

Electron Microscope Imaging Core

Specific aims :

Most biological mechanisms of living organisms are carried out through large molecular assemblies in the range of 10 to 100 nanometers. Cryo-electron microscopy (cryo-EM) provides architecture of these “molecular machines” and extends the capabilities of structural biology. We aim to understand the molecular structure of these macromolecules which is not only essential for the comprehension of their function and mechanism, but can also provide clues for the developing therapeutics related to health and disease.

Accomplishment:

Cryo-electron microscopy

Cryo-electron microscopy (Cryo-EM) is a technique to freeze a hydrated sample and derive the 3D structures of the biological macromolecules using an transmission electron microscope. Using Cryo-EM combined with image processing technique, we have worked on many proteins and are able to solve less than 1 nanometer resolution protein structure.

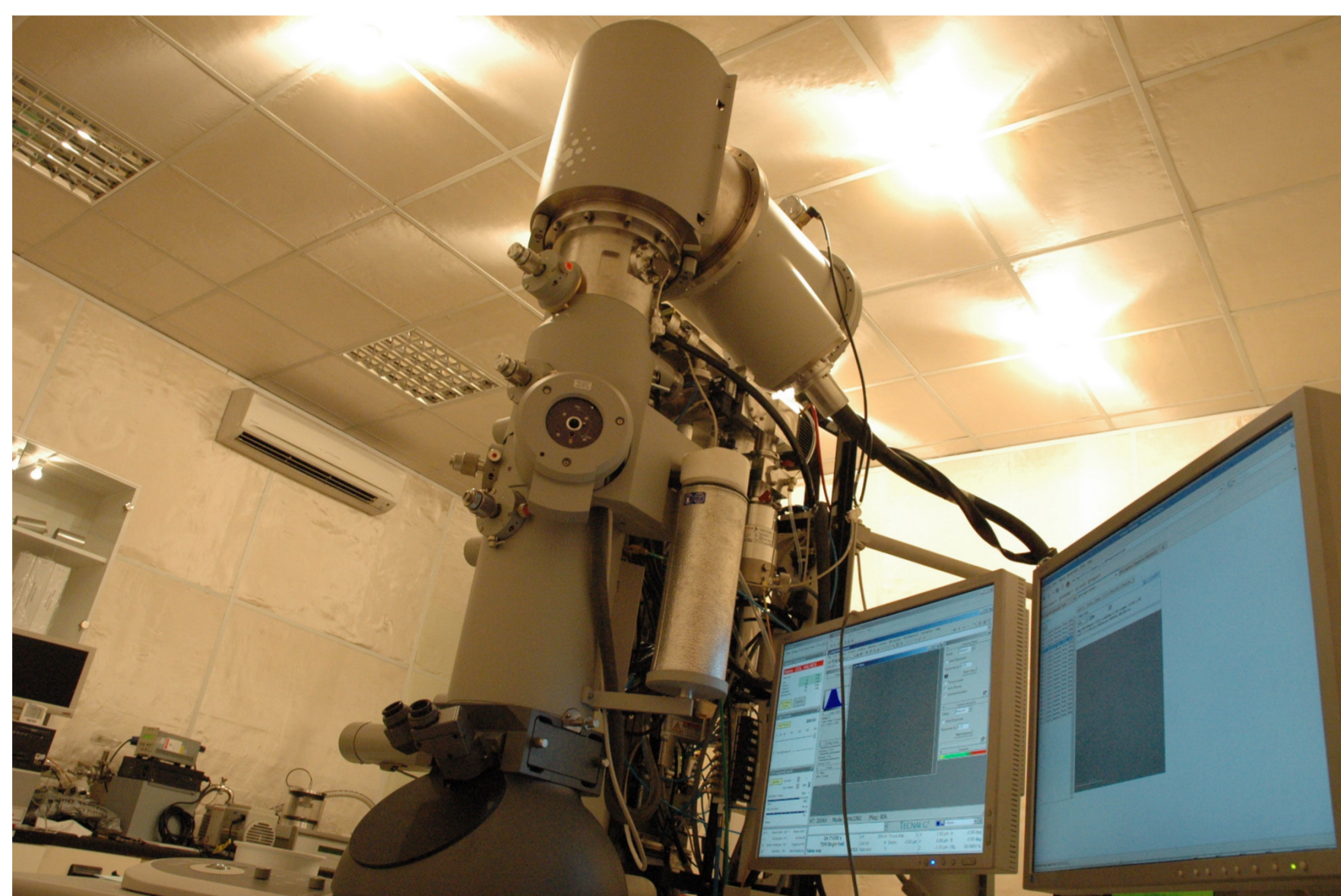


Fig. 1. 200 kV-FEG transmission electron microscope.

