

FEL applications: coulomb explosion imaging of proteins

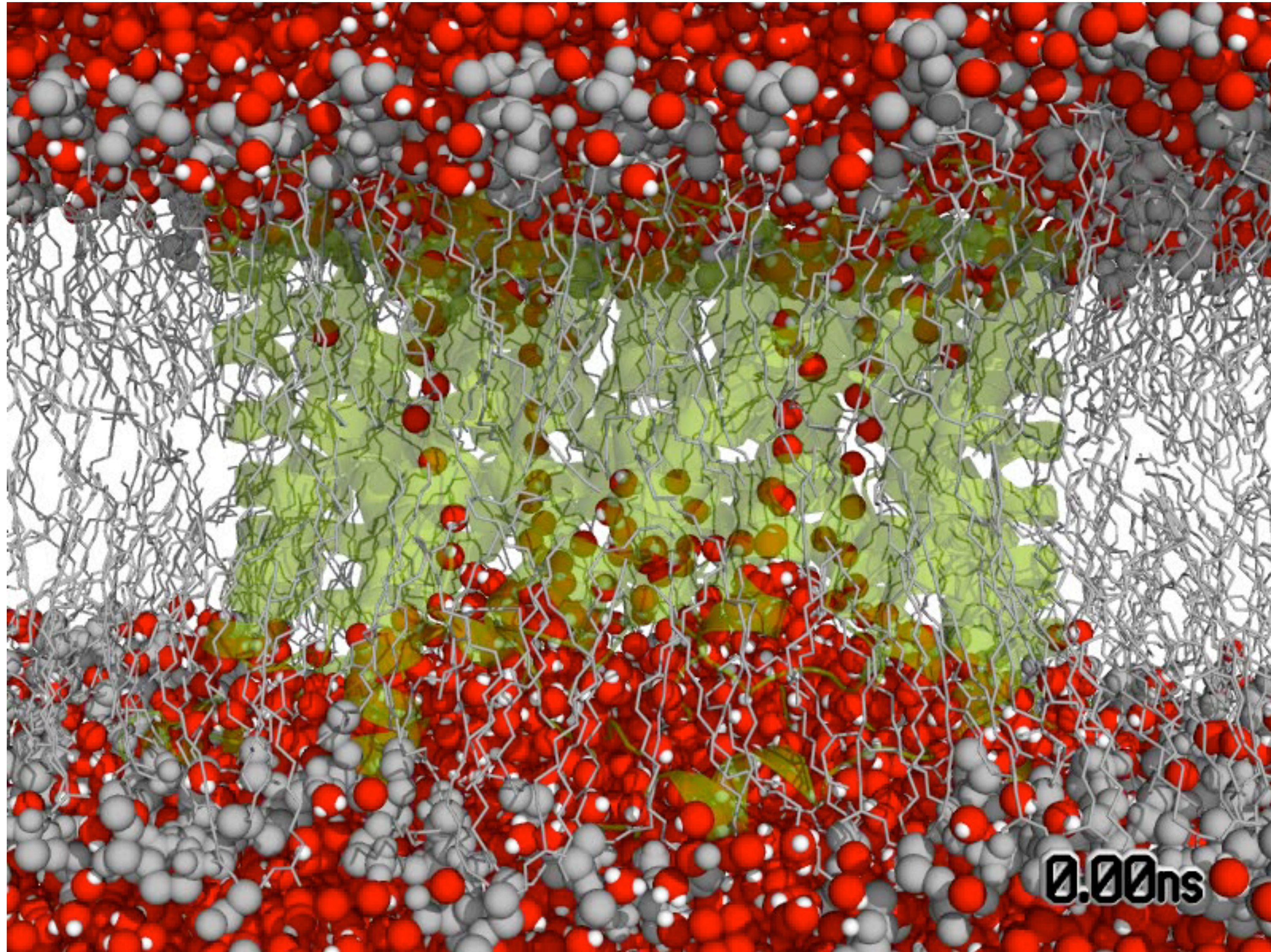
Carl Caleman

Center for Free-Electron Laser Science, DESY

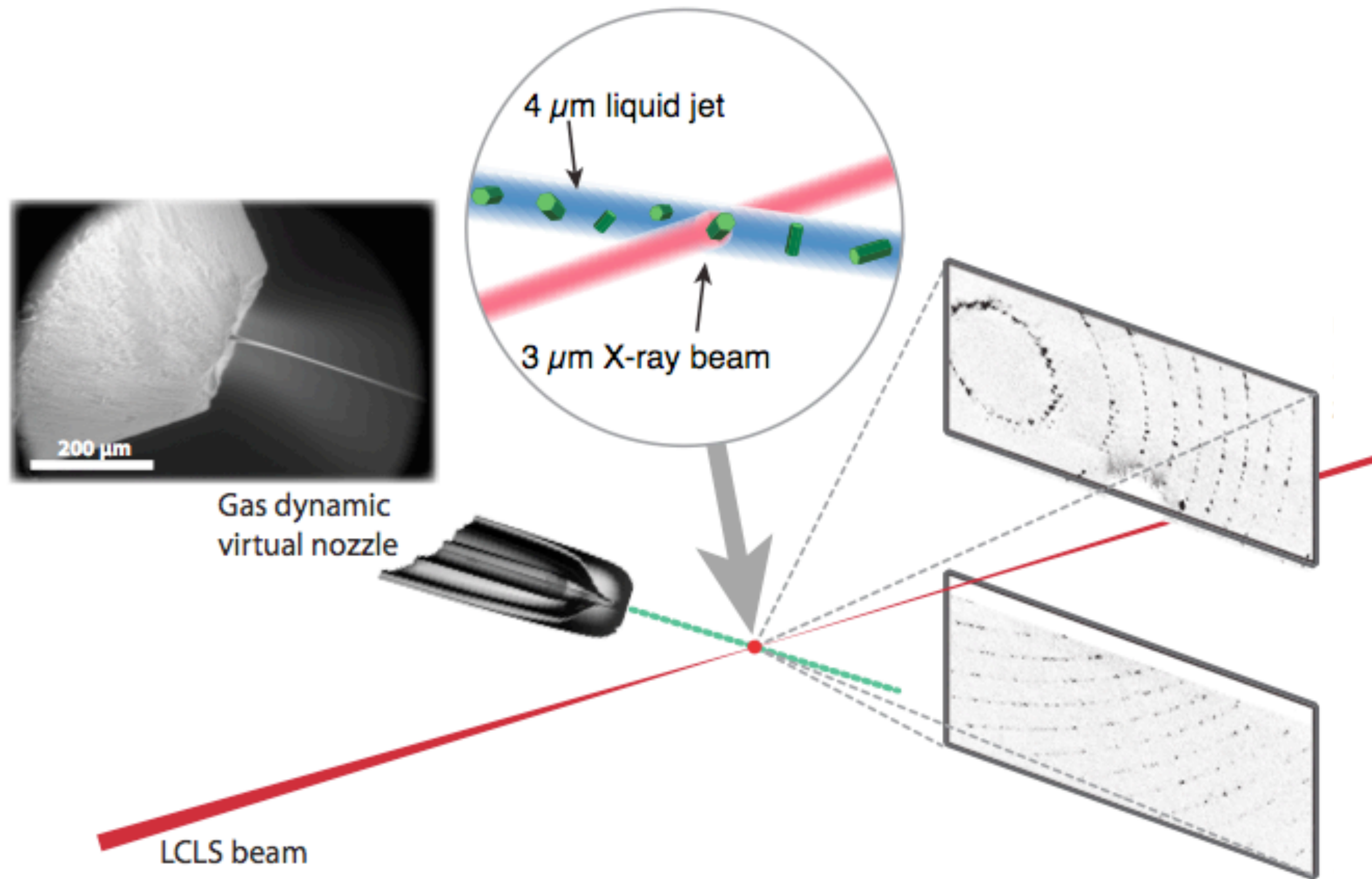
and

Department of Physics and Astronomy, Uppsala University

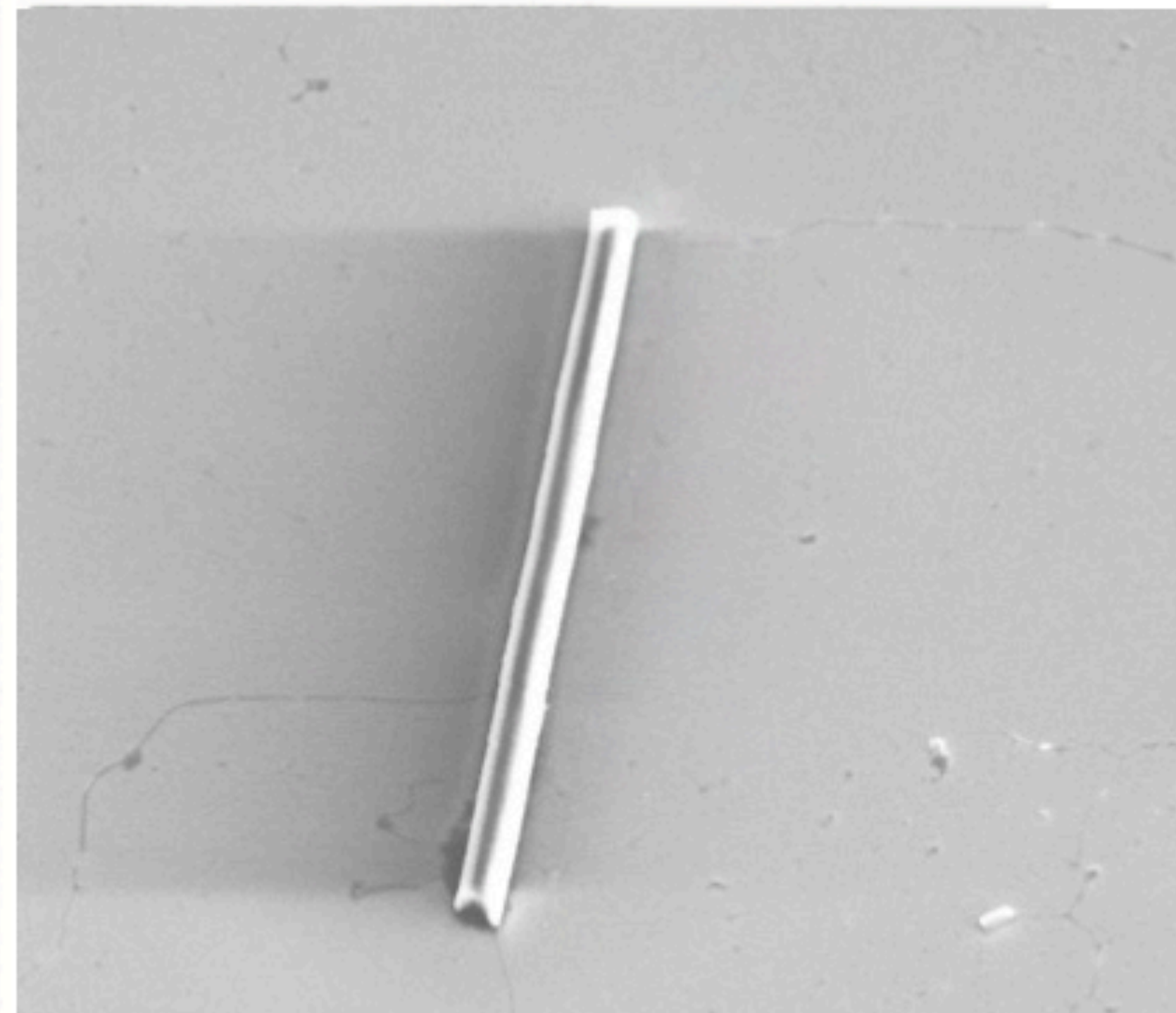
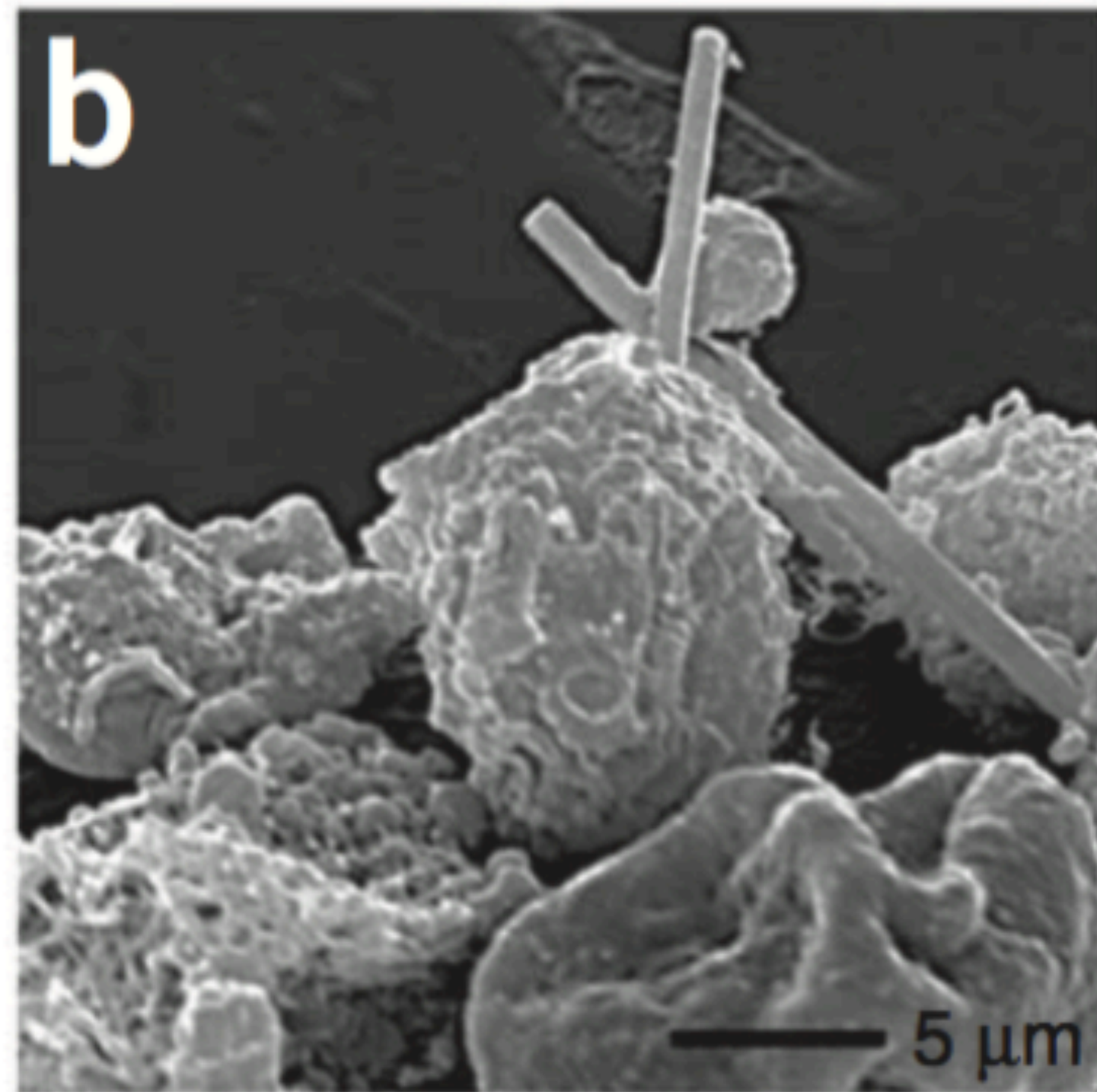
Structure and function



