

300 kV Cryogenic Transmission Electron Microscopy

Facilitating Near-Atomic Resolution
Three-Dimensional Microscopy

David Belnap

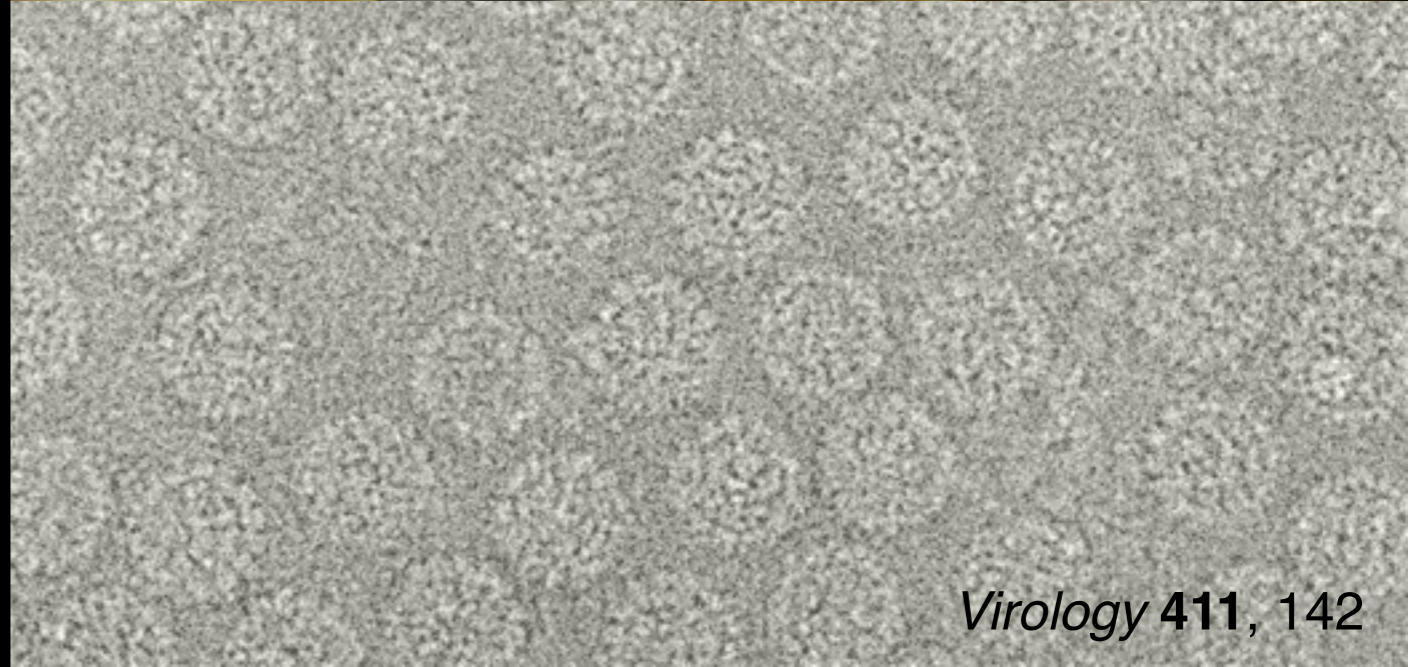
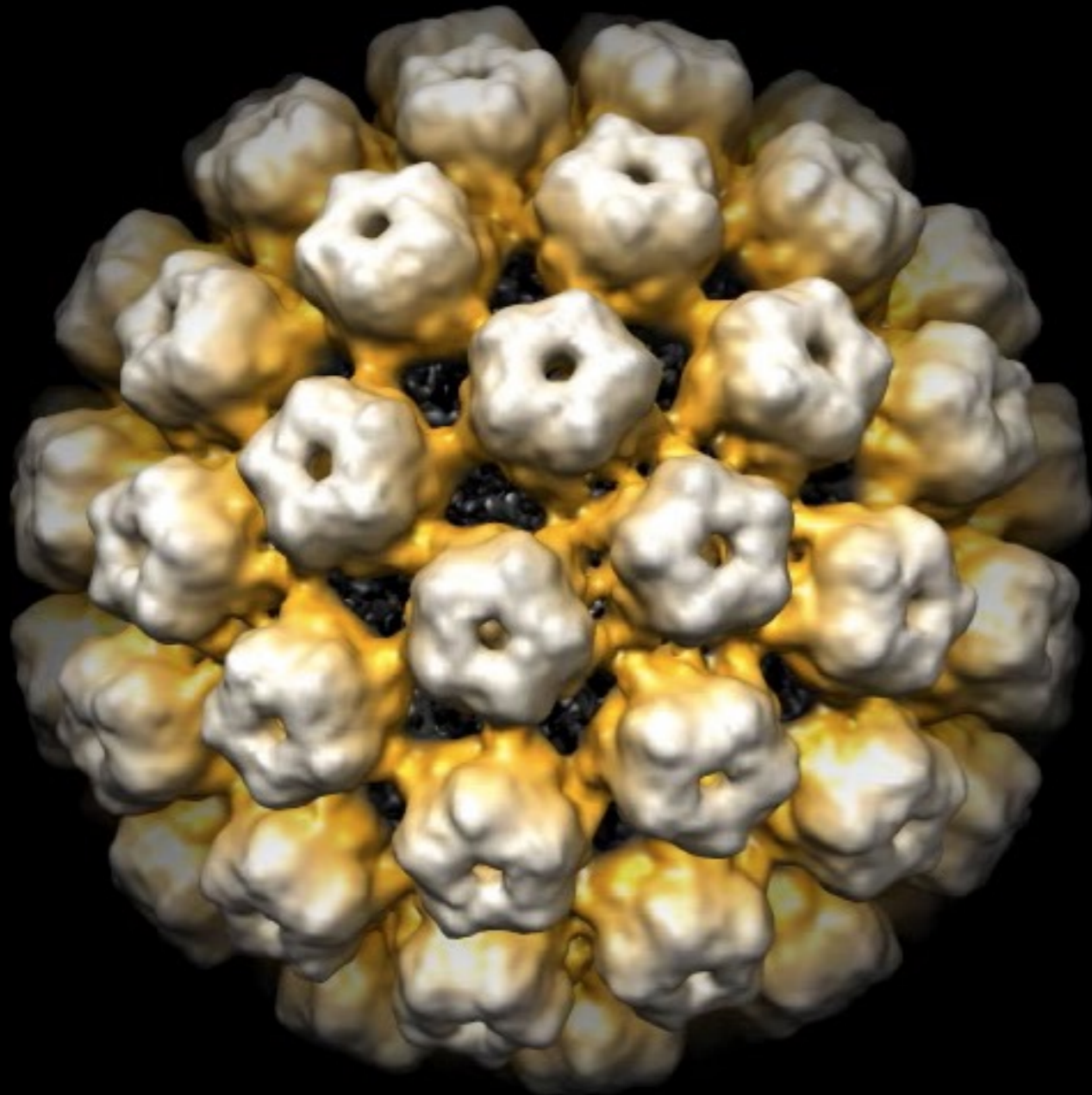
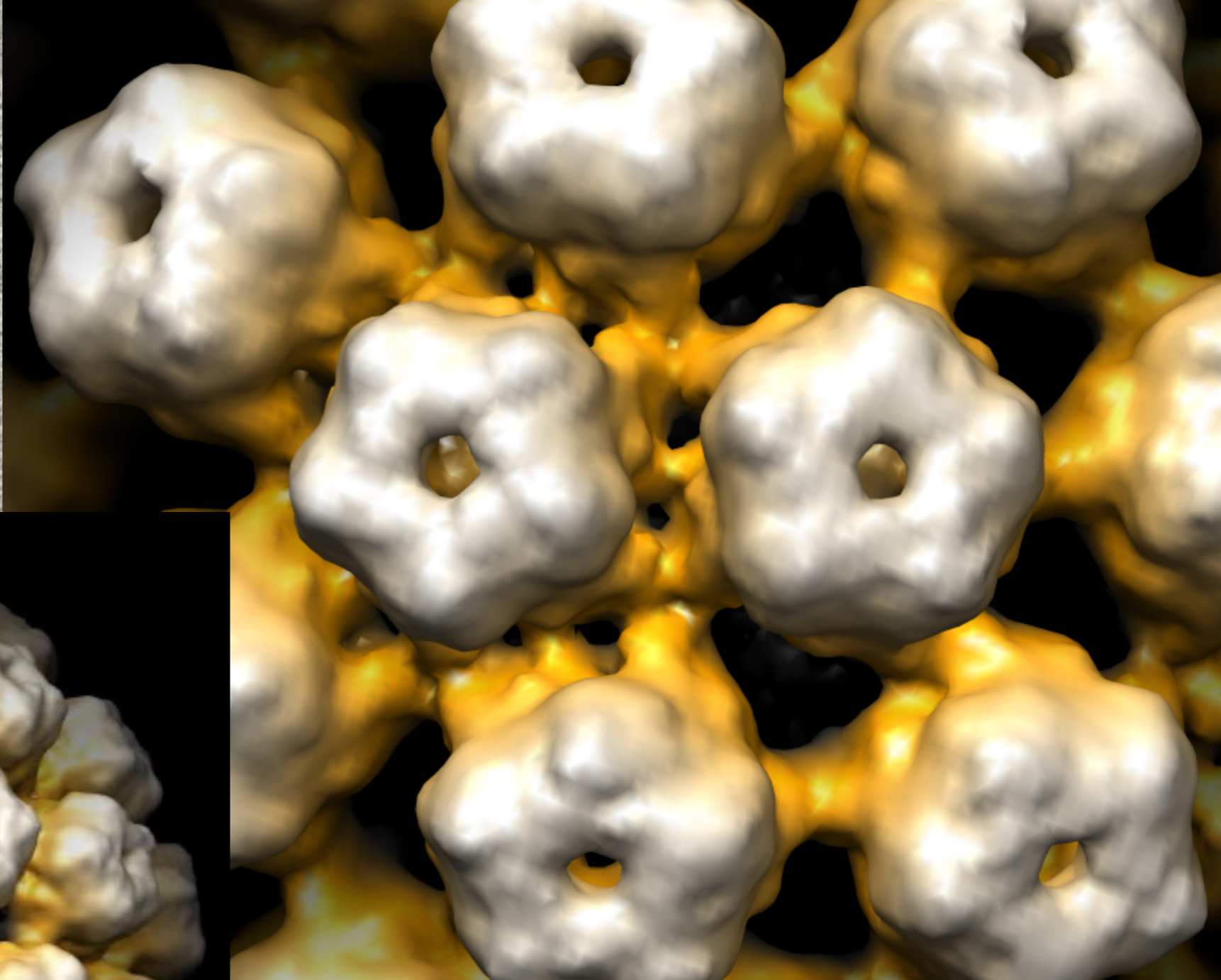
Electron Microscopy Core Laboratory

