



DESY Summer Student Programme 2009

Diffraction X-ray Imaging at FLASH

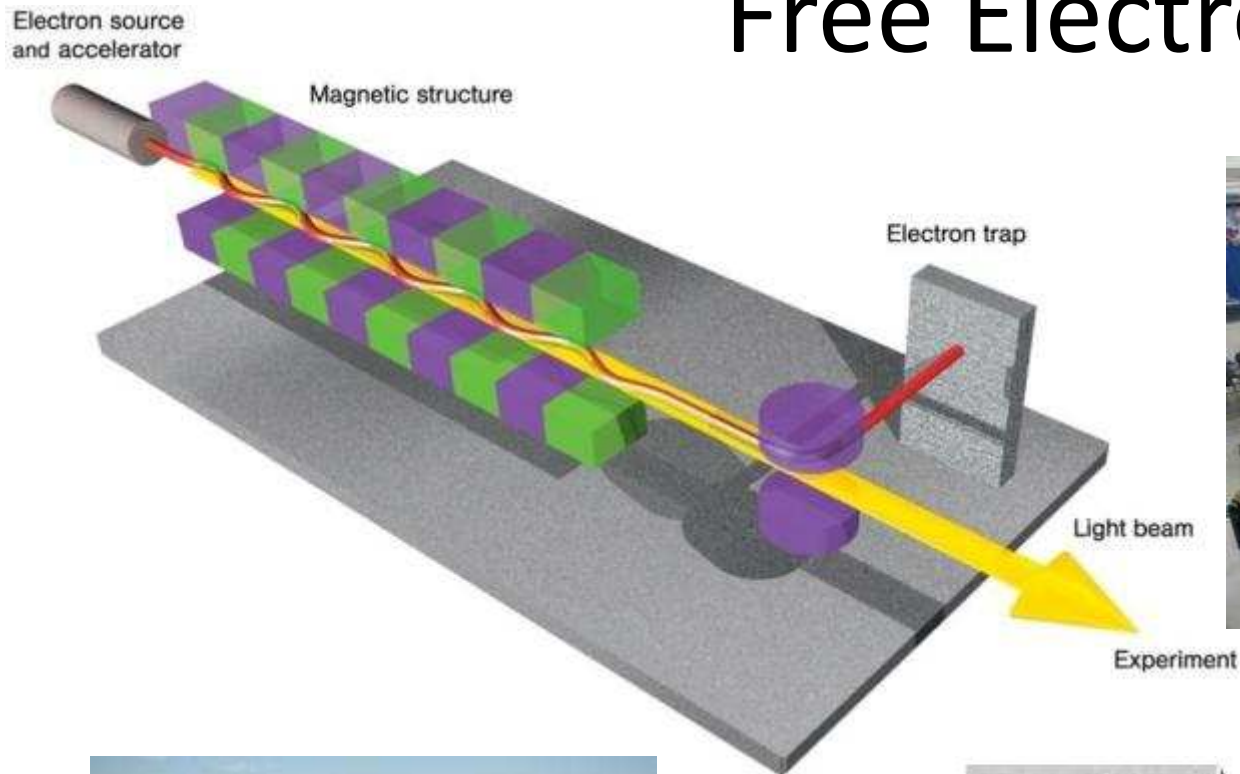
Karol Nass

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Free