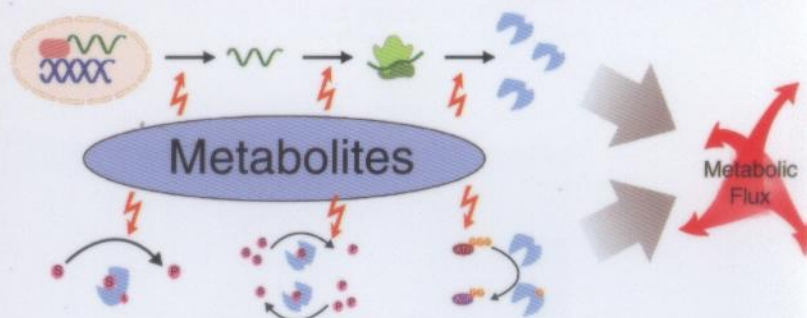


**Jan van der Meer & Greg N Stephanopoulos, Editors**



**August 2015**

**Systems biology**

Edited by Sarah-Maria Fendt and Costas D Maranas

**Nanobiotechnology**

Edited by Igor L Medintz and Matthew Tirrell

**October 2015** Chemical biotechnology • Pharmaceutical biotechnology

**December 2015** Pathway engineering

**February 2016** Food biotechnology • Plant biotechnology

**April 2016** Environmental biotechnology • Energy biotechnology

**June 2016** Systems biology • Nanobiotechnology



## CONTENTS

Abstracted/indexed in: BIOSIS, CAB Abstracts International, CAB Health, Chemical Abstracts, EMBASE, Index Medicus, Medline. Also covered in the abstract and citation database SCOPUS®. Full text available on ScienceDirect®

- v **Sarah-Maria Fendt and Costas D Maranas**  
Editorial overview: Systems biology: Advances diseases understanding and metabolic engineering

- vii **Igor L Medintz and Matthew Tirrell**  
Editorial overview: Nanobiotechnology: A time-stamped cross-sectional analysis

### Systems biology

Edited by Sarah-Maria Fendt and Costas D Maranas

- 1 **Daniel C Sévin, Andreas Kuehne, Nicola Zamboni and Uwe Sauer**  
Biological insights through nontargeted metabolomics
- 9 **Laura de Vargas Roditi and Manfred Claassen**  
Computational and experimental single cell biology techniques for the definition of cell type heterogeneity, interplay and intracellular dynamics
- 16 **Andre Wegner, Johannes Meiser, Daniel Weindl and Karsten Hiller**  
How metabolites modulate metabolic flux
- 23 **Alessandro Carrer and Kathryn E Wellen**  
Metabolism and epigenetics: a link cancer cells exploit
- 48 **Christophe Trefois, Paul MA Antony, Jorge Goncalves, Alexander Skupin and Rudi Balling**  
Critical transitions in chronic disease: transferring concepts from ecology to systems medicine
- 73 **Annalisa Zecchin, Peter C Stapor, Jermaine Goveia and Peter Carmeliet**  
Metabolic pathway compartmentalization: an underappreciated opportunity?
- 82 **Sebastian Niedenführ, Wolfgang Wiechert and Katharina Nöh**  
How to measure metabolic fluxes: a taxonomic guide for <sup>13</sup>C fluxomics
- 91 **Adil Mardinoglu and Jens Nielsen**  
New paradigms for metabolic modeling of human cells
- 98 **John M Leavitt and Hal S Alper**  
Advances and current limitations in transcript-level control of gene expression
- 105 **Benjamin D Heavner and Nathan D Price**  
Transparency in metabolic network reconstruction enables scalable biological discovery
- 110 **Ana P Gomes and John Blenis**  
A nexus for cellular homeostasis: the interplay between metabolic and signal transduction pathways

- 125 **Edward J O'Brien and Bernhard O Palsson**  
Computing the functional proteome: recent progress and future prospects for genome-scale models

- 135 **Matthew R Long, Wai Kit Ong and Jennifer L Reed**  
Computational methods in metabolic engineering for strain design

- 142 **Naveen Venayak, Nikolaos Anesiadis, William R Cluett and Radhakrishnan Mahadevan**  
Engineering metabolism through dynamic control

- 153 **Markus A Keller, Gabriel Piedrafita and Markus Ralser**  
The widespread role of non-enzymatic reactions in cellular metabolism

- 162 **Paul J Boersema, Abdullah Kahraman and Paola Picotti**  
Proteomics beyond large-scale protein expression analysis

- 180 **Karin Voordeckers, Ksenia Pougach and Kevin J Verstrepen**  
How do regulatory networks evolve and expand throughout evolution?

