

# **Synthetic Biology Conference 2014 (SEED 2014)**

Engineering, Evolution & Design

Manhattan Beach, California, USA  
14-17 July 2014

ISBN: 978-1-5108-1763-0

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2014) by AIChE  
All rights reserved.

Printed by Curran Associates, Inc. (2016)

For permission requests, please contact AIChE  
at the address below.

AIChE  
120 Wall Street, FL 23  
New York, NY 10005-4020

Phone: (800) 242-4363  
Fax: (203) 775-5177

[www.aiche.org](http://www.aiche.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## OPENING SESSION

<b>Giving New Life to Materials for Energy, the Environment and Medicine</b> .....	1
<i>Angela M. Belcher</i>	
<b>Synthetic Gene Networks: Emerging Biotech Applications</b> .....	2
<i>James J. Collins</i>	
<b>ME Models: Their Formulation and Applications</b> .....	3
<i>Bernhard Palsson</i>	

## GENOME-SCALE DESIGN AND EVOLUTION

<b>Direct Mutagenesis of Thousands of Genomic Targets using Microarray-derived Oligonucleotides</b> .....	4
<i>Mads T. Bonde, Sriram Kosuri, Kira Sarup-Lytzen, George M. Church, Harris H. Wang</i>	
<b>Genome Engineering Technologies, Strategies and Applications</b> .....	5
<i>Ryan T. Gill</i>	
<b>Generation of Human Artificial Chromosomes in Human Embryonic Stem and Neuronal Cells</b> .....	6
<i>Zoia Monaco</i>	
<b>Development of the Selection Tools for the Evolutionary Engineering of Genetic Networks and for Parallel and Continuous Editing of Genomic DNA</b> .....	7
<i>Daisuke Umeno</i>	

## GENETIC CIRCUIT DESIGN

<b>Engineered Gene Circuits: From Oscillators to Synchronized Clocks and Biopixels</b> .....	8
<i>Jeff Hasty</i>	
<b>Communication and Collaboration in Synthetic Microbial Consortia</b> .....	9
<i>Cynthia Collins</i>	
<b>Controlling Cells through RNA Folding</b> .....	10
<i>Julius B. Lucks</i>	
<b>Developing CRISPR Tools to Reprogram the Mammalian Genome</b> .....	11
<i>Lei Stanley Qi</i>	

## ACS SYNTHETIC BIOLOGY YOUNG INVESTIGATOR AWARD

<b>Molecular Programming with DNA/RNA</b> .....	12
<i>Peng Yin</i>	

## PROTEIN ENGINEERING AND EVOLUTION

<b>New Enzymes by Evolution: Expanding Nature's Catalytic Repertoire</b> .....	13
<i>Frances H. Arnold</i>	
<b>An Orthogonal Genetic System for Rapid Evolution</b> .....	14
<i>Chang C. Liu</i>	
<b>Ultrahigh-throughput Chemical and Biological Screening with Microfluidic Droplets</b> .....	15
<i>Adam R. Abate</i>	

## SENSORS

<b>GeneGuard: a Modular Plasmid System Designed for Biosafety</b> .....	16
<i>Tom Ellis</i>	

<b>Engineering Genetic Sensors and Circuits to Construct Programmable Cells</b> .....	17
<i>Tatenda Shopera, Allison Hoynes-O'Connor, Cheryl Immethun, William R. Henson, Tae Seok Moon</i>	

