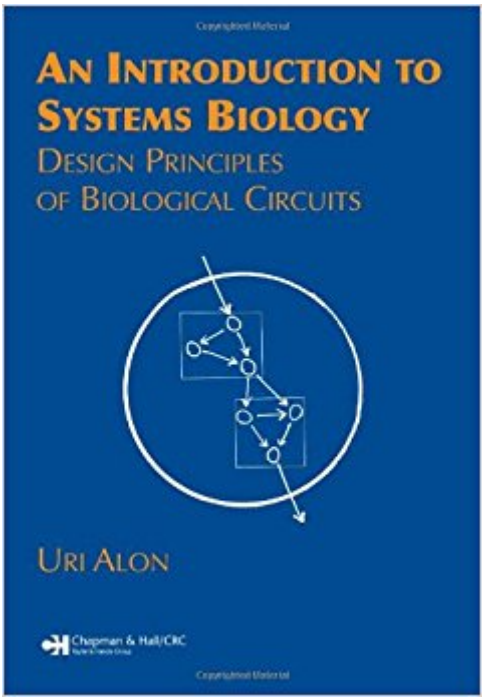
An Introduction To Systems Biology: Design Principles Of Biological Circuits (Chapman & Hall/CRC Mathematical And Computational Biology)



Synopsis

Thorough and accessible, this book presents the design principles of biological systems, and highlights the recurring circuit elements that make up biological networks. It provides a simple mathematical framework which can be used to understand and even design biological circuits. The textavoids specialist terms, focusing instead on several well-studied biological systems that concisely demonstrate key principles. An Introduction to Systems Biology: Design Principles of Biological Circuits builds a solid foundation for the intuitive understanding of general principles. It encourages the reader to ask why a system is designed in a particular way and then proceeds to answer with simplified models.

Book Information

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Customer Reviews

"[This text deserves] serious attention from any quantitative scientist or physicist who hopes to learn about modern biology. [It is] well written. Ã¢â ¬Â¦ AlonÃ¢â ¬â„¢s book is the better place for physicists to start. It assumes no prior knowledge of or even interest in biology. Yet right from chapter 1, the author succeeds in explaining in an intellectually exciting way what the cell does and what degrees of freedom enable it to function. Ã¢â ¬Â¦ The book proceeds with detailed discussions of some of the key network motifs, circuit-element designs Ã¢â ¬Â¦ [and] focuses on concrete examples such as chemotaxis and developmental pattern formation. Ã¢â ¬Â¦ He draws the detailed strands together into an appealing and inspiring overview of biology. Ã¢â ¬Â¦ One final

aspect that must be mentioned is the wonderful set of exercises that accompany each chapter. Ã¢â ¬Â| AlonÃ¢â ¬â„¢s book should become a standard part of the training of graduate students in biological physicsÃ¢â ¬Â| ." Ã¢â ¬â ¢Nigel Goldenfeld, University of Illinois at Urbana-Champaign, Physics Today, June 2007 "Ã¢â ¬Â|a superb, beautifully written and organized work that takes an engineering approach to systems biology. Alon provides nicely written appendices to explain the basic mathematical and biological concepts clearly and succinctly without interfering with the main text. He starts with a mathematical description of transcriptional activation and then describes some basic transcription-network motifs (patterns) that can be combined to form larger networks. Ã¢â ¬Â| Alon investigates networks at a higher level, including genomic regulatory networks. He does an excellent job of explaining and motivating a useful toolbox of engineering models and methods using network-based controls. Ã¢â ¬Â| will be a valuable and non-overlapping addition to a systems-biology curriculum."Ã¢â ¬â ¢Eric Werner, Department of Physiology, Anatomy and Genetics, University of Oxford, Nature, Vol. 446, No. 29, March 2007 "I read Uri AlonÃ¢â ¬â„¢s elegant book almost without stopping for breath. He perceives and explains so many simple regularities, so clearly, that the novice reading this book can move on immediately to research literature, armed with a grasp of the many connections between diverse phenomena." Ã¢â ¬â ¢Philip Nelson, Professor of Physics, University of Pennsylvania, Philadelphia, USA "Ã¢â ¬Â| Beyond simply recounting recent results, Alon boldly articulates the basic principles underlying biological circuitry at different levels and shows how powerful they can be in understanding the complexity of living cells. For anyone who wants to understand how a living cell works, but thought they never would, this book is essential." Ã¢â ¬â ¢Michael B. Elowitz, California Institute of Technology, Pasadena, USA "Uri Alon offers a highly original perspective on systems biology, emphasizing the function of certain simple networks that appear as ubiquitous building blocks of living matter. The quest for simplicity Ã¢â ¬â ¢ without losing contact with complex reality Ã¢â ¬â ¢ is the only way to uncover the principles organizing biological systems. Alon writes with uncommon lucidityÃ¢â ¬Â|" Ã¢â ¬â ¢Boris Shraiman, University of California, Santa Barbara, USA "This is a remarkable book that introduces not only a field but a way of thinking. Uri Alon describes in an elegant, simple way how principles such as stability, robustness and optimal design can be used to analyze and understand the evolution and behavior of living organisms. AlonÃ¢â ¬â„¢s clear intuitive language and helpful examples offer Ã¢â ¬â ¢ even to a mathematically naive reader Ã¢â ¬â ¢ deep mathematical insights into biology. The community has been waiting for this book; it was worth the wait."Ã¢â ¬â ¢Galit Lahav, Harvard Medical School, Boston, Massachusetts, USA