Electron Laser



The European X-Ray Free-Electron Laser in Hamburg

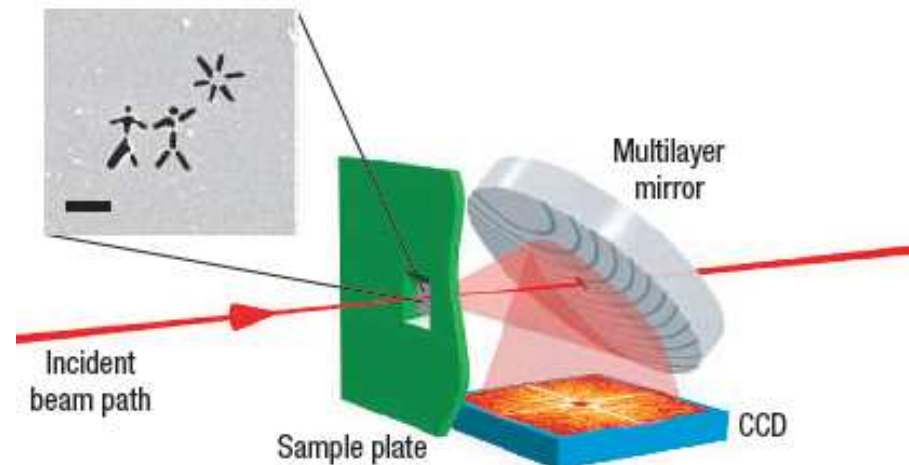
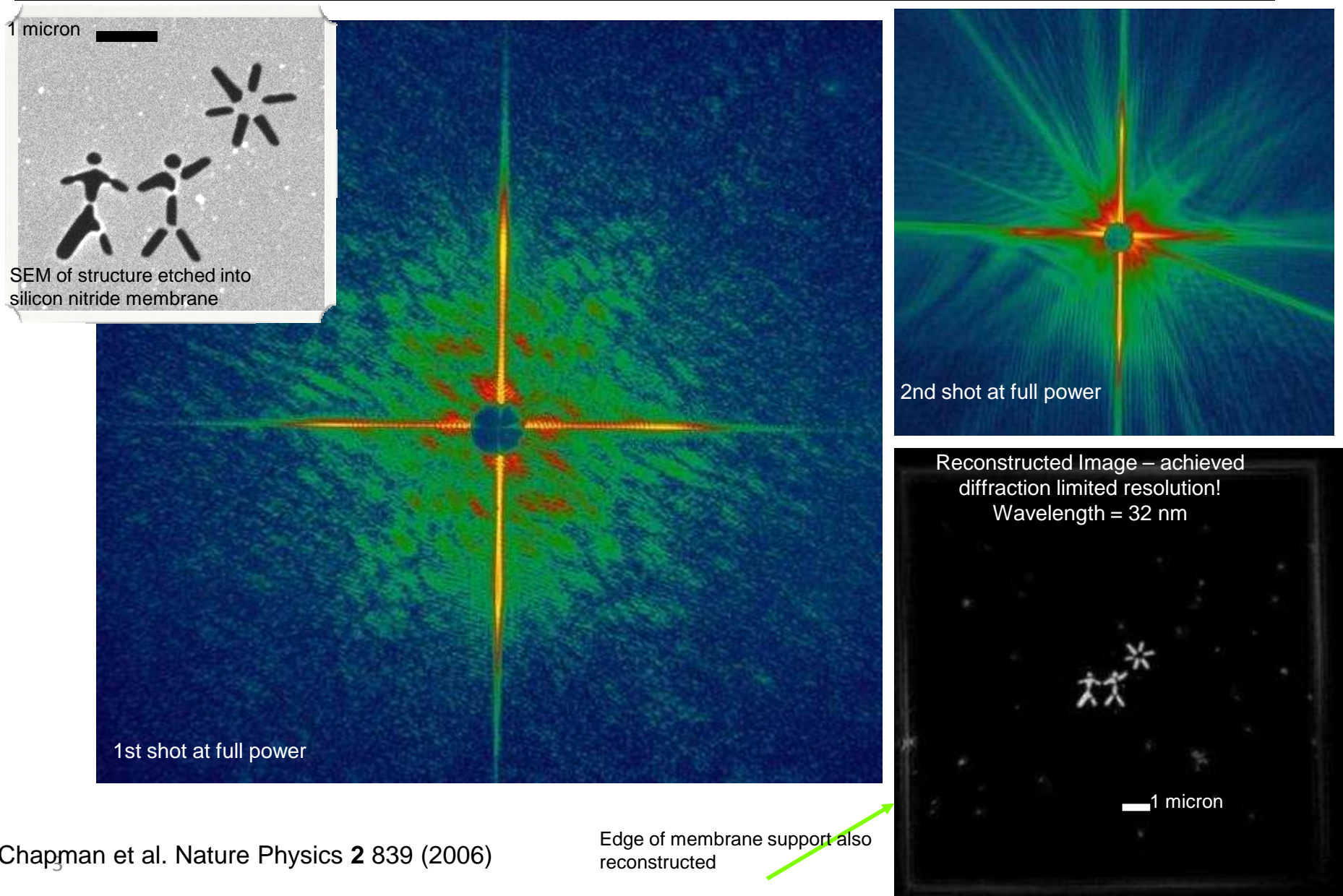