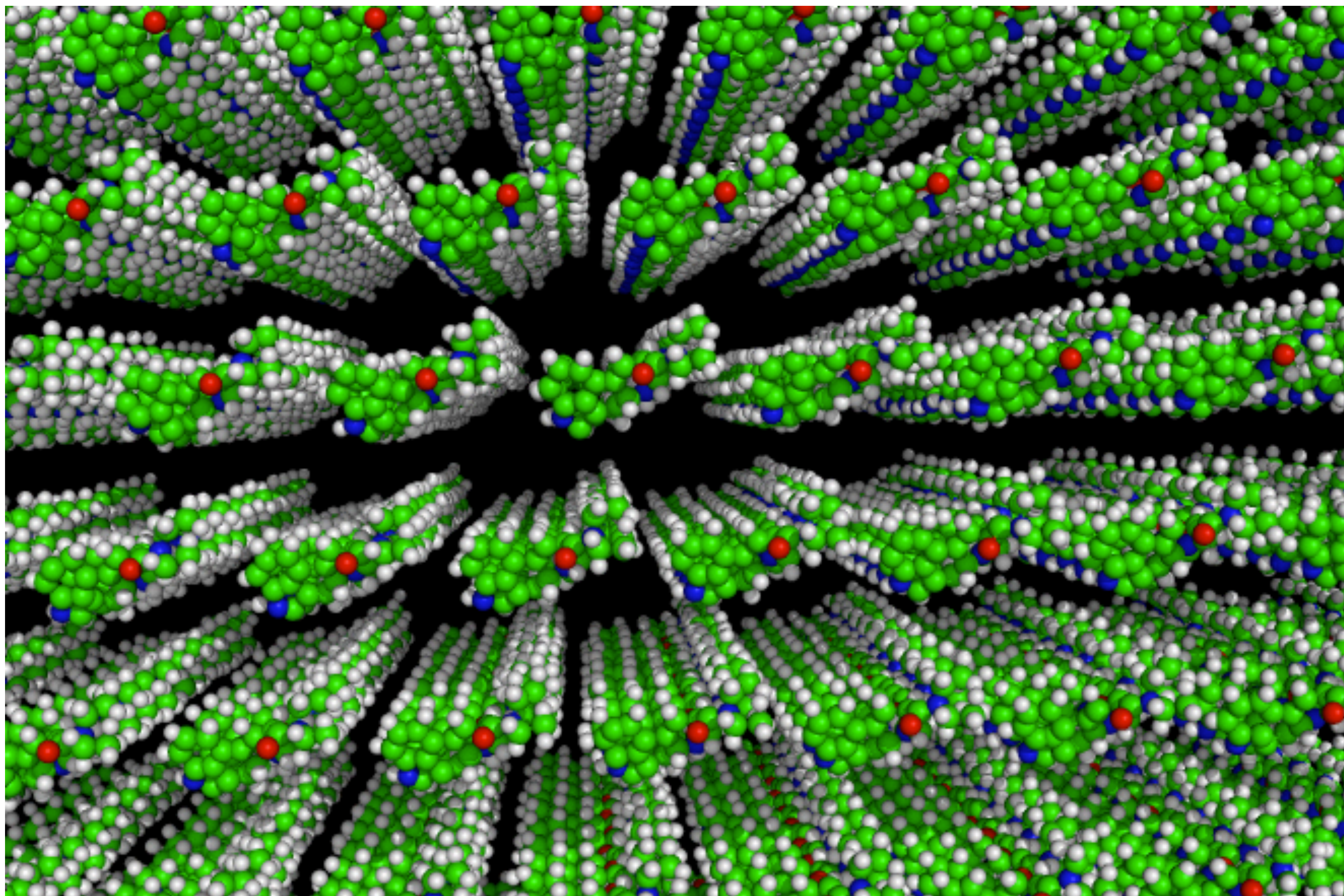
Serial Femtosecond Crystallography



Serial Femtosecond Crystallography

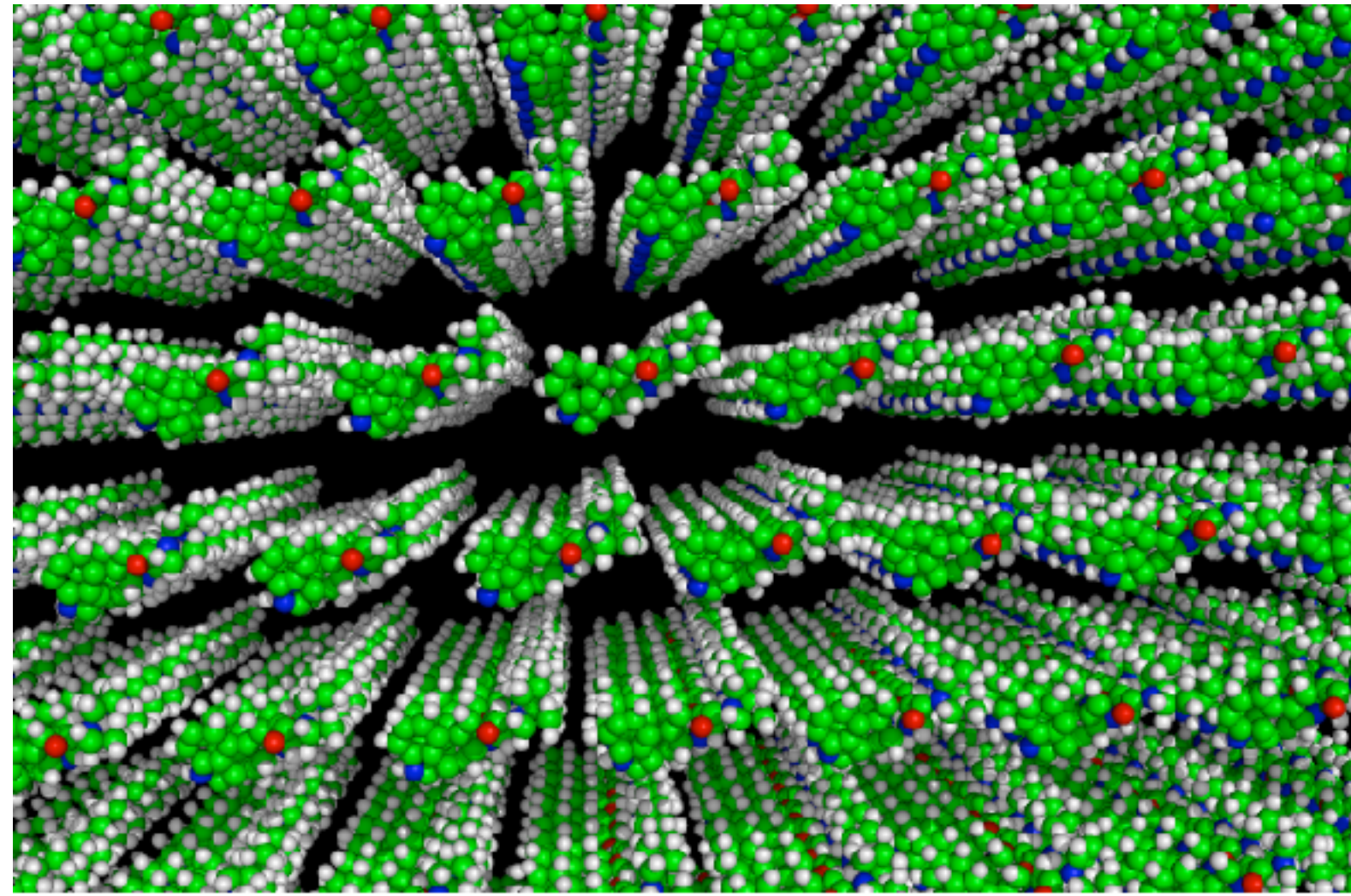


Intense X-ray pulses destroys the structure

