



CLAREMONT CENTER for
the MATHEMATICAL SCIENCES

CCMS COLLOQUIUM

THE GAME OF LIFE (AND SUDDEN DEATH):
PREDICTING CARDIAC INSTABILITIES AT MULTIPLE SCALES
WITH NONLINEAR STOCHASTIC MODELS

by

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ABSTRACT

Cardiac cells have a surprisingly complex architecture, and dynamic instabilities within them may lead to ventricular fibrillation, the leading cause of sudden cardiac death. The principle contractile signal, calcium release, must rise and fall in a controlled fashion, yet is a result of the random action of thousands of subcellular “Calcium Release Units” (CRUs). How does the cardiac cell produce an orderly signal from a seemingly random process, and what causes this system to break down?

We will first examine the dynamics of a single CRU represented as a Birth-Death (Markov) Process with multiple “fixed points”. At a higher scale, we consider a network of such CRUs, encoding their properties into a Cellular Automata scheme. We analyze the average (ensemble) behavior of the system with an iterated map function and find sufficient conditions under which calcium release undergoes a period-2 bifurcation to instability.

Wednesday, September 30, 2009, at 4:15pm

Millikan 134, Pomona College

Refreshments served at 3:45 p.m.

Harry Mullikin Room, Millikan 209

*The dinner will be hosted by Prof. Mike Orrison
If interested in attending, call ext. 79709*