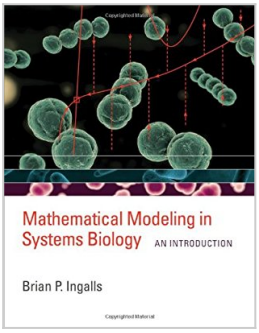

Mathematical Modeling in Systems Biology: An Introduction (MIT Press)

By Brian P. Ingalls

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Systems techniques are integral to current research in molecular cell biology, and system-level investigations are often accompanied by mathematical models. These models serve as working hypotheses: they help us to understand and predict the behavior of complex systems. This book offers an introduction to mathematical concepts and techniques needed for the construction and interpretation of models in molecular systems biology. It is accessible to upper-level undergraduate or graduate students in life science or engineering who have some familiarity with calculus, and will be a useful reference for researchers at all levels.

The first four chapters cover the basics of mathematical modeling in molecular systems biology. The last four chapters address specific biological domains, treating modeling of metabolic networks, of signal transduction pathways, of gene regulatory networks, and of electrophysiology and neuronal action potentials. Chapters 3--8 end with optional sections that address more specialized modeling topics. Exercises, solvable with pen-and-paper calculations, appear throughout the text to encourage interaction with the mathematical techniques. More involved end-of-chapter problem sets require computational software. Appendixes provide a review of basic concepts of molecular biology, additional mathematical background material, and tutorials for two computational software packages (XPPAUT and MATLAB) that can be used for model simulation and analysis.

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Editorial Review

Review

With the emergence of systems biology and synthetic biology, there is a critical need for accessible educational materials for engineers, physicists, and mathematicians who are interested in molecular biology, as well as for molecular biologists who are interested in mathematical biology. Brian Ingalls beautifully addresses this need in providing us with an easy-to-read textbook that can serve as the basis for undergraduate classes, graduate classes, and summer courses and workshops.

(**Jim Collins**, HHMI, Boston University and Harvard University)

There is no question about Brian Ingalls's expertise in this field. He is an excellent teacher, and this book accessibly conveys the important aspects of rather complicated mathematical concepts. I very much recommend *Mathematical Modeling in Systems Biology* to students in combined quantitative/life sciences courses.

(**Zoltan Szallasi**, Department of Systems Biology, Technical University of Denmark; and Children's Hospital Boston, Harvard Medical School)

Brian Ingalls has done a great job. This book will have a major impact on systems biology undergraduate and graduate courses and will be of great help to those moving from an engineering, physics, and mathematics background to systems biology.

(**Diego di Bernardo**, University of Naples Federico II, Italy)

About the Author

Brian P. Ingalls is Associate Professor in the Departments of Applied Mathematics, Biology, and Chemical Engineering at the University of Waterloo, Canada. He is the coeditor of *Control Theory and Systems Biology* (MIT Press, 2010).

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