Health Sciences Center & Department of Biology
University of Utah



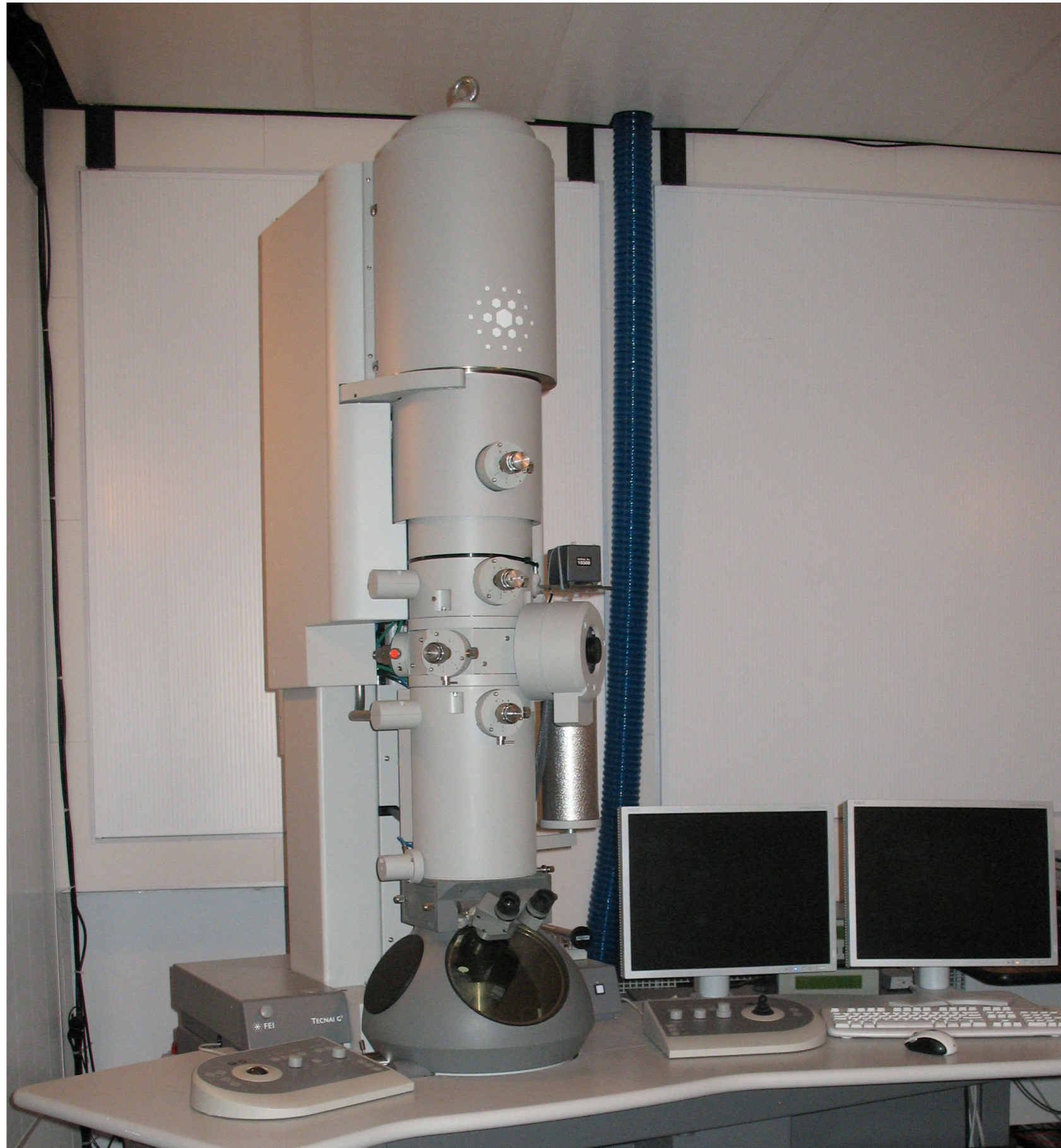
3D Cryo-TEM

Avian polyomavirus



Current Equipment

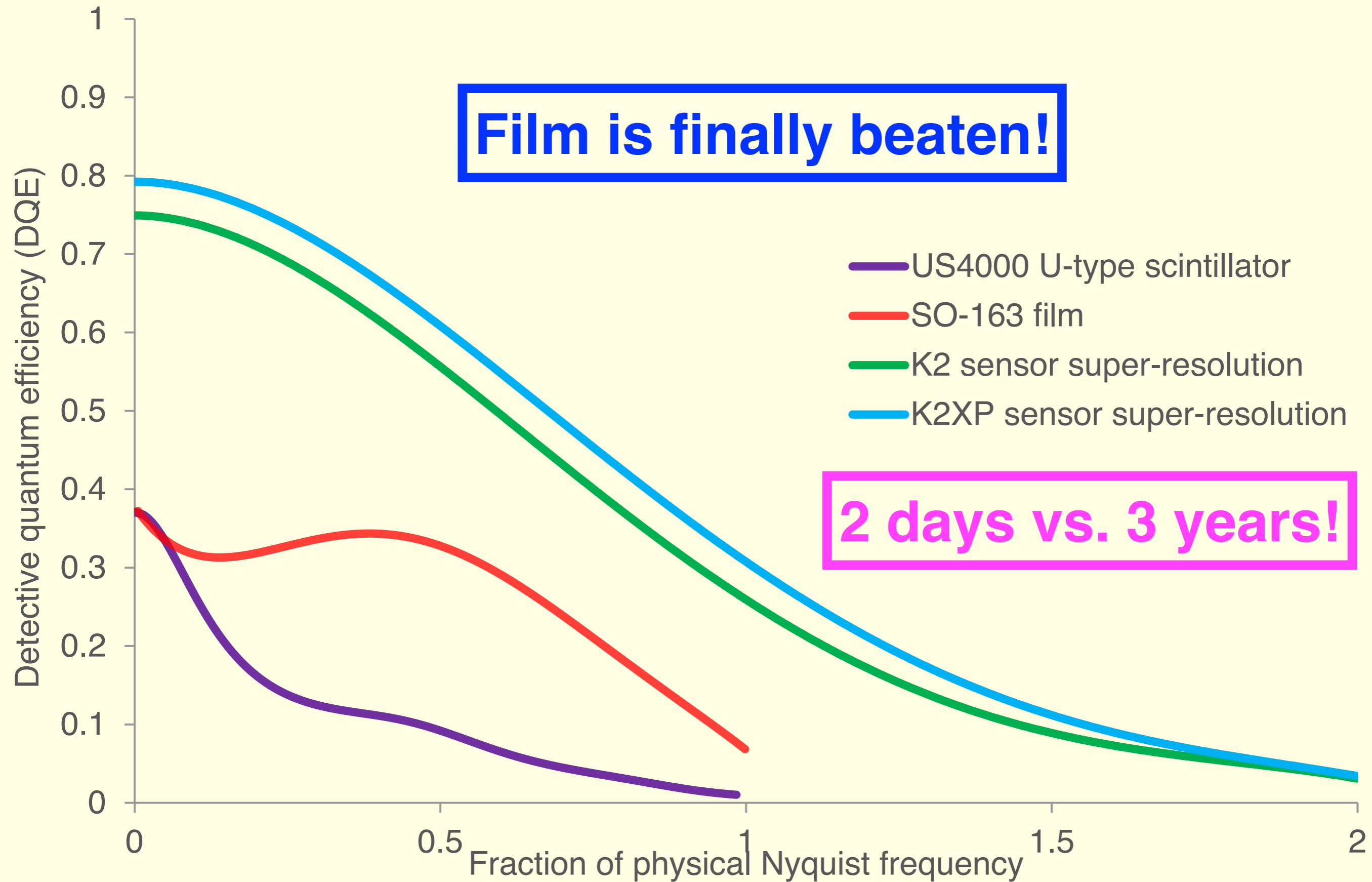
FEI Tecnai F20



Gatan, K2 Summit



Detector Efficiency



Atomic Resolution TEM, Hard Material

Au

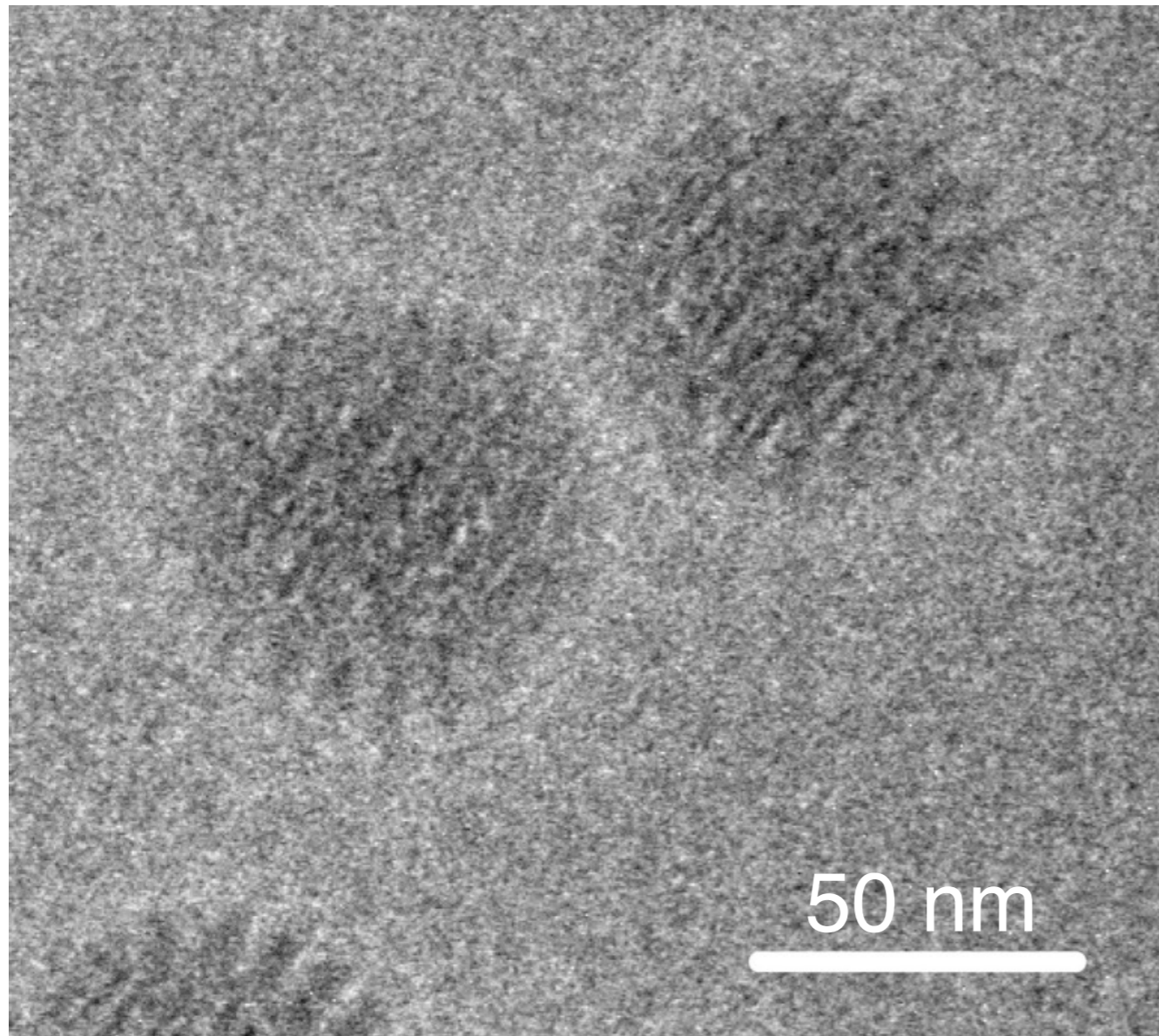
10 nm

This is a high-resolution transmission electron microscopy (TEM) image showing the atomic structure of a hard material. The image displays a complex lattice of atoms, with a central region showing a distinct, more ordered arrangement. A scale bar at the bottom indicates a length of 10 nm. The label 'Au' is positioned on the left side of the image.

