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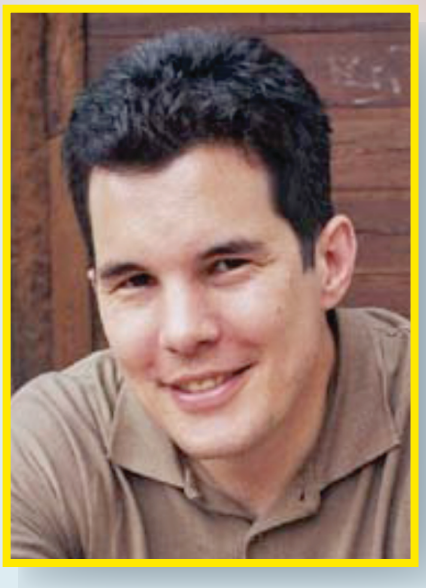
Special Seminar in Neuroscience

Dynamic Control of Dentritic Excitability During Hippocampal Rhythmic Activity



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Dendrites of pyramidal neurons receive about 50000 excitatory and inhibitory synapses. Our lab studies how dendrites integrate synaptic input and transform it into action potential output. Hippocampal theta rhythm is important for encoding and retrieval of memories. During hippocampal theta episodes ensembles of pyramidal neurons receive synchronized excitatory input causing them to discharge at 4-12Hz. We found that dendritic integration during repetitive and synchronized hippocampal activity is a highly dynamic process. Neurons control their dendritic excitability by tuning the availability of voltage-gated ion channels on their surface. As a result the input history of a dendritic branch determines its excitability. At the same time hippocampal interneurons respond to the activity of the pyramidal neuron population and inhibit dendritic excitability. We find that interneurons of the CA1 hippocampal subfield can be separated into two functional groups according to their theta response. The activity of one group attenuates strongly during short theta episodes while the activity of the other group increases. Interestingly, both groups have specialized axonal innervation zones on CA1 pyramidal neuron dendrites allowing a dynamic interplay of excitation and inhibition which may determine when and where synaptic plasticity will occur during theta.

12:00 p.m.
November 18, 2010

8th Floor

Neuroscience Center
of Excellence Conference Room

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