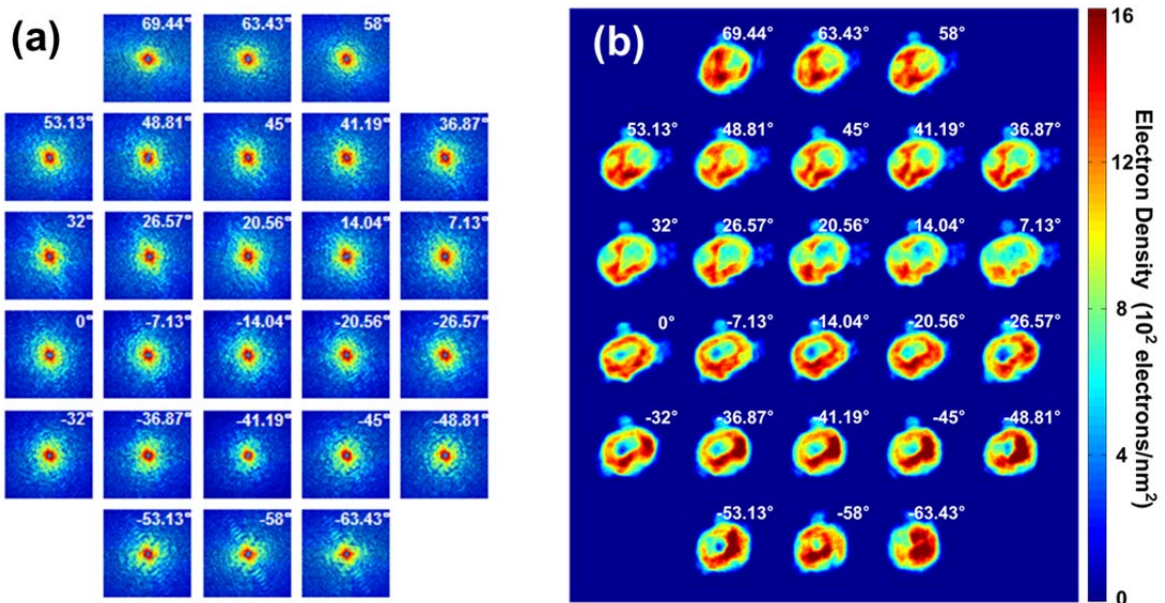
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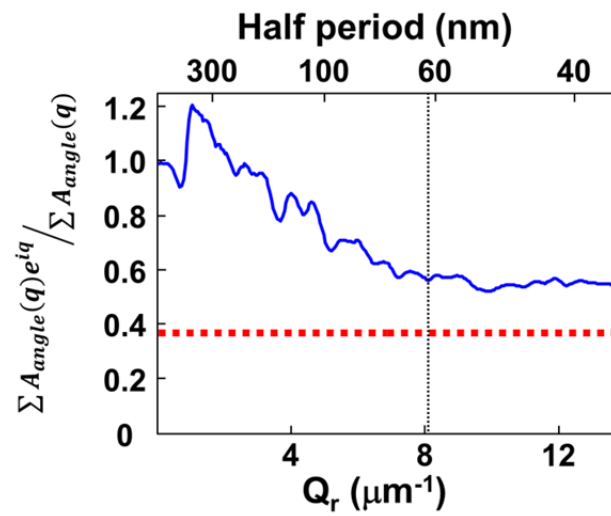
Supplementary Figure S1.

(a) Coherent x-ray diffraction pattern at zero degree projection angle (b) Diffraction pattern after 470 min of x-ray exposure (c, d) Two dimensional projection CXDI images reconstructed from (a) and (b) respectively. There was no significant difference either in the diffraction pattern or reconstruction image.



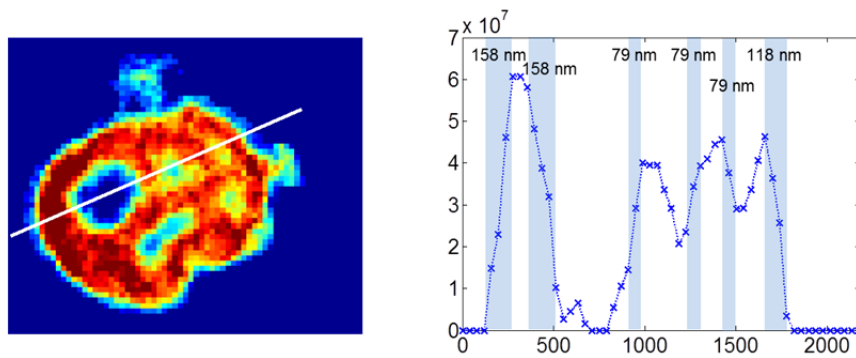
Supplementary Figure S2.