Image reconstructed from an ultrafast FEL diffraction pattern

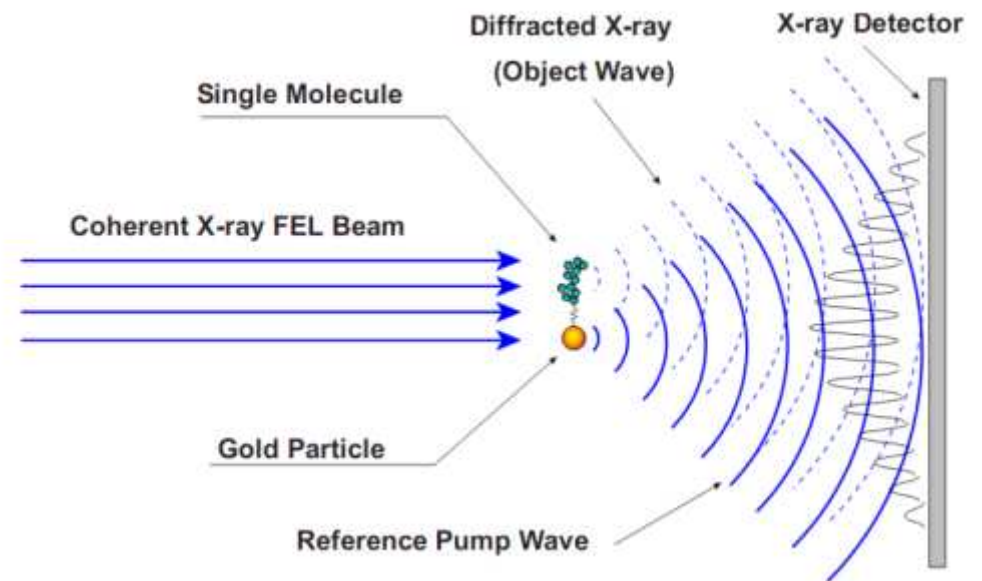
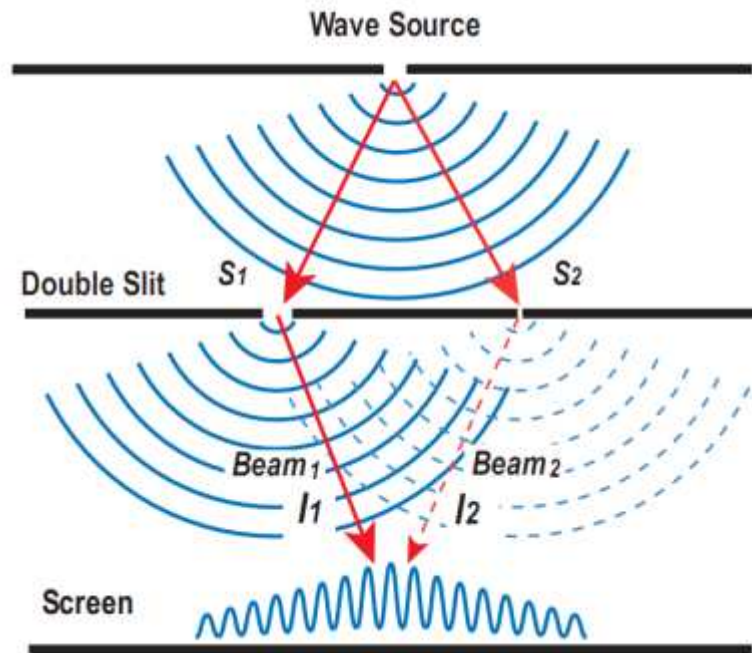


PHYSICAL REVIEW E **78**, 041906 (2008)

