



The Molecules of Life: Physical and Chemical Principles

By John Kuriyan, Boyana Konforti, David Wemmer



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The field of biochemistry is entering an exciting era in which genomic information is being integrated into molecular-level descriptions of the physical processes that make life possible.

The Molecules of Life is a new textbook that provides an integrated physical and biochemical foundation for undergraduate students majoring in biology or health sciences. This new generation of molecular biologists and biochemists will harness the tools and insights of physics and chemistry to exploit the emergence of genomics and systems-level information in biology, and will shape the future of medicine.

The book integrates fundamental concepts in thermodynamics and kinetics with an introduction to biological mechanism at the level of molecular structure. The central theme is that the ways in which proteins, DNA, and RNA work together in a cell are connected intimately to the structures of these biological macromolecules. The structures, in turn, depend on interactions between the atoms in these molecules, and on the interplay between energy and entropy, which results in the remarkable ability of biological systems to self-assemble and control their own replication.

The Molecules of Life deepens our understanding of how life functions by illuminating the physical principles underpinning many complex biological phenomena, including how nerves transmit signals, the actions of chaperones in protein folding, and how polymerases and ribosomes achieve high fidelity.



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Editorial Review

Review

"This is an excellent book that does exactly what it says on the front cover. The book is indeed written in what is now the standard format of a student textbook: very clear presentation with good graphics; special points highlighted in shaded boxes; with problems and suggestions for further reading at the end of each chapter."

- *British Society for Cell Biology Newsletter*, January 2013

"With its quantitative approach and step-by-step derivations of key equations, this book prepares students in biology and health sciences well for the increasingly quantitative approaches in biology....this is an excellent learning resource for anyone interested in the mechanism and function of biomolecules. The particular strengths of the book are the authors' clear and didactic writing style, the excellent figures, and the connection of biophysical principles to current research questions....Kuriyan et al.'s comprehensive undergraduate textbook addresses the future quantitative and physics requirements for students to go on to careers in health care or biomedical research..."

- *Quarterly Review of Biology*, August 2013

"This detailed paperback, written for undergraduates, starts with straightforward explanations that may also appeal to enthusiastic pre-university students. Biologists in other disciplines will also welcome the information on chemical structure and the molecular mechanisms in biology....It certainly provides a fine reference book for those trying to keep up with the vast amount of new information becoming available in this important area of biological science. I strongly recommend it."

- *The Biologist*, April/May 2013

"*The Molecules of Life* is an excellent introductory text from Garland Science with an emphasis on the physical and mathematical principles underpinning structure and function of biological macromolecules...This textbook fills a conspicuous void in university-level biology curricula....As would be expected from the eminent crystallographer John Kuriyan, the book is eloquently written and progresses in a clear and logical fashion."

-Crystallography Reviews, August 2014

"The text is eloquently written and scattered with high-resolution images and easily interpreted figures and diagrams....*The Molecules of Life* is ideal for beginning undergraduate or graduate students with a background in biochemistry, physics, and differential equations who wish to begin understanding the physical basis of life....For instructors and professors looking to prepare their students to ask important questions in the quantitative world that awaits the future of biomedical research, *The Molecules of Life: Physical and Chemical Properties* is an excellent selection." –*Yale Journal of Biology and Medicine*, March 2015

About the Author

John Kuriyan is Professor of Molecular and Cell Biology and of Chemistry at the University of California, Berkeley. He began his career at Rockefeller University, New York and has been an Investigator of the Howard Hughes Medical Institute since 1990. His laboratory uses x-ray crystallography to determine the three-dimensional structures of proteins involved in signaling and replication, as well as biochemical, biophysical, and computational analyses to elucidate mechanisms. Kuriyan was elected to the US National Academy of Sciences in 2001.

Boyana Konforti is the launch Editor of Cell Reports, an open-access journal focused on short papers in biology. Konforti earned her PhD at Stanford University in the Biochemistry Department with Ronald W. Davis studying the mechanism of DNA recombination. Her postdoctoral studies at Rockefeller University with Magda Konarska and Columbia University with Anna Pyle were on the mechanisms of RNA splicing. Konforti has been a professional editor for over 13 years; most recently she was Chief Editor of Nature Structural & Molecular Biology.

David Wemmer is Professor of Chemistry at the University of California, Berkeley and has served as Vice Chair, Assistant Dean, and Executive Associate Dean since joining the faculty in 1985. His research in structural biology uses magnetic resonance methods to investigate the structure of proteins and DNA toward a better understanding of how these molecules function. Systems studied include DNA-ligand complexes, covalent DNA adducts, protein-DNA complexes, and diverse proteins involved in cellular regulatory processes. Wemmer is a Fellow of the AAAS and a member of Phi Kappa Phi and Sigma Xi.

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