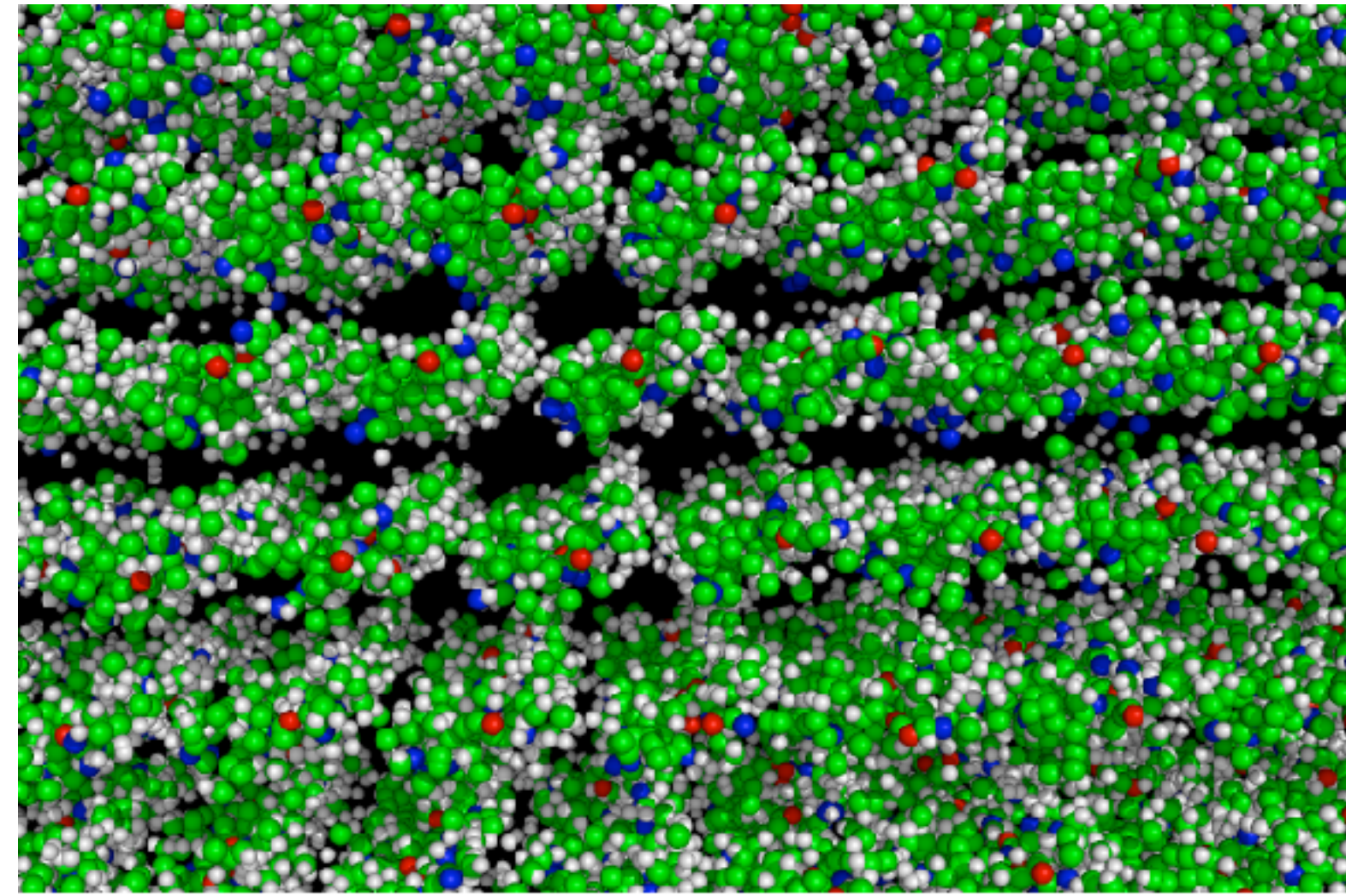


0.00 fs

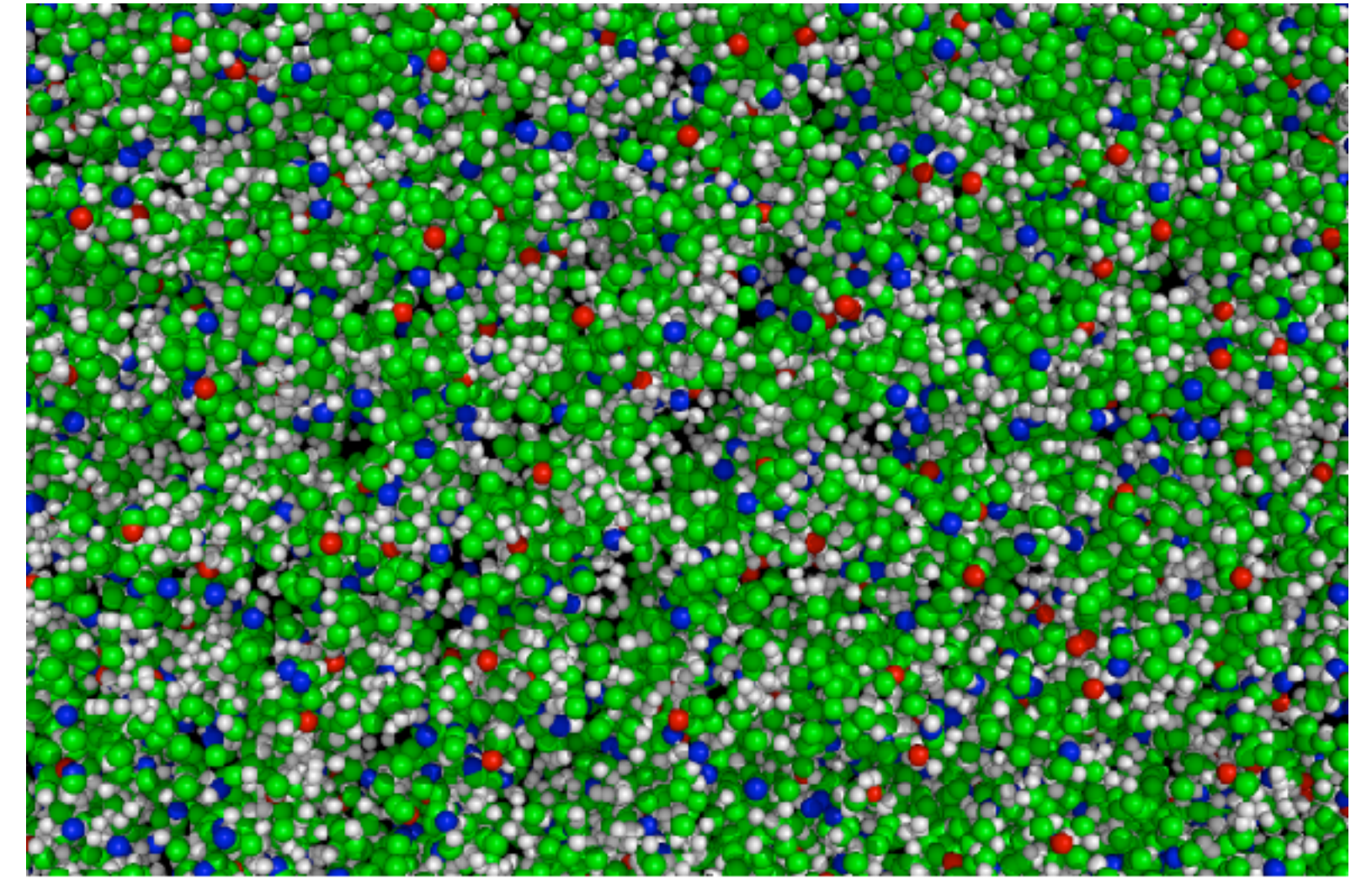
Intense X-ray pulses destroys the structure



0 fs

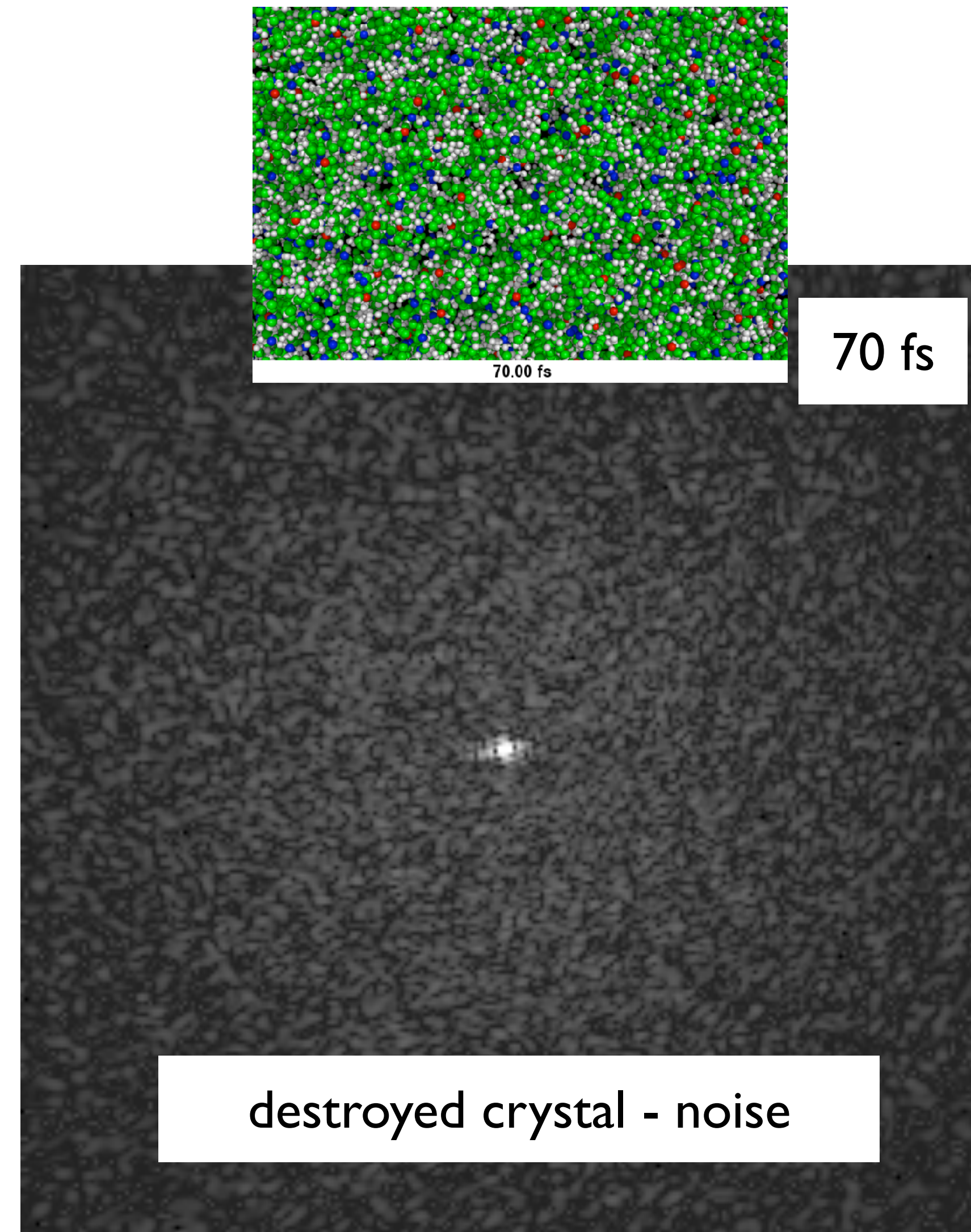
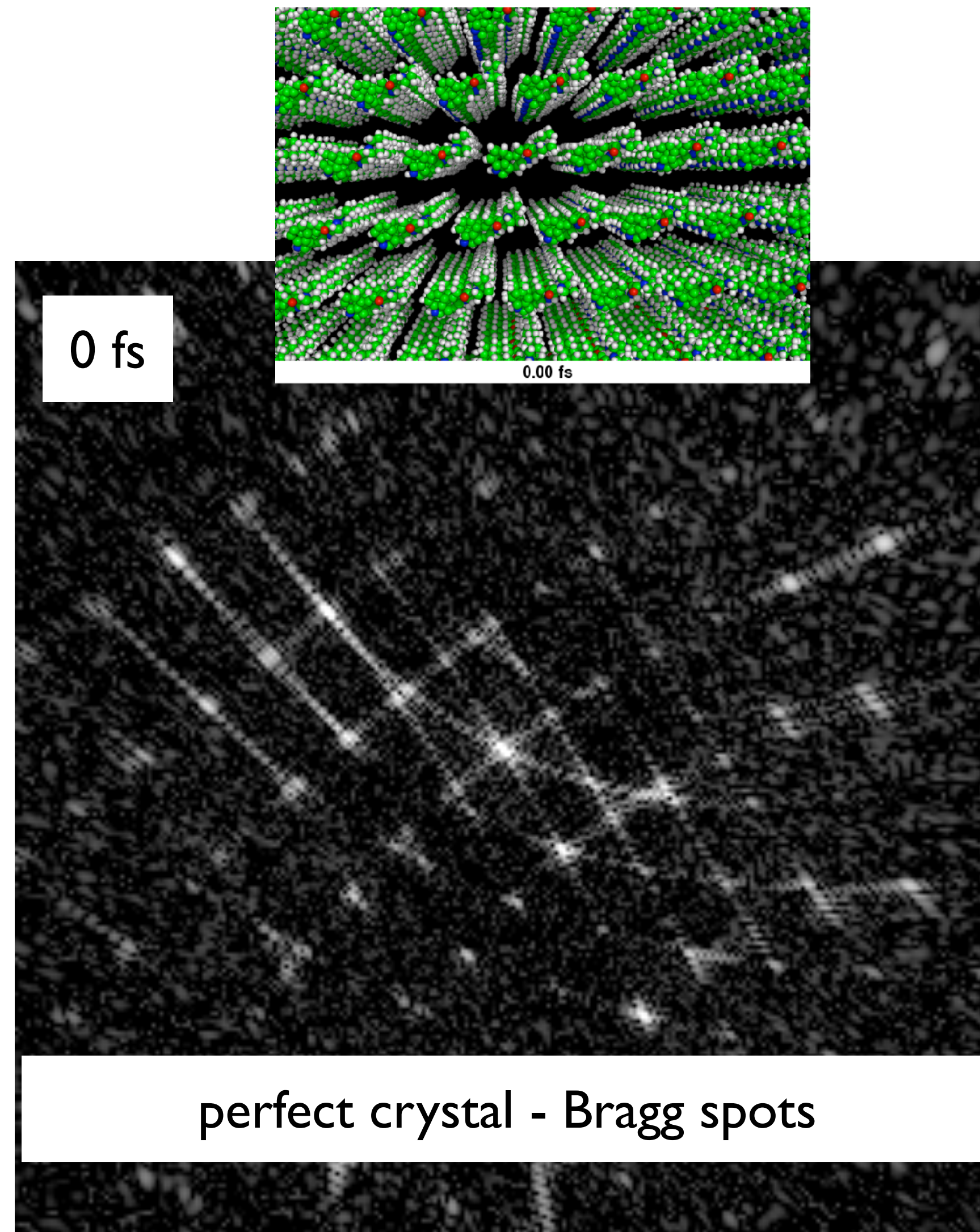


