Genomics Auditorium
University of California, Riverside
November 15-16, 2017
http://icgmb.ucr.edu/

Sponsored by:
NIH Multi-scale Modeling Consortium (MSM)
Interagency Modeling and Analysis Group (IMAG)
Society for Mathematical Biology (SMB)
Interdisciplinary Center for Quantitative Modeling in Biology, UC Riverside
Department of Mathematics, UC Riverside
College of Natural and Agricultural Sciences (CNAS), UC Riverside
Bourns College of Engineering, UC Riverside
Office of Research and Economic Development, UC Riverside
School of Medicine, UC Riverside

Co-organizers:
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Free Registration: http://icgmb.ucr.edu/talkpages/msbmsbpuscad/registration.html

Description: Participants of the Conference will present talks in three tracks indicated below and discuss interactions of methods developed for addressing main challenges to bridging scales from molecular to clinical by catalyzing collaborations with clinicians. Clinicians will lead discussions on establishing interdisciplinary collaborations on development of new patient specific treatment strategies. Researchers from pharmaceutical companies will be also invited to participate in discussions.

1. Multi-scale modeling of cell behavior and tissue growth in patients under stress conditions or with chronic or acute diseases including, among others, cancer, thrombosis and sepsis. For example, modeling blood clot formation in cancer patients or patients with diabetes. Data for patients with acute stage of a disease or with untreated chronic disease are often not available making calibration of models difficult. Discussions will address specific topics including whether a model calibrated under normal conditions can be used for simulating cellular and tissue behavior in a patient with several health problems by just shifting parameter ranges, or new model extensions need to be developed.

2. Multi-scale modeling of therapeutic interventions, including pharmaceuticals as well as gene therapy, cell therapy, and physiological therapy. Development of multi-scale models of the key molecular biology, cellular biology, heterogeneous tissue architecture, and physiology, could lead to detailed comparison of many different treatments, including different drugs, routes of administration, doses and schedules. bvirtual clinical trials that incorporate models of many patients. Due to the multi-scale nature of the models, clinicians could identify emergent therapeutic or toxic effects of treatments, as well as conditions under which therapies fail. These models can translate knowledge from in vitro cell culture to in vivo preclinical and clinical studies, which is important because it is known that observed mechanisms in vitro do not always hold in vivo. These models can help researchers and clinicians translate therapies from animals to humans, or from microphysiological systems (‘body-on-a-chip’) to patients.

3. Multi-scale modelling of biochemical networks personalized with omics data. Combining -omics data, machine learning approaches and other statistical methods with multi-scale modeling approaches to human disease. For example: Integration of statistics, optimization and multi-scale mechanistic modelling of brain metabolism to try to stratify Parkinson's disease patients based on distinct aetiopathegenic origins.

Talks in each of three tracks will focus on the following topics:

1. Key methodologies for different applications. Discussion of whether these methodologies are transferable, and how they can be shared.

2. Specific examples of biomedical applications and diseases studied using multi-scale methods and combining different methodologies. Discussion of how this can be extended to other diseases.

3. Best practices for establishing collaborations with clinicians including development of common language, exchange of data, and application of predictive simulations. Discussion of how to assemble, adopt, and disseminate best practices.

Suggestions of additional topics or extensions of the initially suggested topics will be solicited from the members of the Multi-scale Systems Biology WG and from other members of the MSM Consortium. General information about the Conference will be posted on the WG wiki with several prearranged windows to solicit suggestions on specific subjects.

In the lead-up to the conference, we will organize several webinars to discuss and refine visions for specific conference tracks. These webinars will help to identify and discuss central topics of importance in specific fields and tracks in advance of the conference, so that the conference itself will have well-defined goals for discussions and for outputs of those discussions. A series of webinars will be similarly organized after the conference to finalize white papers, reviews, commentaries and other work products of the conference.

Speakers and Titles of the Talks:

Gary An
Department of Surgery
University of Chicago School of Medicine
Title: "Re-examining the Evaluation and use of Agent-based Models to address the Crisis of Reproducibility, the Translational Dilemma and Precision Medicine"

Daniel Beard
Department of Molecular and Integrative Physiology
University of Michigan Medical School
Title: “Computational Systems Analysis to Predict and Analyze Targets for Improving Mechanical-Energetic Coupling in the Myocardium in Heart Failure”

Danny Bluestein
Biomedical Engineering Department
Stony Brook University
Title: ""A Predictive Multiscale Model for Simulating Platelets Activation and Aggregation in Shear Flows"

William R. Cannon
Systems Biology
Pacific Northwestern National Laboratory
Title: “Multiscale Systems Biology: Thermodynamic Methods for Prediction of Cellular Dynamics, Metabolite Levels and Phenotypes"

Sunny Canic
Department of Mathematics
University of Houston
Title: “"How Arterial Walls Mediate Cardiovascular Flows in High Stress/High Adrenaline Situations”

Jason M. Haugh
Chemical & Biomolecular Engineering
North Carolina State University
Title: “Directed Cell Migration in Wound Healing: Multi-scale, Dynamical Feedback Explains Robustness”

C. Anthony Hunt
Department of Bioengineering and Therapeutic Sciences
Schools of Pharmacy and Medicine
University of California, San Francisco
Title: “Scientifically Productive Virtual Experiments”

George Karniadakis
Division of Applied Mathematics,
Brown University
Title: “Stochastic Multiscale Modeling of hematolgical disorders”

Denise Kirschner
Department of Microbiology and Immunology, University of Michigan Medical School
Title: "Multi-scale Systems Biology Approaches to Understand Infection and Treatment with M. tuberculosis"

Melissa L. Knothe Tate
Biomedical Engineering, University of New South Wales, Australia
Title: "Translation of Engineering Innovations Discovered through Multiscale, Coupled Imaging and Computational Modeling"

Nathan Lewis
Department of Pediatrics
University of California, San Diego
Title: “Capturing a More Accurate View of Tissue and Cell-type Specific Metabolism”

Alison Marsden
Department of Pediatrics – Cardiology
School of Medicine
Department of Bioengineering
Stanford University
Title: “"Computational Investigations of the Biomechanical Underpinnings of Vein Graft Failure”

Andrew D. McCulloch
Department of Bioengineering
Department of Medicine
School of Medicine
University of California, San Diego
Title: “Multi-Scale Modeling and Systems Mechanobiology of Ventricular Hypertrophy and Failure”

Eric Sobie
Icahn Medical Institute
Mount Sinai School of Medicine, New York, NY
Title: “Exploiting mathematical models to predict differences between individuals in cardiac physiology”

John Weisel
Departments of Cell and Developmental Biology
University of Pennsylvania Perelman School of Medicine
Title: "Multi-scale Methods for Studying Blood Clot and Thrombus Structure and Mechanics from Nanometers to Patients"

Laurence Yang
Systems Biology Research Group
University of California, San Diego
Title: "Deciphering alternate microbial responses to oxidative stress by combining omics data with a multi-scale model"