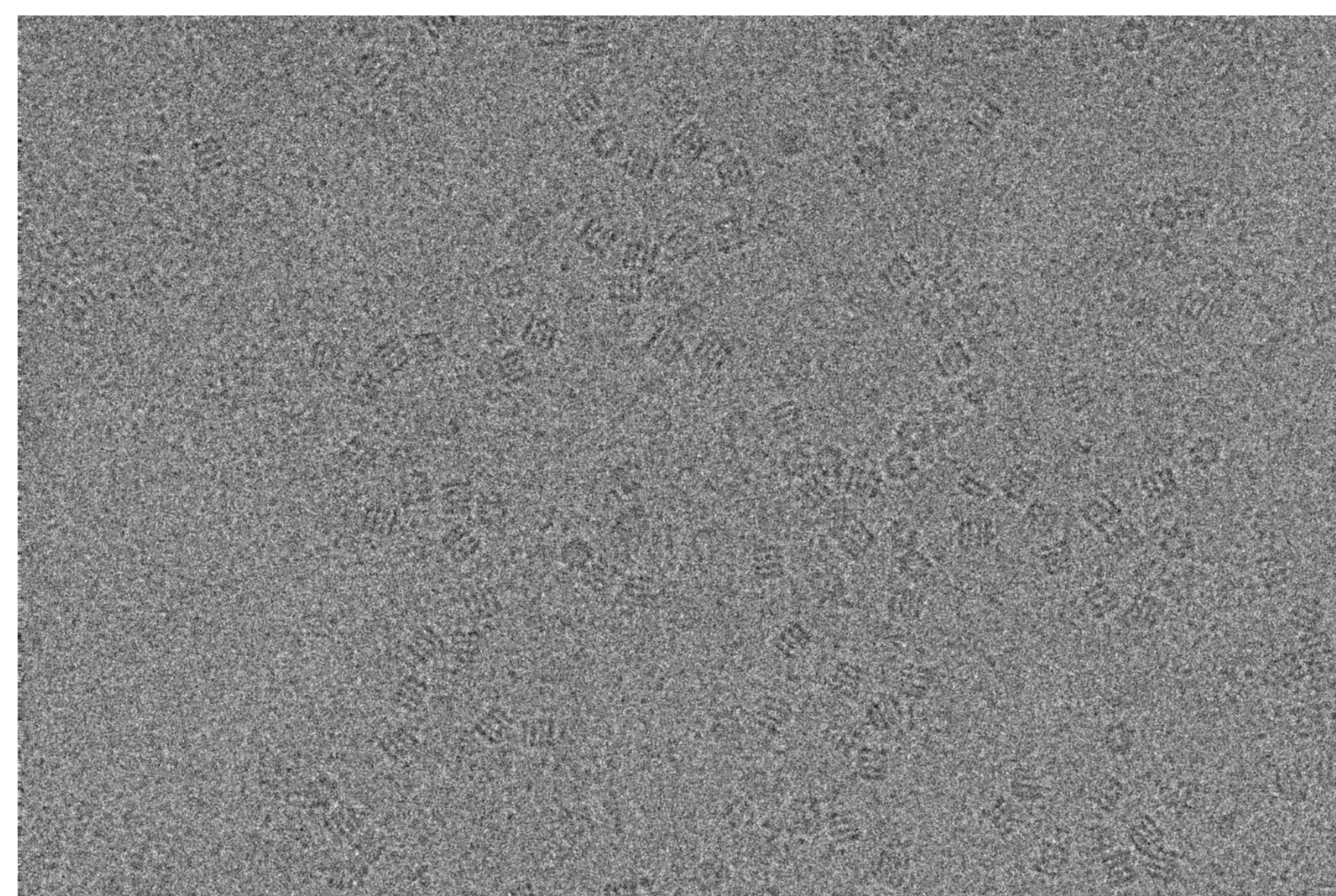


Fig. 2. Cryo-EM micrograph of *Escherichia coli* GroEL.

