Greg Kiar 02/19/2015

SBE II: Homework 3

Experiment-3:

Show below, from left to right, are the responses of the neuron for values of μ ranging from 90%, 100%, and 110% of the initial value of $\mu = 0.0133$.

We can see in the case where μ was decreased, bursting does not occur but a constant stream of action potentials can be observed. When looking at the equation for Calcium change, we notice that the μ term is responsible for scaling the effect of Calcium current. The decrease in μ is effectively a decrease in the rate of Calcium growth after each action potential. Since the growth of Calcium is slower, we see that the "limit" at which the burst stops (i.e. the KCa channel conductance is sufficiently large) is not reached in this case.

We can see in the middle, original, figure, that there is a refractory period after several burst spikes occur while the concentration and conductance of Calcium reset. If you now look at the right plot, with an increased μ, you can see fewer burst spikes occurring before this period sets in. In this case, the growth, $\frac{dCa}{dt}$, after each action potential is larger which means that the conductance of the KCa channel reaches a sufficiently high value to stop further potentiation more quickly.