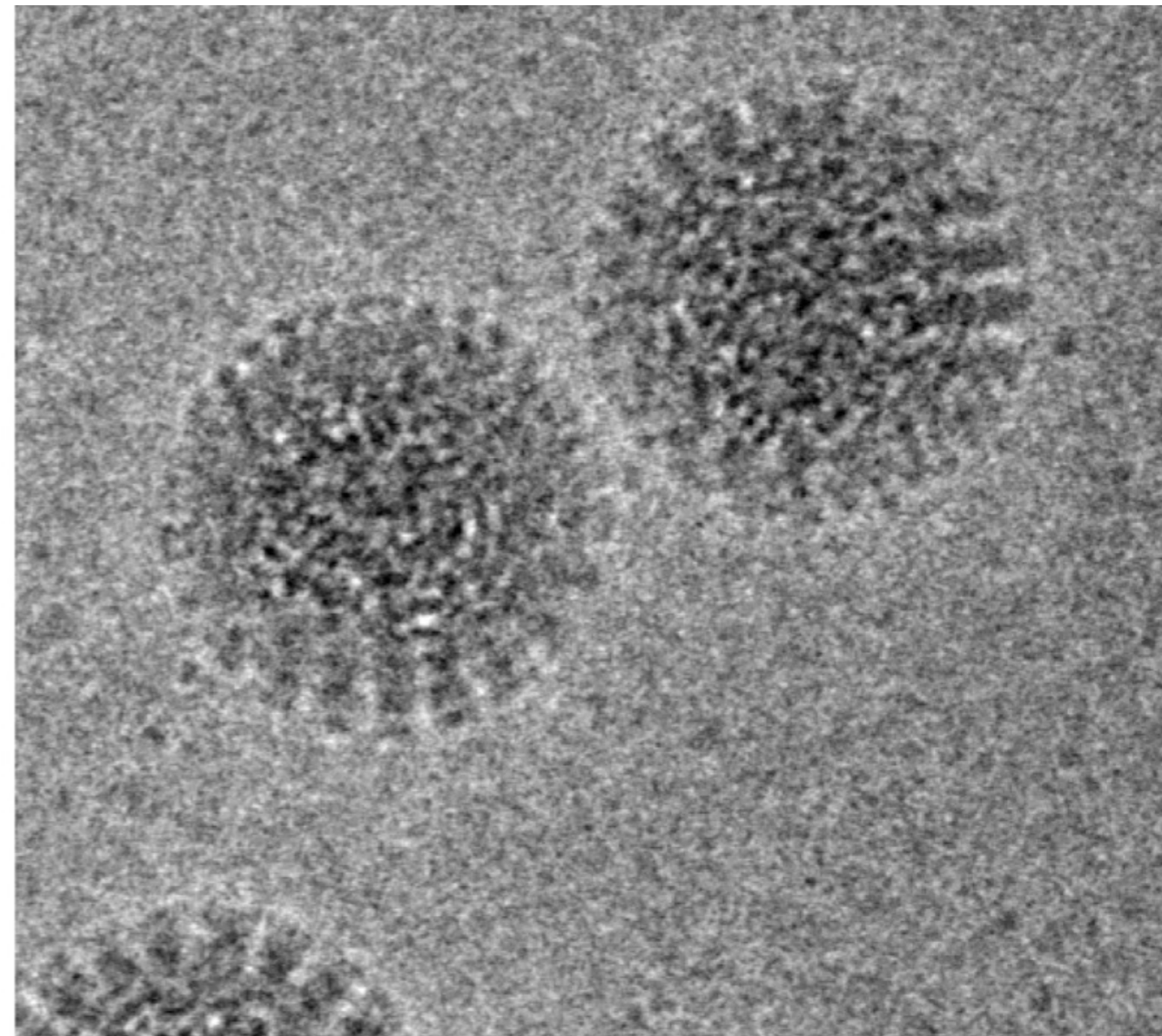
Fast Cameras Showed Movement in Ice

Averages of 60 frames

unaligned frames