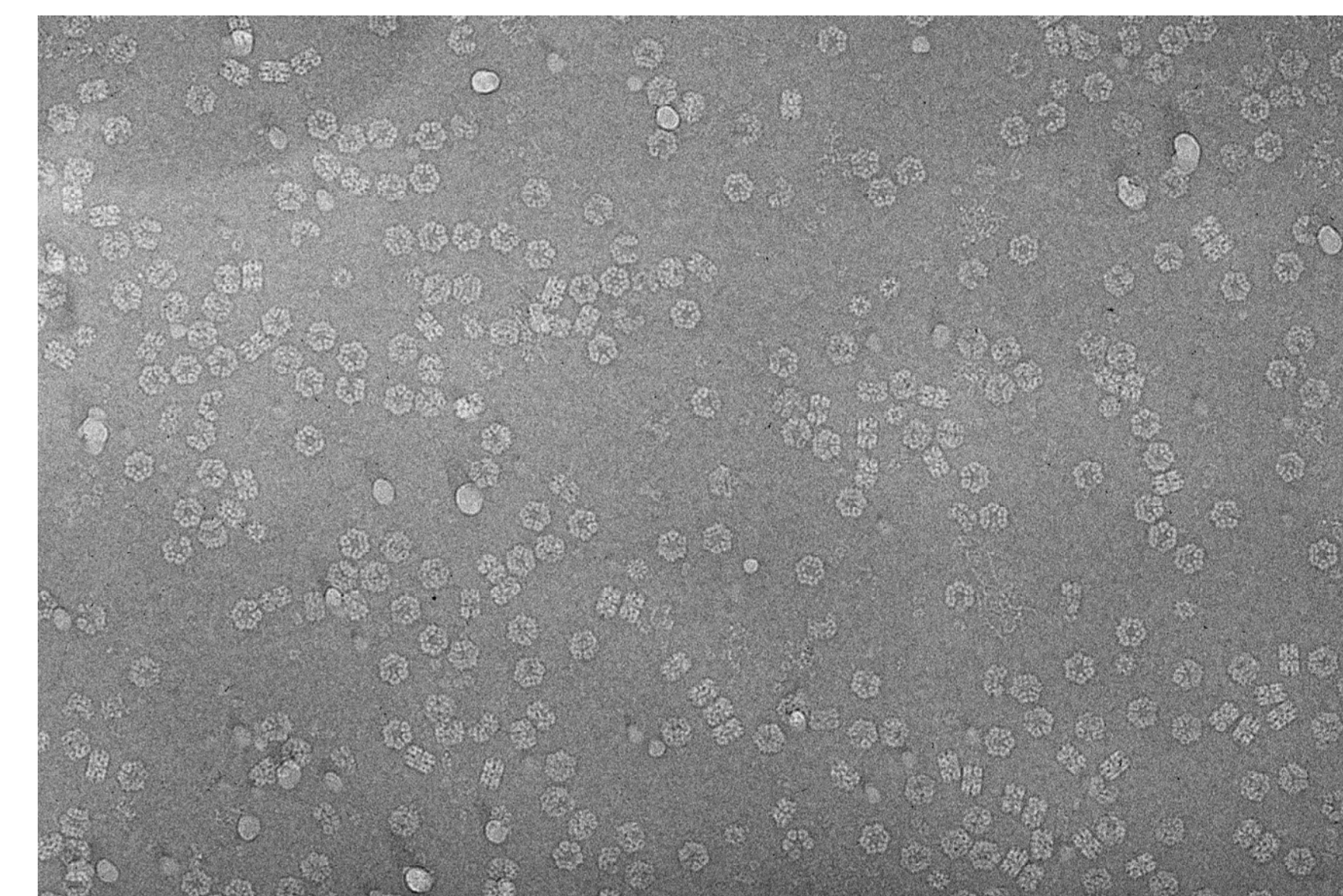


Fig. 3. Cryo-EM micrograph of *Lumbricus terrestris* hemoglobin.