35 fs

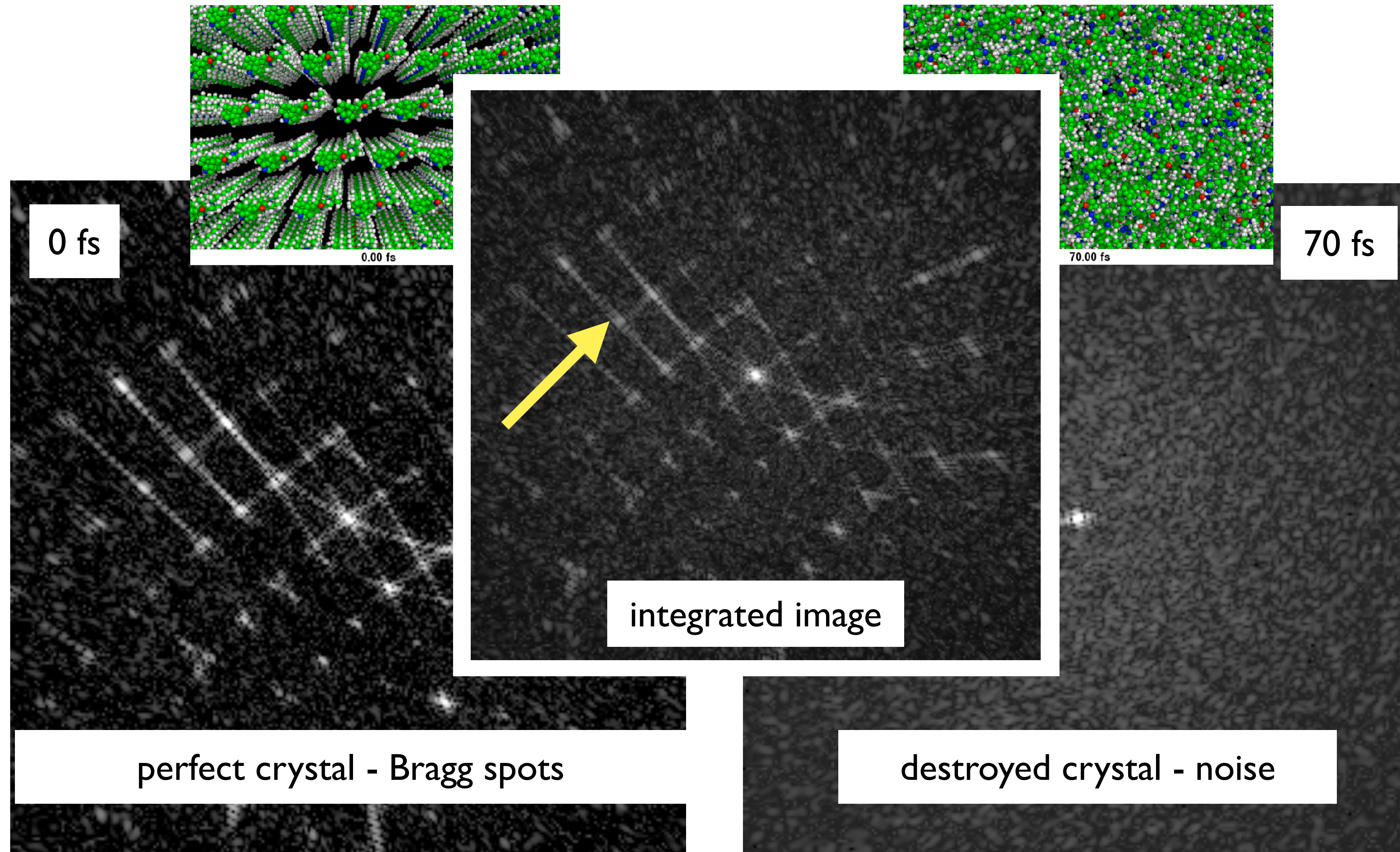


70 fs

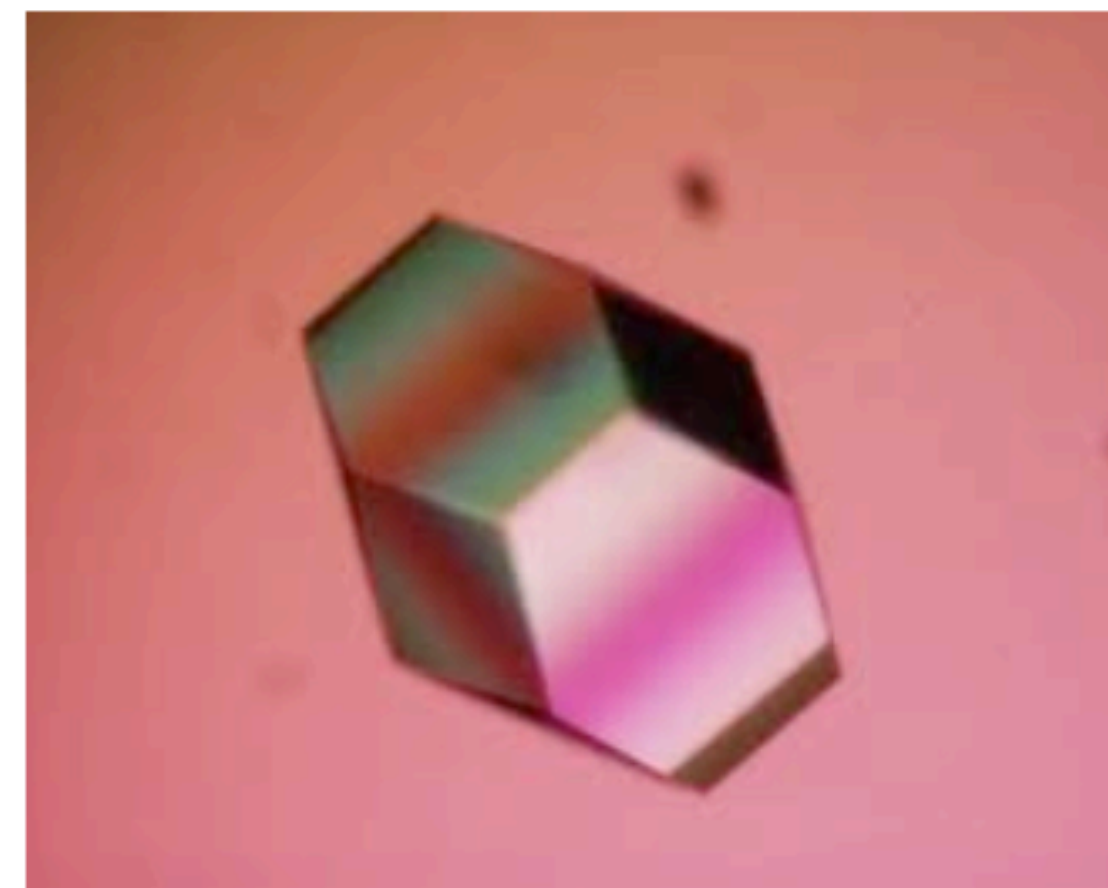
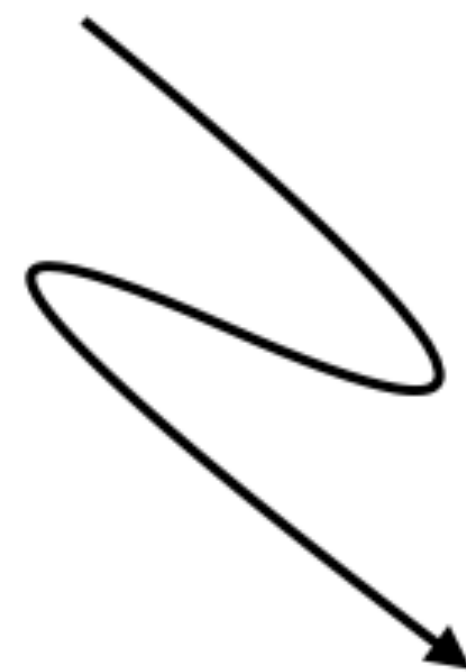
Diffraction before destruction