## **STUDENT SESSION**

<b>Host Cell Response to Synthetic Biology: A Deeper Look for More Robust and Optimised Designs</b> .....	18
<i>Francesca Ceroni, Marta Garcia-Bellmunt, Guy-Bart Stan, Tom Ellis</i>	
<b>Accelerating the Design-build-test Cycle of Synthetic Biological Circuits in E. Coli Using S30 TX-TL Cell-free Systems, Linear DNA, and Modular Assembly</b> .....	19
<i>Zachary Z. Sun, Vincent Noireaux, Richard M. Murray</i>	
<b>Modular Antibody-based Protein Sensors in Mammalian Cells for In-vivo Rewiring of Cellular Fate</b> .....	20
<i>Velia Siciliano, Jacob Beal, Ron Weiss</i>	
<b>Deciphering Global Regulatory Patterns for Cellulase Discovery in Anaerobic Fungi</b> .....	21
<i>Kevin V. Solomon, John K. Henske, Charles Haitjema, Diego Borges-Rivera, Dawn Thompson, Aviv Regev, Michelle A. O'Malley</i>	
<b>In-Situ Resource Utilization on Manned Martian Missions Using Synthetic Biology</b> .....	22
<i>Amor A. Menezes, John Cumbers, John A. Hogan, Adam P. Arkin</i>	
<b>Programmable Multi-input Transcription Factor Based Circuit for the Identification of Specific Cell Types/physiological States</b> .....	24
<i>Bartolomeo Angelici, Benjamin Häfliger, Laura Prochazka, Yaakov Benenson</i>	
<b>Bacteriophages Use an Expanded Genetic Code on Evolutionary Paths to Higher Fitness</b> .....	25
<i>Michael J. Hammerling, Andrew D. Ellington, Jeffrey E. Barrick</i>	
<b>Engineered Microbial Swarmbots with Safeguard Mechanism</b> .....	26
<i>Shuqiang Huang, Anna Lee, Anand Pai, Ying Zhang, Kam Leong, Lingchong You</i>	
<b>A Proposed Data Model for the Next Version of the Synthetic Biology Open Language</b> .....	27
<i>Nicholas Roehner, Ernst Oberortner, Chris J. Myers</i>	

## **AGRICULTURE AND PLANT ENGINEERING**

<b>A Strategy for Decoding Endogenous Plant Promoter Sequences</b> .....	28
<i>Molly Megraw</i>	
<b>Evading Natural Selection in Complex Environments</b> .....	29
<i>Kevin Esvelt</i>	
<b>Creating a Research Agenda for the Ecological Implications of Synthetic Biology</b> .....	30
<i>James Collins, Todd Kuiken, Kenneth Oye</i>	

## **RAPID DEBUGGING**

<b>Implementation of Cell-free Biological Networks at Steady State</b> .....	31
<i>Henrike Niederholtmeyer, Sebastian J. Maerkl</i>	
<b>Engineering Synthetic Ribosomes</b> .....	32
<i>Michael Jewett</i>	

## **MATERIALS AND NANOTECHNOLOGY**

<b>Synthetic Biology Approaches to New Nanomaterials</b> .....	33
<i>Michelle C. Chang</i>	
<b>Engineering Living Functional Materials</b> .....	34
<i>Allen Y. Chen, Chao Zhong, Timothy K. Lu</i>	

## **MAMMALIAN CELL ENGINEERING**

<b>Synthetic Digital Computation in Human Cells</b> .....	35
<i>Wilson Wong, Benjamin H. Weinberg</i>	
<b>CRISPR Transcriptional Repression Devices and Layered Circuits in Mammalian Cells</b> .....	36
<i>Samira Kiani, Jacob Beal, Mohammad R. Ebrahimkhani, Jin Huh, Richard N. Hall, Zhen Xie, Yinqing Li, Ron Weiss</i>	

<b>Circuits of Unknown Function</b> .....	37
<i>Michael Elowitz</i>	

## **ENGINEERING METABOLISM**

<b>Development of Next-generation Tools for Efficient, Costeffective, High-throughput Engineering of Yeast</b> .....	38
<i>Leslie Stanton, Sunil Chandran, Aaron Hernday</i>	
<b>Exploring the Potential of Bacterial Microcompartments for the Spatial Organization of Synthetic Metabolic Pathways</b> .....	39
<i>Edward Kim, Christopher Jakobson, Marilyn Slininger, Danielle Tullman-Ercek</i>	
<b>Identification of a Mono-Phosphomevalonate Decarboxylase and Utilization for Production of Isoprene without a Diphosphomevalonate Intermediate</b> .....	40
<i>Michael Miller, Jörg Mampel, Yuliya Primak, Dmitrii Vaviline, Zachary Beck, Gregg Whited</i>	

