

Table of Contents

How To Use This Index: **Scroll down** or use the **bookmarks** in the navigation pane at left to move to a new location in this index. Click on a **blue paper title** to view that paper. To return to this index after viewing a paper, click the “Previous Menu” bookmark in the navigation pane.

INVITED PAPERS

SYSTEMS BIOLOGY SUCCESS STORIES

- [Quantitative Systems Approach to Cell Signaling and Functional Responses](#)3
Douglas Lauffenburger
- [Application of Predictive Biosimulation within Pharmaceutical Clinical Development: Examples of Significance for Translational Medicine and Clinical Trial Design](#)5
Anuraag R. Kansal and Jeff Trimmer
- [“Integrative Biology”: A Case Study in Osteoporosis](#)13
Jude Onyia

EXPERIMENTAL APPROACHES TO PROFILING BIOLOGICAL SYSTEMS

- [Probing Interaction Specificity in Protein Networks](#)15
Patrick Daugherty
- [Systems Biology, Connectivity and the Future of Medicine](#)17
Jan van der Greef
- [Biological Complexity and Drug Discovery: A Practical Systems Biology Approach](#)25
Ellen L. Berg, Eric J. Kunkel, and Vangelis Hytopoulos

EDUCATION

- [Systems Biology & Bioengineering Curriculum at UCSD](#)31
Bernard Palsson
- [Establishing a Master’s Degree Program in Bioinformatics: Challenges and Opportunities](#)....33
Nikolaos V. Sahinidis, Mehdi T. Harandi, Michael T. Heath, Lamar Murphy,
Marc Snir, Richard P. Wheeler and Charles F. Zukoski
- [Teaching System Biology to Undergraduate and Graduate Students at Humboldt-University Berlin](#)43
Reinhart Heinrich

MODELING ISSUES IN SYSTEMS BIOLOGY

Systems Biology and the Mathematical Modeling of <u>Antibody Directed Enzyme Prodrug Therapy (ADEPT)</u>	45
---	----

Jeffrey D. Varner

Computational Systems Biology for Determining Drug Mechanism of Action	57
---	----

Iya Khalil

Adversity, Diversity and the Dynamics and Evolution of Cellular Networks: Case Studies from Microbes to Macrophage	59
---	----

Adam Arkin

BIOLOGICAL NETWORK ANALYSIS

Systems-Level Questions in <i>Drosophila</i> Oogenesis (title different from presentation)	61
---	----

Nir Yakoby, Christopher A. Bristow, Irina Gouzman, Maria Pia Rossi, Yury Gogotsi, Trudi Schupbach and Stanislav Y. Shvartsman

Control Systems Theory and a Qualitative/Quantitative Approach to Systems Biology	71
--	----

Eduardo Sontag

Systems Biology: The Other Root. Laws and Principles in Signal Transduction Networks	73
---	----

Hans V. Westerhoff

CONTRIBUTED PAPERS

OSCILLATORY BIOSYSTEMS

An Evolution Architecture for Circadian Rhythms Using Adaptive Learning Systems with Error Feedbacks	77
---	----

Takehito Azuma, Kenko Uchida, Masayuki Fujita and Shigenobu Shibata

Robustness Analysis of Stability and Periodicity in Circadian Rhythms	81
--	----

K. Ogawa, N. Takekawa, T. Hinohara, K. Uchida and S. Shibata

Oscill8: A Dynamical Systems and Bifurcation Theory Toolset	85
--	----

Emery D. Conrad and John J. Tyson

Modeling the Synchronization of Biochemically Coupled Circadian Oscillators	89
--	----

TszLeung To, Michael A. Henson and Francis J. Doyle III

A Finite Differences Approach to Phase-Based Sensitivity Analysis of Biological Oscillators	93
--	----