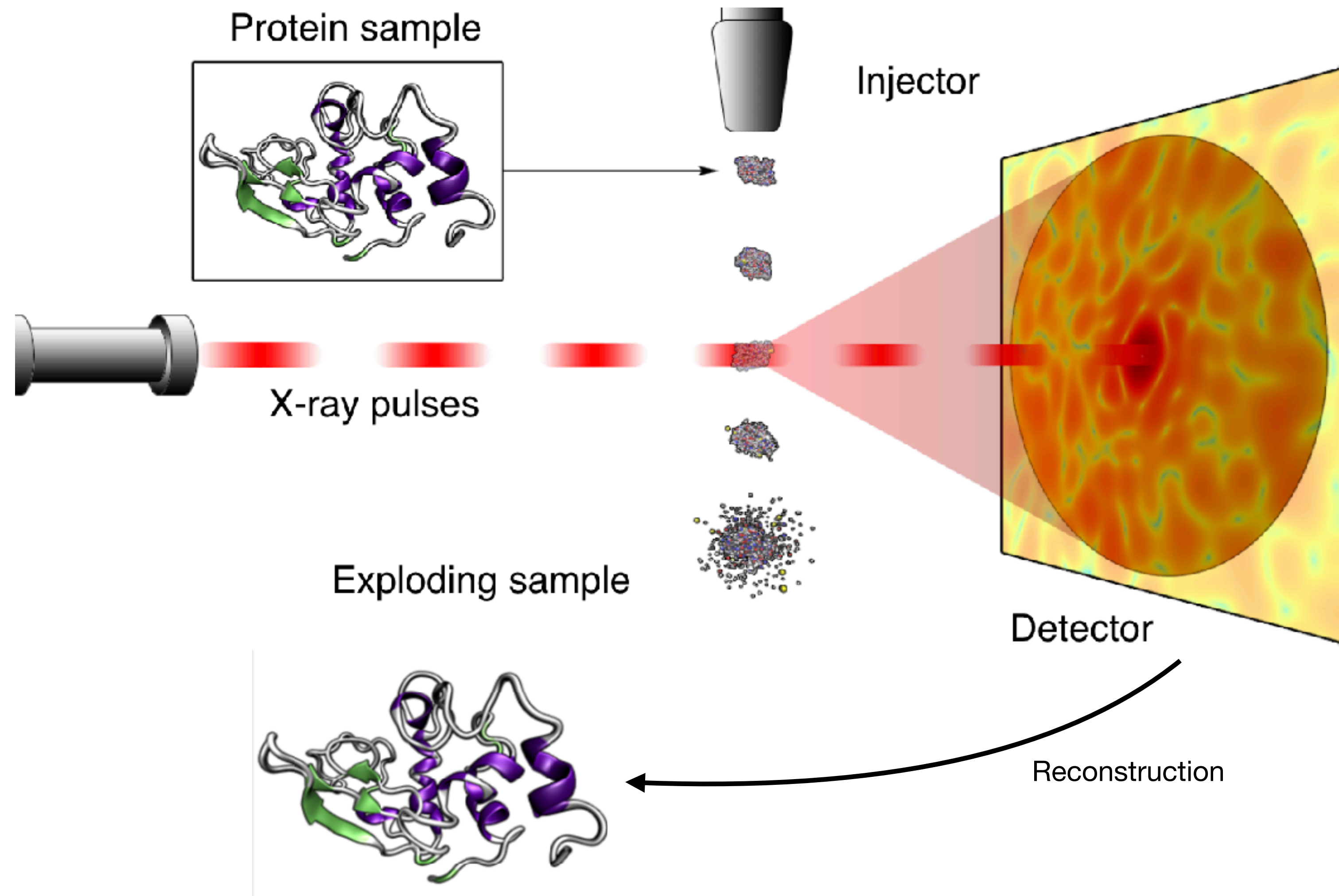
Diffraction before destruction



Crystallography depends crystals



Single particle imaging using XFEL



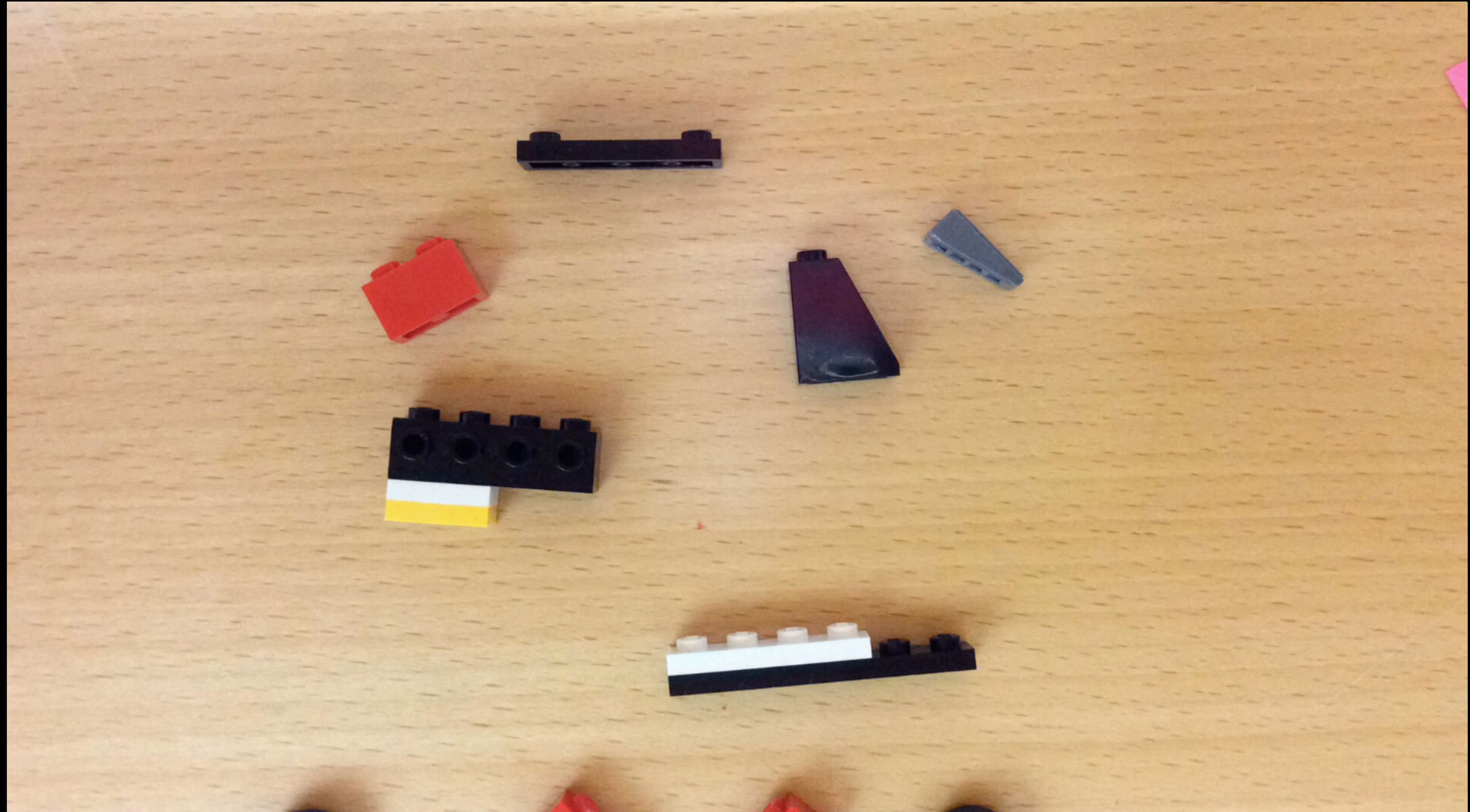


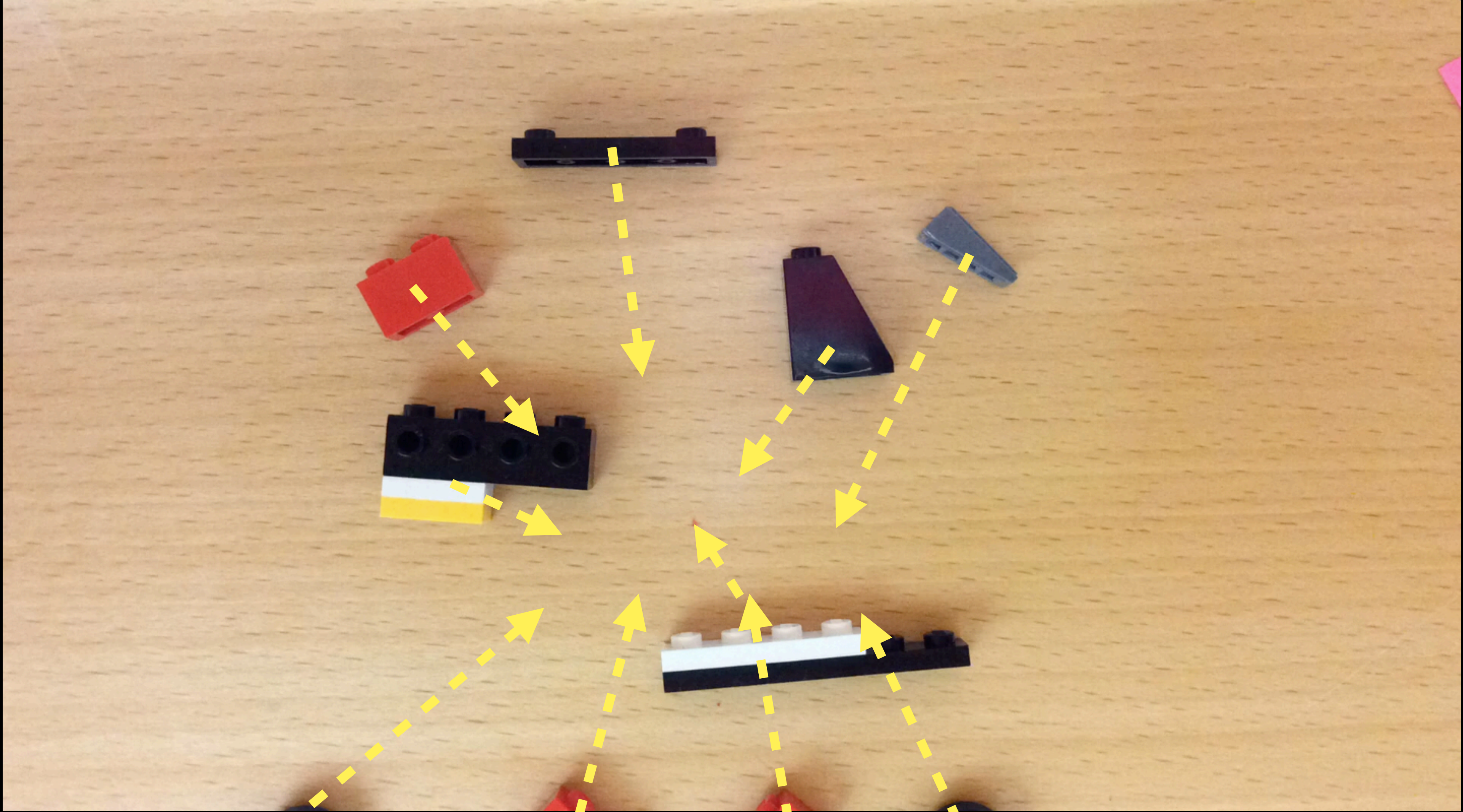
DIFFRACT BEFORE DESTRUCT

DIRECTED BY PROFESSOR CALEMAN

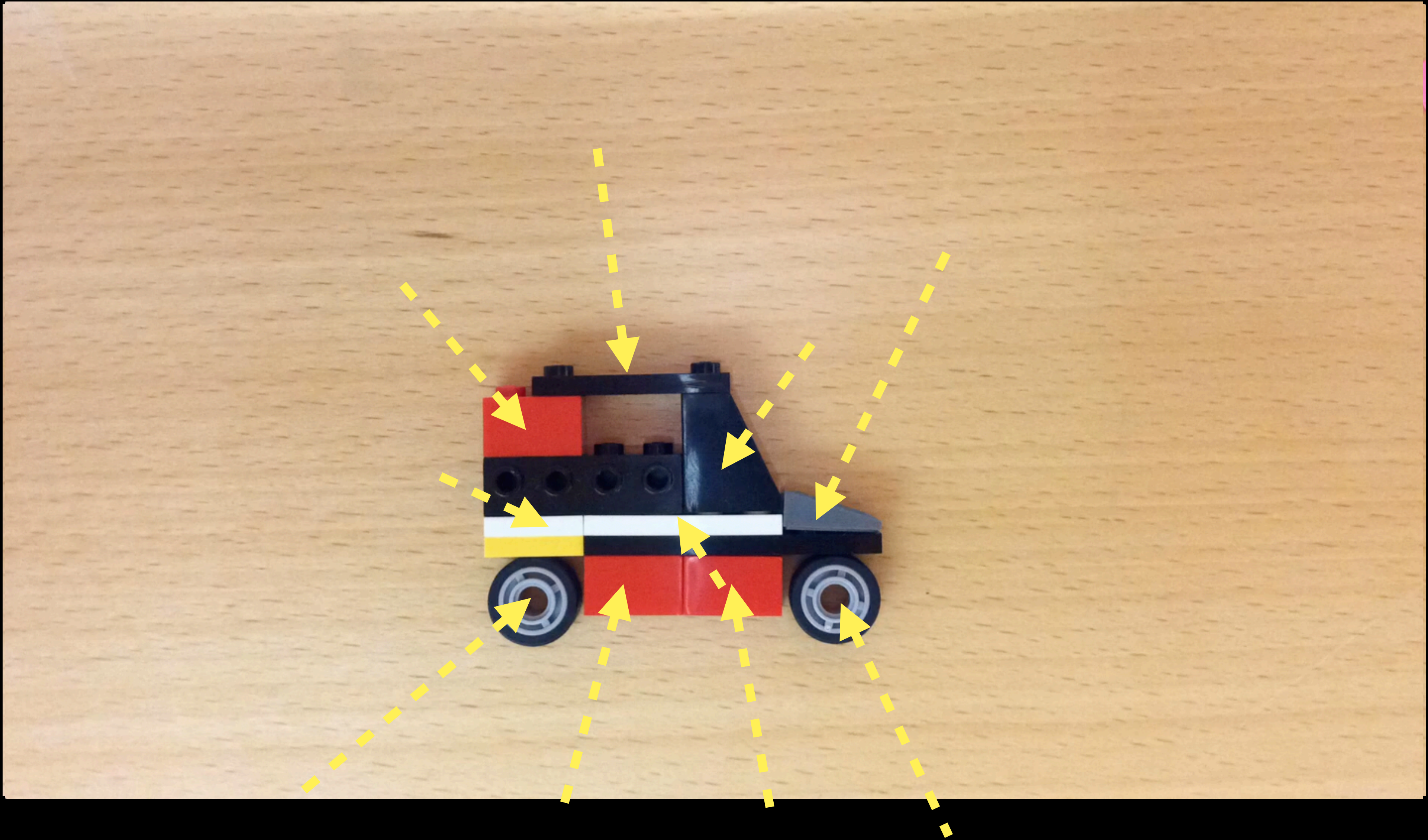


