

Systems Microbiology

Current Topics and Applications



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Systems biology is the study of the dynamic interactions of more than one component in a biological system in order to understand and predict the behaviour of the system as a whole. Systems biology is a rapidly expanding discipline fuelled by the 'omics era and new technological advances that have increased the precision of data obtainable. A focus on simple single cell organisms such as bacteria aids tractability and means that systems microbiology is a rapidly maturing science.

This volume contains cutting-edge reviews by world-leading experts on the systems biology of microorganisms. As well as covering theoretical approaches and mathematical modelling this book includes case studies on single microbial species of bacteria and archaea, and explores the systems analysis of microbial phenomena such as chemotaxis and phagocytosis. Topics covered include mathematical models for systems biology, systems biology of *Escherichia coli* metabolism, bacterial chemotaxis, systems biology of infection, host-microbe interactions, phagocytosis, system-level study of metabolism in *Mycobacterium tuberculosis*, and the systems biology of *Sulfolobus*.

This book is a major resource for anyone interested in systems biology and a recommended text for all microbiology laboratories.

Chapter 1. Mathematical Models for Systems Biology and How to Construct Them. *Chris P. Barnes, Maxime Huvet, Nathan Harmston and Michael P.H. Stumpf*

Chapter 2. Dynamics and Robustness of Metabolic Networks: a Systems Biology Review of *Escherichia coli* Metabolism. *Eivind Almaas, Per Bruheim, Rahmi Lale and Svein Valla*

Chapter 3. Bacterial Chemotaxis: Rising Complexity. *Diana Clausznitzer, Judith P. Armitage and Robert G. Endres*

Chapter 4. Systems Biology of Infection: the Pathogen Perspective. *Dirk Bumann*

Chapter 5. Manipulating the Fight Between Human Host Cells and Intracellular Pathogens. *Rico Barsacchi, Varadharajan Sundaramurthy, Kees Korbee, Jacques Neefjes, Tom Ottenhoff, Tiziana Scanu and Marino Zerial*

Chapter 6. How One Cell Eats Another: Principles of Phagocytosis. *Sylvain Tollis, Navin Gopaldass, Thierry Soldati and Robert G. Endres*

Chapter 7. System-level Strategies for Studying the Metabolism of *Mycobacterium tuberculosis*. *Dany J.V. Beste and Johnjoef McFadden*

Chapter 8. *Sulfolobus* Systems Biology: Cool Hot Design for Metabolic Pathways. *Theresa Kouril, Alexey Kolodkin, Melanie Zaparty, Ralf Steuer, Peter Ruoff, Hans V. Westerhoff, Jacky Snoep, Bettina Siebers and the SulfoSYS consortium*

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