UK Light Source Review

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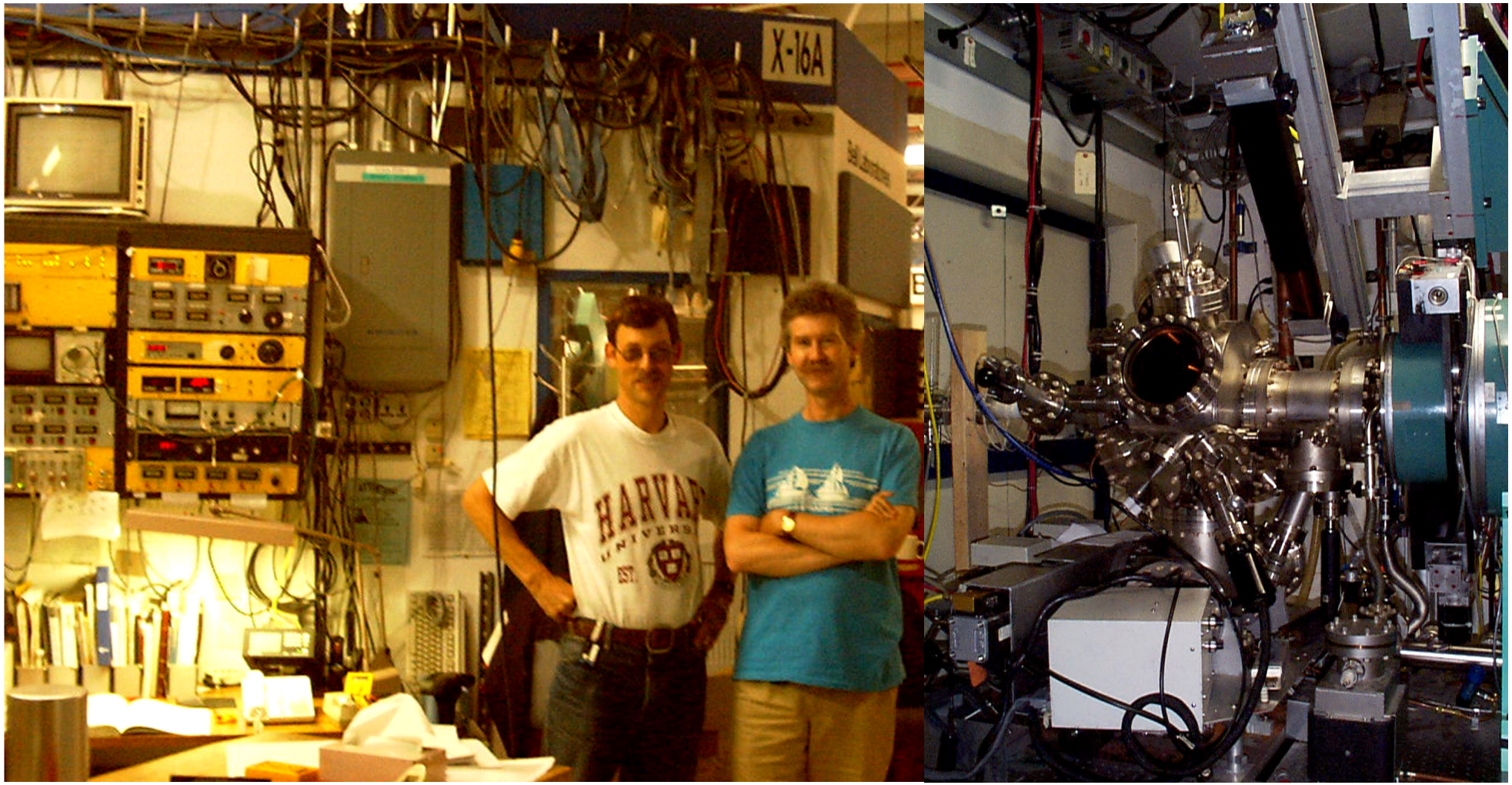
London Centre for Nanotechnology
(University & Imperial Colleges)
Diamond Light Source

Research Track Record

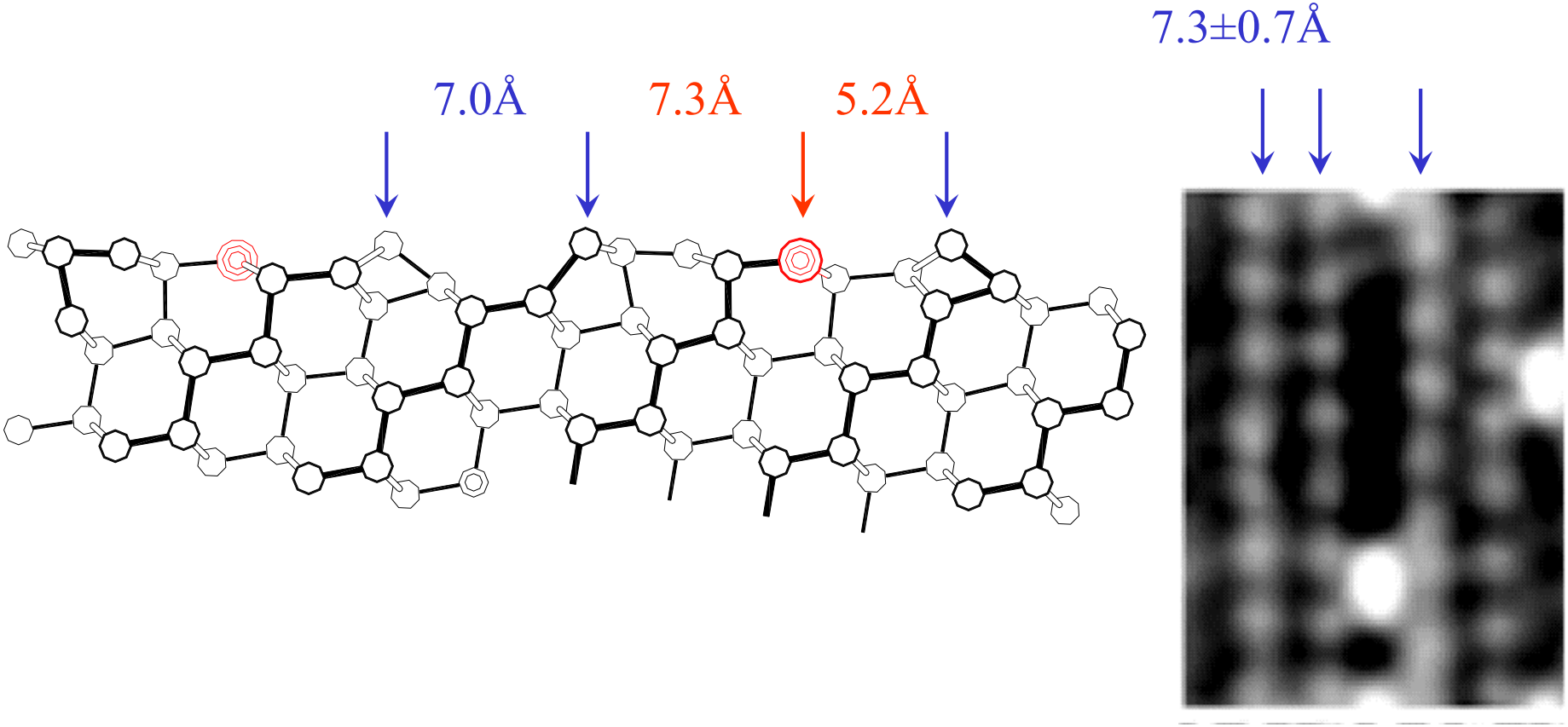
- Bell labs – surface X-ray diffraction (NSLS)
- UIUC – coherent X-ray diffraction (APS)
- LCN – imaging science (DIAMOND)
- Strong proponent of university involvement in facility/technique development

