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Editors

Encyclopedia of Systems Biology

With 830 Figures and 148 Tables

 Springer Reference

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Preface

Systems biology refers to the quantitative analysis of the dynamic interactions among multiple components of a biological system and aims to understand the behavior of the system as a whole. Systems biology involves the development and application of system-theoretic concepts for the study of complex biological systems through iteration over mathematical modeling, computational simulation and biological experimentation. Systems biology could be viewed as a new concept and tool to increase our understanding of biological systems, to develop more directed experiments, and to allow accurate predictions.

Systems biology is among the most rapidly growing fields of scientific research and technology development. Over the past ten to fifteen years, the research activities in this field have been increasing exponentially. This is evidenced by the number of published papers as well as the growing number of conferences, journals, research institutions and centers, and academic events on the topic of systems biology. While research, development and applications in this field are becoming more widespread, one major challenge is the lack of a single reference resource providing up-to-date overviews and definitions of the major concepts and subjects across the various sub-areas of systems biology. The Encyclopedia of Systems Biology is addressing this lack and provides a unified information resource. It has been conceived as a comprehensive reference work covering all aspects of systems biology, including the investigation of living matter through a tight coupling of biological experimentation, mathematical modeling and computational analysis and simulation. The main aim of the Encyclopedia is to provide a complete reference of established knowledge in systems biology – a ‘one-stop shop’ for someone seeking information on key concepts in this field. As a result, the Encyclopedia comprises a broad range of topics relevant in the context of systems biology.

The audience targeted by the Encyclopedia includes researchers, developers, teachers, students and practitioners who are studying or working in the field of systems biology. Keeping in mind the varying needs of the potential readership, we have structured and presented the content in a way that is accessible to readers from a wide range of backgrounds. In contrast to encyclopedic online resources, which often rely on the general public to author their content, a key consideration in the development of the Encyclopedia of Systems Biology was to have subject matter experts define the concepts and subjects of systems biology. We believe that there is no other treatment of this subject in terms of depth and authority of the field.

Ultimately, systems biology represents a *trans-disciplinary* scientific paradigm, in which researchers from diverse backgrounds work jointly using a shared conceptual framework and combined disciplinary-specific approaches to address complex life science R&D problems. Thus, the Encyclopedia of Systems Biology derives its

raison d'être from a modern trans-disciplinary perspective on how to think about and explore complex biological phenomena. We believe that this new publication will help to define the meaning and scope of systems biology, and to extend the impact that systems biology will have on future developments in the life sciences.

Acknowledgments

It has taken several years of hard work by many people to bring this Encyclopedia to life. We would like to give our sincere thanks to the members of the Editorial Board, the contributing authors and the reviewers. Without their expertise, dedication and continuous efforts this comprehensive reference work would not exist.

We wish to thank Joseph Burns (Senior Editor), Sandra Fabiani (Executive Editor) and Melanie Tucker (Editor) who proposed the project to us and provided invaluable counsel in shaping and developing this reference work. **We wish to express our profound gratitude to Sylvia Blago and Simone Giesler from Springer for their outstanding editorial efforts in producing this exciting Encyclopedia.**

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