Metabolic Engineering Principles Stephanopoulos

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Cyanobacteria Biotechnology Cambridge University Press
Transcriptome Analysis, by Frank Stahl, Bernd Hitzmann, Kai Mutz, Daniel Landgrebe, Miriam Lübbecke, Cornelia Kasper, Johanna Walter und Thomas Scheper Transcriptome Data Analysis for Cell Culture Processes, by Marlene Castro-Melchor, Huong Le und Wei-Shou Hu Modeling Metabolic Networks for Mammalian Cell Systems: General Considerations, Modeling Strategies, and Available Tools, by Ziomara P. Gerdtzen Metabolic Flux Analysis in Systems Biology of Mammalian Cells, by Jens Niklas und Elmar Heinzle Advancing Biopharmaceutical Process Development by System-Level Data Analysis and Integration of Omics Data, by Jochen Schaub, Christoph Clemens, Hitto Kaufmann und Torsten W. Schulz Protein Glycosylation and Its Impact on Biotechnology, by Markus Berger, Matthias Kaup und Véronique Blanchard Protein Glycosylation Control in Mammalian Cell Culture: Past Precedents and Contemporary Prospects, by Patrick Hossler Modeling of Intracellular Transport and Compartmentation, by Uwe Jandt und An-Ping Zeng Genetic Aspects of Cell Line Development from a Synthetic Biology Perspective, by L. Botezatu, S. Sievers, L. Gama-Norton, R. Schucht, H. Hauser und D. Wirth.

Bioprocessing for Value-Added Products from Renewable Resources Springer
Illustrating techniques in model development, signal processing, data reconciliation, process monitoring, quality assurance, intelligent real-time process supervision, and fault detection and diagnosis, Batch Fermentation offers valuable simulation and control strategies for batch fermentation applications in the food, pharmaceutical, and chemical industries. The book provides approaches for determining optimal reference trajectories and operating conditions; estimating final product quality; modifying, adjusting, and enhancing batch process operations; and designing integrated real-time intelligent knowledge-based systems

for process monitoring and fault diagnosis.

23rd European Symposium on Computer Aided Process Engineering Springer

This volume consists of 52 peer-reviewed papers, presented at the International Conference on Sustainable Design and Manufacturing (SDM-19) held in Budapest, Hungary in July 2019. Leading-edge research into sustainable design and manufacturing aims to enable the manufacturing industry to grow by adopting more advanced technologies, and at the same time improve its sustainability by reducing its environmental impact. The topic includes the sustainable design of products and services; the sustainable manufacturing of all products; energy efficiency in manufacturing; innovation for eco-design; circular economy; industry 4.0; industrial metabolism; automotive and transportation systems. Application areas are wide and varied. The book will provide an excellent overview of the latest developments in the Sustainable Design and Manufacturing Area.

Metabolic Engineering in the Post Genomic Era CRC Press

Computer-aided process engineering (CAPE) plays a key design and operations role in the process industries, from the molecular scale through managing complex manufacturing sites. The research interests cover a wide range of interdisciplinary problems related to the current needs of society and industry. ESCAPE 23 brings together researchers and practitioners of computer-aided process engineering interested in modeling, simulation and optimization, synthesis and design, automation and control, and education. The proceedings present and evaluate emerging as well as established research methods and concepts, as well as industrial case studies. Contributions from the international community using computer-based methods in process engineering Reviews the latest developments in process systems engineering Emphasis on industrial and societal challenges

Concepts in Plant Metabolomics Metabolic EngineeringMetabolic engineering is a new field with applications in the production of chemicals, fuels, materials, pharmaceuticals, and medicine at the genetic level. The field's novelty is in the synthesis of molecular biology techniques and the tools of mathematical analysis, which allow rational selection of targets for genetic modification through measurements and control of metabolic fluxes. The objective is to identify specific genetics or environmental manipulations that result in improvements in yield and productivities of biotechnological processes. Key features of the book are pathway integration and the focus on metabolic flux as a fundamental determinant of cell physiology. The book keeps

mathematical complexity to a minimum, and provides a glossary of biological terms to facilitate use of the book by a broader spectrum of readers. A web page exists to communicate updates of the codes and homework problems. Key Features * Demonstrates metabolic engineering in action with numerous examples of pathway modification * Includes methods for identifying key enzymes in metabolic networks * Contains a comprehensive review of metabolic biochemistry * Discusses metabolic regulation at the gene, enzyme, operon, and cell levels * Explains concepts of stoichiometry, kinetics, and thermodynamics of metabolic pathways * Minimizes mathematical complexity * Links to a Web page to communicate updates of the software code and homework problemsMetabolic Engineering