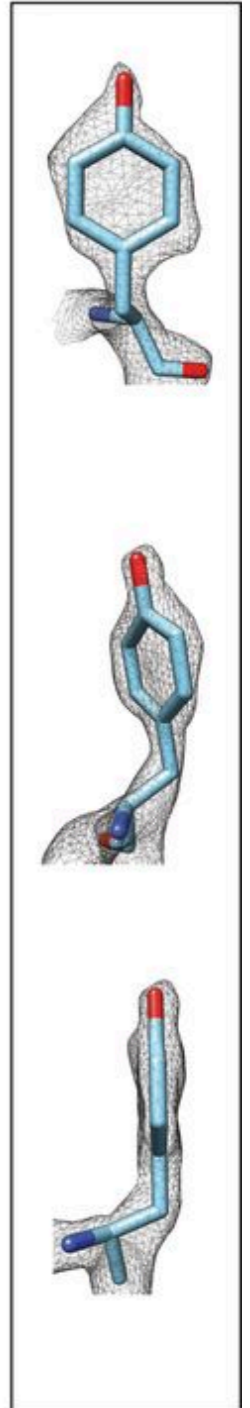
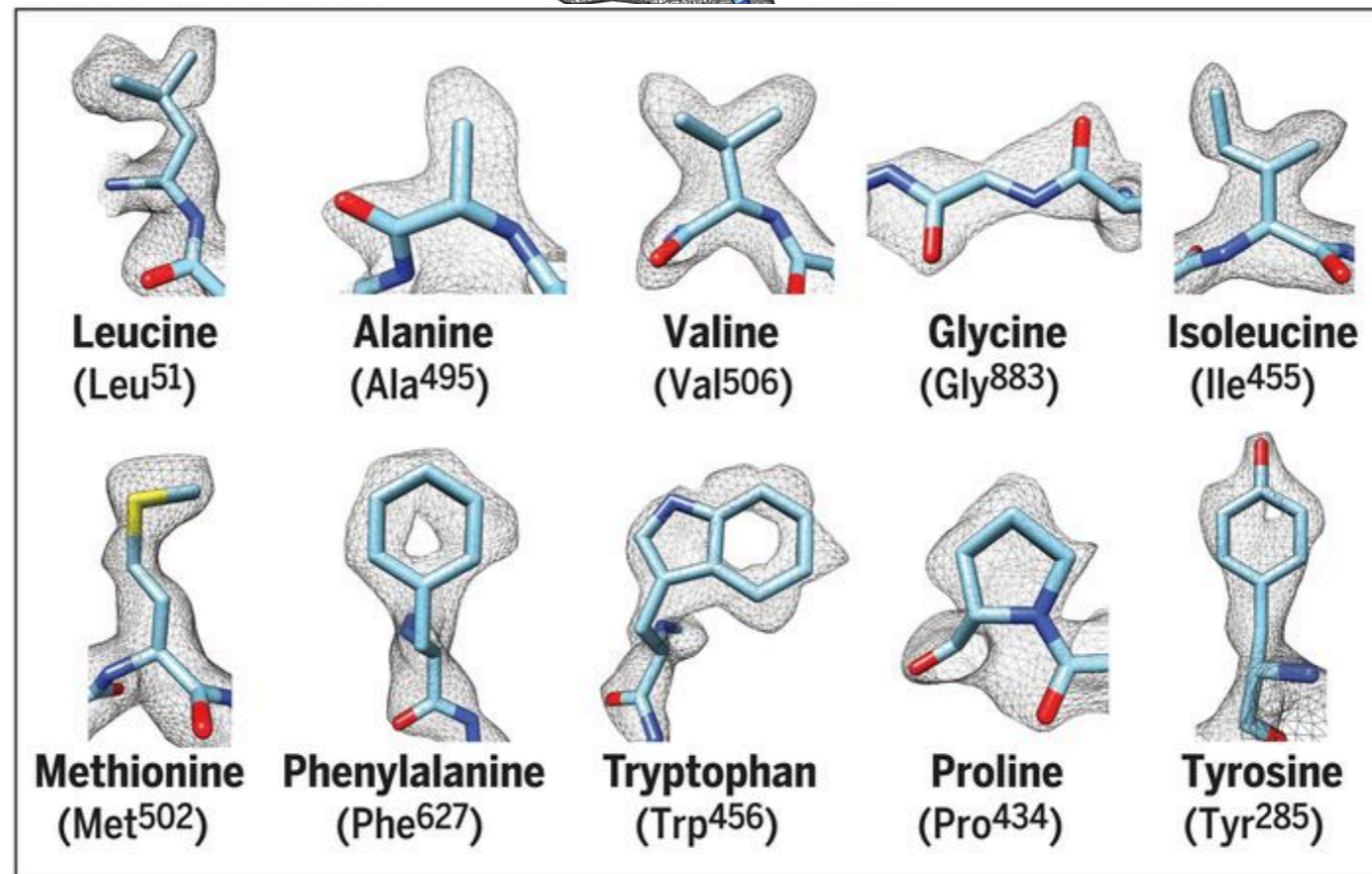
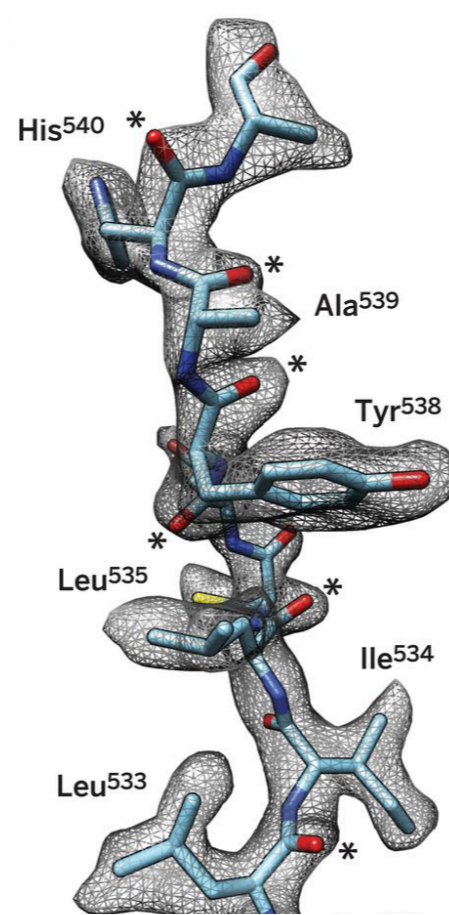