## **COMPUTATION TO PHENOTYPE**

<b>Multiscale Models of Antibiotic Cellbots</b> .....	41
<i>Yiannis N. Kaznessis, Patrick Smadbeck, Katherine Volzing, Juan Borrero</i>	
<b>Genetic Coupling Across Space and Time</b> .....	42
<i>Arthur Prindle</i>	
<b>Automated Metabolic Pathway Design and Characterization</b> .....	43
<i>J. Christopher Anderson</i>	

## **NATURAL PRODUCTS: ACCESS AND DIVERSIFICATION**

<b>Biocompatible Chemistry</b> .....	44
<i>Emily Balskus</i>	
<b>Discovery of Novel Natural Products via Synthetic Biology</b> .....	45
<i>Huimin Zhao</i>	
<b>The Potential and Challenges of Cryptic Metabolites</b> .....	46
<i>Jon Clardy</i>	

## **SYNTHETIC MICROBIOME**

<b>Digital Cell Division Counting Reveals Microbial Dynamics in the Mammalian Gut</b> .....	47
<i>Cameron Myhrvold, Jonathan Kotula, Wade Hicks, Pamela A. Silver</i>	
<b>Parasight – A Synthetic Biology Approach for the Detection of Parasites</b> .....	48
<i>Alexander J. Webb, Richard Kelwick, Ciaran McKeown, Kirsten Jensen, Nicolas Kyllis, Geoff S. Baldwin, Tom Ellis, Paul S. Freemont</i>	
<b>Probiotics Engineered to Fight Against Human Pathogens</b> .....	49
<i>In Young Hwang, Elvin Koh, Choon Kit Wong, Tat Ming Lo, Matthew Wook Chang</i>	
<b>Insights from a Global Analysis of Secondary Metabolism: Small Molecules from the Human Microbiome</b> .....	50
<i>Michael Fischbach</i>	

## **POSTER SESSION**

<b>Quantitative Design of Layered Genetic Circuits</b> .....	51
<i>Alec Nielsen</i>	
<b>Synthetic Chromatin-Based Logic, Spatial Regulation, and Memory</b> .....	52
<i>Albert Keung, Caleb J. Bashor, Szilyia Kiriakov, James J. Collins, Ahmad S. Khalil</i>	
<b>Mpath: Computationally-Aided Design of Synthetic Metabolic Pathways</b> .....	54
<i>Robert Sidney Cox, Masahiko Nakatsui, Hiroki Makiguchi, Teppei Ogawa, Akihiko Kondo, Michihiro Araki</i>	
<b>Evolution of a Yeast Receptor for Non-Native Ligands Using a Novel High-Throughput Screening Method</b> .....	57
<i>Adebola Adeniran, John Bostick, Dante Pertusi, Michael Reddick, Michael Sherer, Taylor Riley, Keith E. J. Tyo</i>	