Destruction for diffraction

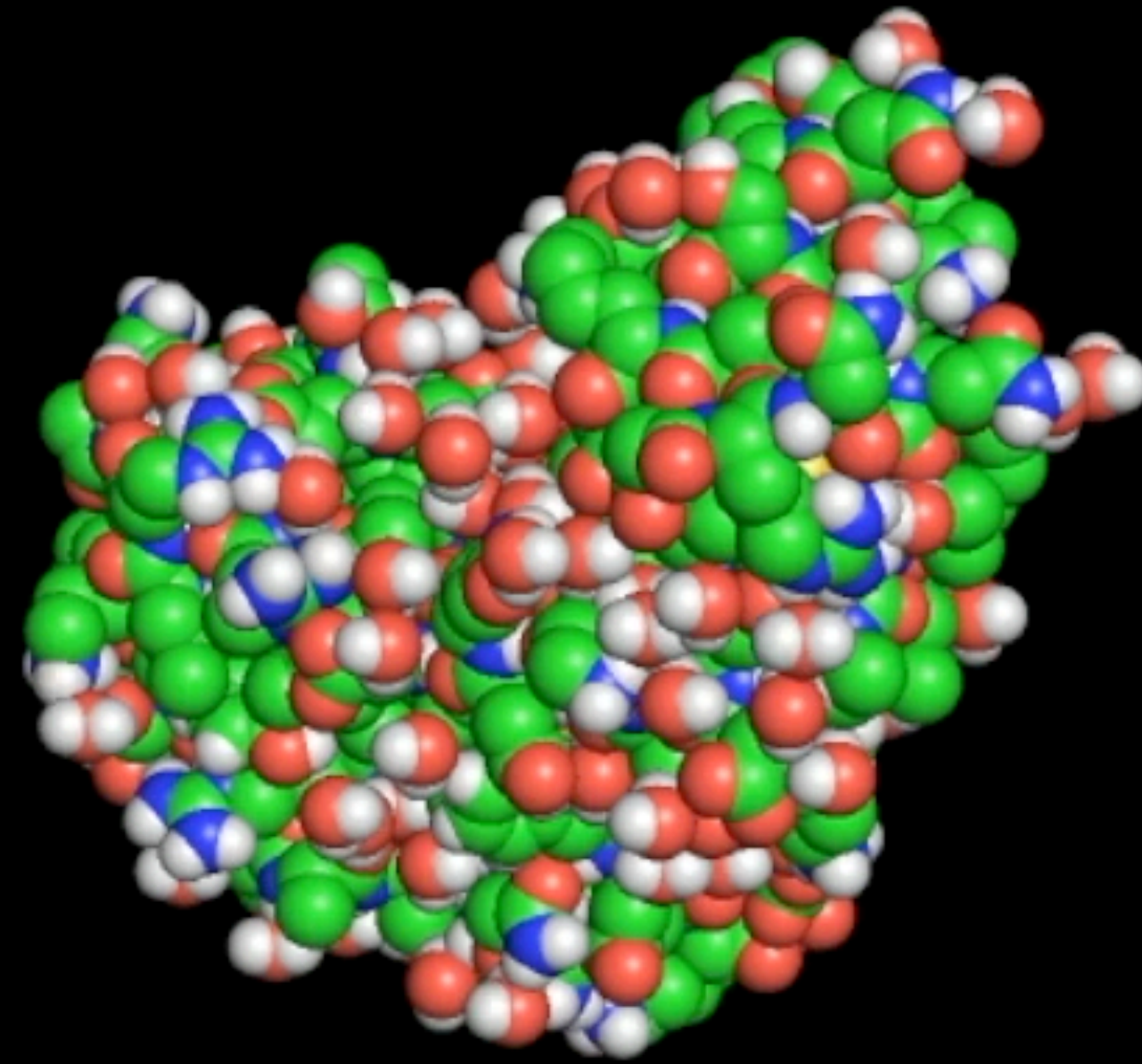




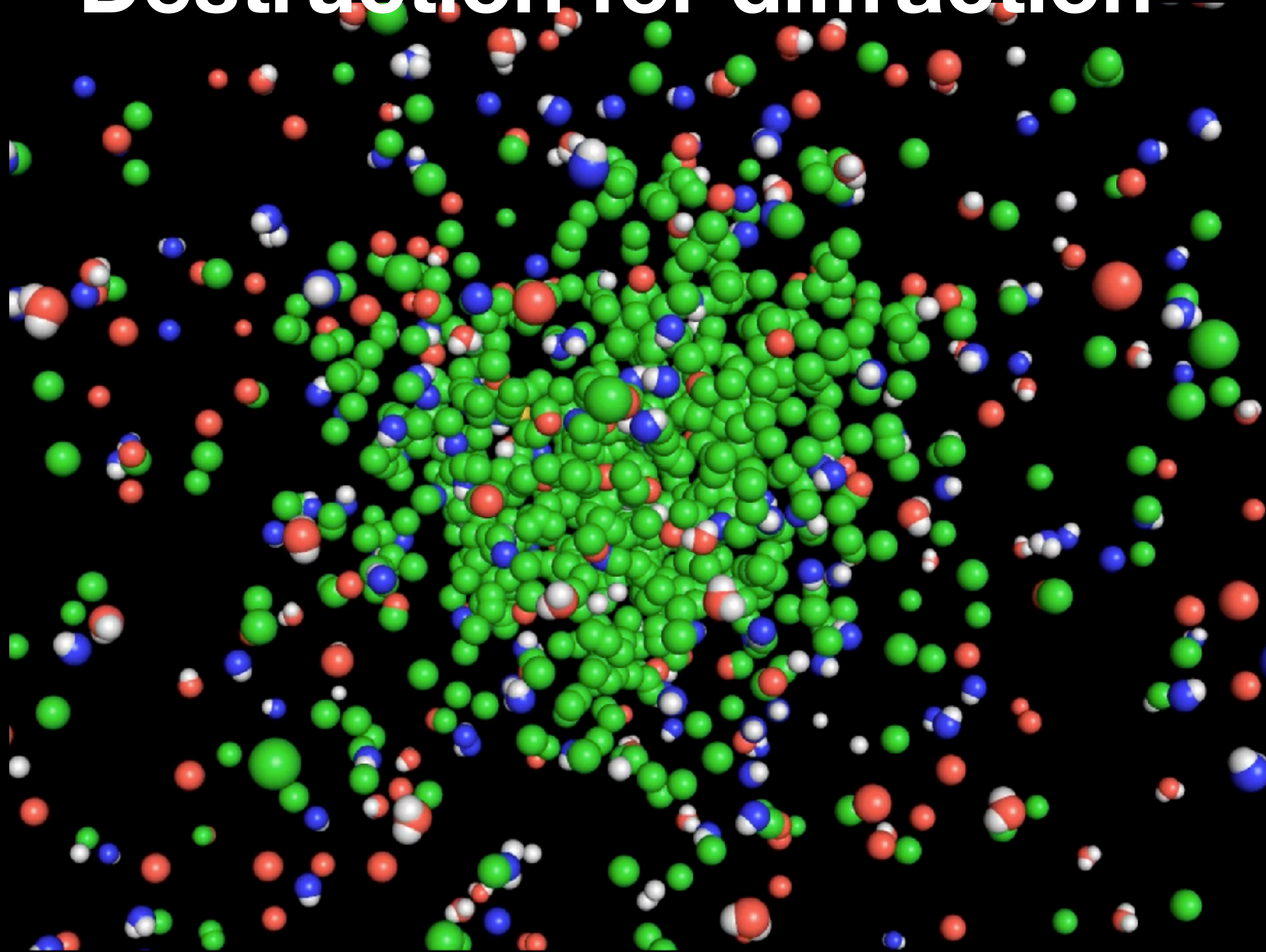
Destruction for diffraction



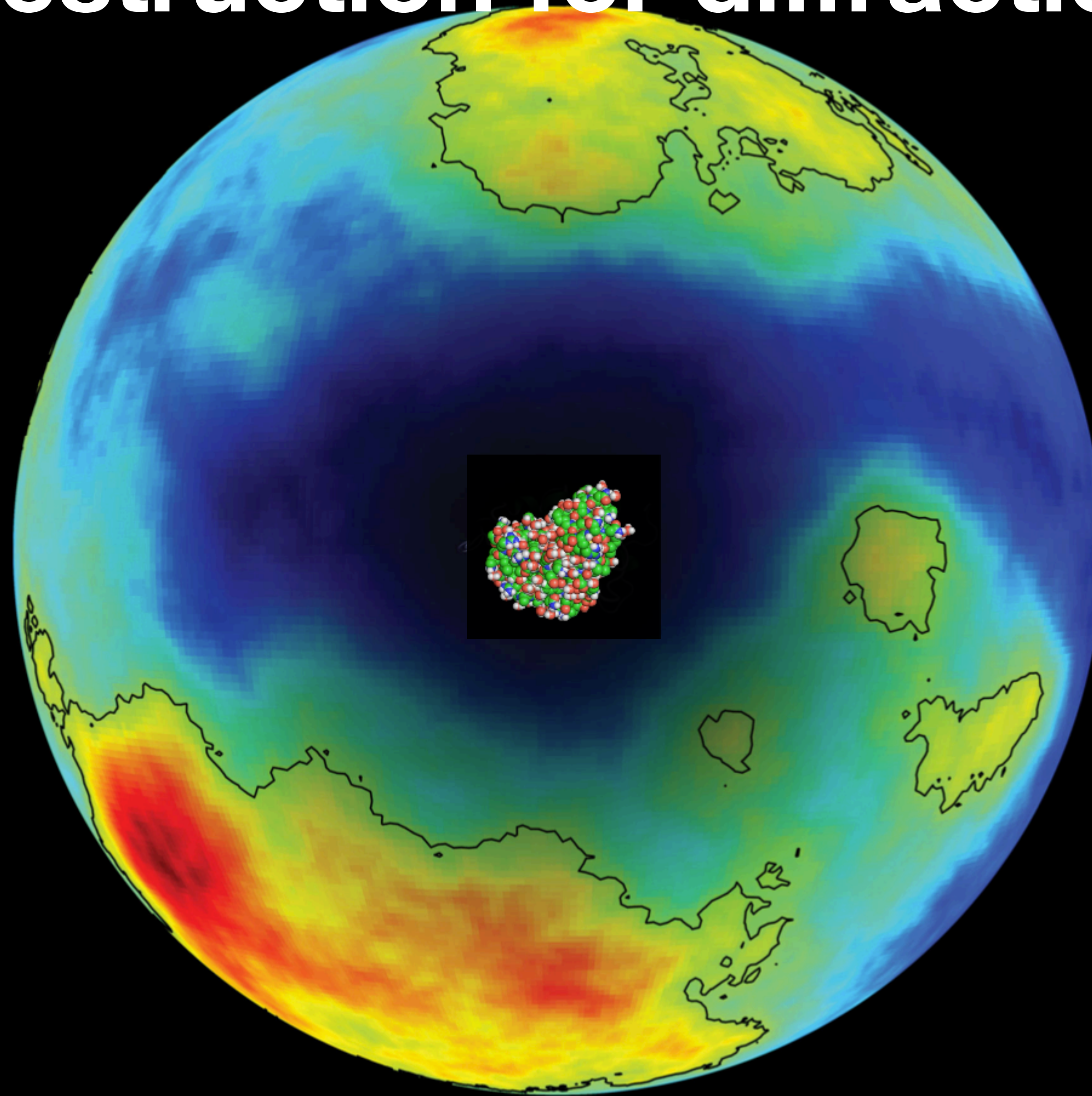
Destruction for diffraction



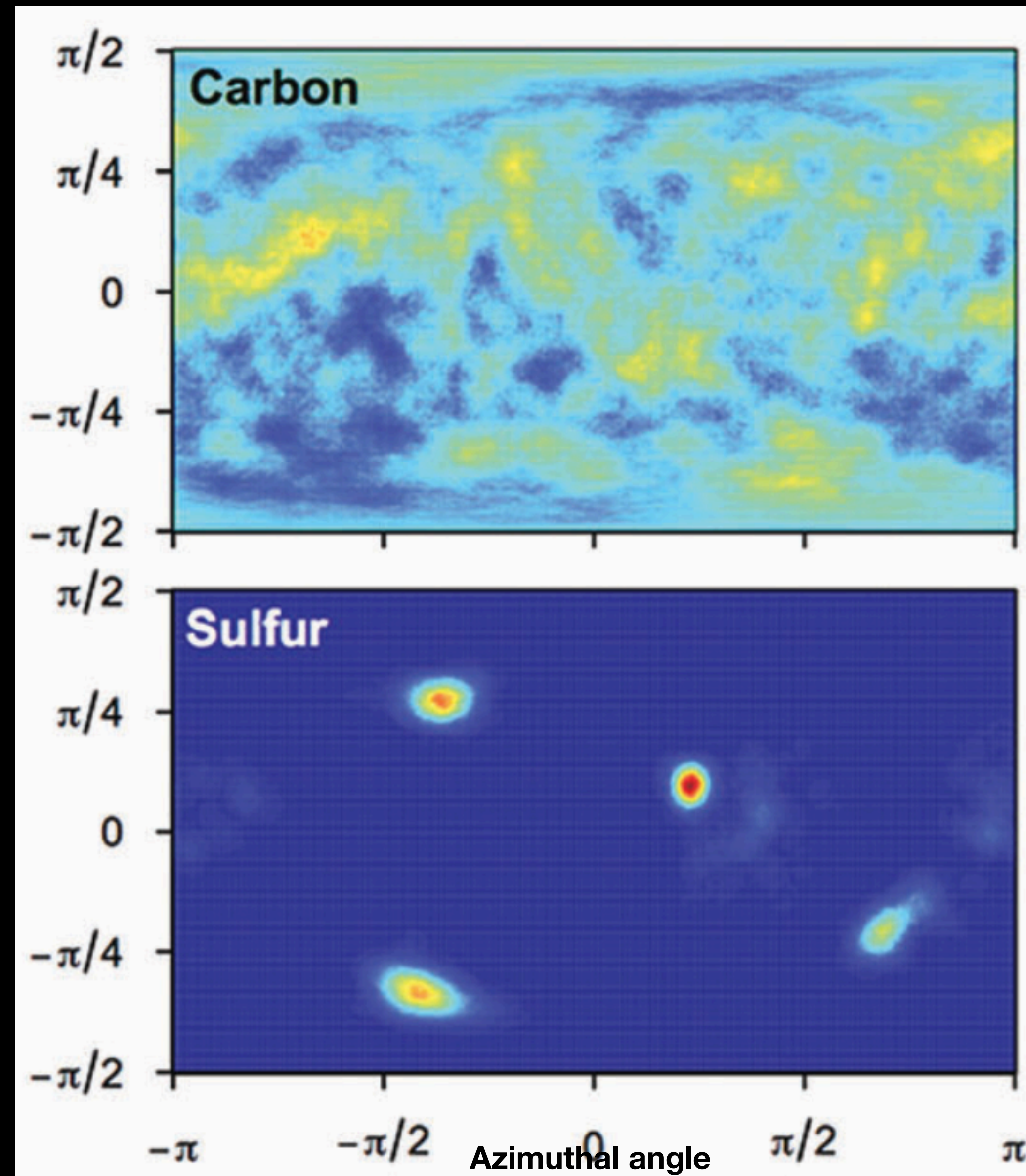
Destruction for diffraction



Destruction for diffraction



