

# Foundations of Systems Biology in Engineering

August 5-8, 2018 ♦ Oak Brook Hills Resort ♦ Oak Brook, Illinois

## FINAL AGENDA

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*The Workshop and the General Session will be in the **DuPage Amphitheater**  
The Poster Sessions will be in the **Monarch Room***

### Sunday, August 5

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|---------------------|-------------------|---|
| 12:00 p.m. to       | 6:00 p.m.         | Conference Registration ( <i>DuPage Amphitheater Foyer</i> )  |
| <b>1:00 p.m. to</b> | <b>5:00 p.m.</b>  | <b>Training Workshops</b><br>(Separate registration required)   |
| 1:00 p.m. to        | 1:45 p.m.         | Computational Design for Mammalian Synthetic Biology: Challenges, Needs, and Opportunities<br><i>Josh Leonard, Northwestern University</i>                              |
| 1:45 p.m. to        | 2:30 p.m.         | Interfacing Large Scale Kinetic Models with Stochastic Gene Expression and Omics Data<br><i>Marc Birtwistle, Clemson University</i>                                     |
| 2:30 p.m. to        | 2:45 p.m.         | Refreshment Break (complimentary for workshop registrants)  |
| 2:45 p.m. to        | 3:30 p.m.         | Bistability and Phenotypic Diversity<br><i>Chris Rao, University of Illinois - Urbana-Champaign</i>   |
| 3:30 p.m. to        | 4:15 p.m.         | Measuring, Modeling, and Manipulating Binding Kinetics<br><i>Casim Sarkar, University of Minnesota</i>  |
| 4:15 p.m. to        | 5:00 p.m.         | Constraint-based Methods for Microbial Strain Design<br><i>Jennifer Reed, University of Wisconsin - Madison</i>   |
| <b>6:00 p.m. to</b> | <b>7:45 p.m.</b>  | <b>Welcome Reception</b> ( <i>Garden Patio</i> )  |
| <b>7:45 p.m. to</b> | <b>8:00 p.m.</b>  | <b>Introductory Remarks</b> ( <i>DuPage Amphitheater</i> )<br><i>Juergen Hahn, Rensselaer Polytechnic Institute</i>   |
| <b>8:00 p.m. to</b> | <b>9:00 p.m.</b>  | <b>Keynote Lecture</b><br>Mining Personal, Dense, Dynamic Data Clouds to Enhance Health and Drive Discovery<br><i>Nathan Price, Systems Biology Institute - Seattle</i> |
| <b>9:00 p.m. to</b> | <b>10:30 p.m.</b> | <b>Hospitality</b> ( <i>Monarch</i> )   |

## Monday, August 6

- 8:00 a.m. to 5:00 p.m. Conference Registration (*DuPage Amphitheater Foyer*)
- 8:00 a.m. to 9:00 a.m. Continental Breakfast**
- 9:00 a.m. to 10:45 p.m. General Session 1 – Modeling of Complex Biological Systems**  
*Session Chair: Ashlee Ford Versypt*
- 9:00 a.m. to 9:40 a.m. Achieving XAI by Merging Big Data Analytics and Genome-scale Models  
*Bernhard Palsson, University of California - San Diego*
- 9:40 a.m. to 10:20 a.m. Metabolic Regulation During Growth on Complex Mixtures of Nutrients  
*Chris Rao, University of Illinois - Urbana-Champaign*
- 10:20 a.m. to 10:45 a.m. Sufficiently Exciting Inputs for Structurally Identifiable Systems Biology Models  
*Alejandro Fernández Villaverde, IIM-CSIC Spain and Neil Evans, Michael Chappell, Julio Banga (co-authors)*
- 10:45 a.m. to 11:00 a.m. Refreshment Break
- 11:00 a.m. to 12:45 p.m. General Session 2 – Industrial Applications of Systems and Synthetic Biology**  
*Session Chair: Michael Koepke*
- 11:00 a.m. to 11:35 a.m. Commercial-scale Production of Fuels and Chemicals from Low Cost Feedstocks via an Integrated, Multi-scale Anaerobic Gas Fermentation Platform  
*Steve Brown, LanzaTech, Inc.*
- 11:35 a.m. to 12:10 p.m. Integrated Quantitative Systems Pharmacology (QSP) and Systems Biology Modeling to Accelerate Drug Development: Examples from Immuno-inflammation and Dermatology  
*Loveleena Bansal, GlaxoSmithKline*
- 12:10 p.m. to 12:45 p.m. Biology by Design  
*Will Cao, Ginkgo Bioworks*
- 12:45 p.m. to 2:10 p.m. Poster Session A with Box Lunch (Monarch)**  
*Session Chair: Neda Bagheri*

