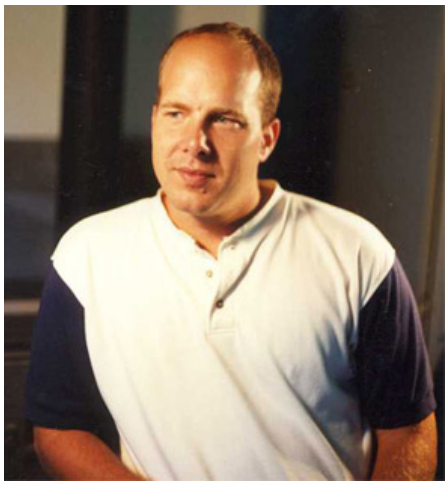
BIOMATH SEMINAR

Friday, October 24
1-2 pm
Harris 4119

Modeling the stochastic dynamics of localized calcium elevations and whole cell calcium responses



Dr. Gregory D. Smith
Director, Biomath Initiative
Professor, Department of Applied Science
Neuroscience Program Faculty Affiliate
The College of William & Mary

When Markov chain models of intracellular Ca channels are coupled via a mathematical representation of a Ca microdomain, simulated Ca release sites exhibit the phenomenon of stochastic Ca excitability whereby IP3Rs and RyRs open and close in a concerted fashion. Such mathematical models provide insight into the relationship between single-channel kinetics and the statistics of Ca puff/spark duration, and clarify the role of stochastic attrition, Ca inactivation, luminal depletion, and allosteric interactions in the dynamics of puff/spark termination. The stochastic dynamics of local Ca is an important aspect of excitation-contraction coupling in cardiac myocytes, where sarcoplasmic reticulum Ca-induced Ca release is locally controlled by trigger Ca influx via L-type channels of the plasma membrane. A recently developed whole cell modeling approach is able to avoid the computationally demanding task of resolving spatial aspects of global Ca signaling by using probability densities and associated moment equations to representing heterogeneous local Ca signals in a population of Ca release units.