BIOMATH SEMINAR

Friday, February 13

1-2 pm

Harris 4119

Intrinsic bursting activity in respiratory neurons

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Abstract: The network of coupled neurons in the pre-Bötzinger complex (pBC) of the medulla generates a bursting rhythm, which underlies the inspiratory phase of respiration. In some of these neurons, bursting persists even when synaptic coupling in the network is blocked and respiratory rhythmic discharge stops. Bursting in inspiratory neurons has been extensively studied, and two classes of bursting neurons have been identified, with bursting mechanism depends on either persistent sodium current or changes in intracellular Ca 2+, respectively. Motivated by experimental evidence from these intrinsically bursting neurons, we present a two-compartment mathematical model of an isolated pBC neuron with two independent bursting mechanisms. Bursting in the somatic compartment is modeled via inactivation of a persistent sodium current, whereas bursting in the dendritic compartment relies on Ca2+ oscillations, which are determined by the neuromodulatory tone. The model explains a number of conflicting experimental results and is able to generate a robust bursting rhythm, over a large range of parameters, with a frequency adjusted by neuromodulators.