# Review of Synthetic Biology – Metabolic Engineering by Huimin Zhao and An-Ping Zeng (Editors)

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**Abstract**

Synthetic biology is the engineering approach to edit or write the genome aiming to design the biological devices (promoters, transcription factors, TFBS, terminators etc.) of an organism to achieve the improved properties, while, metabolic engineering aiming to engineer the microbes to produce metabolites on industrial scale through recombinant DNA technologies. Recently, both synthetic biology and metabolic engineering fields are growing quickly and are used to produce metabolites of interest. The main theme of Synthetic Biology – Metabolic Engineering book is to review the tools and techniques used in synthetic biology and metabolic engineering to design and engineer the microbes to produce value-added metabolites and its application in industrial biotechnology. The book is written by the world-renowned metabolic engineers and synthetic biologists in series of Advances in Biochemical Engineering/Biotechnology and primarily elaborates the synergy between metabolic engineering and synthetic biology.



Book Review

**Review of *Synthetic Biology – Metabolic Engineering* by Huimin Zhao and An-Ping Zeng (Editors), Springer International Publishing, AG, 2018**

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**Book Details**

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**Review**

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synthetic biologists in series of Advances in Biochemical Engineering/Biotechnology and primarily elaborates the synergy between metabolic engineering and synthetic biology.

In the section of Tools Development, Baumann and co-workers elaborates the development and application of pyrrolysine based system used for the translation of orthogonal proteins, a process to produce site-specific labelled recombinant proteins and peptides.

Deaner and Alper elaborates different strategies for the engineering and discovery of promoters and terminators to alter the gene expression of any gene. Specifically, this chapter emphasis on the methodologies for the rational construction, prediction, and characterization of synthetic promoters/terminators and its application in different organisms.

The team lead by An-Ping Zeng delivers a broad overview of natural biomolecular switches, recent advances in engineering of bio-switches (protein-based, RNA-based) and their application for dynamic metabolic control.

Huimin Zhao's team elaborates the design, construction and optimization of pathway in the present review. Specifically, different strategies developed by metabolic engineers and synthetic biologist for the design, construction and optimization (transcriptional and translational level) of metabolic pathways to produce chemicals in microbes were discussed. Moreover, the experimental tools to improve/construct the metabolic synthetic pathway and computational algorithms to construct efficient metabolic pathway were also discussed.

As the name indicates, "synthetic biology for cell-free biosynthesis" elaborates the different strategies to design new biochemical pathways for the *in vitro* enzymatic synthesis of fine chemicals written by Gaspar Morgado and coworkers. Cell-free biosynthesis is a single step process and a promising tool to perform complex catalysis.

Meng and Chen emphasize the use of synthetic biology to produce polyhydroxyalkanoates (PHA)—family of biocompatible and biodegradable polyesters. Initially the metabolic pathways for the synthesis of PHA in different microbes and diversity of PHA were discussed. Then, engineering strategies for the synthesis of PHA were also discussed.

Turner and coworkers debated about recent approaches (both combinatorial and rational) for the engineering and evolution of *Saccharomyces cerevisiae* to produce biofuels (i.e. butanol, ethanol, 2,3-butanediol) and metabolites (i.e. isoprenoids, antioxidants) from different carbon sources (i.e. lactose, glucose, arabinose, xylose, mannitol, cellobiose, alginate, galactose and acetate).

Becker and coworkers highlighted the implementation of synthetic and system biology strategies for the engineering of industrially important *Corynebacterium glutamicum* to produce value-added metabolites.

Guo and coworkers compiled the basics of $^{13}$C-MFA (metabolic flux analysis) in this chapter and demonstrated the application of $^{13}$C-MFA to detect the rate-limiting steps in the pathway for the target metabolite which is of great importance in the metabolic engineering.

The last chapter written by Schmidt and coworkers illustrates up-to-the-minute ethical aspects of new-to nature organism and xenobiology—an emerging field of synthetic biology that implies the re-design of biology.

This book is highly recommended for synthetic biologist, metabolic engineers and natural product scientists to have up-to-the-minute knowledge regarding tools/techniques used in synthetic biology and metabolic engineering

**Competing Interest**

None

**References**

Zhao H, Zeng AP, editors. *Synthetic Biology – Metabolic Engineering.* Springer International Publishing, series in Advances in Biochemical Engineering/Biotechnology [https://link.springer.com/book/10.1007/978-

3-319-55318-4]. 2018. viii + 322 pp. Online ISBN 978-3-319-55318-4; Print ISBN 978-3-319-55317-7; https://doi.org/10.1007/978-3-319-55318-4.