**Possibility of single biomolecule imaging with coherent amplification
of weak scattering x-ray photons**

Tsumoru Shintake

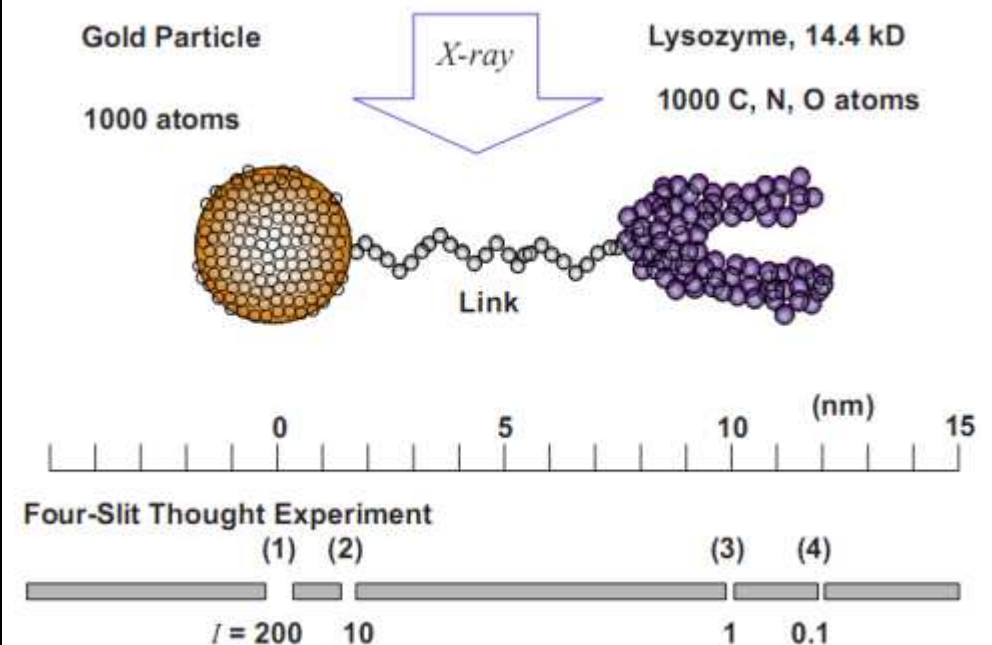
RIKEN SPring-8 Center, Harima Institute, 1-1-1 Kouto, Sayo, Hyogo 679-5148, Japan



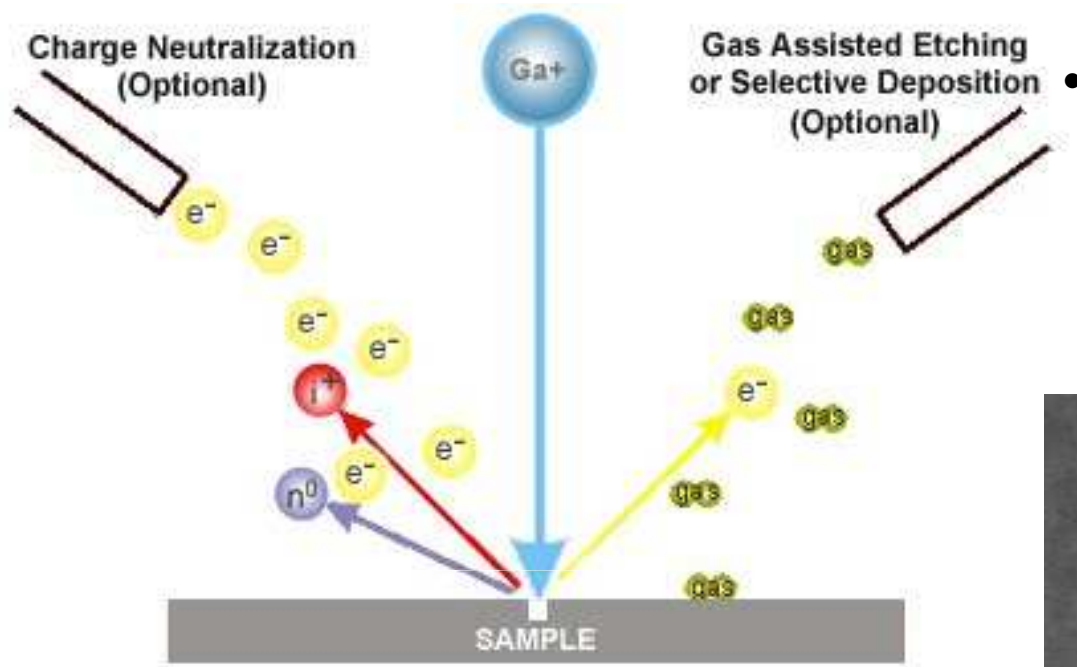
Holographic recording for single molecule imaging.

