



The Abdus Salam
International Centre for Theoretical Physics



Minischool and Workshop on Multiple Time Scale in the
Dynamics of the Nervous System
16 to 29 June 2008, ICTP, Trieste, Italy

NOTES FOR TALK ON

"LEARNING RULES IN THE HIPPOCAMPUS AND CEREBELLUM"

by Prof. Samuel WANG

Department of Molecular Biology and Princeton Neuroscience Institute, Princeton
University, Princeton, New Jersey 08544, USA.

**Graded bidirectional synaptic plasticity is composed of switch-like unitary
events.**

O'Connor DH, Wittenberg GM, Wang SS

Proc Natl Acad Sci U S A. 2005 Jul 5;102(27):9679-84. Epub 2005 Jun 27.

Biological information storage events are often rapid transitions between discrete states. In neural systems, the initiation of bidirectional plasticity by all-or-none events may help confer robustness on memory storage. Here, we report that at CA3-CA1 hippocampal synapses, individual potentiation and depression plasticity events are discrete and heterogeneous in nature. Individual synapses began from extreme high and low strength states. Unitary plasticity events were all-or-none and drove synaptic strength between extremes in <1 min. Under naïve conditions, approximately three-fourths of synapses began in a low-strength state. The timing of these unitary events can account for the time course of macroscopic synaptic plasticity.