(a) Coherent x-ray diffraction pattern obtained at all 26 projection angles. (b) Two dimensional projection CXDI images reconstructed from the data shown in Figure S1. They represent the electron density map integrated along the main beam direction at corresponding projection angles.



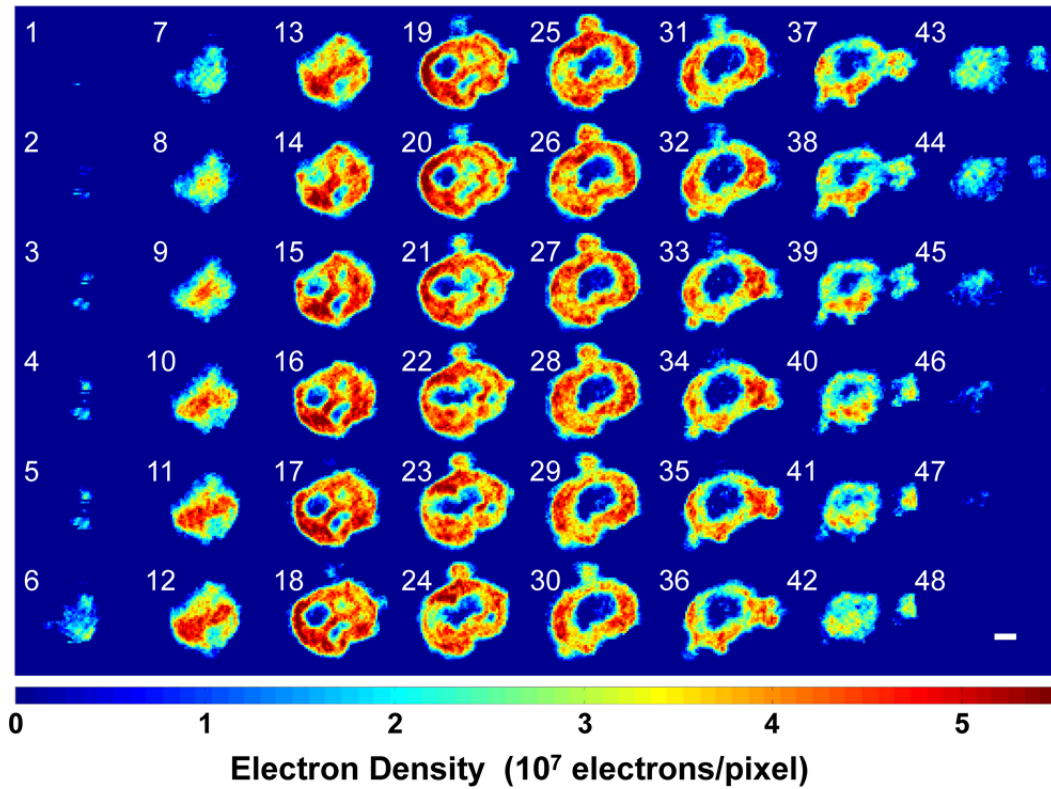
Supplementary Figure S3.

PRTF evaluated from the 3D reconstruction by $\sum S(\mathbf{q})_{recon} e^{i\phi q_{recon}} / \sum S(\mathbf{q})_{recon}$. The value stays above 1/e level indicated by the red horizontal dotted line. The position marked by the black dotted vertical line where the PRTF saturates was quoted as the 3D resolution of 60.3 nm.