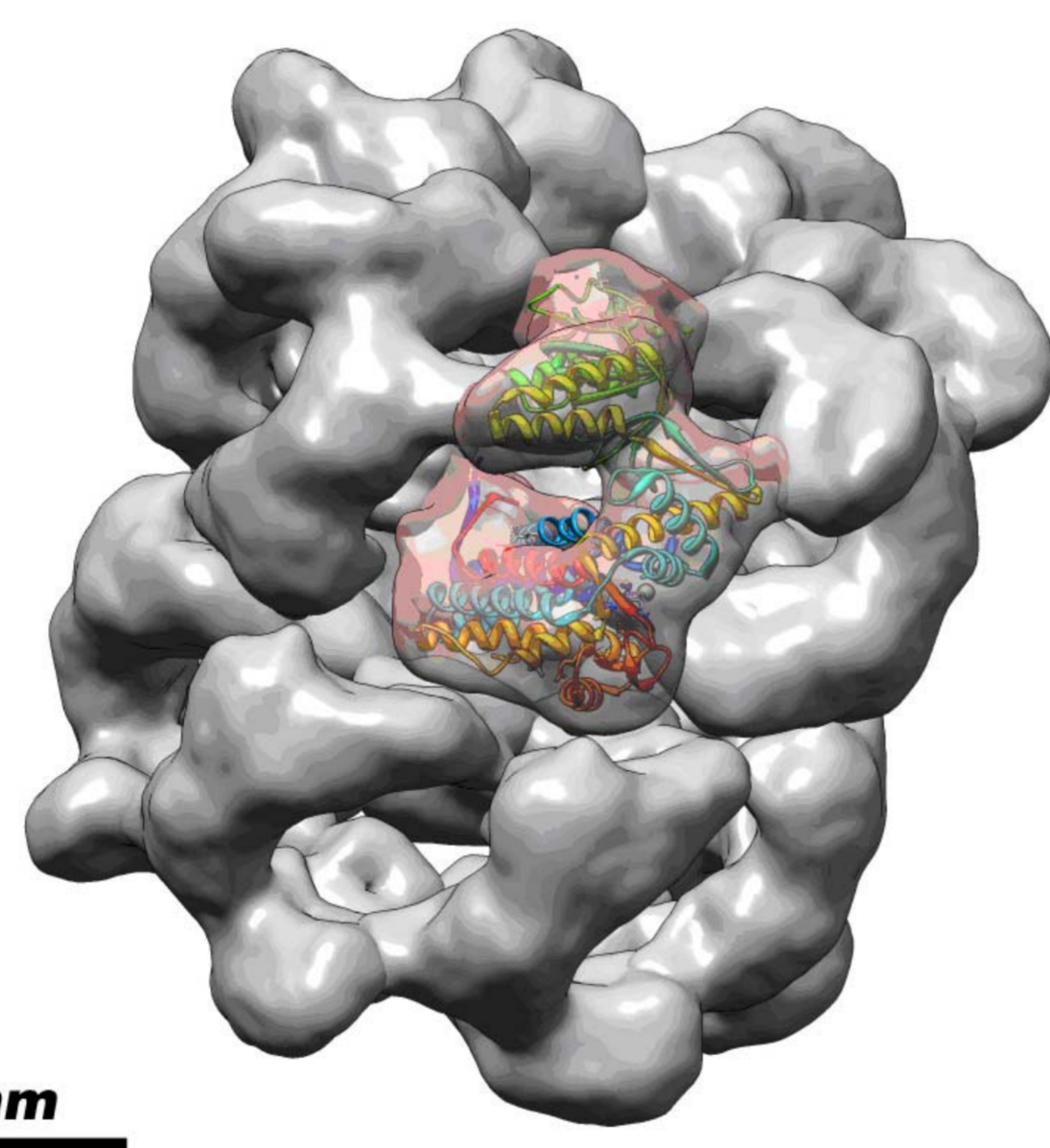


Fig. 4. Cryo-EM structure of *Escherichia coli* GroEL.