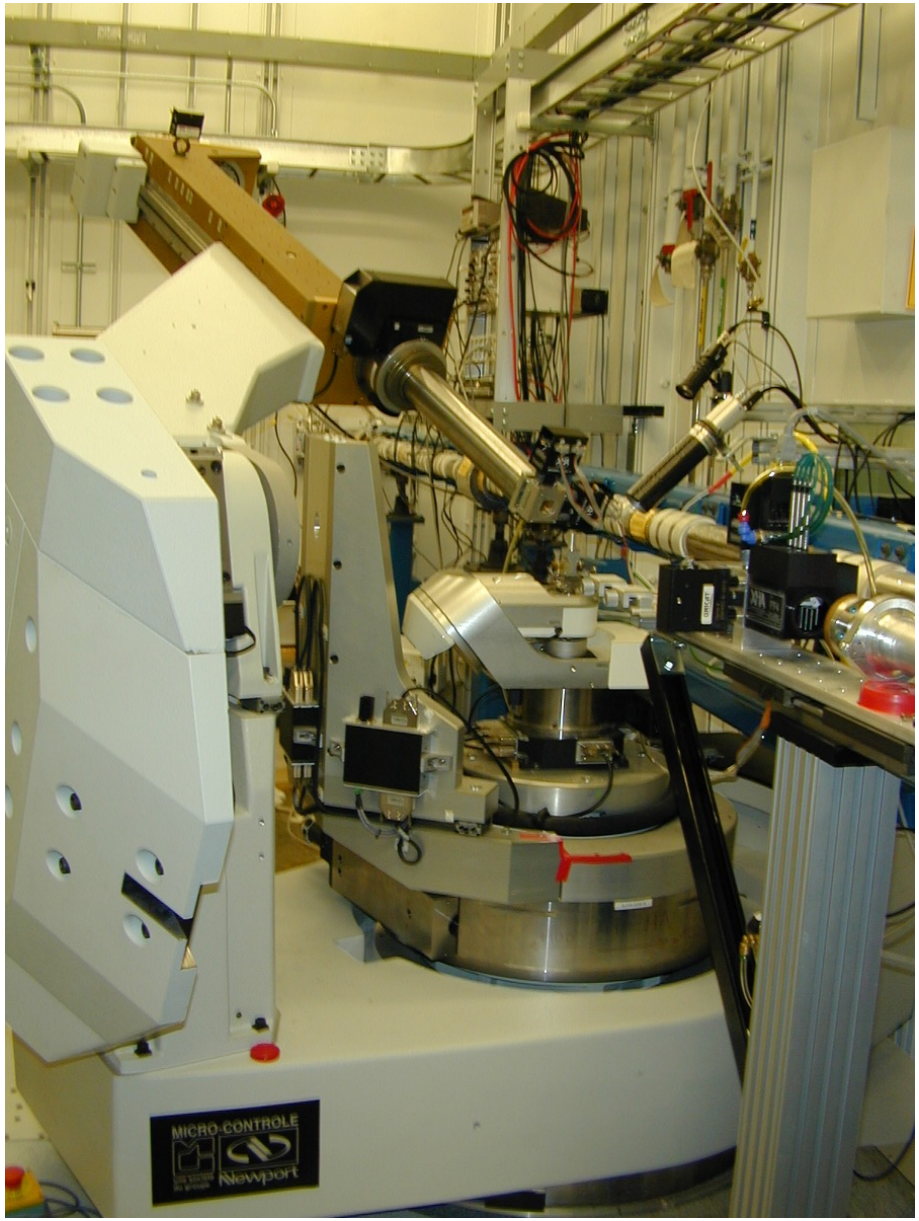
X16A Surface X-ray Diffraction

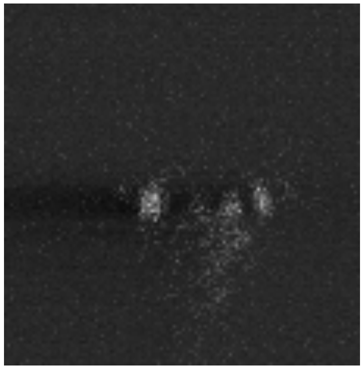
operating 1987 to 2004

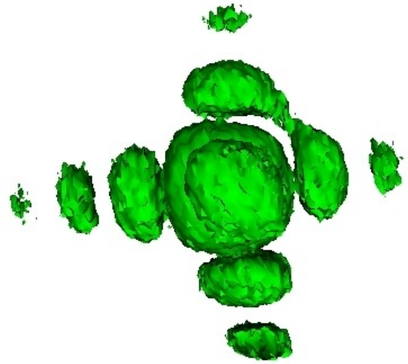


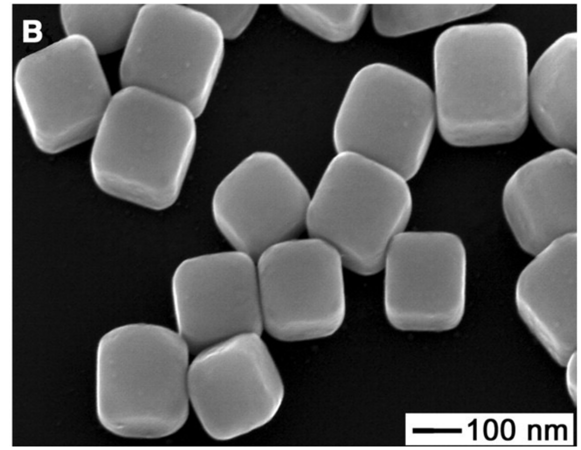
Quantum Wires in Au/Si(557)

