Temple University Mathematics Colloquium

Samuel Isaacson

University of Utah

will speak on

Mathematical Problems From Molecular Cell Biology

ABSTRACT:

We will explain the need for stochastic reaction-diffusion models appropriate for studying the dynamics of gene and signaling networks within biological cells. In particular, we will describe our work developing a stochastic reaction-diffusion method that can incorporate the complex geometry of cellular architecture, and the application of this method to a model for eukaryotic gene expression and nuclear transport. This work raised the question of what the reaction-diffusion master equation (RDME), a lattice based stochastic reaction-diffusion model, approximates as the lattice spacing is decreased. We will discuss our recent work proving that in the continuum limit reaction effects are lost in the RDME model. While this may seem a negative feature, we will also show how the RDME for finite lattice spacings may be interpreted as an asymptotic approximation to a spatially-continuous stochastic reaction-diffusion model due to Smoluchowski. We will conclude with a brief introduction to a new, long term, modeling project we have begun, developing stochastic-reaction diffusion models of gene/signaling networks involved in several cardiac conditions.

Monday, 4 February 2008
Lecture at 4:00 pm
Coffee, tea, and refreshments from 3-5 pm
Room 617, Wachman Building
Department of Mathematics