

Electron 3D crystallography and single particle cryo-EM of membrane proteins for visualization of charges

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Electron 3D crystallography is a useful method for structure analysis from tiny and thin crystals of membrane proteins and protein complexes, which often yield crystals too small or too thin for even the synchrotron X-ray beam and X-ray free electron laser. More importantly, it can visualize the charged states of amino-acid residues and metals, as the diffraction pattern formed by elastically scattered electrons is directly related to the distribution of Coulomb potential. Here I introduce structure determination with charges, and discuss further applications including a suitable treatment of electron scattering factors of charged atoms.