Christina Smolke, who recently developed a novel way to churn out large quantities of drugs from genetically modified brewer's yeast, is regarded as one of the most brilliant minds in biomedical engineering. In this handbook, she brings together pioneering scientists from dozens of disciplines to provide a complete record of accomplishment in metab

Batch Fermentation Artech House

Systems Metabolic Engineering is changing the way microbial cell factories are designed and optimized for industrial production. Integrating systems biology and biotechnology with new concepts from synthetic biology enables the global analysis and engineering of microorganisms and bioprocesses at super efficiency and versatility otherwise not accessible. Without doubt, systems metabolic engineering is a major driver towards bio-based production of chemicals, materials and fuels from renewables and thus one of the core technologies of global green growth. In this book, Christoph Wittmann and Sang-Yup Lee have assembled the world leaders on systems metabolic engineering and cover the full story – from genomes and networks via discovery and design to industrial implementation practises. This book is a comprehensive resource for students and researchers from academia and industry interested in systems metabolic engineering. It provides us with the fundaments to targeted engineering of microbial cells for sustainable bio-production and stimulates those who are interested to enter this exiting research field.

Protein Engineering John Wiley & Sons

Learn more about foundational and advanced topics in metabolic engineering in this comprehensive resource edited by leaders in the field Metabolic Engineering: Concepts

and Applications delivers a one-stop resource for readers seeking a complete description of the concepts, models, and applications of metabolic engineering. This guide offers practical insights into the metabolic engineering of major cell lines, including E. Coli, Bacillus and Yarrowia Lipolytica, and organisms, including human, animal, and plant). The distinguished editors also offer readers resources on microbiome engineering and the use of metabolic engineering in bioremediation. Written in two parts, Metabolic Engineering begins with the essential models and strategies of the field, like Flux Balance Analysis, Quantitative Flux Analysis, and Proteome Constrained Models. It also provides an overview of topics like Pathway Design, Metabolomics, and Genome Editing of Bacteria and Eukarya. The second part contains insightful descriptions of the practical applications of metabolic engineering, including specific examples that shed light on the topics within. In addition to subjects like the metabolic engineering of animals, humans, and plants, you'll learn more about: Metabolic engineering concepts and a historical perspective on their development The different modes of analysis, including flux balance analysis and quantitative flux analysis An illuminating and complete discussion of the thermodynamics of metabolic pathways The Genome architecture of E. coli, as well as genome editing of both bacteria and eukarya An in-depth treatment of the application of metabolic engineering techniques to organisms including corynebacterial, bacillus, and pseudomonas, and more Perfect for students of biotechnology, bioengineers, and biotechnologists, Metabolic Engineering: Concepts and Applications also has a place on the bookshelves of research institutes, biotechnological institutes and industry labs, and university libraries. It's comprehensive treatment of all relevant metabolic engineering concepts, models, and applications will be of use to practicing biotechnologists and bioengineers who wish to solidify their understanding of the field.

Metabolic Engineering Oxford University Press This book examines the value of the Saccharomyces genus in areas of agriculture and pharmaceuticals. It includes seven chapters in two sections: "Agricultural and

Biotechnological Applications" and "Medical and Pharmaceutical Applications." The chapters cover such topics as metabolic engineering of S. cerevisiae using CRISPR-Cas9. technology to produce biopharmaceuticals, fruit juice fermentation for antioxidant activity, mode of action of indigenous S. cerevisiae, the performance of Saccharomyces as an antiviral microorganism for pandemic diseases, application of yeast to study DNA repair and damage tolerance on cell cycle division, how calorie restriction can support the anti-aging process using yeast budding cells, and secondary metabolites from S. cerevisiae with anticancer activity.

Encyclopedia of Chemical Processing Garland Science Microbiome Metabolic Pathways and Disease provides insight into the interaction of microbial metabolic pathways in the human body and the impact these can have on a variety of diseases. By analyzing these pathways the book seeks to investigate how these metabolic processes can be targeted and manipulated in order to treat various disorders and diseases. Topics covered in the book include microbial shikimate pathways, protein biosynthesis, tryptophan metabolites, microbiome metabolic engineering, fecal microbiota transplantation, and virulence factors. Additionally, a variety of conditions are covered, such as disorders associated with metabolic syndromes, serotonin syndromes, Alzheimer's disease, and Covid-19, providing a detailed overview of how metabolic pathways of microbiome can impact health and disease in the human body. Explores microbial metabolic pathways in the human body and implications for disease Investigates specific steps involved in metabolic reactions in the human microbiome, including shikimate pathways and tryptophan pathways Considers a variety of diseases and disorders, such as Alzheimer's disease, metabolic syndromes, Crohn's disease and Covid-19 Includes analysis of various amino acids and enzymes in microbial and human cells and how these can impact health

