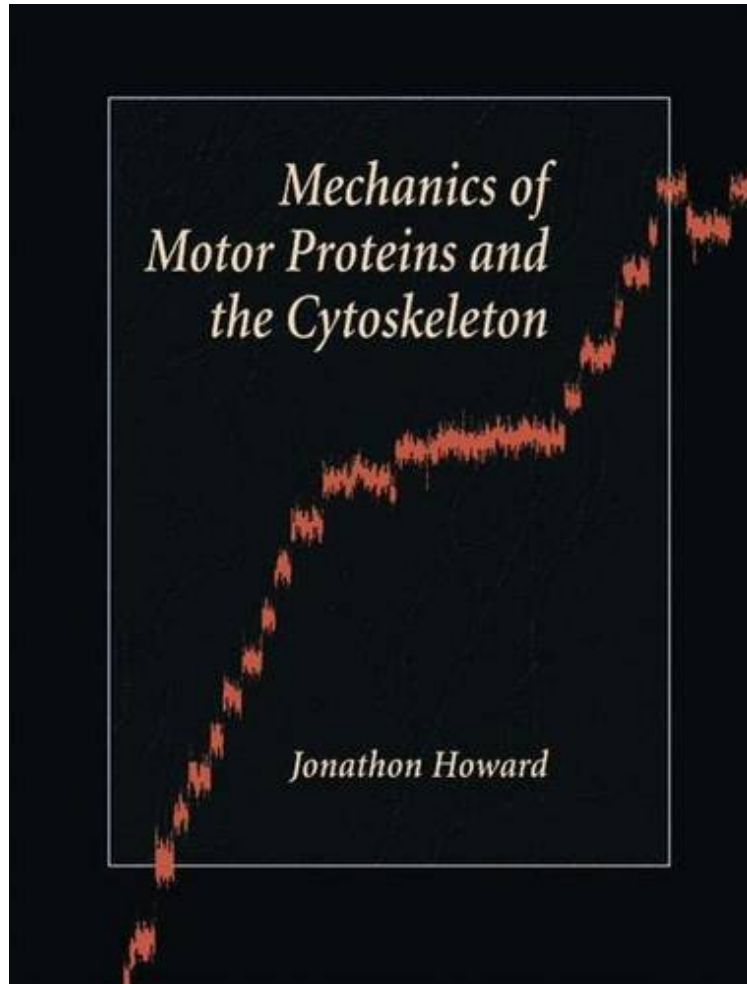


(Download) Mechanics of Motor Proteins the Cytoskeleton

# Mechanics of Motor Proteins the Cytoskeleton

*Jonathon Howard*

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**Jonathon Howard : Mechanics of Motor Proteins the Cytoskeleton** before purchasing it in order to gage whether or not it would be worth my time, and all praised Mechanics of Motor Proteins the Cytoskeleton:

1 of 1 people found the following review helpful. This book breaks all barriers across disciplines By Ajit Rajasekharan As the previous reviewer stated this book does break barriers across disciplines to help us understand how life works at the molecular level. Truly remarkable. Its lucid writing is bound to capture the interest of anyone who is curious to know how nature works at a molecular level. If you are a mechanical, electrical, chemical, software engineer, or engineer of any other discipline, this book would appeal for its very engineering flavor. It looks at the mechanics of living systems from an engineer's perspective. If you are a biologist or chemist, you will get a completely new perspective on how things work. Let me state a few concrete examples. Starting with the environment inside the cell. The first thing Dr. Howard does is to set the visual stage for us by clearly elucidating in numerical terms the forces at work inside a cell - think of a cell magnified a million times to the size of a football field (300 ft) and