Neda Bagheri, Stephanie Taylor, Joerg Stelling, and Francis J. Doyle III

NETWORK ANALYSIS I

A Hybrid Stochastic/Boolean Approach to Understanding the <i>Pap</i> Epigenetic Switch	99
Jason E Shoemaker and F.J. Doyle III	
Highly Organized Tradeoffs in Metabolic Networks	103
Reiko Tanaka, John Doyle and Marie Csete	
An Integrated Interaction Network of <i>Escherichia Coli</i>	107
Bharani Kumar, Hong-Wu Ma and An-Ping Zeng	
Perturbations are Key to Quantitative Identification of a Complex Sub-System in Yeast Cell Cycle Control	111
Jörg Stelling and Ernst Dieter Gilles	
Multilevel, Hierarchical Systems Paradigm for Systems Biology: Search for Organizing Principles in Clusterin Pathway	115
Mihajlo D. Mesarovic, Sree N. Sreenath and Olaf Wolkenhauer	
The Effect of Network Architecture on Noise Propagation	119
Sara Hooshangi and Ron Weiss	
Progress in Computing Elementary Modes in Large Biochemical Reaction Networks	123
Steffen Klamt and Julien Gagneur	
Holistic Theory of Design and Adaptation of Complex Biological Networks	127
Priyan Patkar, Leaef Hailemariam, Chunhua Zhao and Venkat Venkatasubramanian	
Application of Robust Model Validation Using SOSTOOLS to the Study of G-Protein Signaling in Yeast	133
Tau-Mu Yi, Maryam Fazel, Xin Liu, Tosin Otitoju, Jorge Goncalves, Antonis Papachristodoulou, Stephen Prajna and John Doyle	
Analysis of Robustness for Biological Feedback Loops	137
Brian Aufderheide	
A Hierarchical Framework for Metabolic Pathway Discovery and Strain Design	141
Priti Pharkya and Costas D. Maranas	
Stochastic Modeling of the <i>Pap Pili</i> Epigenetic Switch	145
Brian Munsky, Aaron Hernday, David Low and Mustafa Khammash	
Trapezoidal Tau-Leaping Formula for the Stochastic Simulation of Biochemical Systems	149
Yan Cao and Linda Petzold	

SYSTEMS APPROACHES

A PSE Approach for Yield Enhancement in Bioprocessing	155
Eyal Dassau, Israel Zadok and Daniel R. Lewin	
Optimal Switching During Structured Treatment Interruption for HIV Therapy	159
Won Hee Kim, Han Byul Chung and Chung Choo Chung	
Drug Delivery into the Human Brain	163
Andreas A. Linninger, MahadevaBharath R. Somayaji, Michalis Xenos and Srinivasa Kondapalli	
Modelling of Surgery Under Anesthesia	169
Pinky Dua, Vivek Dua and Efstratios N. Pistikopoulos	
Yield Optimization of <i>Saccharomyces Cerevisiae</i> Using a GMA Model and a MILP-Based Piecewise Linear Relaxation Method	173
Pradeep K. Polisetty, Eberhard O. Voit and Edward P. Gatzke	

MEDICINE

The Control Mechanism for DNA Damage Repair with the p53-Mdm2 Module	179
Babatunde A. Ogunnaike	
Towards a Systems Understanding of the Cerebral Motor Circuit	185
Peter Wellstead, Oliver Mason, William T. O'Connor, Kwang-Hyung Cho, Eric Bullinger, Olaf Wolkenhauer and Steven Duncan	
Mathematical Model of IL-6 Signal Transduction in Hepatocytes	189
Abhay Singh, Arul Jayaraman and Juergen Hahn	
Optimal Metabolic Control of Hepatocyte Function	193
Nripen Sharma, Hong Yang, Charles Roth, Martin L. Yarmush and Marianthi Ierapetritou	
Model Discrimination Tools in Apoptosis	197
Carla Cimatoribus, Thomas Eißing, Nicola Elvassore, Frank Allgöwer and Eric Bullinger	
On the Production of Bioactive AAV in Insect Cells: Balance is Key	201
Marc G. Aucoin, Amine A. Kamen and Michel Perrier	
Quantitative Analysis of Renal Secretion in the Organic Anion Transport System	205
Debbie Lin, Christopher Rao and Kathleen Giacomini	
Quantitative Data Generation for Systems Biology - The Impact of Randomization, Calibrators and Normalizers	209
Marcel Schilling, Thomas Maiwald, Markus Kollmann, Sebastian Bohl, Clemens Kreutz, Jens Timmer and Ursula Klingmüller	