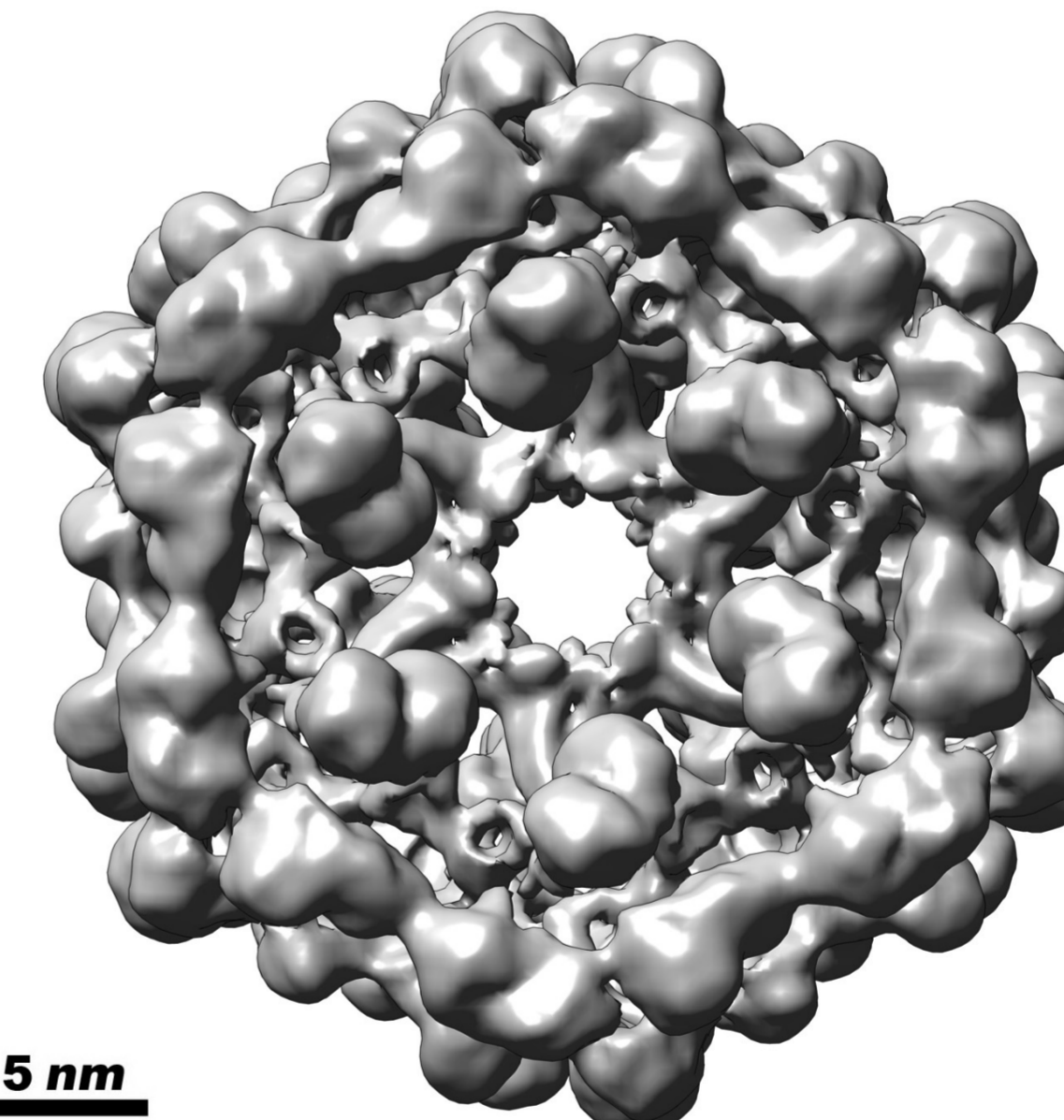


Fig. 5. Cryo-EM structure of *Lumbricus terrestris* hemoglobin.