the things moving inside are all range from 1cm - 3ft . The force of gravity is at least a billion times smaller than the viscous force on a molecule - gravity is irrelevant in the world inside cells. For those of us who have read Dr. Seuss's Horton Hears a Who, journey into the world of cells would be very much like visiting Whoville, except the kangaroo had its way and dipped the soft clover with its village, and all its little people living on it, into the barrel of oil - luckily it is not hot. Now the question immediately arises, how do things move inside a treacle? Add crowding to that too! To give you a sense of the crowding inside a cell, a typical mammalian cell contains a billion individual protein molecules. Can diffusion alone do the job of moving stuff around? The answer is no. Diffusion only plays a role at short ranges but for long range movement inside cells, nature has devised a means of transport of hauling stuff around on cables (see Dr. Howard's recent excellent paper in Nature June 2011 on diffusion vs active transport - Turing's next step: the mechanochemical basis of morphogenesis). Cables that double as scaffolds too - nature assembles these cables inside cells and uses them to haul cargo around using energy from food we eat. Dr. Howard explains in great detail how nature dynamically assembles cables and how little nanomachines walk (rather strut) on them hauling cargo. This form of active transport is faster than diffusion - nature's solution that is ubiquitous in all forms of life - from single cells to multicellular life forms. This is a must read for any person who is curious to know what is happening inside each cell in our bodies. Nature's engineering is bound to humble and awe even the best engineer among us and this book is a great start in that incredibly exciting journey. Thank you Dr. Howard for writing such a great book.

26 of 26 people found the following review helpful. Bridging the gap from physics to cell biology  
By Edmund Paley  
I wish there was a way to give a book more than five stars, because if there was, this book would get them! One of the most important trends in cell biology in recent years is the study of mechanics at a single molecule level. Since most of the really interesting processes in cell biology, such as division and motility, ultimately are carried out by molecules that convert energy into motion, the question of how these molecules actually move has very broad implications and impinged on everyone. However, in order to understand this, one has to understand some basic physics which of course involves some math. The biologist who is interested in this subject thus has two, and only two options. One is to bury one's head in the sand and say it's just too hard to understand, and the other is to read Joe Howard's book. Although the mathematical content is readily apparent, only the basics are needed to get started. The author has thoughtfully compiled detailed derivations at the end in an appendix, so that one can see the details without becoming enmired in them on first reading. Considering the potential difficulties of taking a "hard science" approach to cell biology, the book is remarkably easy to read, which is a tribute to the thought the author has put into presenting the subject in the most logical possible way. In addition to being an excellent entry point for biologists into this subject, this book would also be an excellent resource for engineers who become interested in cell biology (like myself) because it presents many of the current research frontiers in cell biology from an essentially engineering perspective and using quantitative reasoning. Again, the author has taken great pains to present the subject in a logical way that does not require much prior knowledge about biology on the part of the reader. Thus, either for biologists who want to learn about the quantitative/physical approach to cell biology, and for engineers or physicists who want to learn how they can apply their type of thinking to problems of cell biology, this book is highly recommended.

This text is for biology, biochemistry and chemistry students who want to learn about the principles of protein mechanics and how it applies to the morphology and motility of cells. Understanding how motors and the cytoskeleton operate requires mechanical concepts such as force, elasticity and damping. Introductory physics textbooks address these concepts, yet they are concerned primarily with macroscopic systems, whose motions are qualitatively different from the highly damped, diffusive motion of individual molecules; this book provides a physical foundation for molecular mechanics. Part I explains how small particles like proteins respond to mechanical, thermal, and chemical forces, Part II focuses on cytoskeletal filaments, and Part III focuses on motor proteins. The treatments are unified in the respect that they are organized around principles rather than proteins: chapters are centered on topics such as structure, chemistry, and mechanics, and different filaments or motors are discussed together.

"The cytoskeleton is an area of intense research and we are in danger of drowning in a sea of facts. A textbook is needed which starts from first principles and leads to an understanding of the dynamics of the system. And here is that book." --Edwin Taylor, Nature  
"The book is a great launching point for gaining a biophysical understanding of the current detailed literature of motility which is increasingly filled with mathematical models describing motility data. As such, it will benefit students of a wide range of biological and physical backgrounds who are interested in understanding the nuts-and-bolts of cellular motility." --Stephen J. King, Cell  
About the Author  
JONATHON HOWARD is Professor of Physiology and Biophysics at the University of Washington in Seattle.