There were several times during my first reading of this book when my jaw literally dropped at how cool biological systems are. I recommend this book to anyone wanting to understand what systems biology is and/or how the specific "topology" of interactions between system components can confer functions to the cell/organism.There is a fair amount of calculus is this book, but one can still appreciate the main points of the text without knowing the math because the writing style is so good. However, I'd recommend trying to work through the derivations while reading, in order to gain a deeper understanding of the material. Simply reviewing the basics of differentiation, integration, and separable differential equations somewhere online is enough to get through most of the math. Appendix A is especially important to understand as it provides the theoretical foundation for most of the main text.One last tip, don't get discouraged if you can't solve all or even most of the problems; some of them are very challenging and I'm convinced were not meant to be solved by someone whose only experience comes from this book.

A must read for any synthetic biologists picking up the theoretical and mathematical side of the field. The only unfortunate thing is that answers to exercises are not available unless requesting directly from Prof. Alon.

Got this as textbook to a course that discuss what we can learn from biological systems and apply the concepts into circuit and control system designs. Really interesting topic and well written book. Things are explained in really simple language and easy to comprehend.

I come from a Biological background and have a deep interest in Systems Biology. I didn't find the book particularly difficult to get through but it can be dry at times (would you expect any different?). Overall I found the book both very deep, interesting, and fulfilling. Many of the engineering concepts were explained in a very easy-to-understand method. Math equations are provided when important for those of us who are interested.I have learned a great deal more about Systems Biology from reading this book!

it is very good.fast and excellent

I'm a professor in molecular biology and wanted to learn more about networks so I could begin to apply it in my research. This textbook is an excellent introduction for getting a professional in a related area up to speed to begin to apply and use these ideas in a technical capacity. Very easy to

read and understand. The information plugs into a general knowledge of modern molecular biology. The math starts at the level we all were trained in, such as a Michaelis-Menten reaction. Excellent book and highly recommended.

Bought this book in college for class.

If you have any interest in how life actually works, you should read this book. It weighs in at less than 300 pages, which makes it very approachable, but it manages to pack a wide array of fascinating material into those pages.Life is complicated, and there is no reason to expect it to be readily comprehensible. Yet over the last few decades we have found that biological systems make extensive and repetitive use of certain patterns of functionality, and that these patterns often embody good design principles as practiced by human engineers.Concepts such as modularity, robustness, and even optimality are found to be reflected in biological systems and exploitable to make verifiable predictions about how biological systems operate experimentally.It is worth noting that while this book is deeply fascinating, it is not math free. Indeed the author began his career as a physicist and the reader will find it helpful to have some knowledge of basic ordinary differential equations, calculus, and elementary algebra. Some understanding of biochemistry is recommended, but not strictly required. You might be able to get by with Wikipedia as you go.On the other hand, if the word "design" in the title makes you think you are going to find ammunition for intelligent design, you are going to be sorely disappointed.

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