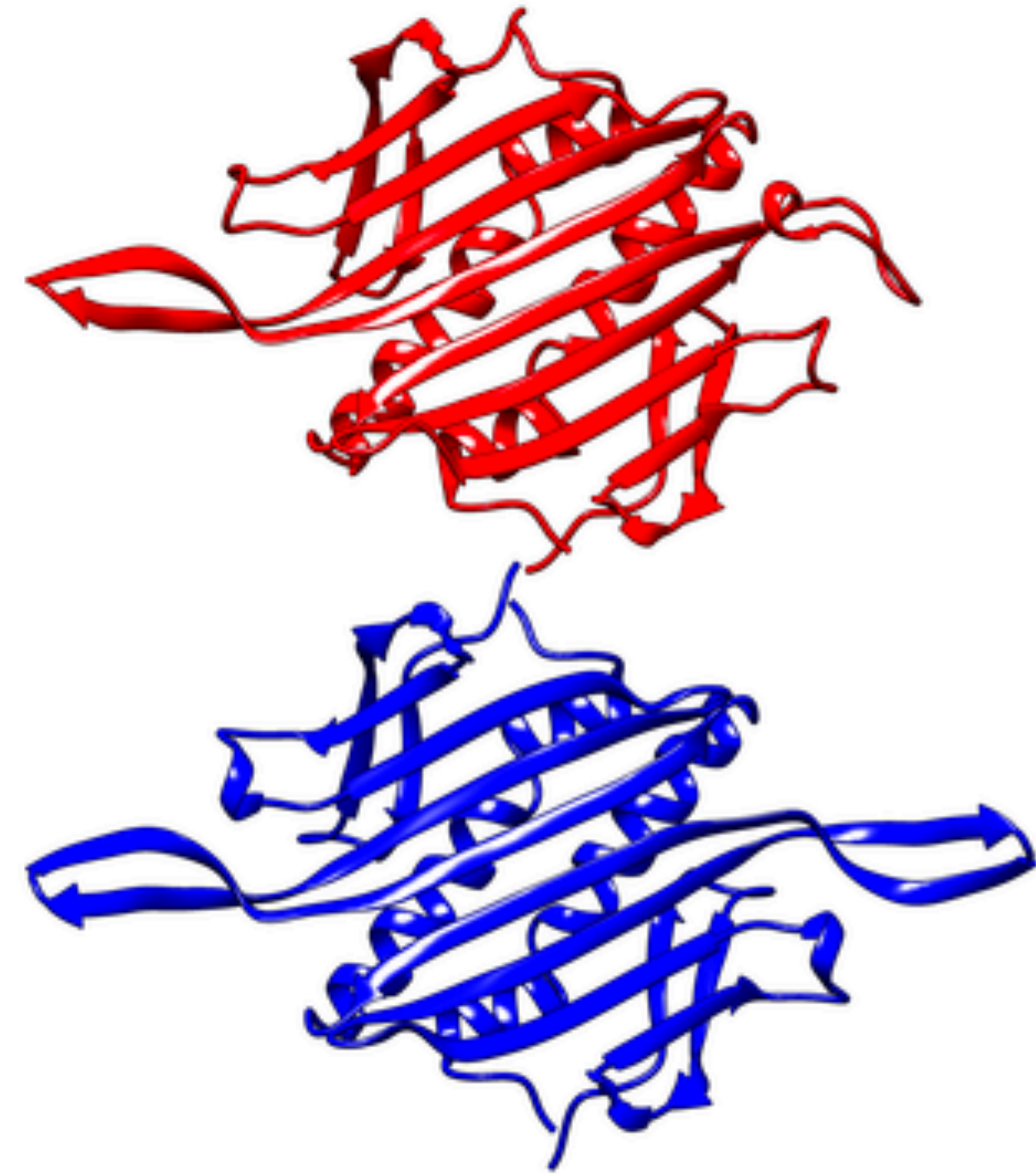
Destruction for diffraction



What can we learn from the explosions?

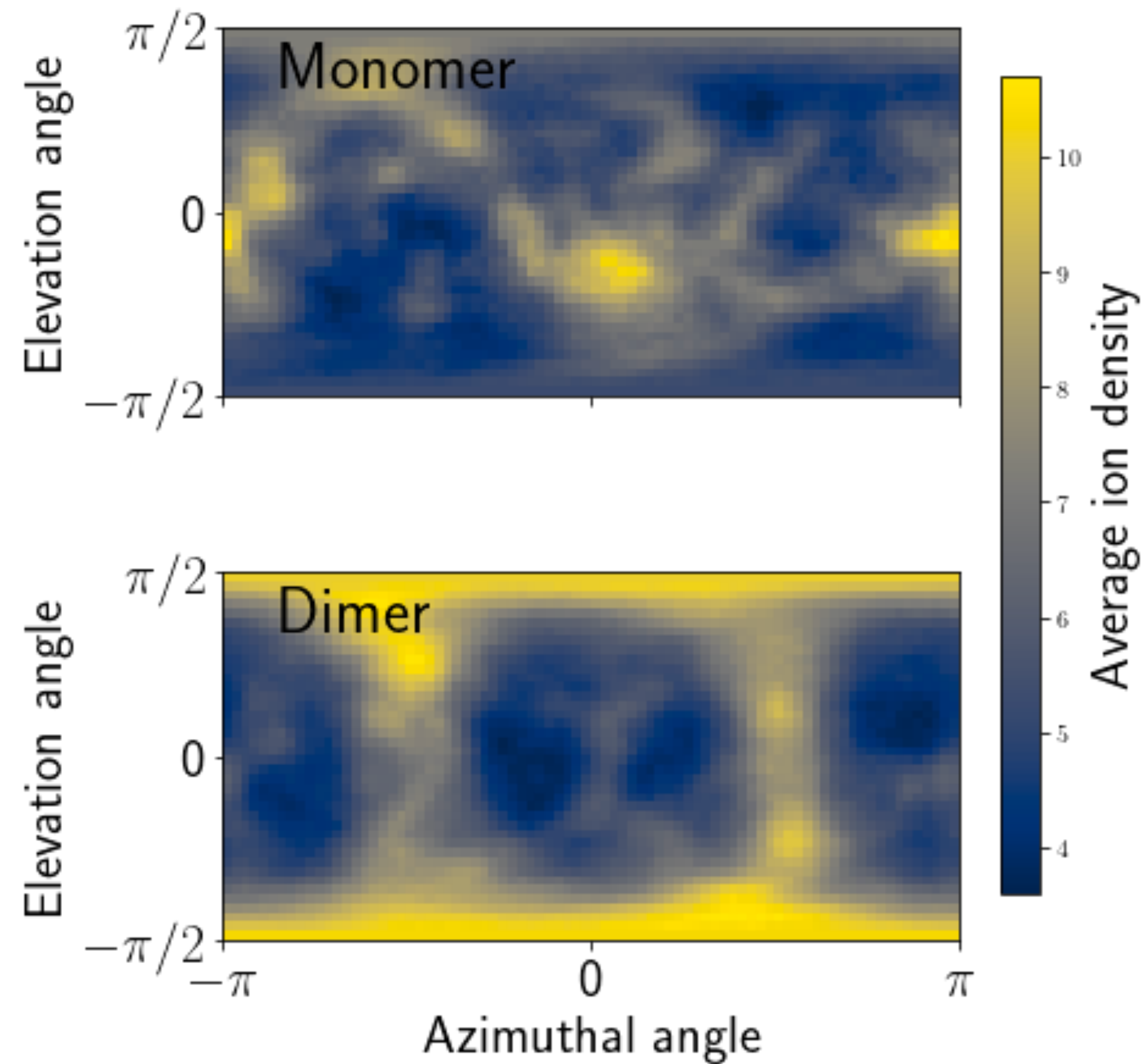


HiPIP dimer and monomer

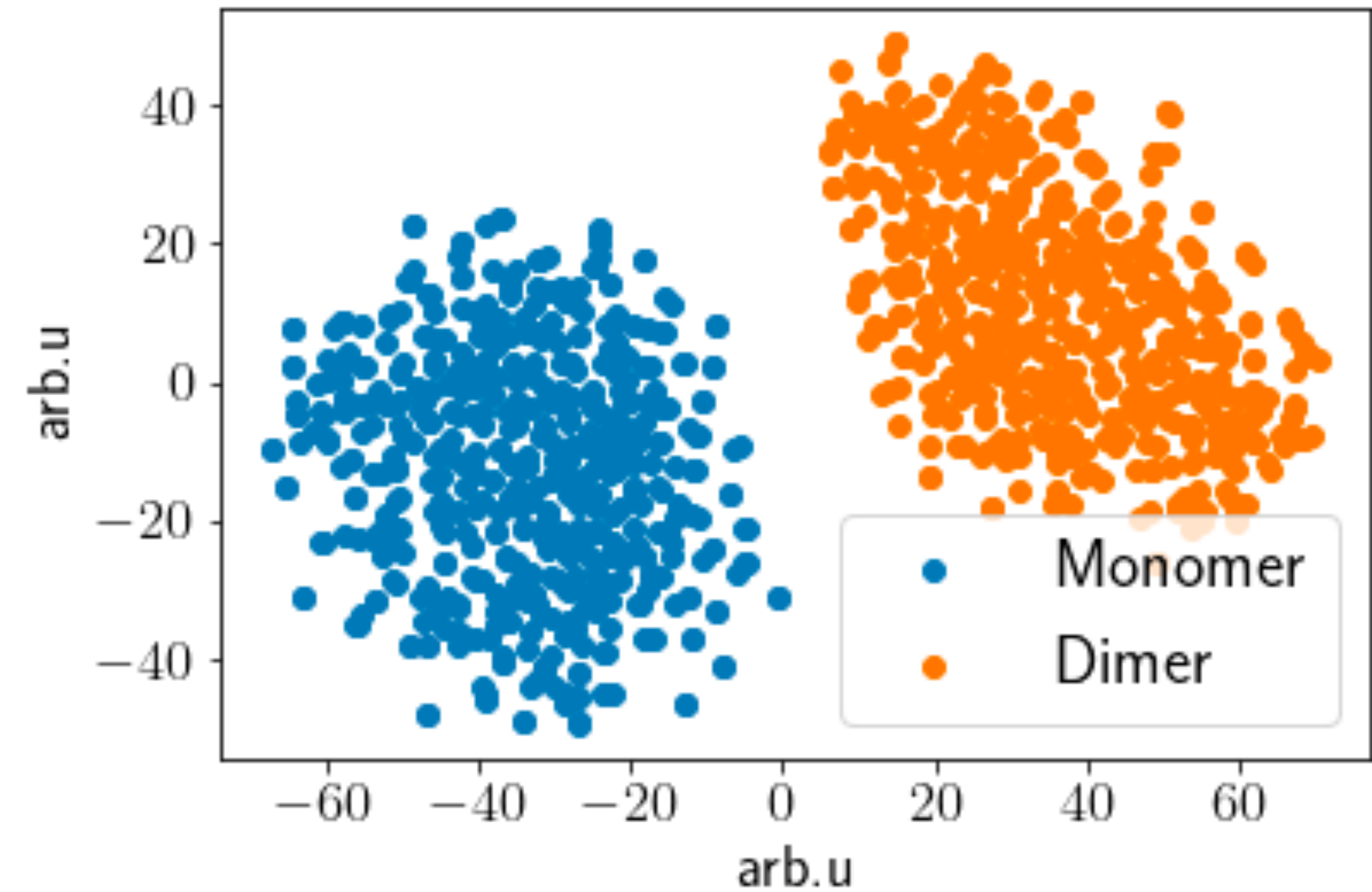


MS2 virus dimer symmetric
and asymmetric

What can we learn from the explosions?