<b>Engineering Auto-Regulatory Genetic Circuits That Enable Programmable Biological Functionalities: Biotechnological Applications .....</b>	<b>58</b>
<i>Tat-Ming Lo, Matthew Wook Chang</i>	
<b>Functional Probiotics Engineered to Eradicate <i>P. Aeruginosa</i> .....</b>	<b>59</b>
<i>In Young Hwang, Matthew Wook Chang</i>	
<b>Development and Characterization of Dynamic Controllers in <i>Saccharomyces Cerevisiae</i> .....</b>	<b>60</b>
<i>Wei Suong Teo, Kai Sheng Hee, Matthew Wook Chang</i>	
<b>Transporter Engineering for Improved Microbial Tolerance Against Biofuel Molecules .....</b>	<b>62</b>
<i>Binbin Chen, Jee Loon Foo, Susanna Su Jan Leong, Matthew Wook Chang</i>	
<b>MazF-Mediated Deletion System for Genome Engineering in Budding Yeast <i>Saccharomyces Cerevisiae</i> .....</b>	<b>64</b>
<i>Quanli Liu, Yuzhen Wu, Xiuming Zhang, Yanling Bai, Haijin Xu, Mingqiang Qiao</i>	
<b>Creating Components for Synthetic Gene Networks .....</b>	<b>67</b>
<i>David Shis, Faiza Hussain, Sarah Meinhardt, Liskin Swint-Kruse, Matthew Bennett</i>	
<b>Development of a Synthetic Biology Toolbox for <i>Synechococcus Sp. PCC 7002</i> .....</b>	<b>68</b>
<i>Anne Ruffing</i>	
<b>Temporal Inactivation of DNA Repair Enables Highly Precise Genome Engineering in <i>Escherichia Coli</i> .....</b>	<b>69</b>
<i>Akos Nyerges, Bálint Csörgo, György Pósfai, Csaba Pál</i>	
<b>Optimizing Multi-Gene Biological Systems Using High-Throughput DNA Assembly, Sequencing, and Model-Guided Search Strategies .....</b>	<b>70</b>
<i>Lauren B. A. Woodruff, Tarjei Mikkelsen, Michael J. Smanski, D. Benjamin Gordon, Christopher A. Voigt, Robert Nicol</i>	
<b>Multiplexed and Programmable Regulation of Gene Networks with an Integrated RNA and Crisp/Cas Toolkit in Human Cells .....</b>	<b>71</b>
<i>Lior Nissim, Samuel D. Perli, Alexandra Fridkin, Pablo Perez-Pinera, Timothy K. Lu</i>	
<b>Reconstitution of Orphan Fungal Polyketide Gene Clusters in <i>Saccharomyces Cerevisiae</i> .....</b>	<b>72</b>
<i>James Li, Colin Harvey, Maureen Hillenmeyer, Ronald Davis</i>	
<b>Engineering Regulation in Anaerobic Fungi during Lignocellulose Breakdown .....</b>	<b>73</b>
<i>John Henske</i>	
<b>Design and Implementation of a Biomolecular Concentration Tracker .....</b>	<b>74</b>
