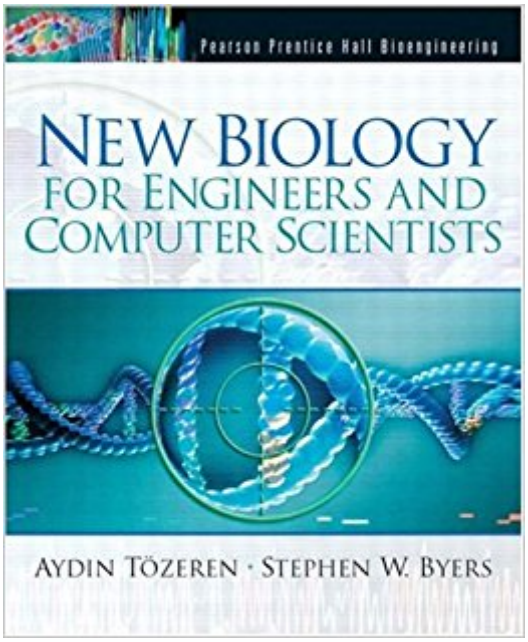
New Biology For Engineers And Computer Scientists



Synopsis

Taking a system approach to expose modern biology, this book presents the fundamental system principles and parameters common to all living species. The straightforward examination begins with a presentation of molecular cell biology and progresses to the complex interrelationship between genes and proteins as observed in metabolic process, signal transduction, cell division and embryonic development. The book's unique approach provides a depiction of the human genome project, a review of high throughput biology and bioinformatic tools and a presentation of gene circuitry and pathway analysis as applied to cell division, development of embryo and metabolic pathways and expose of emerging proteomic science. The volume presents the chemistry of life, macromolecules of life, cells and their housekeeping functions, gene circuits, genomics, cell adhesion and communication, cell division and its regulation, development of multicellular organisms and large scale biology. For computer scientists, physicists, and engineers.

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Customer Reviews

The exciting new integration between biology, physics, and computational sciences brings out the need for a new type of engineer, one with a grasp of modern biology. New Biology for Engineers and Computer Scientists is designed as a textbook for engineering and computer science undergraduates and will also be of interest to bioinformatics or biomedical engineering graduate students with little background in biology. Physicists, engineers, and computer scientists interested in learning about biology and biotechnology will also find this book useful. New Biology for

Engineers and Computer Scientists focuses on the essentials of new biology, namely, genes and proteins, cells as the basic units of life, cell division, and animal development. The book introduces cells as robust complex networks of genes and proteins and adopts a systems view to discuss communication of cells with other cells and with the external environment. In keeping with the "hands on" approach common in engineering classes, assignment sections in each chapter illustrate the link between biology and engineering. New Biology for Engineers and Computer Scientists integrates the tools of bioinformatics throughout the text and illustrates their effective use. Students will learn how to read nucleotide sequences from the gene bank, search for similarities among proteins or genes, and learn how to read molecular pathway diagrams. The reader is introduced to advances in genomics and protein sciences and to the emerging tools of biotechnology such as microarrays, microfluidic chips, and proteomics. Engineering and computational skills, from building micro-robots to pattern-recognition and large-scale data analysis, are of crucial importance to the biotechnology industry. This book provides an effective tool to teach new biology to those engineers and computer scientists wanting to join the biotechnology work force.

New Biology for Engineers and Computer Scientists is an easy-to-read modern biology book specifically targeting engineers, engineering students, and computer scientists. Biology is probably the most fascinating science of our time and is extraordinarily ambitious because it seeks to uncover the mysteries of life itself. Recent advances in biotechnology have already enabled scientists to decode the human genome. Considerable progress has also been made in understanding the complex world of proteins, and the networks they form within and across living cells. The systemwide analyses used in the New Biology era represent a paradigm shift for scientists accustomed to investigating discrete pathways or simple biological phenomena. The contribution of computer scientists and engineers to New Biology is undeniable. Genome sequencing and gene prediction are based on sophisticated pattern recognition analyses and the recent advances in nanotechnology and microrobotics have transformed proteomics from science fiction into reality. The exciting new integration of biology, physics, and computational sciences brings to light the need for a new type of engineer, one with a grasp of modern biology. Educating engineers in molecular cell biology has always been a challenge. Biology is perceived by many engineering students as a memorization, not a learning, class. However, New Biology is intellectually stimulating and can be mathematically rigorous; therefore, it has great appeal for engineers and computer scientists. New Biology is terminology rich, because researchers have identified many of the genes and proteins