Pathway Analysis and Optimization in Metabolic Engineering John Wiley & Sons This book covers the state-of-the-art research on molecular biology assays and molecular techniques enabled or enhanced by microfluidic platforms. Topics covered include microfluidic methods for cellular separations and single cell studies, droplet-based approaches to study protein expression and forensics, and microfluidic in situ hybridization for RNA analysis. Key molecular biology studies using model organisms are reviewed in detail. This is an ideal book for students and researchers in the microfluidics and molecular biology fields as well as engineers working in the biotechnology industry. This book also: Reviews exhaustively the latest techniques

for single-cell genetic, epigenetic, metabolomic, and proteomic analysis Illustrates microfluidic approaches for inverse metabolic engineering, as well as analysis of circulating exosomes Broadens readers' understanding of microfluidics convection-based PCR technology, microfluidic RNA-seq, and microfluidics for robust mobile diagnostics

Saccharomyces John Wiley & Sons

Metabolic engineering is a rapidly evolving field that is being applied for the optimization of many different industrial processes. In this issue of Advances in Biochemical Engineering/Biotechnology, developments in different areas of metabolic engineering are reviewed. The contributions discuss the application of metabolic engineering in the improvement of yield and productivity - illustrated by amino acid production and the production of novel compounds - in the production of polyketides and extension of the substrate range - and in the engineering of S. cerevisiae for xylose metabolism, and the improvement of a complex biotransformation process.

Microbial Metabolism and Disease John Wiley & Sons

This first volume of the Metabolic Pathway Engineering Handbook provides an overview of metabolic pathway engineering with a look towards the future. It discusses cellular metabolism, including transport processes inside the cell and energy generating reactions, as well as rare metabolic conversions. This volume also explores balances and reaction

Methods in Bioengineering Academic Press

The Horizon Scientific Press titles focus on high-level microbiology and molecular biology topics. Written by internationally renowned and highly respected leaders in the field, titles in this series comprise of review manuals, practical manuals, and reference texts for research scientists, bioscience professionals and graduate students. Engineering living cells continues to pose immense challenges to the researcher. In fact many bioengineers have only just started to appreciate the full extent of the hierarchical control used by living systems: upon attempts to increase the activity of a "rate-limiting" step, the multiple feedbacks at the metabolic, signaling and genetic levels result in the rate limiting step shifting to elsewhere in that pathway or even to elsewhere in the whole organism. The advent of full-force genomics should enable preventing this response, however, it has been difficult for

researchers to know where to turn for guidance. This book aims to help the reader understand and deal with the plasticity of living cell factories and to turn the plasticity into the desired rather than the adverse direction. The book brings together all the recent, most important breakthroughs in this exciting field: Internationally renowned key scientists have reviewed each topic in detail. In the Introduction, the editors give an overview of new approaches and spell out what the engineer and the industry may now really begin to aim for; they even adapt the definition of metabolic engineering to befit the post-genomics era. Other topics included are: the experimental approaches necessary to understand cellular regulation at all of its hierarchical levels, including proteomics [Chapter 2], metabolomics [Chapter 3] and fluxomics [Chapter 4]; new tools that help metabolic engineering [Chapters 5-7]; modeling of living cells, e.g. finding metabolic pathways [Chapter 8] and comparing the actual and predicted use of these in living organisms such as E. coli and Corynebacteria [Chapters 9, 10]; the optimization of cell factories as production organisms (e.g., use of whole cell models, silicon cells, and coordinate manipulation of multiple genes [Chapters 12-15]). A chapter on future perspectives directs further developments of the field in the near future. Metabolic Engineering in the Post Genomic Erais an essential reading for everyone with an interest in engineering living cells including: Metabolic egnineers, bioengineers, biotechnologists, molecular biologists, and pharmaceutical and biotechnology companies.

Microfluidic Methods for Molecular Biology CRC Press

Now presented in large format, the new Schmid is the ideal primer in biotechnology. The two-page layout with one page being a full color figure and the opposite page being explanatory text is the ideal combination between rapid visual-based learning with in depth information.

The Metabolic Pathway Engineering Handbook, Two Volume Set CRC Press

Biotechnology is one of the major technologies of the twenty-first century. Its wide-ranging, multi-disciplinary activities include recombinant DNA techniques, cloning and the application of microbiology to the production of goods from bread to antibiotics. In this new edition of the textbook

Basic Biotechnology, biology and bioprocessing topics are uniquely combined to provide a complete overview of biotechnology. The fundamental principles that underpin all biotechnology are explained and a full range of examples are discussed to show how these principles are applied; from starting substrate to final product. A distinctive feature of this text are the discussions of the public perception of biotechnology and the business of biotechnology, which set the science in a broader context. This comprehensive textbook is essential reading for all students of biotechnology and applied microbiology, and for researchers in biotechnology industries.

