

**Program for the 8<sup>th</sup> International Conference on Complexity in Acute Illness  
Stanford University, Palo Alto, California**

**Friday, August 28**

8:00 – 8:45 AM: Breakfast

8:45 – 9:00 AM: Welcome and Introductory Remarks: Gary An

Overview Talks: Expert Perspectives and Context

9:00 – 9:40 AM: Tentative Title: “Applied Topology for Pattern Analysis in Biological Systems.”

Gunnar Carlson, PhD. Professor, Department of Mathematics, Stanford University

9:40 – 10:20 AM: Tentative Title: ”Robust yet Fragile Systems: Implications for Biology and Lessons from Exercise Physiology.”

John Doyle, PhD, Professor of Control and Dynamical Systems, and of Electrical Engineering, California Institute of Technology

10:20 – 11:00 AM: “Abductive Reasoning through Synthetic Modeling and Simulation: Creative Cognition and Knowledge Creation.”

C. Tony Hunt, PhD, Professor, Department of Biopharmaceutical Sciences, University of California, San Francisco

11:00 – 11:40 AM: Tentative Title: “Translational Systems Biology”

Yoram Vodovotz, PhD. Professor, Department of Surgery, and Immunology, and Computational Biology, University of Pittsburgh, Director of the Center for Inflammation and Regenerative Modeling, the McGowan Institute for Regenerative Medicine, University of Pittsburgh

11:40 AM – 1:00 PM: Lunch

1:00 PM – 1:50 PM: Keynote: *Title TBD.*

Adam Arkin, PhD, Professor, Department of Bioengineering, Director of The Virtual Institute of Microbial Stress and Survival, Lawrence Berkeley National Laboratory

Focus Area: Traumatic Brain Injury

1:50 – 2:30 PM: Tentative Title: “Integrative Analysis of Traumatic Brain Injury.”

Geoff Manley, MD, PhD. Associate Professor, Department of Neurological Surgery, University of California, San Francisco, Chief of Neurotrauma, San Francisco General Hospital

2:30 – 2:50 PM: “Patient-Specific Mathematical Models of Traumatic Brain Injury”

Qi Mi, PhD. Departments of Sports Medicine and Nutrition, University of Pittsburgh

2:50 – 3:10 PM Coffee Break

3:10 – 3:30 PM “Data-Driven Modeling Approaches for Predicting Outcomes Following Traumatic Brain Injury”

Gregory Constantine, PhD. Department of Mathematics, University of Pittsburgh

3:30 – 3:50 PM “Assessing the prediction potential of an in silico computer model of intracranial pressure dynamics”

Brahm Goldstein, MD, MCR. Department of Pediatrics, University of Medicine and Dentistry of New Jersey, New Brunswick, and Ikaria, Inc.

### Modeling Methods and Tools

3:50 – 4:10 PM: “The Abstracted Biological Computational Unit (ABCU): Introduction of a recursive descriptor for multi-scale computational modeling of biological systems.”

Ricardo Colasanti, PhD. Department of Surgery, Northwestern University

4:10 – 4:30 PM “An Agent-based Modeling Framework for Ontology Integration: Towards Formal Executable Knowledge Representation”

Gary An, MD. Department of Surgery, Northwestern University

4:30 – 4:50 PM: “Simulation of Lung Alveolar Type II Epithelial Wound Healing In Vitro”

Sean H. J. Kim, PhD. UCSF/UC Berkeley Joint Graduate Group in Bioengineering, University of California, Berkeley and the University of California, San Francisco

4:50 – 5:10 PM: “Using statistical model selection criteria to discriminate non-subjectively between hypotheses about physiological mechanisms underlying experimental observations: a practical example”

Sven Zenker, MD. Department of Anaesthesiology and Intensive Care Medicine, University of Bonn Medical Center

5:10 – 5:30 PM: “A Parallel Implementation of an Agent-based Modeling Platform with Application in Modeling Calcium Release in Cardiomyocytes.”

Maxim Mikheev, PhD. Departments of Surgery, Mathematics, and Sports Medicine and Nutrition, University of Pittsburgh

5:30 – 6:30 PM: Business Meeting

7:00 PM+ Dinner on your own

## **Saturday, August 29**

8:00 – 8:20 AM: Breakfast

### Pattern Recognition: Complexity and the Physiologic Response

8:20 – 8:40 AM: “Fluctuation-dissipation theorem (FDT) Provides a Simple Analytical Relationship between post-stress heart rate recovery (HRR) and heart rate Variability (HRV) During the Stress.”

Anton Burykin, PhD. Department of Surgery, Washington University

8:40 – 9:00 AM: “Changes in temporal structure of heart rate variability during clinical stress testing.”

