

**Silvio Rizzoli, European Neuroscience Institute, Göttingen**

## **Synaptic Vesicle Recycling in Vivo**

### *Abstract*

Neurotransmitter release from synaptic vesicles is a key event in neuronal function. Nerve terminals contain a large number of vesicles, the majority of which is generally assumed to participate in release during conditions of high demand. We tested this assumption in vivo by FM dye photo-oxidation, on synapses from a variety of behaving animals (nematode, fruit fly, locust, cricket, zebrafish, frog, mouse, chicken embryo). Surprisingly, only 1-5% of the vesicles released neurotransmitter, even under extreme stress (predation of locusts by frogs). This proportion increased to ~30% in fruit flies lacking the vesicle-binding protein synapsin. The inactive vesicles assemble in clusters (possibly interlinked by synapsin), which serve as a buffer, binding soluble accessory molecules required for vesicle recycling. The buffering action prevents such proteins from diffusing into the axon. This proposed mechanism, which supports vesicle recycling, thus assigns a functional role to the majority of the vesicles.