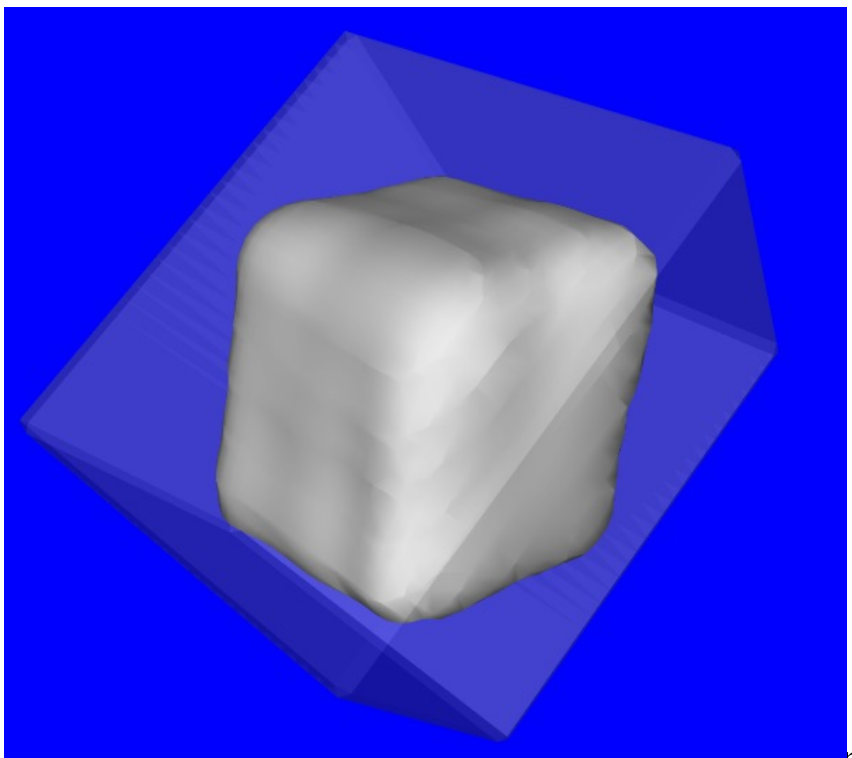


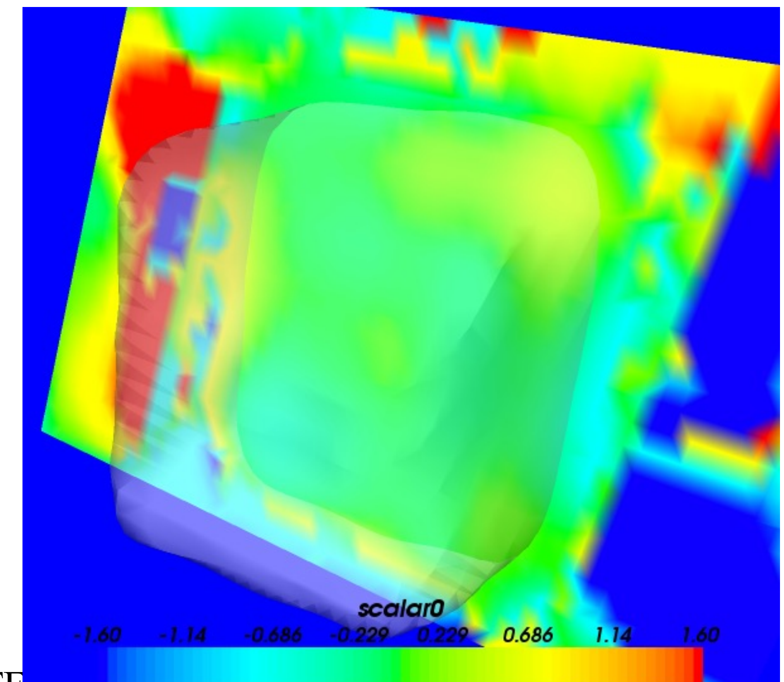

MICRO-CONTROLE
Newport





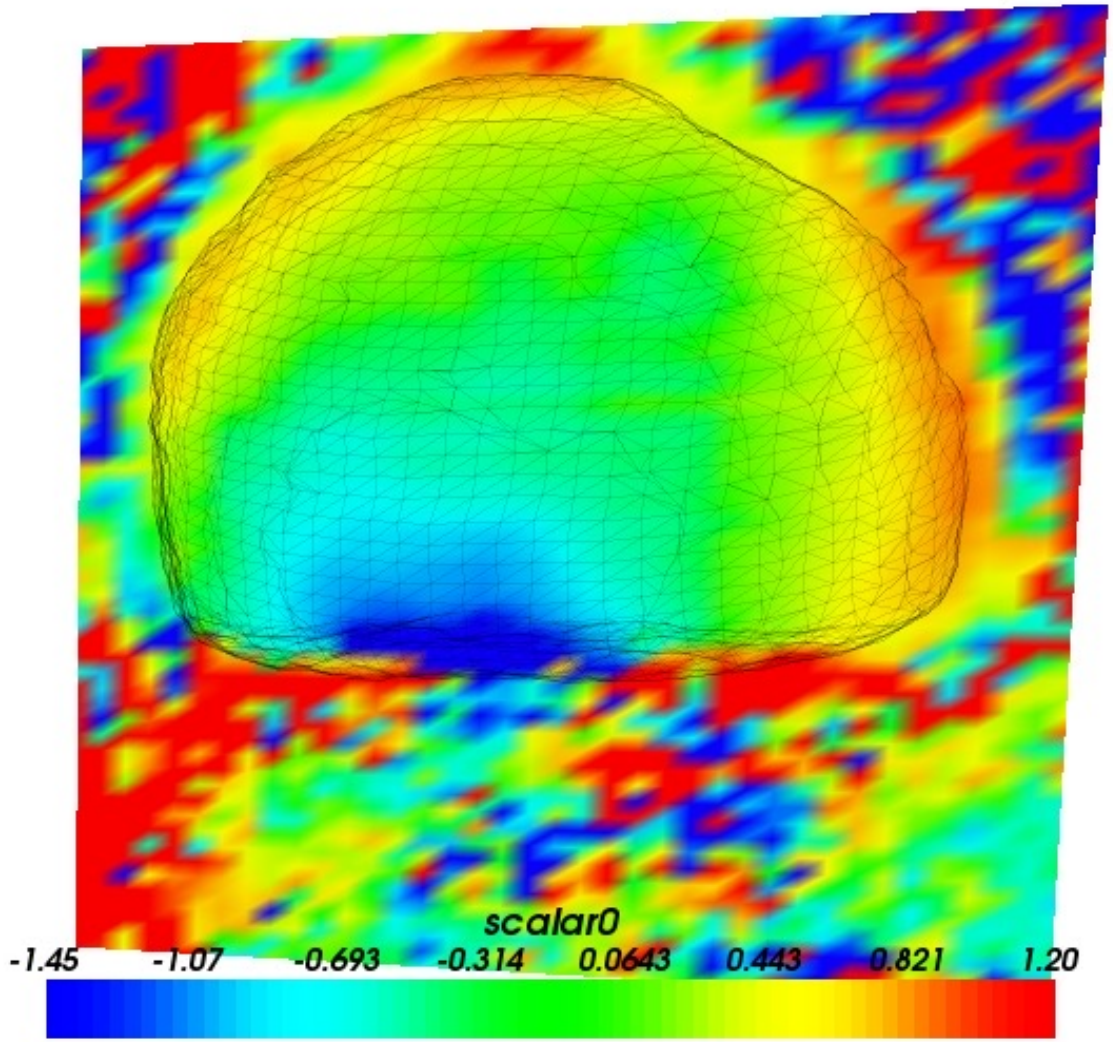

B
100 nm




scalar0
-1.60 -1.14 -0.686 -0.229 0.229 0.686 1.14 1.60

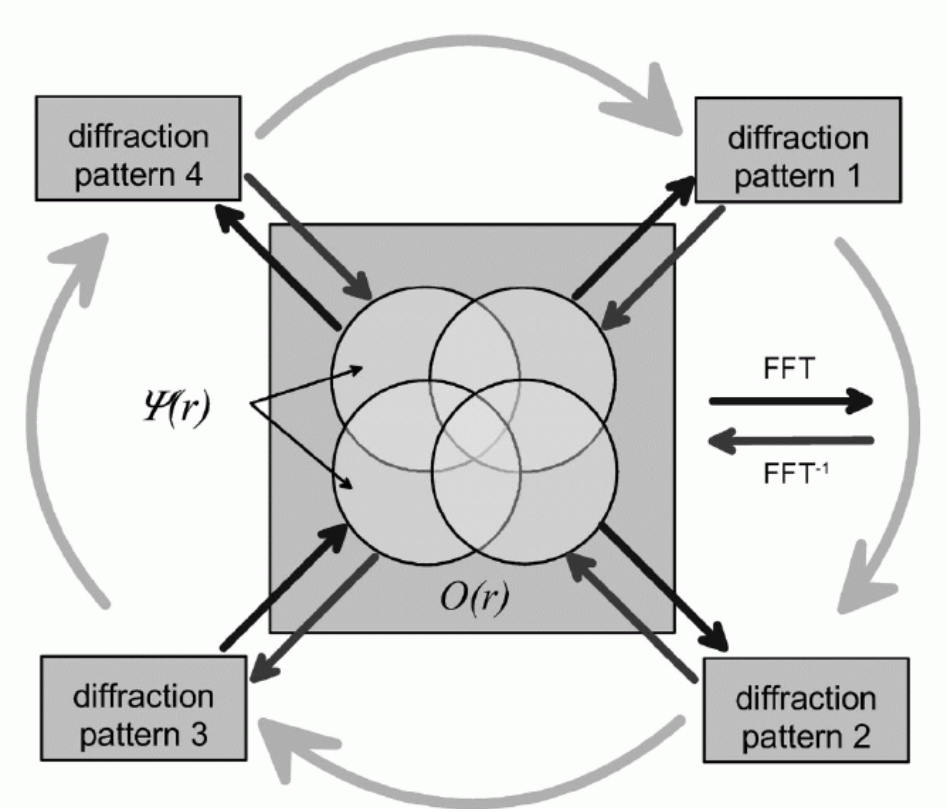
3D Strain Map of Pb Nanocrystal

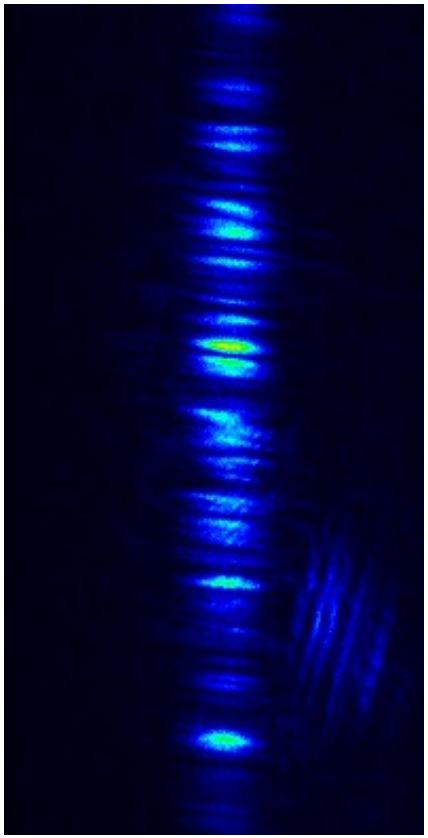
including correction for refraction by crystal