Cryo-FIB scanning electron microscopy

Imaging of cryo-fracturing samples to reveal internal structures is a well established microscopy technique. For Cryo DualBeam technique, the full advantage of Focused Ion Beam (FIB) site specific cross sectioning normal to the sample surface, and direct SEM imaging are the unique capabilities that allow us to investigate the internal structures of biological specimens without the loss of any data or artifacts introduced by sample preparation.

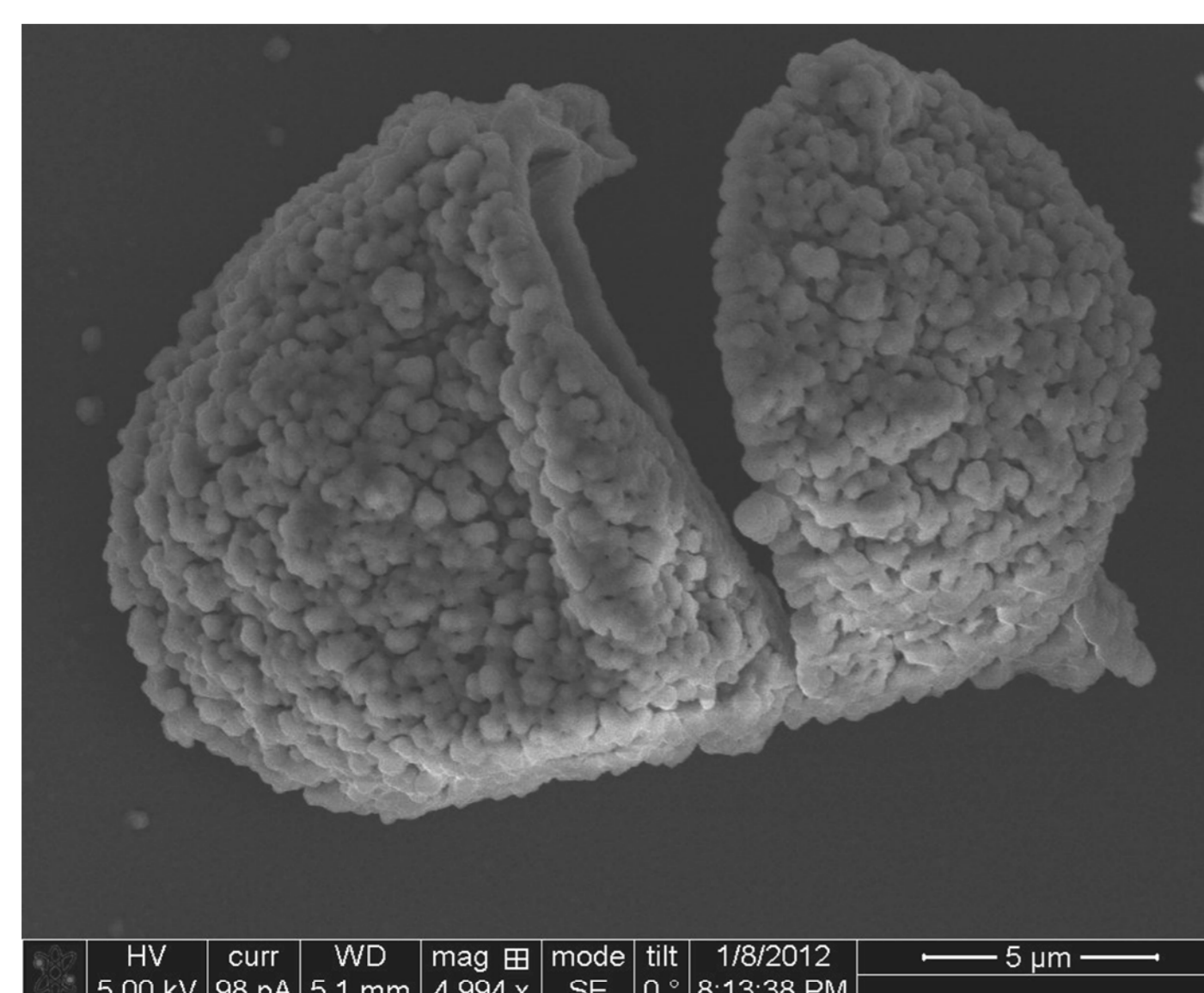


Fig. 6. Cryo-SEM image of a disrupted chloroplast.

