

Tutorial Proposal for ICSB 2008

Title:

From Quantitative Microscopy to Spatial Simulations of Kinetic Models

Presenter:

Ion I. Moraru (moraru@panda.uhc.edu)
Richard D. Berlin Center for Cell Analysis and Modeling
University of Connecticut Health Center
Farmington, CT 06030-1507, USA

Abstract:

Recent years have seen a proliferation of microscopy-related technologies that aim to gather quantitative data in live cells such as molecular concentration distributions, diffusion rates, and reaction rates. Highly specialized algorithms and software are required both for proper analysis of experimental data and for building predictive models of molecular interactions. This tutorial will cover intermediate and advanced topics related to spatially-resolved kinetic models and simulations of intracellular reaction networks. It is assumed that the participants will have a basic understanding of microscopy and biochemical principles (e.g. fluorescent labels, rate laws, mass action).

A wide spectrum of examples will be presented. On the one hand, we will show how kinetic simulations are useful to properly analyze experiments such as FRAP and FLIP. On the other hand, we will show how microscopy data can be used in conjunction to molecular biology and biochemistry data to generate mechanistic and predictive models of spatial signaling and regulation in eukaryotic cells. We will discuss the use of both stochastic and deterministic models, as well as practical issues regarding software platforms and applications. In particular, we will demonstrate the use of the Virtual Cell web environment (<http://vcell.org/>) and related standalone applications.