



Design and Analysis of Biomolecular Circuits: Engineering Approaches to Systems and Synthetic Biology

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The book deals with engineering aspects of the two emerging and intertwined fields of synthetic and systems biology. Both fields hold promise to revolutionize the way molecular biology research is done, the way today's drug discovery works and the way bio-engineering is done. Both fields stress the importance of building and characterizing small bio-molecular networks in order to synthesize incrementally and understand large complex networks inside living cells. Reminiscent of computer-aided design (CAD) of electronic circuits, abstraction is believed to be the key concept to achieve this goal. It allows hiding the overwhelming complexity of cellular processes by encapsulating network parts into abstract modules. This book provides a unique perspective on how concepts and methods from CAD of electronic circuits can be leveraged to overcome complexity barrier perceived in synthetic and systems biology.

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Editorial Review

Review

From the reviews:

“This collection of papers is an excellent reference for anyone who would like to learn more about the engineering and computing side of systems and synthetic biology. ... this clear and detailed volume will help to introduce mathematicians, engineers, and computer scientists to an application of their fields in biology. It will also serve biologists who want to know more about how in silico technologies can be an important part of the arsenal used to understand and create biological systems.” (Sara Kalvala, ACM Computing Reviews, June, 2012)

From the Back Cover

This book is devoted to the design and analysis of biomolecular circuits as considered in systems biology and synthetic biology. The aim of the book is to present in a coherent framework some of the most recent work on the analysis, simulation and design of biomolecular circuits and systems, reflecting the interdisciplinary and collaborative nature of the field. The results discussed range from how these systems should be modeled and analyzed, to how they should be physically designed and implemented.

Drawing parallels to electronic circuit design, this book's contents are organized to reflect what the editors believe are the important, necessary steps to build complex synthetic circuits. Coverage includes analysis and simulation, modularity and abstraction, design and standardization, and enabling technologies. Each of these themes is organized in different chapters that are self-contained so that they can be read individually by experts but also read sequentially by someone wanting to get an overview of the field. This book is intended for computational scientists, e.g. mathematicians, physicists, computer scientist or engineers as well as for researchers from the life sciences. Every effort has been made to make the presentation accessible to a broad, multi-disciplinary audience.

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