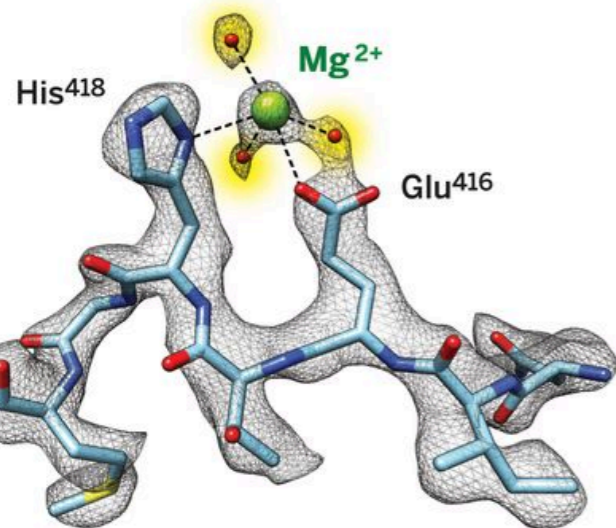
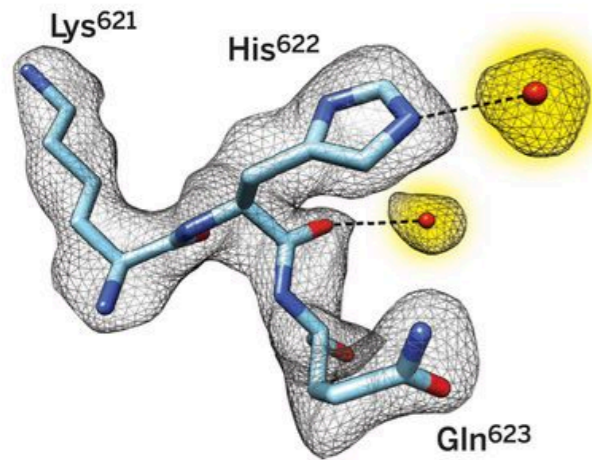
aligned frames



