At synaptic contacts between neurons, the presynaptic active zone organizes Ca2+-mediated release of neurotransmitter to activate neurotransmitter receptors localized at the postsynaptic specialization.

How these synaptic compartments assemble and control their function is under intense investigation.

Genetic analysis in the fruit fly Drosophila allowed us to identify a master organizer of presynaptic active zones, a protein we called Bruchpilot. At synapses lacking Bruchpilot, clustering of presynaptic

Ca2+-channels is defective, and efficiency of neurotransmitter release

is dramatically reduced. Thus, this protein might well organize changes of synaptic performance in vivo. We now address the architecture of active zones systematically analyzing synapses in two models, flies and mice. To this end, genetic and biochemical analysis is combined with a recent advance of light microscopy, stimulated emission microscopy (STED). STED drastically increases resolution of fluorescence microscopy, uncovering so far unseen substructures in the molecular architecture of synapses. Our results are relevant in the context of learning and memory as well as degenerative diseases of the nervous system.