- Conceptual diagram of a single lysozyme molecule linked to a gold particle.
- The gold particle produces 200 times more coherent x-ray scattering than the single lysozyme molecule.
- The bar at the bottom of the figure represents a four-slit thought experiment.

T. Shintake; PhysRevE.78.041906 (2008).

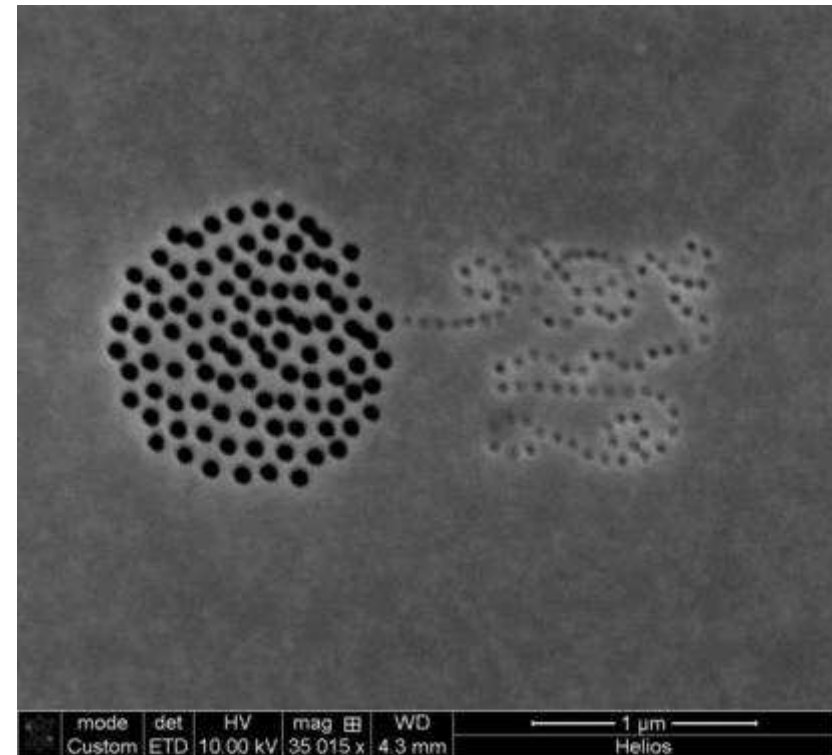


Focused Ion Beam Principle



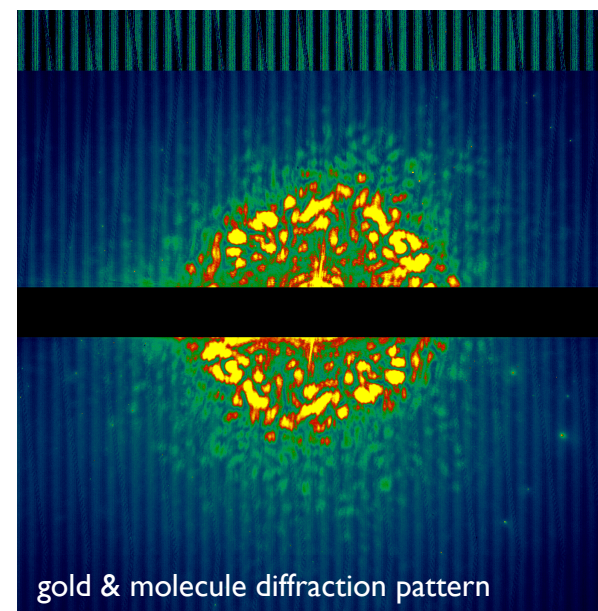
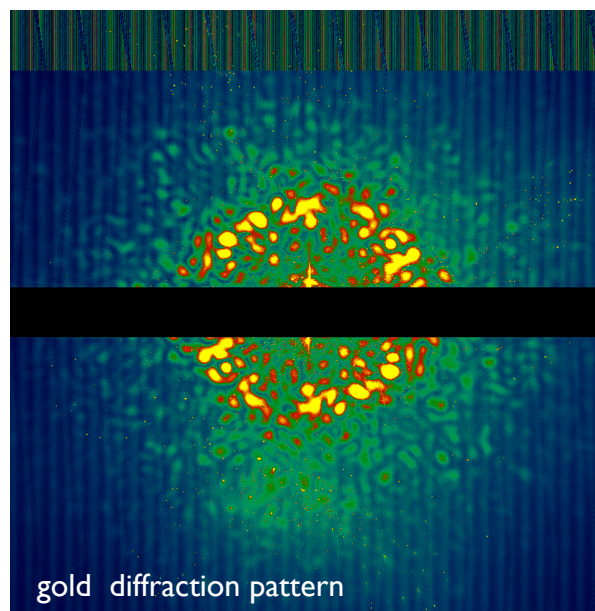
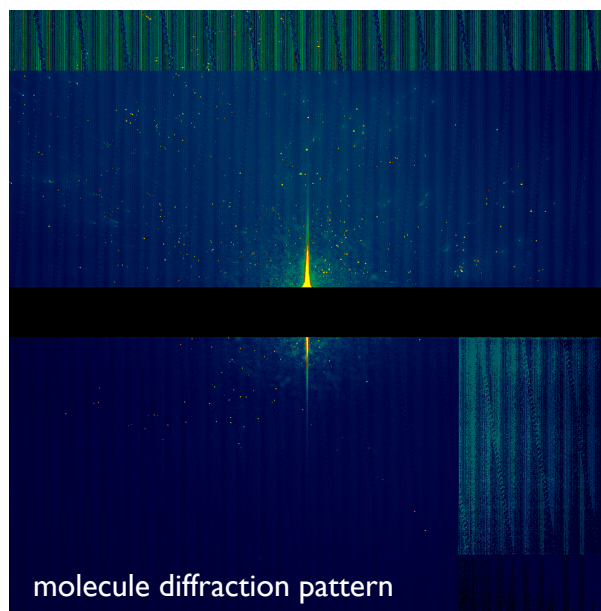