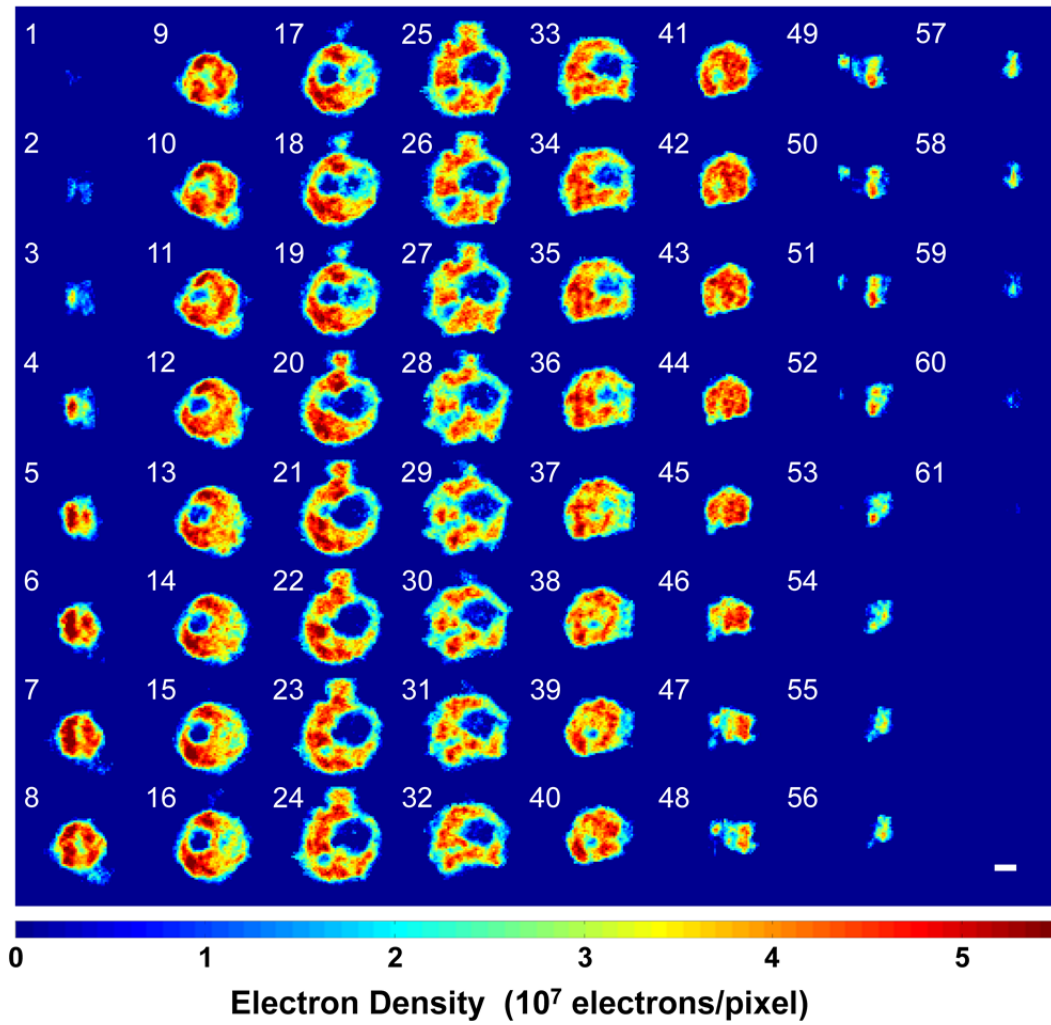
Supplementary Figure S4.

A line profile through the sectioned image shown in Fig. 2(c) to illustrate the image resolution in 3D. There are several features smaller than 100 nm.



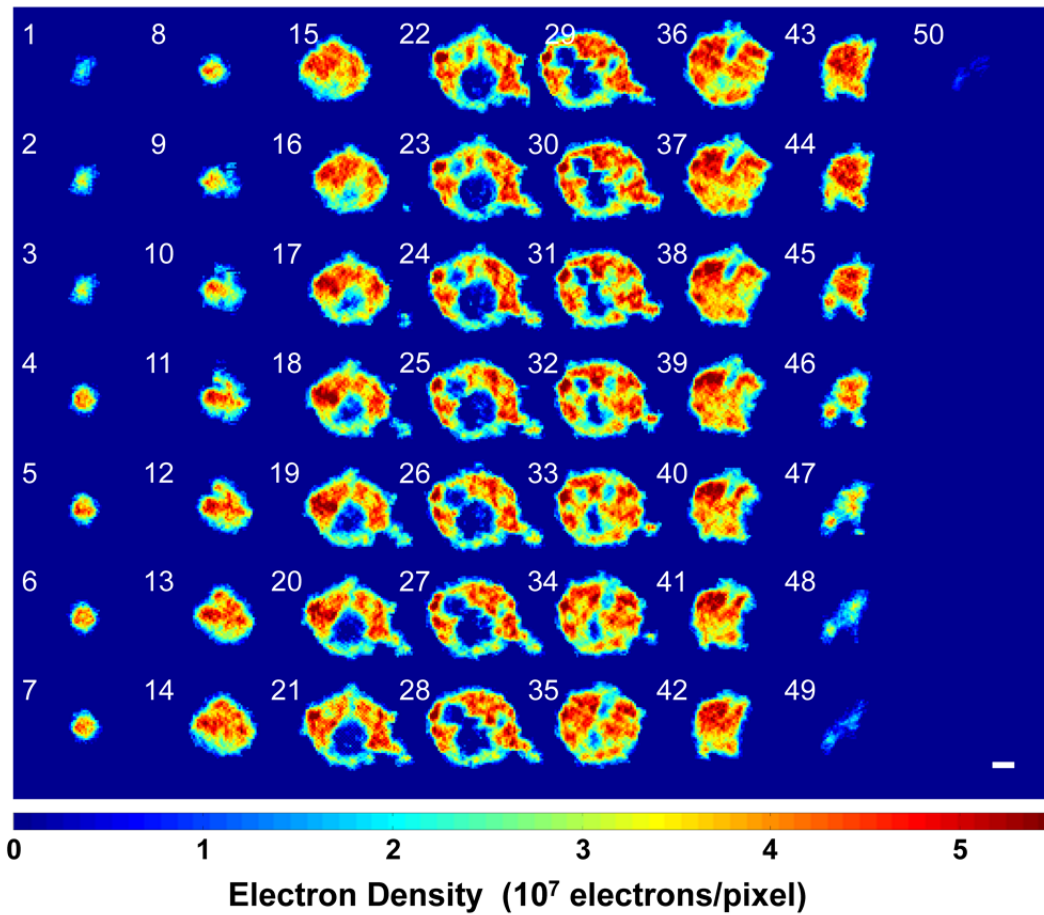
Supplementary Figure S5.