Bacterial Cellular Metabolic Systems Elsevier The metabolic regulation of a cell system is of critical importance in systems biology, and a robust model of these mechanisms is essential in predicting the effects on the metabolism of both the culture environment and the knockout of specific genes. Bacterial cellular metabolic systems focuses on this highly topical subject in relation to culture environment and provides a detailed analysis from gene level to metabolic level regulation, as well as offering a discussion of the most recent modelling approaches. The book begins with an introduction to metabolic mechanisms and to the metabolic regulation of a cell, before moving on to discussing the action of global regulators in response to a specific culture environment. The second half of the book examines conventional flux balance analysis and its applications, 13C-metabolic flux analysis, and the effect of a specific gene knockout on the metabolism. Comprehensive account of metabolic regulation via global regulators in response to changes in the culture environment Basic formulation of 13C-metabolic flux analysis based on 13C-labelling experiments Systems biology approach for the modelling and computer simulation of the main metabolic pathways of a cell system

Metabolic Engineering for Bioprocess Commercialization Springer Science & Business Media Metabolic engineering has been developed over the past 20 years to become an important tool for rational engineering of microorganisms. This book has a particular interest in the methods and applications of metabolic engineering to improve the production and yield of a variety of metabolites in microorganisms. The overall goal is to achieve a better understanding of metabolism in different microorganisms, and provide a rational basis to reprogram microorganisms for improved biochemical production. This book brings together contributions from leading researchers at the cutting edge of these topics. The subject matter is divided into two sections. The first section deals with novel and emerging methods for redesigning microorganisms exploiting systems biology and gene regulation. The second discusses practical aspects of metabolic engineering for over production of a

variety of valuable chemicals and materials by fermentation.

Metabolic Engineering CRC Press

This book provides an introductory text for undergraduate and graduate students who are interested in comprehensive biological systems. The authors offer a broad overview of the field using key examples and typical approaches to experimental design. The volume begins with an introduction to systems biology and then details experimental omics tools. Other sections introduce the reader to challenging computational approaches. The final sections provide ideas for theoretical and modeling optimization in systemic biological researches. The book is an indispensable resource, providing a first glimpse into the state-of-the-art in systems biology.

Reprogramming Microbial Metabolic Pathways Elsevier

Designed for undergraduates, graduate students, and industry practitioners, Bioseparations Science and Engineering fills a critical need in the field of bioseparations. Current, comprehensive, and concise, it covers bioseparations unit operations in unprecedented depth. In each of the chapters, the authors use a consistent method of explaining unit operations, starting with a qualitative description noting the significance and general application of the unit operation. They then illustrate the scientific application of the operation, develop the required mathematical theory, and finally, describe the applications of the theory in engineering practice, with an emphasis on design and scaleup. Unique to this text is a chapter dedicated to bioseparations process design and economics, in which a process simular, SuperPro Designer® is used to analyze and evaluate the production of three important biological products. New to this second edition are updated discussions of moment analysis, computer simulation, membrane chromatography, and evaporation, among others, as well as revised problem sets. Unique features include basic information about bioproducts and engineering analysis and a chapter with bioseparations laboratory exercises. Bioseparations Science and Engineering is ideal for students and professionals working in or studying bioseparations, and is the premier text in the field.

Basic Biotechnology Springer Science & Business Media

Metabolic flux analysis is a useful tool for metabolism characterization and verification of genetic modification effects; it is a support for decisions on biotechnological process improvement. Commercial production of biodegradable polymers, specifically polyhydroxyalkanoates PHAs, is restricted by production costs, which may be cut by increasing yield from substrate to product, since carbon source for PHAs production accounts up to 50% of the total production costs; additionally, in Pseudomonas sp. LMF046 the experimental yield is between 60-70% of theoretical maximum yield. This work presents metabolic pathways identification, flux quantification and analysis on this strain, employing position isotopomer balancing and measurements of labeling patterns in the polymer by GC-MS. Initial results –using [1-13C]glucose-allow to rule out carbohydrate catabolism by EMP pathway, whereas final ones –using a mixture of [U-13C]glucose and natural glucose– allow to estimate fraction of glucose metabolized by ED and PP pathways. Metabolic network includes eight intracellular metabolite and 324 isotopomer balances, and it is solved in 1.3 seconds in a Core i5 PC. Sensitivity analysis shows inclusion of carbon natural labeling improves the prediction. The estimated ratio for sugar metabolism into PP and ED pathways, 1.35:0.55, that corresponds to 77% of the theoretical yield, leads to the conclusion that the glucose metabolism in larger proportion by the Pentoses pathway is the main reason for a low yield. The problem has been solved satisfactorily, and a sensitivity analysis shows that it is necessary to reduce uncertainty on labeling measurements.