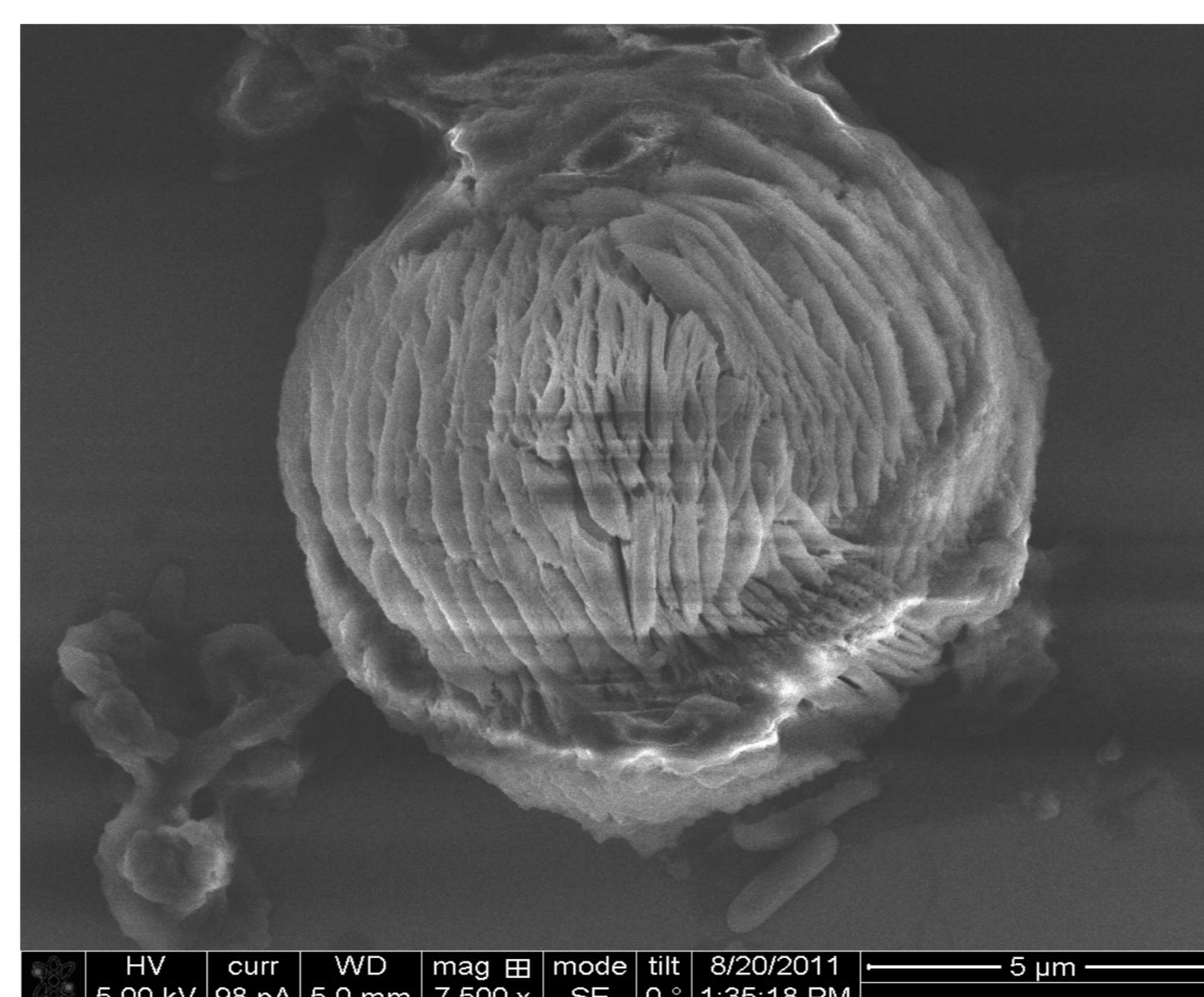


Fig. 7. Cryo-SEM image of chloroplast internal structure.