Sectioned images of the 3D mitochondrion tomogram cut in the y-z plane obtained at 36.33 nm intervals which corresponds to the single pixel size. The numbers marked on the upper left side of the each image indicate the distance from the edge in the unit of the single pixel size. Images 15-18 show baffle shape while images 19-25 look similar to septa shape. Cristae located near the perimeter of mitochondrion are observed in images 26-40.



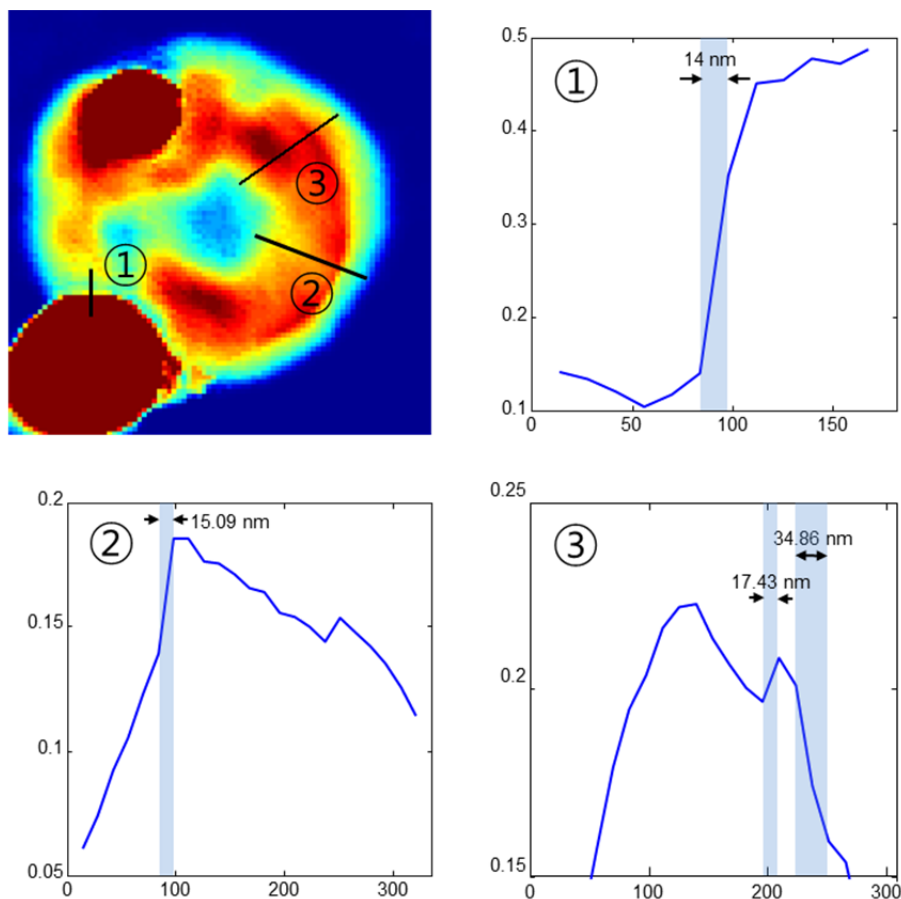
Supplementary Figure S6.

Sectioned images of the 3D mitochondrion tomogram cut in the x-z plane obtained at 36.33 nm intervals. In this direction, mitochondrion is rather circular in shape. The structural variations in the outer region are shown in most images. Low density mitochondrial matrix is localized to a circular (or spherical) region.



Supplementary Figure S7.

Sectioned images of the 3D mitochondrion tomogram cut in the x-y plane obtained at 36.33 nm intervals. Complicated internal structural variations are illustrated in the images.



Supplementary Figure S8.

A line profile through the mitochondria projection image with reference Au objects shown in Fig. 4(b). The image resolution 14 nm is reflected in the line through the edge a Au particle. However, the detailed mitochondrial structures are not clearly resolved since the image is a projected image where all densities are summed along the beam direction.

Supplementary Movie S9. Animations illustrating the sequential sectioned images cut in the y-z, x-z, and x-y direction. Three dimensional morphology of the mitochondrion is well described. The overall mitochondrial shape is illustrated using translucent green.