<i>Victoria Hsiao, Emmanuel L. C. De Los Santos, Weston R. Whitaker, John E. Dueber, Richard M. Murray</i>	
<b>Rapidly Characterizing the Fast Dynamics of RNA Genetic Circuitry with Cell-Free Transcription-Translation (TX-TL) Systems .....</b>	<b>75</b>
<i>Melissa K. Takahashi, James Chappell, Clarmyra A. Hayes, Zachary Z. Sun, Jongmin Kim, Vipul Singhal, Kevin J. Spring, Shaïma Al-Khabouri, Christopher P. Fall, Vincent Noireaux, Richard M. Murray, Julius B. Lucks</i>	
<b>Isocost Lines in the Cellular Economy: Gene Expression Is Coupled Due to Competition for Shared Resources .....</b>	<b>76</b>
<i>Andras Gyorgy, Jose I. Jimenez, Hattie Chung, Ron Weiss, Domitilla Del Vecchio</i>	
<b>Engineering of Small RNA Transcriptional Activators .....</b>	<b>78</b>
<i>James Chappell, Melissa K. Takahashi, Julius B. Lucks</i>	
<b>Targeting Chromatin: An Emerging Layer of Synthetic Control .....</b>	<b>79</b>
<i>Albert J Keung, Caleb J. Bashor, Szilvia Kiriakov, James J Collins, Ahmad S. Khalil</i>	
<b>Gene Circuit Performance Characterization and Resource Usage in a Cell-Free "Breadboard" .....</b>	<b>80</b>
<i>Dan Siegal-Gaskins, Zoltan A. Tuza, Jongmin Kim, Vincent Noireaux, Richard M. Murray</i>	
<b>Optimized in-Fusion Cloning System Demonstrates High Efficiency and Accuracy of Multi-Fragment Cloning .....</b>	<b>81</b>
<i>Steve Oh, Gia Jokhadze, Tommy Duong, Magnolia Bostick, Andrew Farmer</i>	
<b>A Low Cost, Customizable Turbidostat for Use in Synthetic Circuit Characterization .....</b>	<b>82</b>
<i>Chris Takahashi, Aaron Miller, Felix Ekness, Eric Klavins, Maitreya Dunham</i>	
<b>A Rapid, Label-Free, and Scalable Method for Characterizing Binding Properties of Small Molecule Aptamers .....</b>	<b>83</b>
<i>Maureen McKeague, Andrew L. Chang, Christina D. Smolke</i>	
<b>Recombinant Optimization of an Orthogonal Tryptophanyl Suppressor tRNA .....</b>	<b>84</b>
<i>Arti Pothukuchy, Randall Hughes</i>	
<b>RNA-Guided Nucleases As Programmable-Spectrum Antimicrobials and Microbial Population Sculptors .....</b>	<b>85</b>
<i>Robert Citorik, Mark Mimeo, Timothy K. Lu</i>	
<b>Conditional siRNA Production in Human Cell Lysate Via Shape and Sequence Transduction with Small Conditional RNAs .....</b>	<b>86</b>
<i>Lisa M. Hochrein, Tianjia J. Ge, Maayan Schwarzkopf, Niles A. Pierce</i>	

