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Presentation title: Molecular electron tomography can visualize individual macromolecules!

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The Structural Cellular Biology Unit combines microscopy (light microscopy as well as electron microscopy) and computational methods to visualize molecules and cellular structures in 3D or as functional supramolecular complexes in the cells. Cryo-transmission electron microscope, as well as super-resolution light microscopes for fluorescence studies, are used to understand the dynamics of macromolecules in situ and to investigate how they bind and interact with each other. This work has potential for drug delivery, as it offers molecular details of protein binding, virus structures, and receptor interactions in cell membranes.

There are several projects running within the Structural Cellular Biology unit:

- (1) Inverse problems and regularization, which address mathematical problems involved tomographic 3D reconstruction.
- (2) Mathematical logic, which focuses on both familiar and new ordinal notation systems and their combinatorial properties as objects in discrete mathematics.
- (3) Bacterial cell division, which uses super-resolution structured illumination microscopy, cryo-electron tomography and correlative cryo-fluorescence and cryo-electron microscopy to better understand the structural arrangement of the E. coli divisome during different stages of division.
- (4) Determination of the structure of the full length glucocorticoid receptor.
- (5) Structure and function studies of Malaria parasite infected human blood and the expressed parasite proteins that causes e.g. the phenomenon of rosetting in blood-vessels and gives rise to fever.

The SCB research Unit writes the original computer source code for most of the methods used and is also involved in creating fast hardware to increase the computational speed.