Future of CXD: Ptychography

Rodenburg & Pfeiffer, PRL (2007)





Ptychography algorithm

STFC Next Generation Facilities programme

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FeAl antiphase domains (001)

Lorenz Stadler, PhD dissertation, Universität Wien (2005)

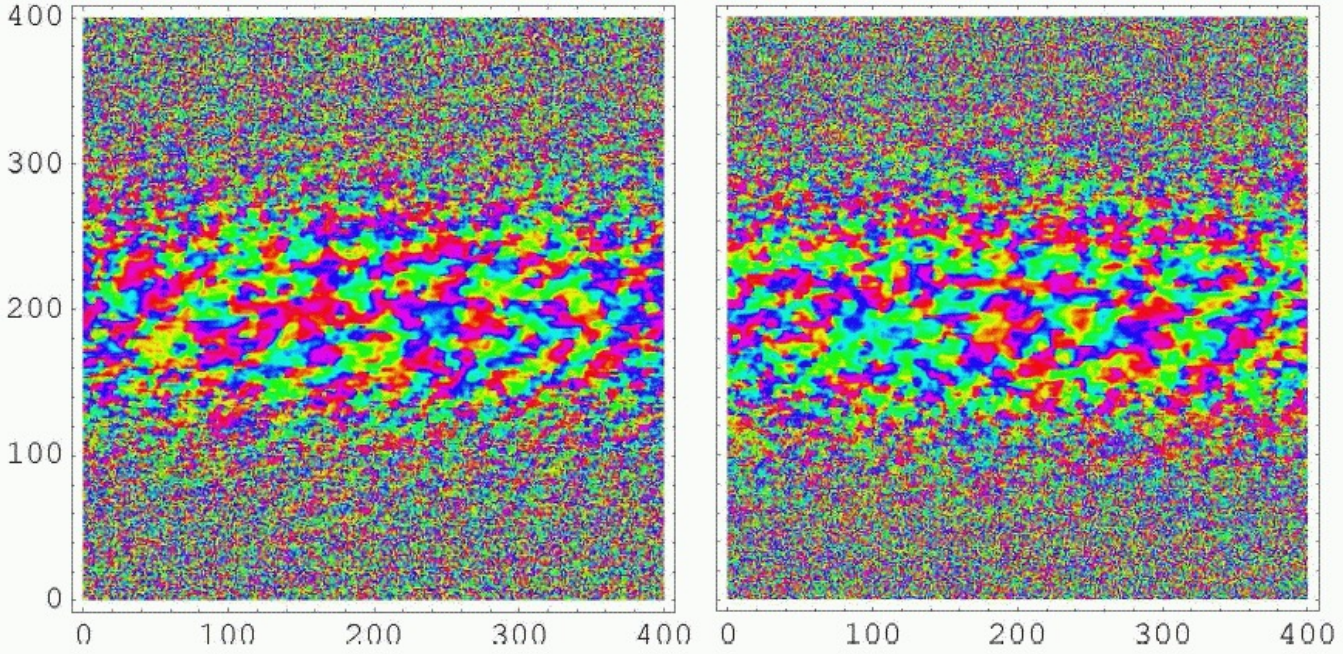
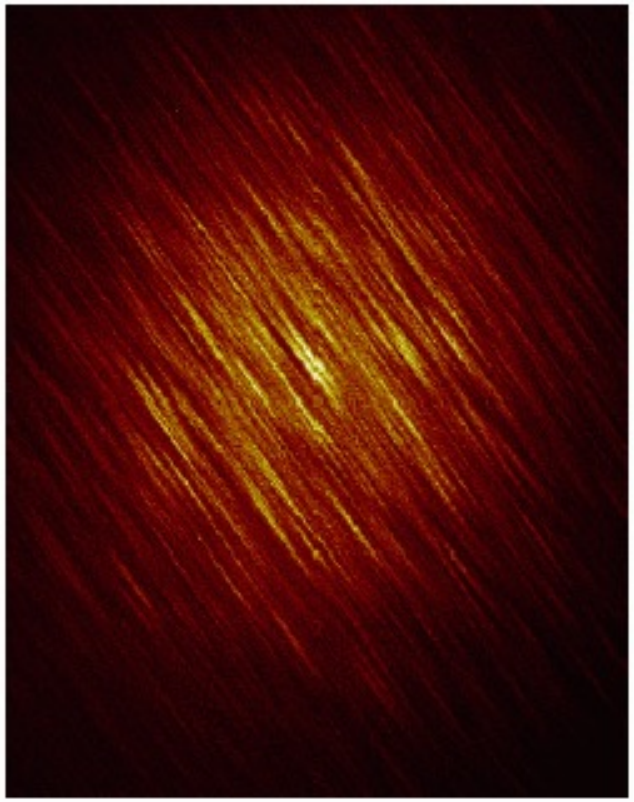
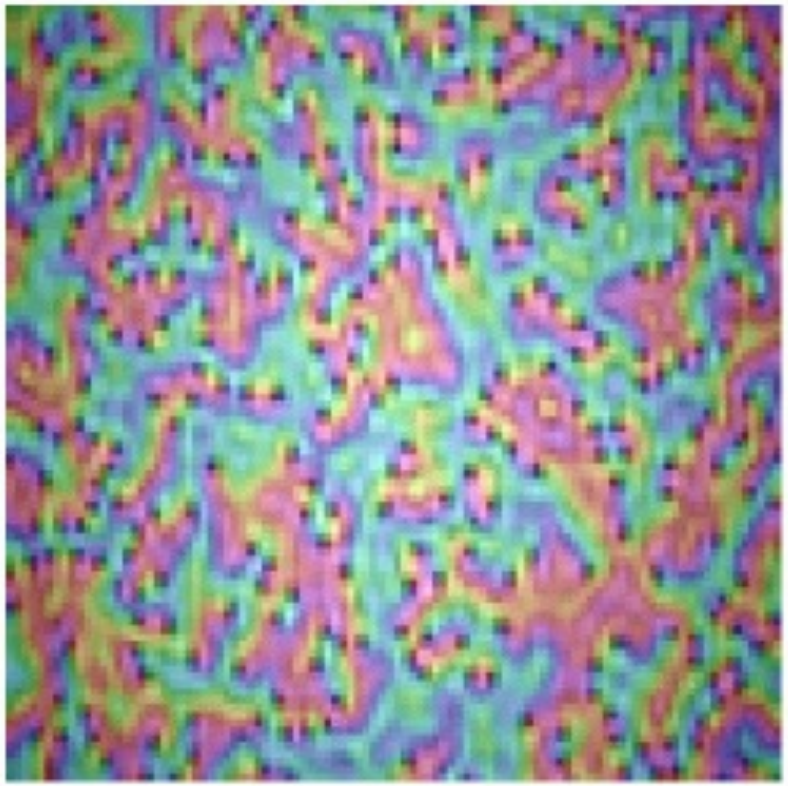