<b>Synthetic Biology with a Cell-Free TX-TL System: Metabolism, Gene Circuits, Phages and Artificial Cell</b> .....	87
<i>Jonghyeon Shin, Filippo Caschera, Vincent Noireaux</i>	
<b>Spider Dragline Silk Inspired Man-Made Fibers with Unique Property</b> .....	88
<i>Congyue Peng, Julia Russo, Charlene Gravgaard, Heather McCartney, William Gaines, William Marcotte</i>	
<b>Enhanced Isoprenoid Production through the Cofactor Metabolic Engineering in Saccharomyces Cerevisiae</b> .....	89
<i>Linqi Zhu, Huiqing Chong, Chi Bun Ching</i>	
<b>Rapid Evaluation of Tyrosine Kinase Activity of Membrane-Integrated Human Epidermal Growth Factor Receptor Using the Yeast Ggamma Recruitment System</b> .....	91
<i>Nobuo Fukuda, Shinya Honda</i>	
<b>A Modular Approach to the Design of Embedded Controllers for Chemical Reaction Networks</b> .....	92
<i>Carlo Cosentino, Mariacconcetta Bilotta, Francesco Montefusco, Rucha Sawlekar, Francesco Amato, Declan Bates</i>	
<b>Control Engineering Inspired Design Tools for Synthetic Biology</b> .....	93
<i>James Arpino, Edward Hancock, Marios Tomazou, Ye Yuan, Mariano Beguerisse, Jorge Goncalves, Mauricio Barahona, Karen M. Polizzi, Guy-Bart Stan, Antonis Papachristodoulou</i>	
<b>Controlled Gene Amplification Enables High, Stable, Selection Free Gene Expression in Saccharomyces Cerevisiae</b> .....	94
<i>Christina S. Nødvig, Line D. Buron, Tomas Strucko, Zofia Jarczynska, Louise Mølgård, Uffe H. Mortensen</i>	
<b>Tunable and Multifunctional Eukaryotic Transcription Factors Based on Crispr/Cas</b> .....	95
<i>Fahim Farzadfard</i>	
<b>Characterizing and Alleviating Substrate Limitations for Improved in Vitro Ribosome Construction</b> .....	96
<i>Yi Liu, Brian R. Fritz, Mark J. Anderson, Jennifer A. Schoborg, Michael C. Jewett</i>	
<b>Bioprospecting for Genes That Confer Biofuel Tolerance Using a Genomic Library Approach</b> .....	97
<i>Timothy Tomko, Mary Dunlop</i>	
<b>Directed Evolution of Far-Red Fluorescent Rhodopsins</b> .....	98
<i>R. Scott McIsaac, Martin Engqvist, Timothy Wannier, Lukas Herwig, Frances H. Arnold</i>	
<b>Bottom-up Construction of Orthogonal Regulation for Gene Circuits Using Transcription Factor-Promoter Pairs with Predictable Properties</b> .....	99
<i>Benjamin A Blount, Tom Ellis</i>	
<b>Exploiting Anaerobic Gut Fungi for Lignocellulose Breakdown and Enzyme Discovery</b> .....	100
<i>Kevin V. Solomon, Charles Haitjema, John K. Henske, Diego Borges-Rivera, Dawn A. Thompson, Michelle A. O'Malley</i>	
<b>A Genetically-Structured Deterministic Chemical Kinetic Simulation of the Life Cycle of the Biotechnologically Important Filamentous Bacteriophage M13</b> .....	101
<i>John Fisk, Steven Smeal, Ashok Prasad</i>	
<b>Engineering Transcriptional Regulator Effector Specificity through Rational Design and Rapid Prototyping</b> .....	102
<i>Emmanuel L. C. De Los Santos, Joseph T. Meyerowitz, Stephen L. Mayo, Richard M. Murray</i>	
<b>Fatty Acid Responsive Hybrid Promoter Design in Oleaginous Yeast Yarrowia Lipolytica</b> .....	103
<i>Murtaza Shabbir-Hussain, Mark A. Blenner</i>	
<b>Sensitivity of Synthetic Biological Circuits to Environmental Conditions</b> .....	104
<i>Naveen Venayak, Radhakrishnan Mahadevan</i>	
<b>A Highly Tunable System for the Simultaneous Expression of Multiple Enzymes in Saccharomyces Cerevisiae</b> .....	105
<i>Yoichiro Ito, Mamoru Yamanishi, Akinori Ikeuchi, Takashi Matsuyama</i>	
<b>Rapid Evaluation of Itaconic Acid Production Strategies in Saccharomyces Cerevisiae</b> .....	106
<i>Liang Wu, Zheng Zhao, Ben Meijerink, Bianca Gielesen, Burhan Ozalp, Rob Van Der Hoeven, Roel Bovenberg, Hans Roubos</i>	
<b>Engineering and Understanding Enzyme and Pathway Localization to ER and Lipid Droplet Membranes</b> .....	107
<i>Jyun-Liang Lin, Ian Wheeldon</i>	
<b>An Orthogonal DNA Replication System in Yeast</b> .....	108
<i>Arjun Ravikumar, Adrian Arrieta, Chang C. Liu</i>	
<b>Engineering Protein-Nucleic Acid Binding for Cellular Circuits</b> .....	109
<i>Thomas J. Mansell, Anna Domènech Corts, Ryan T. Gill</i>	
<b>Construction of a Metabolite Valve in Saccharomyces Cerevisiae Increases Pathway Yields</b> .....	110
<i>Sue Zanne Tan, Kristala L. Jones Prather</i>	
<b>Synthetic Approaches to Investigate Intracellular Transport and Cytoskeletal Regulatory Systems</b> .....	111
<i>Jan Zimak, David Tsao, Eric Kumar, Tyler McLaughlin, Michael Diehl</i>	
<b>The Development of in Vitro-Based Biosensors for the Detection of Pathogenic Biofilms</b> .....	112
<i>Ke Yan Wen, James Chappell, Kirsten Jensen, Paul S. Freemont, Alain Filloux, Jane Davies</i>	