## Monday, August 6 (continued)

<b>2:10 p.m. to</b>	<b>3:55 p.m.</b>	<b>General Session 3 – Multi-scale and Multi-omics Experimentation, Data Integration and Modeling</b> <i>Session Chair: Krishna Mahadevan</i>
2:10 p.m. to	2:50 p.m.	Metabolic Coordination Through Metabolite-protein Interactions <i>Uwe Sauer, ETH Zurich</i>
2:50 p.m. to	3:30 p.m.	Elucidating Binding Dynamics in Multivalent Protein-Protein Interactions <i>Casim Sarkar, University of Minnesota</i>
3:30 p.m. to	3:55 p.m.	Dynamic Transcriptomic Data Analysis by Integrating Data-driven and Model-guided Approaches <i>Jin Wang, Auburn University and Matthew Hillard, Qinghua (Peter) He (co-authors)</i>
3:55 p.m. to	4:10 p.m.	Refreshment Break
<b>4:10 p.m. to</b>	<b>5:55 p.m.</b>	<b>General Session 4 – Network Inference and Modeling</b> <i>Session Chair: Jin Wang</i>
4:10 p.m. to	4:50 p.m.	Using Models to Link Chemistry to Biology in Microbiome Systems <i>Chris Henry, Argonne National Laboratory</i>
4:50 p.m. to	5:30 p.m.	One-Stage vs. Two-Stage Bioprocesses: Comparative Computational and Experimental Studies and Consequences for Strain Design <i>Steffen Klamt, Max Planck Institute - Madgeburg</i>
5:30 p.m. to	5:55 p.m.	Network Inference Performance: A Consequence of Topological, Experimental, and Algorithmic Determinants <i>Joseph J. Muldoon, Northwestern University and Jessica Yu, Mohammad-Kasim Fassia, Neda Bagheri (co-authors)</i>

## Tuesday, August 7

- 8:00 a.m. to 5:00 p.m. Conference Registration
- 8:00 a.m. to 9:00 a.m. Continental Breakfast**
- 9:00 a.m. to 10:45 p.m. General Session 5 – Synthetic Biology**  
*Session Chair: Marc Birtwistle*
- 9:00 a.m. to 9:40 a.m. Genome-scale Modeling and Engineering of Yeasts for Production of Chemicals and Fuels  
*Huimin Zhao, University of Illinois - Urbana-Champaign*
- 9:40 a.m. to 10:20 a.m. Enabling Design-driven Medicine with Synthetic Biology: Engineering Programmable Cell-based Therapies  
*Josh Leonard, Northwestern University*
- 10:20 a.m. to 10:45 a.m. Engineering Microbes to Modulate Opportunistic Pathogens  
*In Young Hwang, National University of Singapore and Elvin Koh, Matthew Chang (co-authors)*
- 10:45 a.m. to 11:00 a.m. Refreshment Break
- 11:00 a.m. to 12:45 p.m. General Session 6 – Next Generation Networks and Tools**  
*Session Chair: Zuyi Huang*
- 11:00 a.m. to 11:40 a.m. Phenotypic Diversity Reduces Fitness Trade-offs in Motile Bacterial Populations  
*Yann Dufour, Michigan State University*
- 11:40 a.m. to 12:20 p.m. Biological Control: The Versatile Ways in Which Cells Use Feedback Loops  
*Hana El-Samad, University of California - San Francisco*
- 12:20 p.m. to 12:45 p.m. Evaluation of Derivative-Free Optimizers for Parameter Estimation in Systems Biology  
*Yannik Schälte, Helmholtz Center Munich and Paul Stapor, Jan Hasenauer (co-authors)*
- 12:45 p.m. to 2:15 p.m. Poster Session B with Box Lunch (Monarch)**  
*Session Chair: Neda Bagheri*