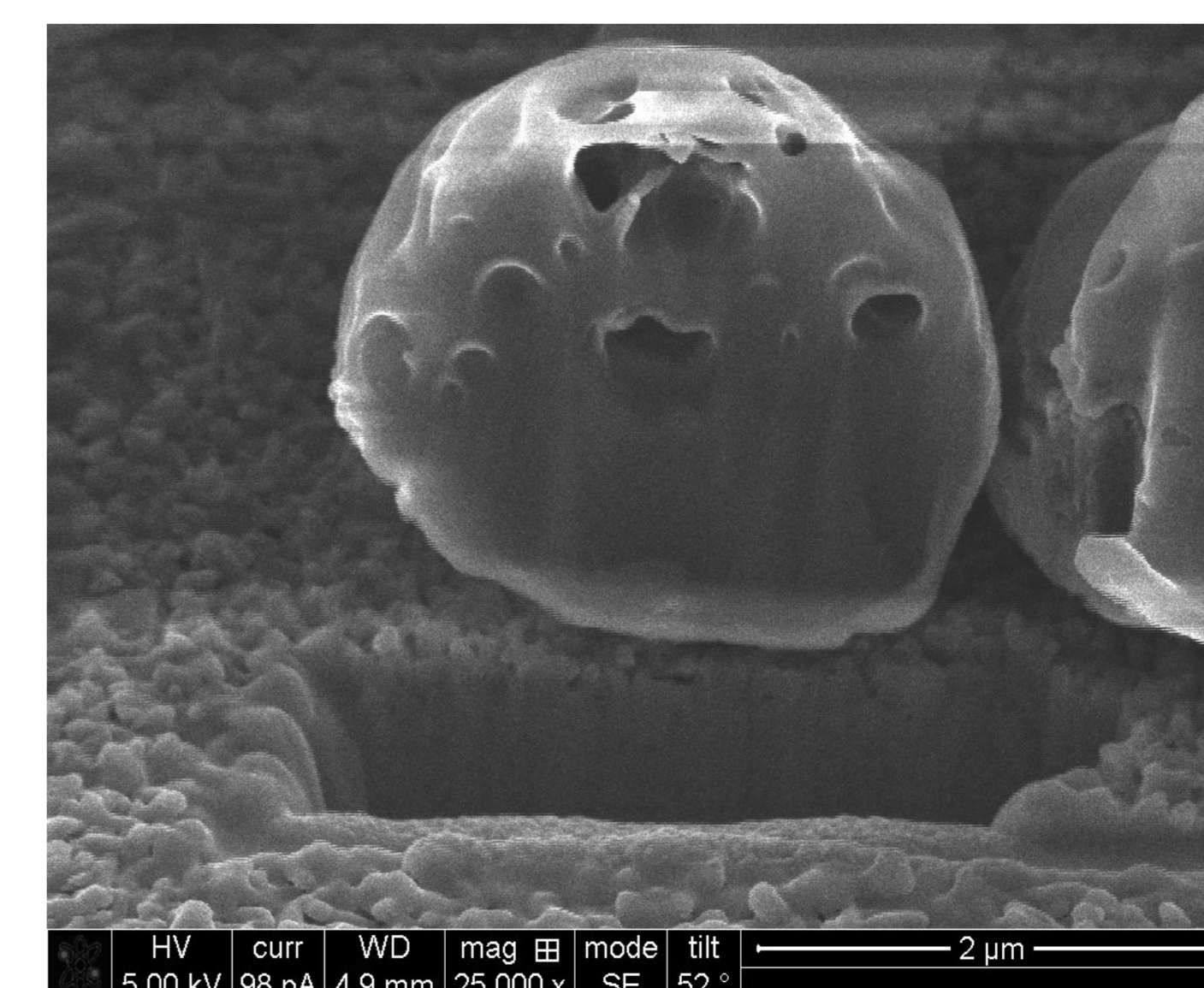


Fig. 8. Cryo-FIB prepared cross section of chloroplast grana.