

BI-CO MATHEMATICS COLLOQUIUM

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“Mathematical Models of Calcium Regulation”

Tuesday, January 27, 2009

Talk at 4:45 – Park 338
Tea at 4:30 – Park 355, Math Lounge

Abstract:

Calcium is a ubiquitous signaling molecule involved in the regulation processes ranging from muscle contraction to egg fertilization. Oscillations in cytosolic calcium concentration are often observed in the presence of signals from outside the cell, such as hormones. In this talk, mathematical models of calcium regulation are built and analyzed. As a starting point, we assume that calcium concentration is always uniform throughout the cell, and we study a model which consists of ordinary differential equations. This model exhibits a sharp transition from a stable steady-state with minimal calcium release to a periodic calcium release as the amount of signaling molecule is increased. However, biological data show a gradual transition. Moreover, calcium concentration can be inhomogeneous in space as wave propagations and spontaneous localized releases are often observed. We thus created partial differential equation models to study how spatial diffusion and release localization affect the onset of oscillation.

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