1014-92-1130 **Bradford E Peercy*** (bpeercy@rice.edu), Computational and Applied Mathematics, Rice University - MS 134, Houston, TX 77005. *Calcium Wave Initiation and Evolution in a Neuron.*

Recent advances in calcium imaging have made visualization of large evanescent calcium waves in hippocampal pyramidal neurons possible, quantifiable, and repeatable. The mechanism behind large calcium waves is auto-catalytic release of calcium from internal stores incumbent upon inositol 1,4,5-triphosphate (IP3) generated by neurotransmitter binding to a transmembrane receptor. Pertinent questions are how, when, and where does a calcium wave initiate; why is wave propagation unidirectional toward the cell body; why does the wave stall at the cell body, and what conditions surround this stalling? To focus on these issues biophysical complexity is pointedly modeled including a) critical geometry - the cell body, the main dendritic trunk, and a single oblique dendrite, b) IP3 production, and c) excitable IP3 receptor dynamics. The model initiation of such calcium waves uses one-dimensional nonlinear reaction diffusion equations coupled to a system of subordinate ODE dynamics. Using analytical solutions coupled with numerical techniques we find 1) conditions to guarantee calcium wave generation involving coincidence of stimuli, 2) heterogeneity which forces unidirectional calcium wave propagation, and 3) conditions for calcium wave propagation into the cell body. (Received September 27, 2005)