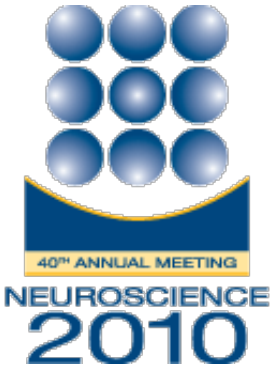

Presentation Abstract

Program#/Poster#:	448.5/G35
Title:	Stochastic modeling of vesicular release at hippocampal synapses
Location:	Halls B-H
Presentation Time:	Monday, Nov 15, 2010, 1:00 PM - 2:00 PM
Authors:	***S. NADKARNI**[1,2], T. M. BARTOL, Jr[2], T. J. SEJNOWSKI[2], H. LEVINE[1]; [1]Ctr. for Theoretical Biol. Physics, UC San Diego, LA JOLLA, CA; [2]Computat. Neurobio. Lab., Salk Inst. for Biol. Studies, La Jolla, CA
Abstract:	We develop a spatially explicit biophysical model of the hippocampal CA3-CA1 presynaptic bouton to study local calcium dynamics leading to vesicle fusion. A kinetic model with two calcium sensors is formulated specifically for the CA3-CA1 synapse. The model includes a sensor for fast synchronous release that lasts a few tens of milliseconds and a sensor for slow asynchronous release that lasts a few hundred milliseconds. We show that a variety of extant data on CA3-CA1 synapse can be accounted for consistently only when a refractory period of the order of few milliseconds between releases is introduced. Including a second sensor for asynchronous release that has a slow unbinding site and therefore an embedded memory is shown to play a role in short-term plasticity by facilitating release. For synchronous release mediated by Synaptotagmin a third timescale (0.53 ms) is revealed in addition to the fast and slow release. This third time scale corresponds to 'stimulus -correlated super-fast' neurotransmitter release. Our detailed spatial simulation indicates that all three-time scales of neurotransmitter release are an emergent property of the calcium sensor and independent of synaptic ultrastructure. Furthermore, it allows us to identify features of synaptic transmission that are universal and those that are modulated by structure.
Disclosures:	**S. Nadkarni:** None. **T.M. Bartol:** None. **T.J. Sejnowski:** None. **H. Levine:** None.
Keyword(s):	CALCIUM

SYNAPTIC PLASTICITY

ULTRASTRUCTURE

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