QBI Seminar next Wednesday. If you want to talk to Greg during his visit, please contact Peter Jung (jungp@ohio.edu)

Greg Smith, Department of Applied Science, The College of William and Mary.

"Modeling local control of calcium-induced calcium release in cardiac myocytes"

Irvine 159, Wednesday February 6, 2008, 4:10-5:00 PM

Abstract. I will present a probability density approach to modeling localized Ca influx via L-type Ca channels and Ca-induced Ca release mediated by clusters of ryanodine receptors during excitation-contraction coupling in cardiac myocytes. Coupled advection-reaction equations are derived relating the time-dependent probability density of subsarcolemmal subspace and junctional sarcoplasmic reticulum [Ca] conditioned on "Ca release unit" state. When these equations are solved numerically using a high-resolution finite difference scheme and the resulting probability densities are coupled to ordinary differential equations for the bulk myoplasmic and sarcoplasmic reticulum [Ca], a realistic but minimal model of cardiac excitation-contraction coupling is produced. Modeling Ca release unit activity using this probability density approach avoids the computationally demanding task of resolving spatial aspects of global Ca signaling, while accurately representing heterogeneous local Ca signals in a population of diadic subspaces and junctional sarcoplasmic reticulum depletion domains. The probability density approach is validated for a physiologically realistic number of Ca release units and benchmarked for computational efficiency by comparison to traditional Monte Carlo simulations. [This is joint work with George S. B. Williams, Marco A. Huertas, Eric A. Sobie, and M. Saleet Jafri.]