Systems Biology for Battling Rheumatoid Arthritis: Application of the Entelos Physiolab Platform	213
J.A.C. Rullmann, C.M. Meeuwisse, H. Struemper, N. A. Defranoux , A. van Elsas and N.V. Organon, Oss	
Accounting for Quiescent Cells in Tumor Growth and Cancer Treatment	217
Jeffrey A. Florian Jr., Julie L. Eiseman and Robert S. Parker	
The IκB-NF-κB Signaling Module: Signal Downregulation is Required for Initial Response to TNFα	221
Raymond Cheong, Adriel Bergmann, Alexander Hoffmann and Andre Levchenko	
Engineering Virus Growth by Gene-Order Permutation	225
Kwang-il Lim, Vy Lam, Tobias Lang and John Yin	

MATHEMATICAL MODELING

Antibiotics and Resistant Bacterial Populations: A Systems Approach	231
Michael Nikolaou and Vincent H. Tam	
Simulating Differential Coding of Humoral Stimuli by Timing and Amplitude of Intracellular Calcium Spike Trains	235
Martin Kropp, Fabrizio Gabbiani and Klaus Prank	
Mathematical Model of RPOS Regulation in <i>E. Coli</i>	239
T. Backfisch, M. Pruteanu, R. Hengge and E. D. Gilles	
Using Accurate Hybrid Stochastic Simulations to Design Regulatory Gene Networks	243
Howard Salis, Jonathan Tomshine, Lisa Tuttle and Yiannis N. Kaznessis	
Integration of Cyclic AMP Signaling and Metabolism in a Single-Cell Model of <i>Saccharomyces Cerevisiae</i>	249
D. Müller, L. Aguilera-Vázquez, T. Barl, H. Diaz-Cuervo, E. Guerrero-Martín, J. O. Marquetand, P.K. Murugan, A. Niebel and M. Reuss	
The Lactose Utilization Network of <i>E. Coli</i> as a Hybrid System: Exploring Bistability with Reachability Analysis	255
Adam Halasz, Marcin Imielinski, Peter Finin, Oleg Sokolsky, Harvey Rubin and Vijay Kumar	
Selecting Maximally Informative Genes to Enable Temporal Expression Profiling Analysis	259
I.P. Androulakis, J. Wu, J. Vitolo and C. Roth	
Two Numerical Model Analyses for the Movement of a Restriction Enzyme	263
Noriko Hiroi, Akira Funahashi and Hiroaki Kitano	