more or less arbitrarily. In addition, the procedures biologists use originate from a large variety of disciplines and are difficult to capture in a one-year course. As a result, most biology books are large, complex texts covering many topics such as the structure and function of cells, heredity, evolution, biology of plants and animals, and ecology and biogeography. As such, they are extremely useful learning tools for graduate students with a background in biology. On the other hand, New Biology for Engineers and Computer Scientists focuses narrowly on what we perceive to be the essentials of New Biology, namely, genes and proteins, cells as the basic units of life, cell division, and animal development. The contents of New Biology for Engineers and Computer Scientists reflect the opinions voiced in an extensive survey among the biomedical engineering faculty in the United States. The survey also attested to the strong need for such a book. New Biology for Engineers and Computer Scientists introduces cells as robust complex networks of genes and proteins and adopts a systems view to discuss communication of cells with other cells and with the external environment. Some of the assignments listed at the end of each chapter illustrate the link between biology and engineering. In keeping with the "hands on" approach common in engineering classes, these assignment sections are a particularly important aspect of the learning experience of New Biology for Engineers and Computer Scientists. By completing the assignments, the student can both test his or her knowledge and expand it to include areas not covered directly in the text. New Biology for Engineers and Computer Scientists integrates the tools of bioinformatics throughout the text and illustrates their effective use: The assignments that follow are used to further emphasize the important themes of New Biology. These assignments typically have more specifics than the main text and refer the reader for further bioinformatics research to Web sites such as www.ncbi.nim.nih.gov/ and http://www.genome.ad.jp/dbget.html. Students will learn how to read nucleotide sequences from the Gene Bank, search for similarities among proteins or genes, and learn how to read molecular pathway diagrams. New Biology for Engineers and Computer Scientists introduces the reader to advances in functional genomics and protein sciences and to the emerging tools of biotechnology such as microarrays, microfluidic chips, and proteomics. Our experience in teaching biology to engineering students indicates that bioinformatics tools become very powerful in the hands of those engineering students who are eager to uncover the language and content of the decoded genomes. We have refrained from adding extensive sets of numerical or quantitative examples into the book, as this book is in our view a primer for engineers and computer scientists, not a computational biology textbook. New Biology for Engineers and Computer Scientists is designed as textbook for a course for engineering and computer science undergraduates. The book will also be useful in teaching systems biology to starting bioinformatics

or biomedical engineering graduate students with little background in biology. Physicists, engineers, and computer scientists interested in learning about biology and biotechnology will also find New Biology for Engineers and Computer Scientists useful. The demand for engineers in the biomedical industry is growing rapidly. Engineering skills, from building microrobots to pattern recognition and large-scale data analysis, are of crucial importance to the biotechnology industry. We believe our book provides an effective tool in teaching basic biology to those engineers and scientists wanting to join the biotechnology workforce.

We wish to express our gratitude to the many authors on whose work we have drawn. We are deeply indebted to Drs. Banu Onaral, Mike Mullins, George Zahalak, Robert Lechleider, Tracey Rowlands, Christopher Avvisato, Orest Blaschuk, and Becky Hoxter for reviewing and contributing to different sections of the book. We are grateful to Nathalie Boyd, Neil Weston, and Zihang On for pointing out many errors and inconsistencies. Zihang Ou created many of the figures in the text. The suggestions of Christopher Batich (University of Florida), Holly V Goodson (University of Notre Dame), Ali Shokoufandeh, (Drexel University), and Nikolaos V. Sahinidis (Univ of Illinois at Urbana) greatly improved the final version of this book. Finally, our thanks go to editors Eric Frank, Dorothy Marrero, Scott Disanno, and other members of the Prentice Hall community for bringing the idea behind this book to life. AYDIN TOZEREN STEPHEN W. BYERS

The book has a lot of information on molecular biology accessible to anyone with an electrical engineering or computer science background, very much what the title advertises. (I just don’t quite get the "new" qualifier for "biology" in the title). A big positive of the book are the assignments at the end of each chapter. They are built to make you go out after more and explore further resources available on the subject (mainly web based), and these are very nice indeed if you are using the book for self-study. Another big positive is that the authors make lots of referencing to using the web-based KEGG database, and that is very helpful and neatly done. Negatives are: the text sometimes is a bit confusing and difficult to understand, presenting too much information all at once and treating everything too superficially. The authors presented some topics very clearly for an engineer, but as for others you have to have some ’good’ grasp of chemistry and molecular biology to understand. Also, there are lots of typos that make you feel like the editors wanted a book with a very nice presentation (the book looks very nice) but didn’t care much about proof-reading. Figures are also confusing at times and are "recycled" here and there. Nonetheless, you can usually figure out what is wrong and what the authors wanted to say. In brief, it is a book with a nice presentation, lots of information, many references, nice assignments and one can learn from it, but it gives you

the feel that they could have worked a bit more on content.

This book gives a very good overview of cell and molecular biology. The information provided is not complete but enough to get a solid knowledge about biological processes. That means you do not have to read hundreds of papes to come to the point you are interested in. Moreover, it provides you a good knowledge about different types of proteins and their role in biological processes. This is important because somehow they are all connected with each other in a complex way.The only negative point is, that it is poorly written. I guess this is more the fault of the publisher then of the authors because they accepted it as it is. A new edition would certainly profit by a thorough review. Nevertheless, a very good book one can strongly recommend to non-biologists.

I was expecting to recieve a book with colored pictures. To my great disappointment, all pictures were black and white. As such, for a biomedical engineer, I have to refer myself to another source for more clear pictures.Also the page margins were so narrow to the extent some lines were missing.

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