

Cryo-electron tomography of synapses

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The chemical synapse is a specialized contact structure by which neurons can communicate. We study their fine morphology by cryo-electron microscopy and tomography. On one hand we have developed methods and tools to produce cryo-sections of vitrified brain slices. On the other hand we are also working with isolated synapses (synaptosomes) and synaptic membranes, which are thin enough to be plunge frozen and imaged directly. We have in particular focused on the structure of acetylcholine receptor clusters present at the postsynaptic membrane of the neuromuscular junction. Acetylcholine receptors need to be highly concentrated for the muscle to function properly. Rapsyn is a scaffold protein and it is necessary to cluster the receptors to high concentration. With cryo-electron tomography and subtomogram averaging we have shown that the receptors are interconnected by rapsyn bridges and that each receptor can have up to three such bridges. More recently we have developed methods to trigger and observe exocytosis in synaptosomes and other systems.