- FIB systems use a focused ion beam of gallium that can be operated at low beam currents for imaging or highbeam currents for site specific sputtering or milling.

- Patterns were milled on the 300nm Si_3N_4 + 70nm Tungsten substrate.

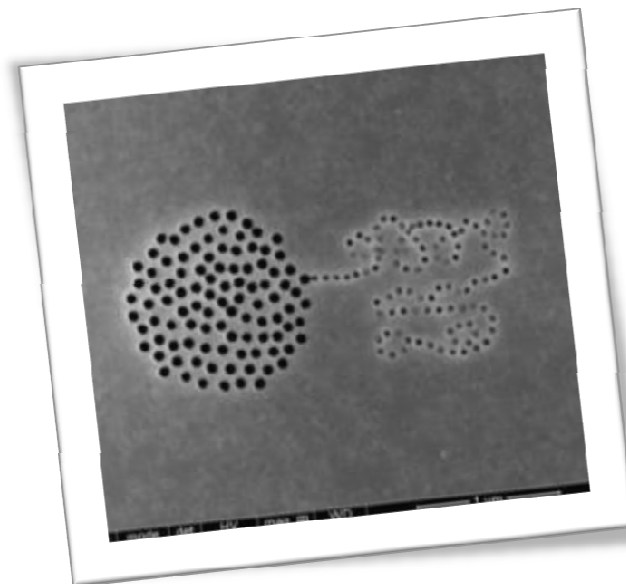


Sample Preparation

Experiment and Result



By using a combination of advanced gold labeling technology and intense x-ray pulses from x-ray FELs, we can study the structures of various proteins with a resolution close to few angstroms, without crystallization.



Thank you for your attention!