<b>Quantitative Prediction of Therapeutic Fusion Protein Dynamics</b> .....	114
<i>Avi Robinson-Mosher, Jan-Hung Chen, Jeffrey Way, Pamela A. Silver</i>	
<b>Programmable Bacteria As Diagnostics of Gut Health</b> .....	115
<i>Jonathan Kotula</i>	
<b>Controlled Measurements of Multiple Cellular Components in E. coli As a Resource for Integrative Computational Modeling of Cellular Subsystems</b> .....	116
<i>John Houser, Craig Barnhart, Daniel Boutz, Sean Carroll, Joshua K. Michener, Brittany Needham, Ophelia Papoulas, Viswanadham Sridhara, Dariya Sydykova, Christopher J. Marx, M. Stephen Trent, Jeffrey E. Barrick, Claus Wilke, Edward Marcotte</i>	
<b>Improving Polyketide Production By Screening Heterologously Expressed Synthetic Propionyl-CoA Carboxylases</b> .....	117
<i>Gergana Vandova, Robert O'Brien, Colin Harvey, Brian Lowry, Ronald Davis, Chaitan Khosla, Maureen Hillenmeyer</i>	
<b>Characterization of the Performance of Non-Fluorescent Genetic Constructs Via Indirect Competitive Construct Characterization (iCCC)</b> .....	118
<i>Ariel Hecht, Matthew S. Munson, Drew Endy, Marc Salit</i>	
<b>Harnessing Peroxisomes for Metabolic Engineering</b> .....	120
<i>Zachary N. Russ, William C. DeLoache, John E. Dueber</i>	
<b>High-Throughput Crispr Studies of Gene Function and Regulation in E. Coli</b> .....	121
<i>Esteban Toro, Harneet S. Rishi, David Chen, Guillaume Cambray, Xiaowo Wang, Honglei Liu, Lei S. Qi, Adam P. Arkin</i>	
<b>Model-Driven Engineering of Gene Expression from RNA Replicons</b> .....	122
<i>Jacob Beal, Tyler Wagner, Tasuku Kitada, Odisse Azizgolshani, Jordan Moberg Parker, Douglas Densmore, Ron Weiss</i>	
<b>Extrinsic Noise and Low-Level Pulsing Orchestrate Bet-Hedging Responses</b> .....	123
<i>Javier Garcia-Bernardo, Mary Dunlop</i>	
<b>The Layered Analysis and Control of Biochemical Reaction Networks</b> .....	125
<i>Thomas P. Prescott, Antonis Papachristodoulou</i>	
<b>Ultra-High-Throughput Screening of Enzyme Libraries with Droplet-Based Microfluidics</b> .....	127
<i>Philip Romero, Tuan Tran, Adam R. Abate</i>	
<b>Construction and Characterization of Synthetic Dual-Input Promoters</b> .....	128
<i>Ian Roney, Mads Kaern</i>	
<b>Using a Biosensor Controlled Genetic Feedback Loop to Improve Microbial Biofuel Tolerance</b> .....	129
<i>Jessica Lindle, Mary Dunlop</i>	
<b>Novel Combinations of Efflux Pumps Improve Fitness Landscape of E. Coli Under Biofuel Stress</b> .....	130
<i>William Turner, Mary Dunlop</i>	
<b>Crystal Structure of the E. Coli AcpP=FabB Complex</b> .....	131
<i>David Jackson</i>	
<b>Engineering Cellulose-Degrading Complexes from Anaerobic Gut Fungi</b> .....	132
<i>Charles Haitjema, Kevin V. Solomon, Michelle A. O'Malley</i>	
<b>Highly Modular “Bow-Tie” Gene Circuits with Programmable Dynamic Behavior</b> .....	133
<i>Laura Prochazka, Bartolomeo Angelici, Benjamin Häflicher, Yaakov Benenson</i>	
<b>Enhanced Gene Disruption at Specific Promoter Region By Simultaneous Digestion of ZFN or Crispr/Cas System</b> .....	134
<i>Wataru Nomura, Akemi Masuda, Hirokazu Tamamura</i>	
<b>Near-Perfect Digital Switching in a Synthetic Biosensor Circuit Achieved through Temporal Control of Circuit's Genetic Makeup</b> .....	135
<i>Nicolas Lapique, Yaakov Benenson</i>	
<b>Parasight V1.0 – A Synthetic Biology Approach for the Detection of Parasites</b> .....	136
<i>Alexander J. Webb, Richard Kelwick, Ciaran McKeown, Kirsten Jensen, Nicolas Kylilis, Geoff S. Baldwin, Tom Ellis, Paul S. Freemont</i>	
<b>Marinobacter Aquaeolei VT8 As a Model for the Production of High-Value Neutral Lipids in Bacteria</b> .....	137
<i>Brett M. Barney</i>	
<b>Engineering Autonomous Recombinase Switches</b> .....	138
<i>Olivier Borkowski, Pakpoom Subsoontorn, Drew Endy</i>	
<b>Crispr-Cas9 Assisted Recombineering in Lactobacillus Reuteri</b> .....	139
<i>Jan Peter Van Pijkeren, Jee-Hwan Oh</i>	
<b>Library of Azotobacter Vinelandii Identifies a Strain with Biofertilizer Potential</b> .....	140
<i>Lauren J. Eberhart, Brett M. Barney</i>	
<b>Effective Dynamic Modeling of Transcriptional RNA Circuitry in Cell-Free Transcription-Translation (TX-TL) Systems</b> .....	141
<i>Chelsea Hu, Jeffery D. Varner, Julius B. Lucks</i>	