Figure 7.11: Typical reconstructed phases from runs with different combinations of algorithms and supports derived from the 2D Gaussian fit of the illumination function. Numbers in brackets denote how many iterations of the particular algorithm were done each cycle. Graphs on the left are from reconstruc-

Phase Vortices in Cu_3Au Reconstruction



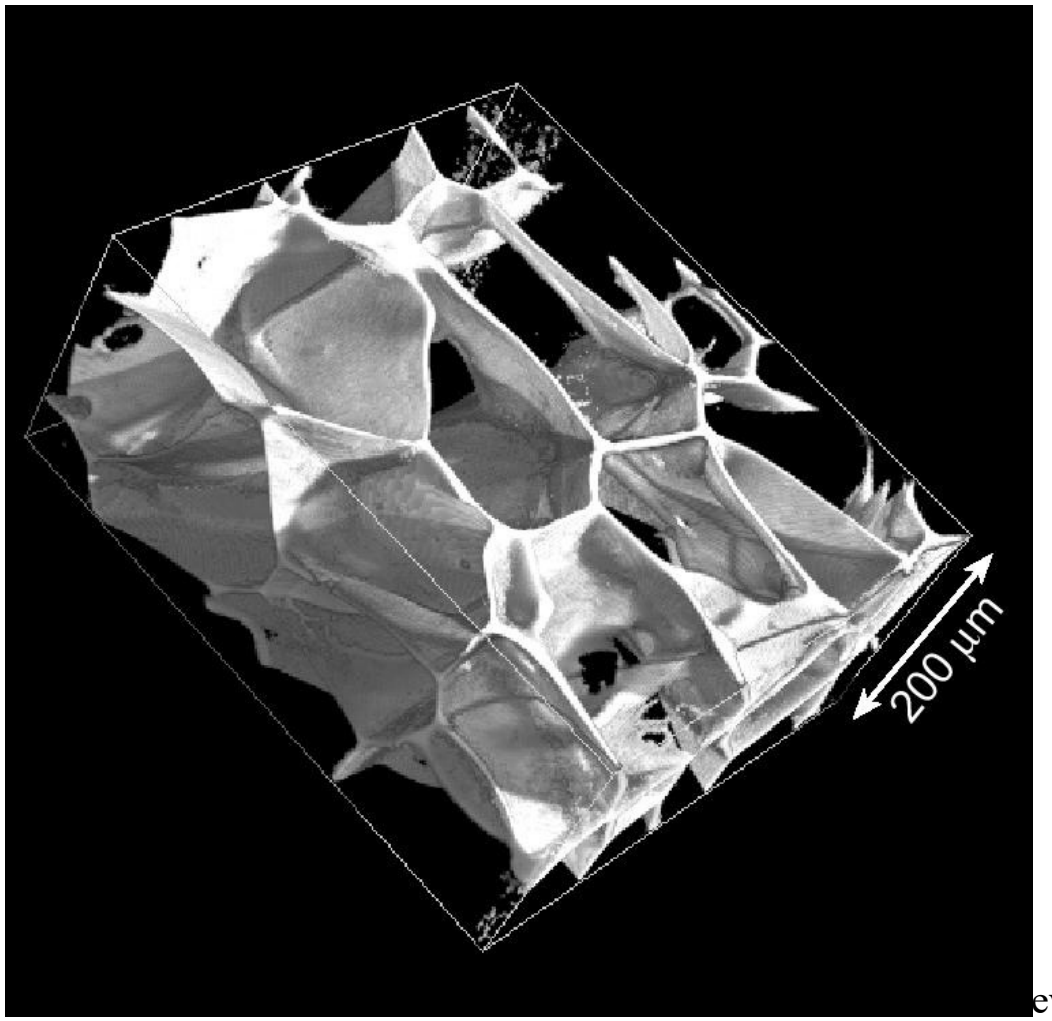


LCN research agenda

- Tomography of nanoscale materials
- X-ray microscopy/ptychography of granular materials (turbine blades, poly-Si, etc)
- Phase contrast medical imaging
- Microdiffraction of nano-sensor elements

Grain boundaries in Al-Sn alloys

C. E. Krill, K. Döbrich, D. Michels, et al., Proc. SPIE Vol. 4503 (2002), 205-212



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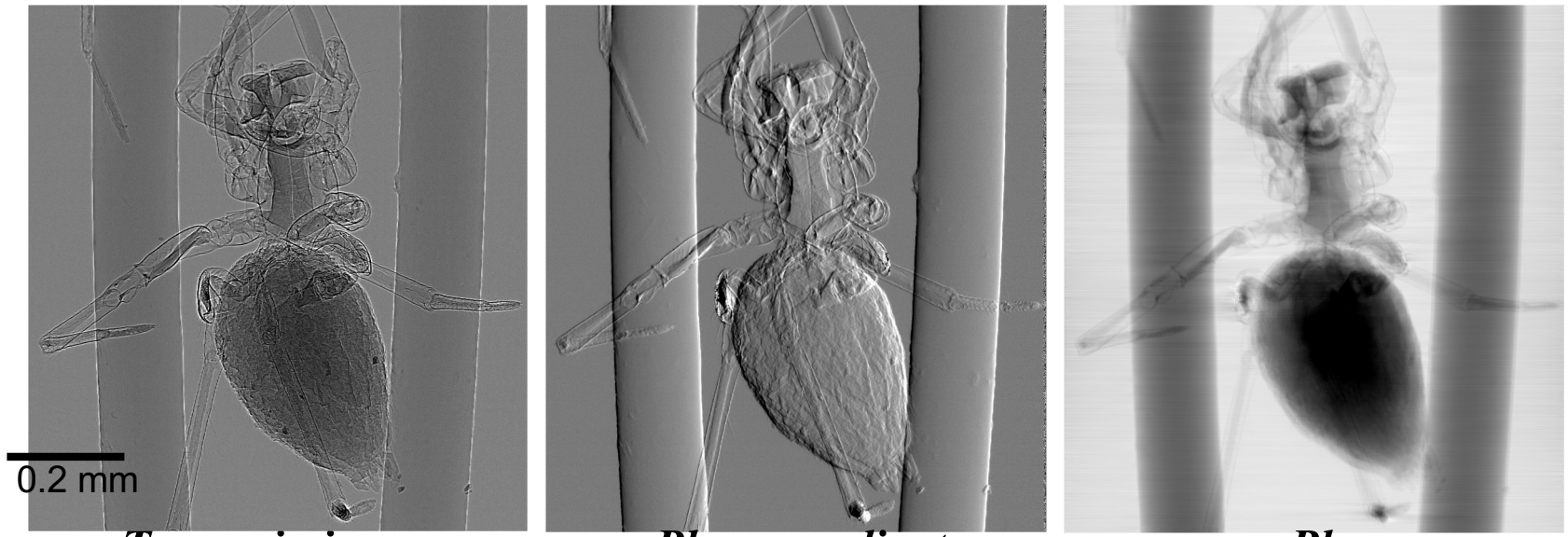
Christoph Rau
(ESRF)
now I-13 PBS