Timothy Buchman, MD, PhD. Emory Critical Care Center, Emory University Hospital

### Pattern Recognition: Clinical Applications

9:00 – 9:20 AM: “Integer Heart Rate Complexity, Mechanical Ventilation, and Mortality: Effect of Pressure and Rate in 527 Trauma Patients”

William Riordan, MD. Division of Trauma and Surgical Critical Care, Vanderbilt University

9:20 – 9:40 AM: “Combination of Dynamic Analysis and Data Mining for Stability Prediction after Cardiac Surgery.”

Jean-Marie Aerts, MSc, PhD. Department of Biosystems, Katholieke Universiteit Leuven

9:40 – 10:00 AM: “Dynamic information improves discharge prediction after cardiac surgery”

Jean-Marie Aerts, MSc, PhD. Department of Biosystems, Katholieke Universiteit Leuven

10:00 – 10:20 AM: Coffee Break

### Patterns and Potential Relationships to Mechanisms

10:20 – 10:40 AM: “Principal Component Analysis Delineates both Subgroup and Patient-Specific Insights into Acute Inflammation in Trauma Patients”

Ali Ghuma, PhD. Department of Surgery, University of Pittsburgh

10:40 – 11:00 AM: “A Multi-scale Model for the Assessment of Autonomic Dysfunction in Human Endotoxemia”

Panagiota Foteinou, PhD. Department of Biomedical Engineering, Rutgers University, Piscataway

11:00 – 11:20 AM: Catch up Time

11:20 – 11:40 AM: “The Role of Weak Internal Noise in Biological Systems”  
Dawei Hong, PhD. Center for Computational and Integrative Biology, Rutgers University, Camden

11:40 – 12:00 Noon: “Are We Listening to Music or Noise? Use of the Lyapunov Exponent for Comprehensive Assessment of Heart Rate Complexity during Hemorrhage in Sedated Conscious Miniature Swine”  
Andriy Batchinsky, MD. U. S. Army Institute of Surgical Research

12:00 – 1:00 PM: Lunch

1:00 – 1:20 PM: “Porcine Endotoxemia: Multiplexed Cytokine Analysis and Mathematical Modeling”  
Yoram Vodovotz, PhD. Departments of Surgery, Immunology and Computational Biology, University of Pittsburgh, and the Center for Inflammation and Regenerative Modeling (CIRM)

#### Aspects of Biological Control and Regulation

1:20 – 1:40 PM: “Injury, Stress and Dysregulation: A Complex Adaptive Systems Approach”  
Richard Chapman, PhD. Department of Anesthesiology, University of Utah

1:40 – 2:00 PM: “Dynamics of Mitotic Exit”  
Baris Hancioglu, PhD. Department of Biological Sciences, Virginia Polytechnic Institute and State University

2:00 – 2:20 PM: “Modeling the immune rheostat of macrophages in the lung in response to infection”  
Judy Day, PhD. Mathematical Biosciences Institute, The Ohio State University

2:20 – 2:40 PM: “A compartmental model reveals a mechanism for misregulation of neutrophil trafficking in sepsis.”  
Justin Hogg, BS. Carnegie Mellon – University of Pittsburgh Ph.D. Program in Computational Biology

#### Mechanistic Computational Modeling

2:40 – 3:00 PM: “Mechanistic Simulations Explain Paradoxical Saquinavir Metabolism During In Vitro Vectorial Transport Study”

Tai Ning Lam, BS. UCSF/UC Berkeley Joint Graduate Group in Bioengineering, University of California, Berkeley and University of California, San Francisco

3:00 – 3:20 PM Coffee Break

3:20 – 3:40 PM: “Using a mathematical model to analyze the role of probiotics and inflammation in necrotizing enterocolitis.”

Julia Arciero, PhD. Department of Mathematics, University of Pittsburgh

4:00 – 4:20 PM: “A Synthetic In Silico Model of Leukocyte Rolling, Activation, and Adhesion During Inflammation”

Jonathon Tang, BS. UCSF/UC Berkeley Joint Graduate Group in Bioengineering, University of California, Berkeley and University of California, San Francisco

4:20 – 4:40 PM: “Immune Response to Influenza A”

Ian Price, BS. Department of Mathematics, University of Pittsburgh

Jesse Engelberg, BS. UCSF/UC Berkeley Joint Graduate Group in Bioengineering, University of California, Berkeley and Department of Bioengineering and Therapeutic Sciences, University of California, San Francisco

4:40 – 5:00 PM: “An agent-based model of epithelial cell cystogenesis implemented with a cellular Potts model.”

Jesse Engelberg, BS. UCSF/UC Berkeley Joint Graduate Group in Bioengineering, University of California, Berkeley and University of California, San Francisco

5:00 – 5:20 PM: “A multi-reservoir model of influenza evolution”

David Dreisigmeyer, PhD. Departments of Mathematics, Critical Care Medicine and Computational Biology, University of Pittsburgh

5:20 – 6:00 PM: Summary and Future Prospects: Where do we go from here?

Moderator: Timothy Buchman

7:00 Banquet: Three Seasons Palo Alto <http://www.threeseasonsrestaurant.com/>