- 189 **Joerg M Buescher, Maciek R Antoniewicz, Laszlo G Boros, Shawn C Burgess, Henri Brunengraber, Clary B Clish, Ralph J DeBerardinis, Olivier Feron, Christian Frezza, Bart Ghesquiere, Eyal Gottlieb, Karsten Hiller, Russell G Jones, Jurre J Kamphorst, Richard G Kibbey, Alec C Kimmelman, Jason W Locasale, Sophia Y Lunt, Oliver DK Maddocks, Craig Malloy, Christian M Metallo, Emmanuelle J Meuillet, Joshua Munger, Katharina Nöh, Joshua D Rabinowitz, Markus Ralser, Uwe Sauer, Gregory Stephanopoulos, Julie St-Pierre, Daniel A Tennant, Christoph Wittmann, Matthew G Vander Heiden, Alexei Vazquez, Karen Vousden, Jamey D Young, Nicola Zamboni and Sarah-Maria Fendt**  
A roadmap for interpreting <sup>13</sup>C metabolite labeling patterns from cells

### Nanobiotechnology

Edited by Igor L Medintz and Matthew Tirrell

- 30 **Melissa Massey, Miao Wu, Erin M Conroy and W Russ Algar**  
Mind your P's and Q's: the coming of age of semiconducting polymer dots and semiconductor quantum dots in biological applications
- 41 **Xu Han, Yeting Zheng, Catherine J Munro, Yiwen Ji and Adam B Braunschweig**  
Carbohydrate nanotechnology: hierarchical assembly using nature's other information carrying biopolymers
- 56 **Jing Pan, Feiran Li, Tae-Gon Cha, Haorong Chen and Jong Hyun Choi**  
Recent progress on DNA based walkers



- |   |  |     |  |
|---|--|-----|--|
| 65  | <b>S Bouccara, G Sitbon, A Fragola, V Lorientte, N Lequeux and T Pons</b><br>Enhancing fluorescence <i>in vivo</i> imaging using inorganic nanopores   | 225 | <b>Mary M Nguyen, Nathan C Gianneschi and Karen L Christman</b><br>Developing injectable nanomaterials to repair the heart                                     |
| 118   | <b>Sivashankar Krishnamoorthy</b><br>Nanostructured sensors for biomedical applications – a current perspective  | 232 | <b>Scott A Walper, Kendrick B Turner and Igor L Medintz</b><br>Enzymatic bioconjugation of nanoparticles: developing specificity and control                   |
| 171   | <b>Pengcheng Zhang, Andrew G Cheetham, Lye Lin Lock, Yaping Li and Honggang Cui</b><br>Activatable nanopores for biomolecular detection                | 242 | <b>Shaowei Ding, Allison A Cargill, Igor L Medintz and Jonathan C Claussen</b><br>Increasing the activity of immobilized enzymes with nanoparticle conjugation |
| 202   | <b>Evgeny Katz</b><br>Biocomputing – tools, aims, perspectives   |     |  |
| 209   | <b>Leslie P Silva and Trent R Northern</b><br>Exometabolomics and MSI: deconstructing how cells interact to transform their small molecule environment |     |  |
| 217   | <b>Josiah D Smith, Logan D Morton and Bret D Ulery</b><br>Nanoparticles as synthetic vaccines  |     |  |
| <hr/>   |  |     |  |
| <b>The cover</b>  |  |     |  |
| Metabolites are involved in the modulation of metabolic fluxes. Based on their concentrations, small molecules directly influence the rates of coupled biochemical reactions. Allosteric interactions between metabolites and enzymes provide an efficient and fast mechanism for controlling metabolic fluxes and allow for an immediate response to environmental perturbations. By interfering with transcriptional and translational regulation, metabolites are also involved in long term regulatory processes. (See Wegner <i>et al.</i> , pages 16–22, this issue). |  |     |  |

The cover

Metabolites are involved in the modulation of metabolic fluxes. Based on their concentrations, small molecules directly influence the rates of coupled biochemical reactions. Allosteric interactions between metabolites and enzymes provide an efficient and fast mechanism for controlling metabolic fluxes and allow for an immediate response to environmental perturbations. By interfering with transcriptional and translational regulation, metabolites are also involved in long term regulatory processes. (See Wegner *et al.*, pages 16–22, this issue).