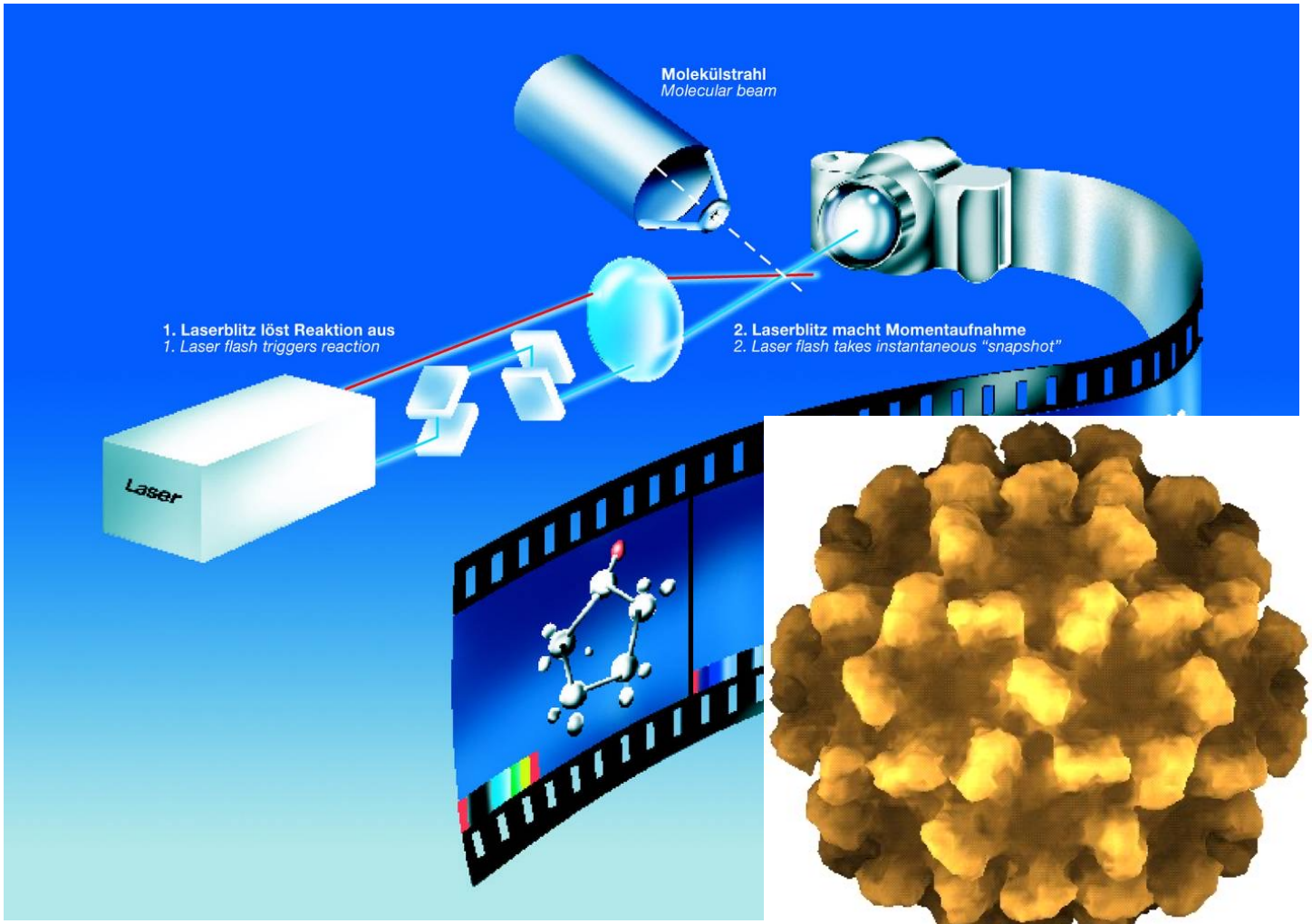
Grating results at ESRF ID19

T. Weitkamp , F. Pfeiffer, C. David, PSI



200 μm

Molecular Movies using XFEL



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