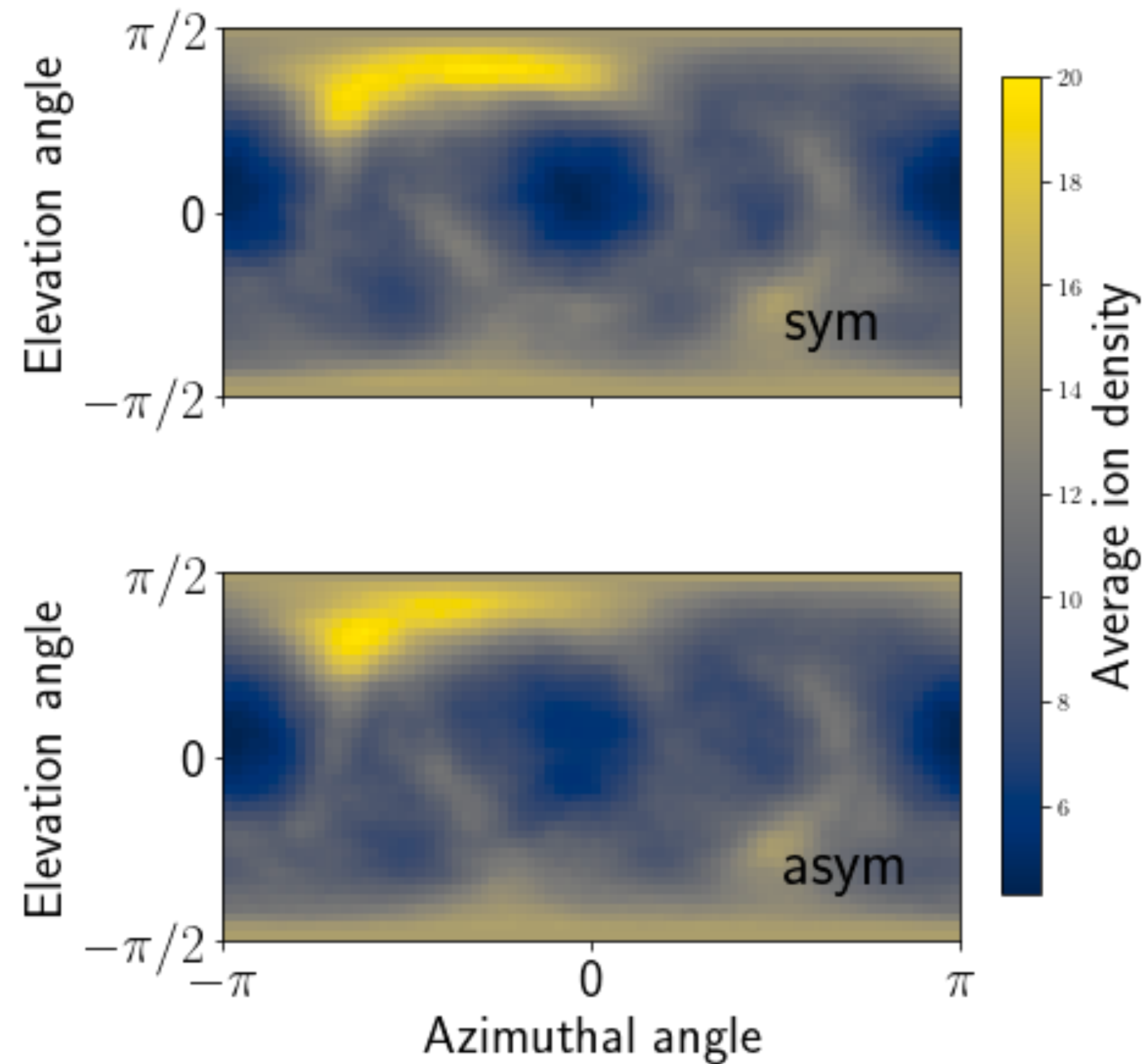


TSNE - dimensionality reduction algorithm

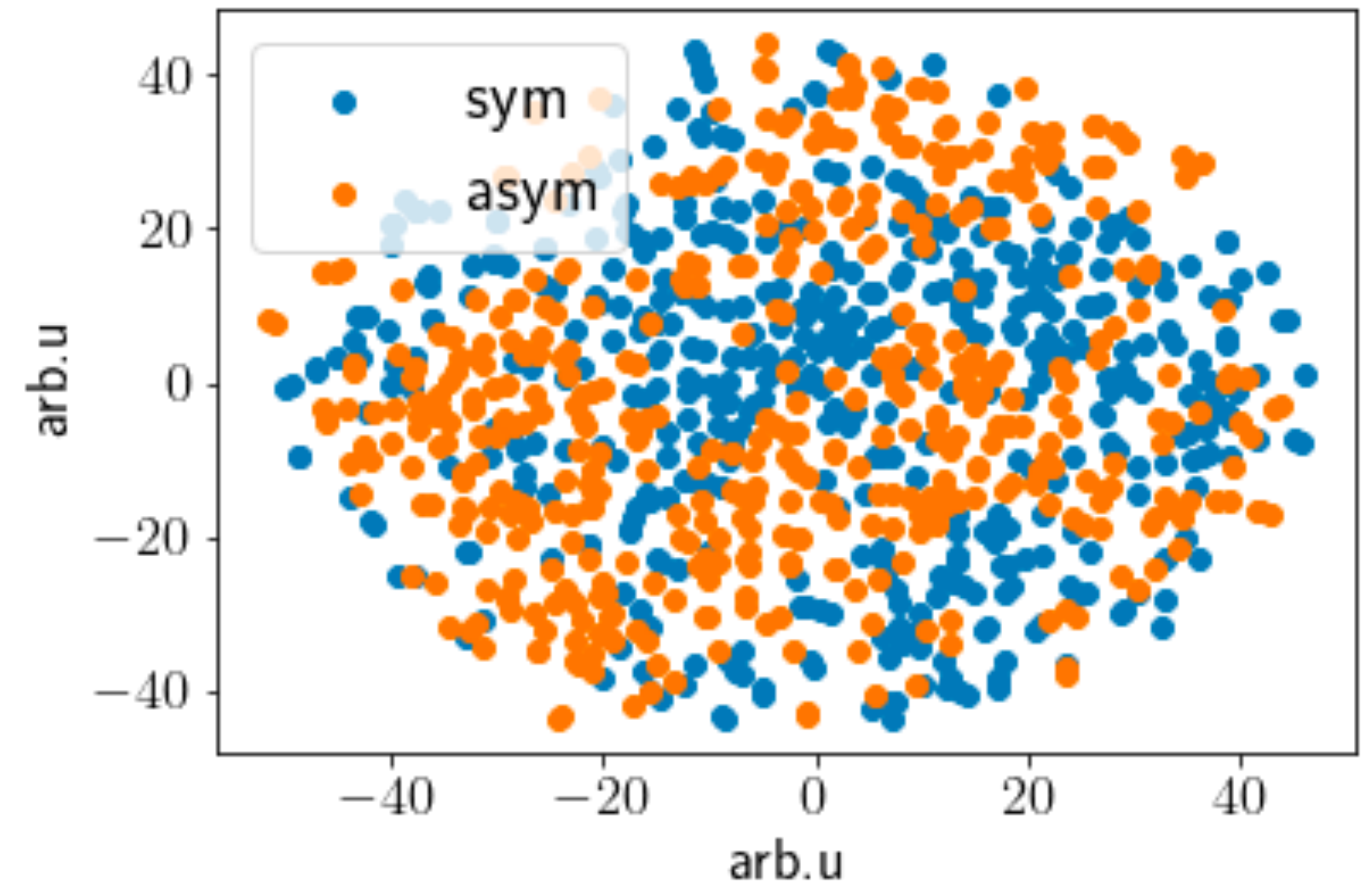


HiPIP dimer and monomer

What can we learn from the explosions?

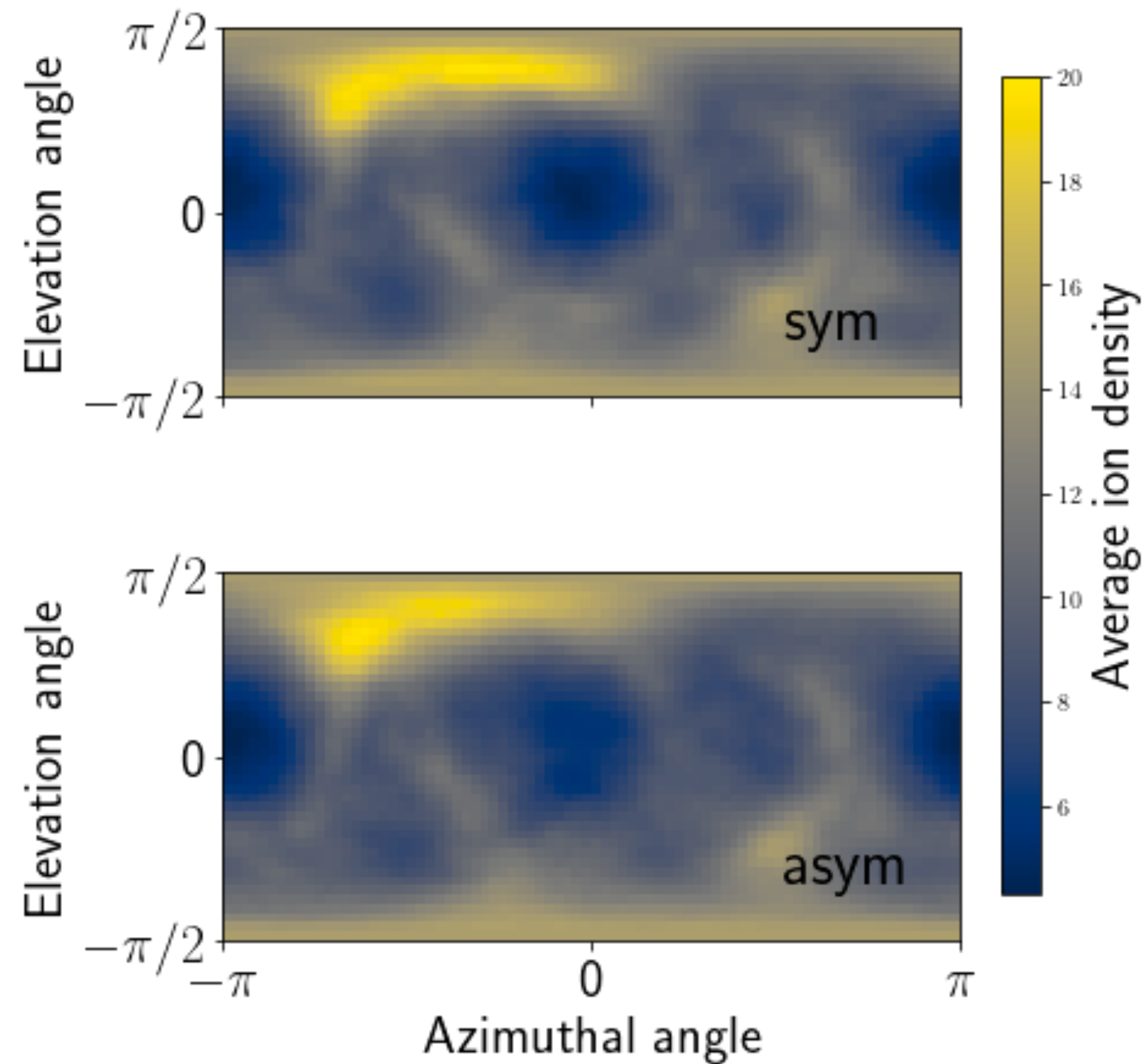


TSNE - dimensionality reduction algorithm

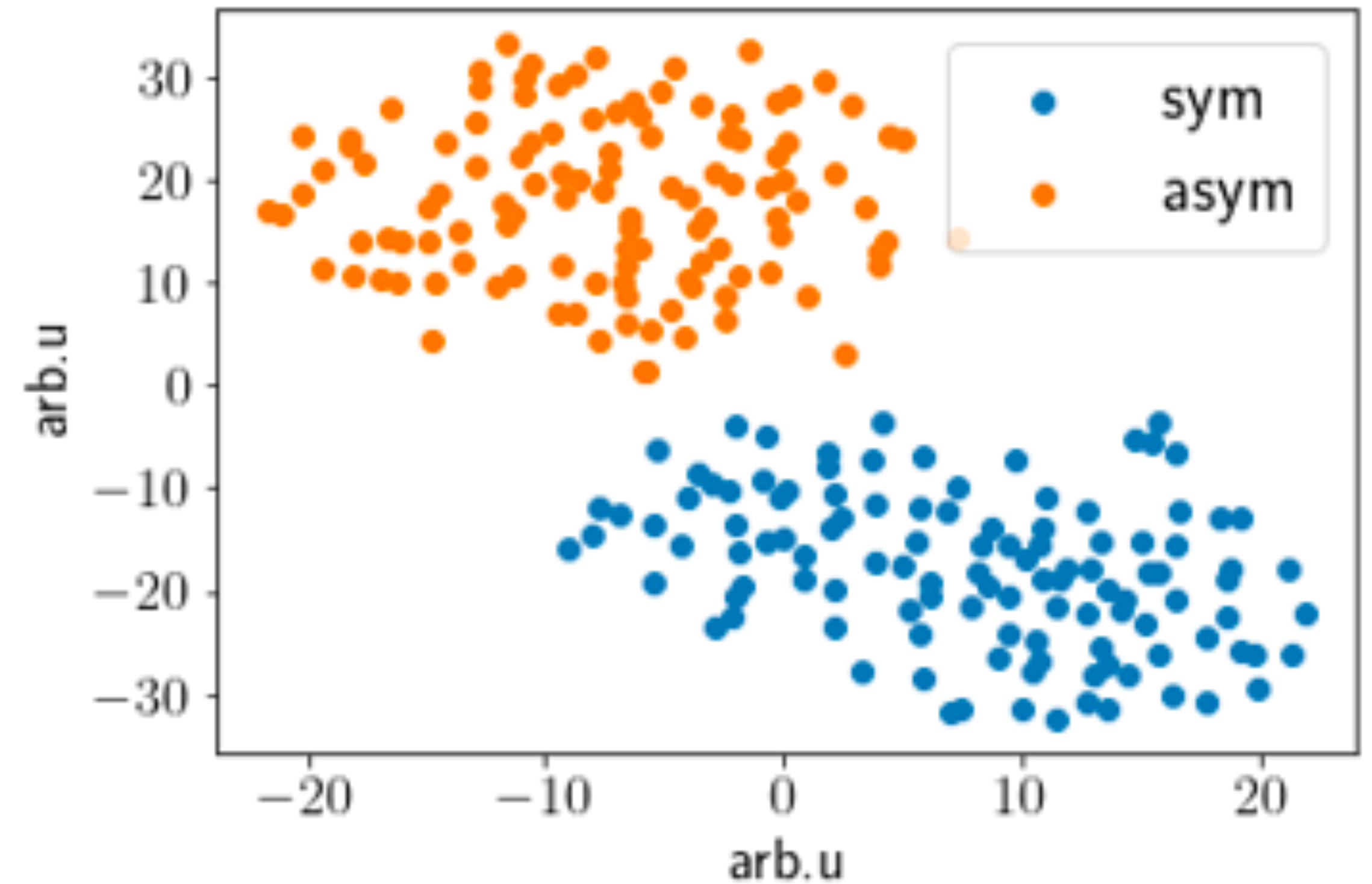


MS2 virus dimer symmetric
and asymmetric

What can we learn from the explosions?



TSNE - dimensionality reduction algorithm



MS2 virus dimer symmetric
and asymmetric

What can we learn from the explosions?

The path forward is to combine diffraction, ion maps, alpha fold.

Can we even do without high resolutions (hard x-rays) diffraction?

Tack.