<b>Combinatorial Assembly of Large Biochemical Pathways into Yeast Chromosomes for Improved Production of Value-Added Compounds</b> .....	142
<i>Jifeng Yuan, Chi Bun Ching</i>	
<b>Models of the Cell for Synthetic Gene Circuits Design</b> .....	143
<i>Chueh Loo Poh, Prem Kumar Jayaraman</i>	
<b>Systematic Comparison of Enzymatic Error Correction Methods Using Deep Sequencing</b> .....	144
<i>Di Zhang, Nathan B. Lubock, George M. Church, Sriram Kosuri</i>	
<b>Engineering Yeast as a Host for Modular Polyketide Production</b> .....	145
<i>Dmitriy Kolesnikov, Robert P. St Onge, Ronald Davis</i>	
<b>Rational Design for Enzyme Engineering Using a Next Generation Gene Synthesis Approach to Generate Combinatorial Variant Libraries</b> .....	146
<i>Ishtiaq Saaem, Michael Hudson, Li Kung, Daniel Schindler, Nicholas Guido, Devin Leake</i>	
<b>Optogenetic Characterization Methods Overcome Key Challenges in Synthetic Biology</b> .....	149
<i>Jeff Tabor</i>	
<b>Sensitive Detection of Proteasomal Degradation Using Orthogonal Gene Circuits</b> .....	150
<i>Wenting Zhao, Yimeng Zeng, Laura Segatori</i>	
<b>Genetic Reporter Systems for Understanding the MAR Operon in Escherichia Coli</b> .....	151
<i>Nicholas A. Rossi</i>	
<b>Genome Wide Manipulation of Transcription by CRISPR-Cas9 Transcription Factors in Saccharomyces Cerevisiae</b> .....	152
<i>Justin Smith, Ulrich Schlecht, Sundari Suresh, Ana Maria Aparicio, Lars M. Steinmetz, Ron W. Davis, Leopold Parts, Robert P. St Onge</i>	
<b>Modulation of Gene Expression Via Directed Electrical Signaling; Voltage Sensitive Promoters</b> .....	153
<i>Yousef Okasheh, Nicholas M. Marshall, Ross McBee</i>	
<b>Author Index</b>	