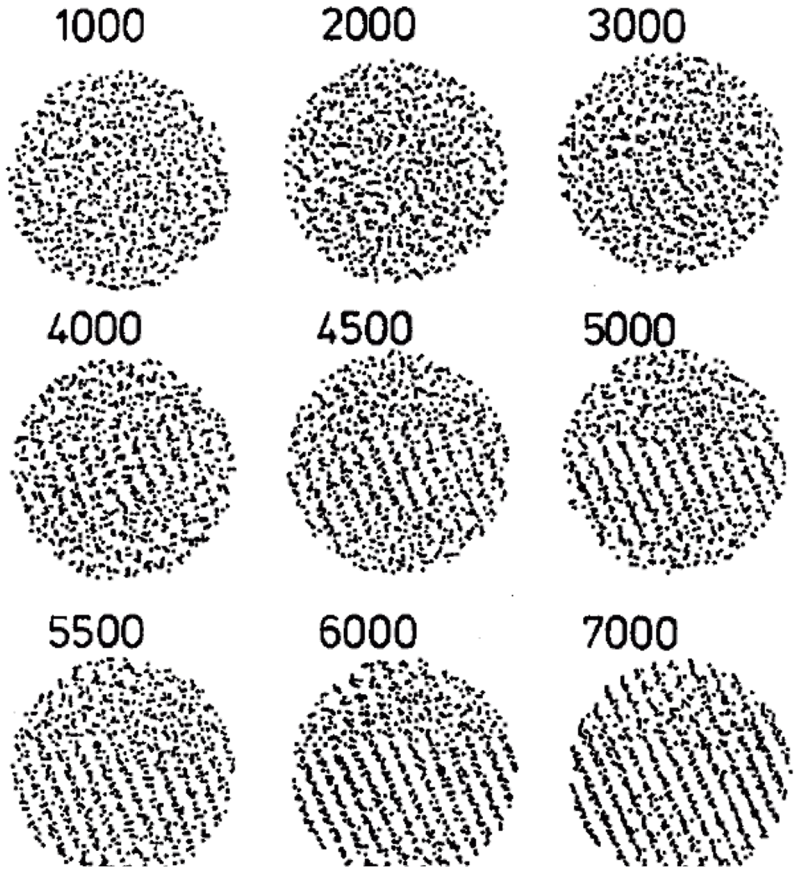
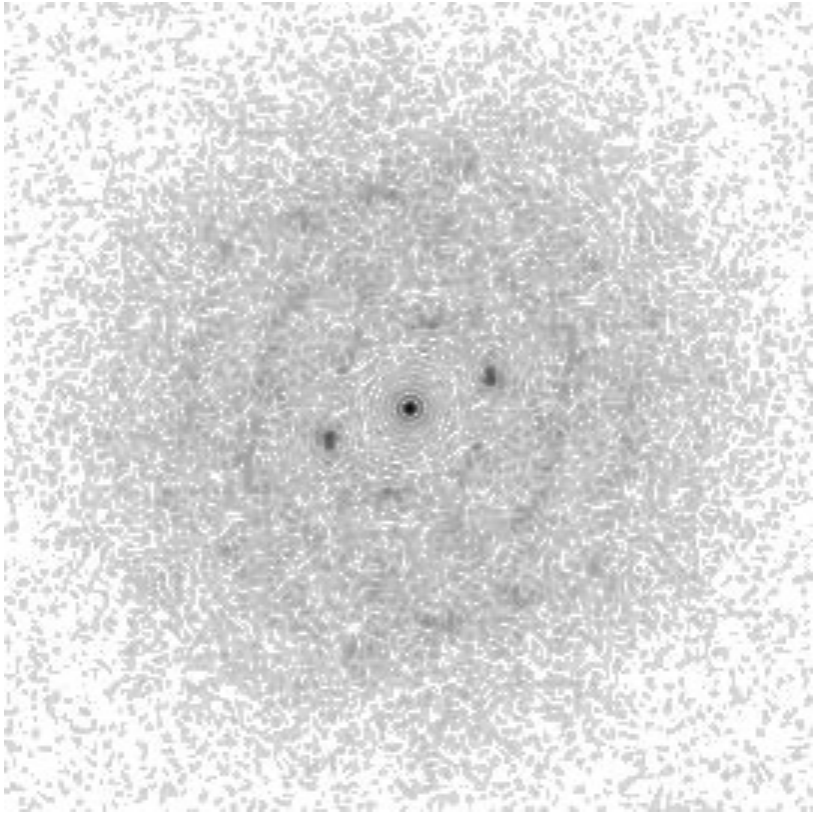
MD simulation of freezing

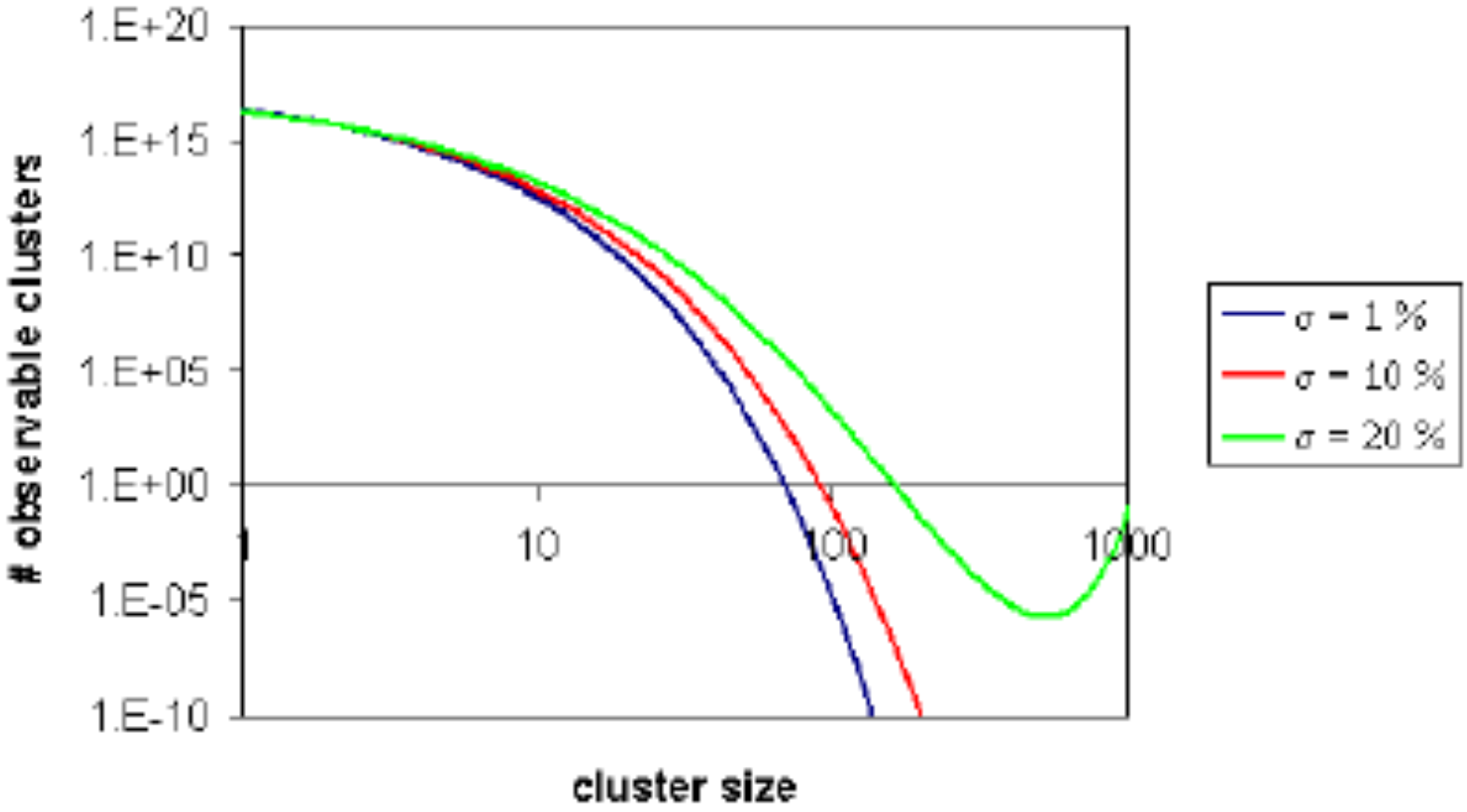
LJ liquid of 864 atoms. Time steps after T-Jump