Near-Atomic Resolution from TEM Images

β -galactosidase

2.2-Å resolution



Advantages of FEI Titan

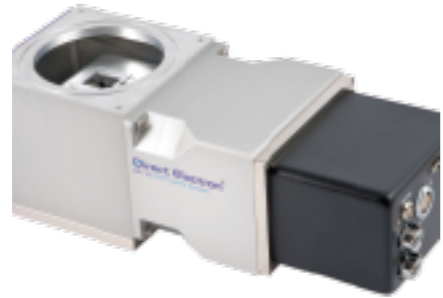
- more stable stage
- better depth-of-field
- improved lens stability
- improved stability with respect to the room environment

Room being built to specifications
in new Crocker Science Center



courtesy FEI

Direct Electron Detectors



Direct Electron, DE-12 and DE-20

www.directelectron.com



Gatan, K2 Summit

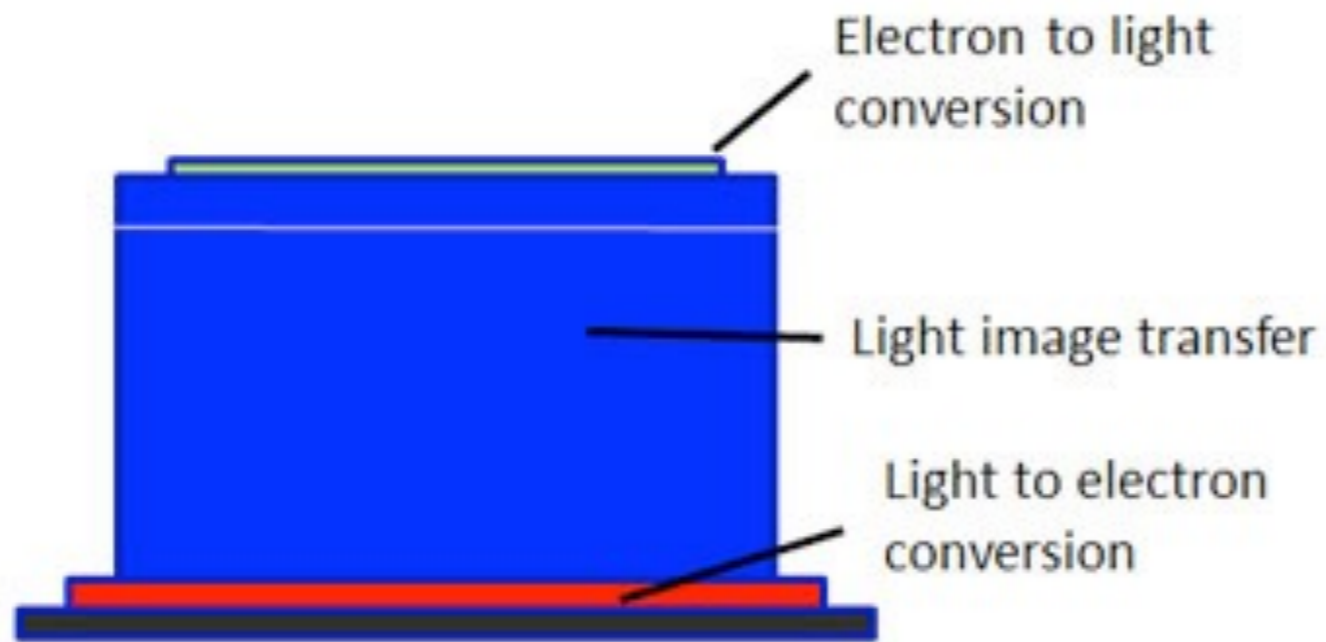
www.gatan.com

FEI, Falcon I and Falcon II

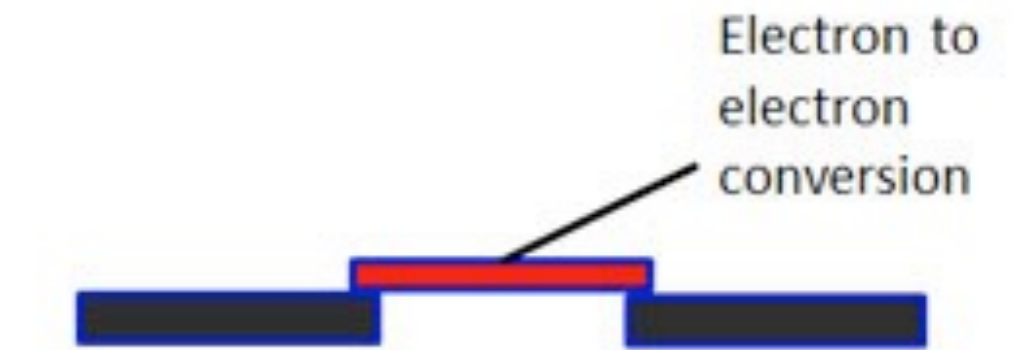
www.fei.com

Charge-Coupled Device vs. Direct Electron Detector

CCD



DED



One
Step