## Tuesday, August 7 (continued)

- 2:15 p.m. to 3:45 p.m. Panel Discussion: Future Funding Directions**  
*Session Chair: Michael Koepke*
- David Babson, DOE  
Haluk Resat, NIH  
Ruth Shuman, NSF (via audio conference)
- 3:45 p.m. to 4:00 p.m. Refreshment Break
- 4:00 p.m. to 5:40 p.m. General Session 7 – Systems Biology of Cellular Functions**  
*Session Chair: Robert Parker*
- 4:00 p.m. to 4:40 p.m. A Metabolic Oscillator and the Cell Cycle Oscillators Jointly Control the Cell Division Process as a System of Coupled Oscillators  
*Matthias Heinemann, University of Groningen*
- 4:40 p.m. to 5:10 p.m. Comparator-based Gene Regulatory Network Designs for Control of Expression  
*Brian Ingalls, University of Waterloo and Jafar Kazemi, Sadjad Ozgoli (co-authors)*
- 5:10 p.m. to 5:40 p.m. Toward Multi-Input Control: A Dual-Feedback Loop Model of the Mammalian Circadian Clock  
*Lindsey Brown, Harvard University and Francis Doyle III (co-author)*
- 6:00 p.m. to 6:45 p.m. Reception (DuPage Amphitheater Foyer)**
- 6:45 p.m. to 7:45 p.m. Systems Biology Foundation Award Presentation (DuPage Amphitheater)**  
*Introduction: Juergen Hahn*
- Non-Equilibrium Thermodynamics after all? Engineering Robustness through Diversity  
*Hans V. Westerhoff*  
*Universities of Amsterdam / University of Manchester*
- 7:45 p.m. to 9:45 p.m. Banquet (Ballroom E)**

## Wednesday, August 8

<b>8:00 a.m. to</b>	<b>9:00 a.m.</b>	<b>Continental Breakfast</b>
<b>9:00 a.m. to</b>	<b>10:45 p.m.</b>	<b>General Session 8 – Systems and Synthetic Biology for Biotechnology</b> <i>Session Chair: Jason Shoemaker</i>
9:00 a.m. to	9:40 a.m.	Orthogonality Based Dynamic Control of Metabolism <i>Krishna Mahadevan, University of Toronto</i>
9:40 a.m. to	10:20 a.m.	Systems Approaches for Engineering Microbial Biocatalysts <i>Jennifer Reed, University of Wisconsin - Madison</i>
10:20 a.m. to	10:45 a.m.	Mathematical Modeling as a Tool to Improve Influenza Vaccine Production Processes <i>Robert Dürr, Max Planck Institute Magdeburg, and Stefanie Duvigneau, Tanja Laske, Mandy Bachmann, Melanie Dostert, Udo Reichl, Achim Kienle (co-authors)</i>
10:45 a.m. to	11:00 a.m.	Refreshment Break
<b>11:00 a.m. to</b>	<b>12:45 p.m.</b>	<b>General Session 9 – Systems Medicine</b> <i>Session Chair: Raj Vadigepalli</i>
11:00 a.m. to	11:40 a.m.	Agent-Based Modeling of Biological Systems – Applications in Tissue Engineering, Bioreactors and Beta Cell Destruction <i>Ali Cinar, Illinois Institute of Technology</i>
11:40 a.m. to	12:20 p.m.	A Mechanistic Pan-cancer Pathway Model Informed by Multi-omics Data Interprets Stochastic Cell Fate Responses to Drugs and Mitogens <i>Marc Birtwistle, Clemson University</i>
12:20 p.m. to	12:45 p.m.	A Dynamic Model of Cystic Fibrosis Airway Epithelium Electrophysiology <i>Florencio Serrano Castillo, University of Pittsburgh and Carol Bertrand, Timothy Corcoran, Monica Shapiro, Robert Parker (co-authors)</i>
<b>12:45 p.m. to</b>	<b>1:00 p.m.</b>	<b>Closing Remarks</b> <i>Juergen Hahn, Rensselaer Polytechnic Institute</i>