S. Nose and F. Yonezawa, JCP 84 1893 (1986)





Nucleation cluster size distribution



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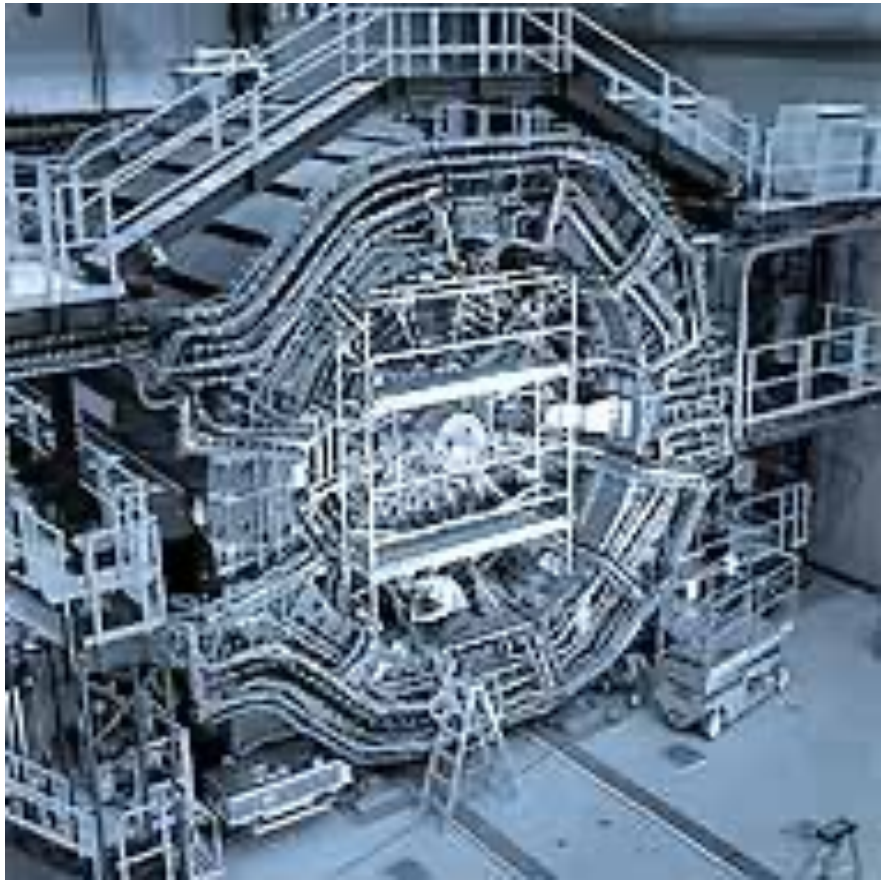
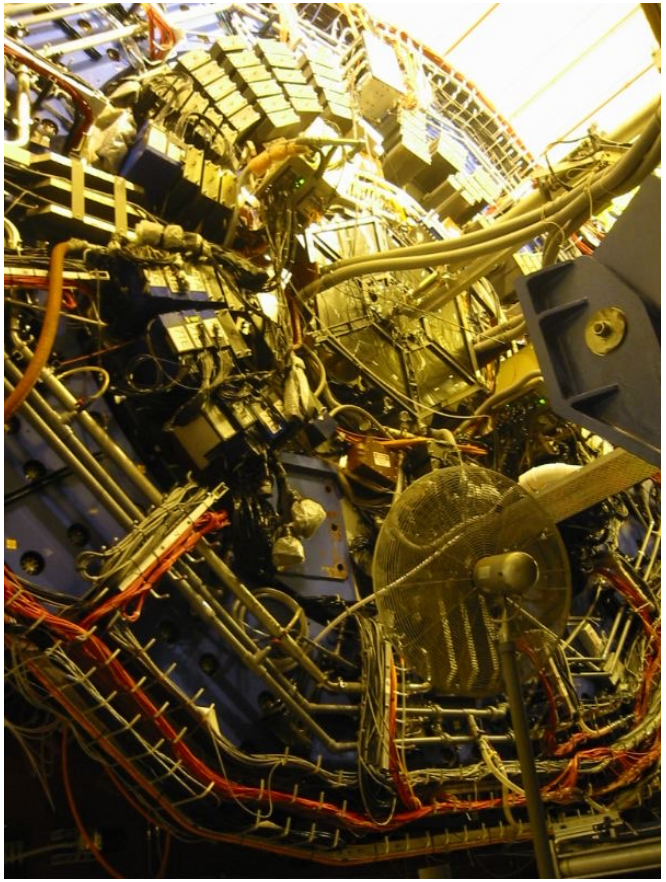
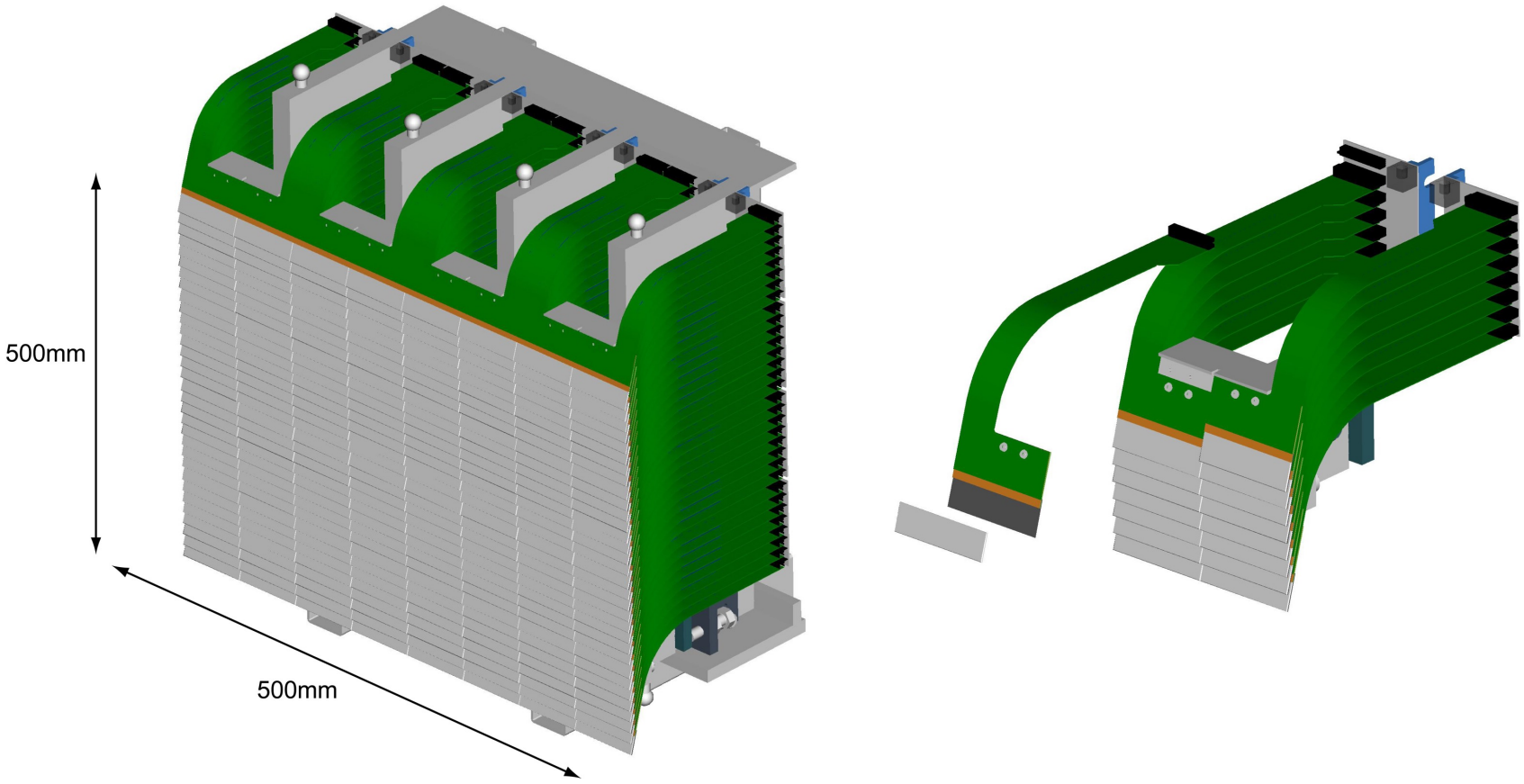
The HEP approach: detectors drive the science





UK “Large Pixel” Detector Consortium (Marcus French, RAL)



LCN facility requirements

- ESRF for Surface/Interface structure
- Diamond for CXD ptychography
- E-XFEL for imaging fluctuations
- Important to have university involvement in facility development
- Detector-centric E-XFEL planning