



Connecting Experiments, Data Standards, and 3-D Simulations for Multicellular Systems Biology



Paul Macklin, Ph.D.

Assistant Professor

Center for Applied Molecular Medicine

University of Southern California

Thursday, November 19, 2015

4:00 PM

A2-342 MDCC, Moss Auditorium

Marion Davies Children's Clinic

ABSTRACT:

New experimental and imaging techniques have created a deluge of molecular and multicellular data, but these data have not necessarily improved our understanding of multicellular biological systems. One solution is to use mechanistic 3-D simulators for hypothesis testing, engineering, and therapeutic planning. In this talk, we will present our work to create a suite of open source tools and data standards for multicellular systems biology and medicine.

We will show parameter identification tools that extract cell birth and death parameters from high-content screening experiments. We store these and other biophysical parameters in a library of model-independent digital cell lines using MultiCellDS (multicellular data standard). We will present BioFVM (finite volume method for biology) and PhysiCell (physics-based cell simulator), which jointly can simulate millions of cells in 3-D tissues. The C++ codes use OpenMP to enable large simulations (at least 5 million cells, 10 diffusing substrates, 1 million voxels) on quad-core desktops and individual supercomputer nodes, or large parameter investigations distributed across high performance clusters. We will close with applications to bioengineering experiments and patient-tailored cancer simulations.

Host: Mary Sehl, M.D., Ph.D.

To receive e-mail seminar notices, contact David Tomita (dtomita@biomath.ucla.edu)