Analysis of the Regulatory Behavior of Phosphate Metabolism in Plant Cells	267
Mathieu Cloutier, Mario Jolicoeur, Jingkui Chen and Michel Perrier	
Analysis of Cellular Response to Protein Overexpression	271
David Raden, Scott Hildebrandt, Ping Xu, Elizabeth Bell, Francis J. Doyle III and Anne Skaja Robinson	
Modeling the Biomolecular Network of Glutathione Synthesis in a Cell-Free Transcription/Translation System	275
John M. Frazier, Brent Foy and Nancy Kelley-Loughnane	
Reduced-Order Modeling of Biochemical Networks by Simultaneous Determination of Network Topology and Parameters	281
Mano Ram Maurya, Scott J. Bornheimer, Venkat Venkatasubramanian and Shankar Subramaniam	
Reduced Order Modeling of Global Regulation - Redox Regulation in <i>Escherichia Coli</i>	285
M. Ederer, T. Sauter and E.D.Gilles	
Modeling of CaMKII/Calcineurin-PP1 Switch in Calcium-Dependent Growth Cone Guidance	289
Xiong Li, Guo-li Ming and Andre Levchenko	
Spatial and Temporal Quantification of <i>Escherichia Coli</i> Stress Response Gene Regulation System in the Micro-Environment	293
Ho Jung Cho, Alex Groisman, Adriel Bergmann and Andre Levchenko	
Design Principles of Signal Transduction Pathways to Compensate Intracellular Perturbations	297
Markus Kollmann, Kilian Bartholome and Jens Timmer	
Integrated Spatio-Temporal Model of Cell Signaling	301
Avijit Ghosh, David Miller, Rui Zou, Harriet Pais, Elisabeth Papazoglou, Bahrad Sokhansanj and Andres Kriete	
Quantitative Study of Calcium Homeostasis Maintenance Through Systemic Modeling	307
Zhengyuan Wang, Song Wu, Ye Li, Pawan Dhar, Masa Tsuchiya and Adrian Mondry	

NETWORK ANALYSIS II

Using the Linear Noise Approximation to Characterize Molecular Noise in Reaction Pathways	313
Matthew Scott and Brian Ingalls	

Systems Analysis of Ire1p's Role in the <i>Saccharomyces Cerevisiae</i> UPR	317
Scott Hildebrandt, David Raden, Elizabeth Bell, Anne Skaja Robinson and Francis J. Doyle III	
Switches and Feedbacks in Gene Regulation and Gradient Sensing in Yeast Phermone Response	321
Saurabh Paliwal, Zoe Hilioti, Alexander Groisman and Andre Levchenko	
Using Chemical Reaction Network Theory to Discard a Kinetic Mechanism Hypothesis	325
Carsten Conradi, Julio Saez-Rodriguez, Ernst-Dieter Gilles and Joerg Raisch	
Neutrophil Chemotaxis in Multiple Chemoattractant Gradients	329
Keith A. Erickson, Christopher V. Rao and Adam P. Arkin	
Metabolic Control Analysis and Local Controllability of Biochemical Networks	333
Brian P. Ingalls and Christopher V. Rao	
Sensitivity Analysis of <i>Escherichia Coli</i>'s Tricarboxilic Acid Cycle Under Anaerobic Conditions	337
Irina Dana Ofiteru, Eric Bullinger, Vasile Lavric and Frank Allgöwer	
Information Theory and Biochemical Communication	341
Robert Prill and Andre Levchenko	
Bacterial Decisions: Chemotaxis and Multiple Attractants	345
Robert Entus and Brian Aufderheide	
Tradeoffs in Networks with Positive and Negative Feedback	349
Jorge Goncalves, Tau-Mu Yi and John Doyle	
Experimental Design for Biological Networks Using a Systems Approach	353
Brian Aufderheide	
Estimation of Spectral Properties and Kinetic Parameters from Stochastic Measurements of Reporter Gene Activity in Individual Cells	357
Chris D. Cox, James M. McCollum, Derek W. Austin, Roy D. Dar, Michael S. Allen, Nagiza F. Samatova and Michael L. Simpson	

ADVANCED OMICS

Exploiting Combinatorial Complexity – Searching for New Functional Entities in the Cell	363
Jens Hollunder, Andreas Beyer and Thomas Wilhelm	
Characterizing Elementary Combinations of Producing Species in Metabolic Networks	367
Marcin Imieliński, Călin Belta, Ádám Halász and Harvey Rubin	

Backup Reaction Pathways and Synthetic Lethality in Metabolic Network of <i>Escherichia Coli</i>	371
C.-M. Ghim, K.-I. Goh and B. Kahng	
A Machine Learning Approach to Biochemical Reaction Rules Discovery	375
L. Calzone, N. Chabrier-River, F. Fages and S. Soliman	
A Segmentation Algorithm for Consensus Regions in Biosequences	381
David Chiu and Yan Wang	
Author Index	387