



# Mechanics of Motor Proteins and the Cytoskeleton

By Jonathon Howard

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## Mechanics of Motor Proteins and the Cytoskeleton By Jonathon Howard

Motor proteins are molecular machines that convert chemical energy from ATP hydrolysis into mechanical work, which powers cell motility. Over the last ten years, single-molecule techniques and structural studies have led to rapid progress in understanding how these biological motors operate. How do they move? How do they generate force? How much fuel do they consume, and with what efficiency? *Mechanics of Motor Proteins and the Cytoskeleton* brings these new findings together. This book is for biology, physics, and engineering 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, damping, and work. 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. *Mechanics of Motor Proteins and the Cytoskeleton* 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.

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# Mechanics of Motor Proteins and the Cytoskeleton

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#### Review

"The cytoskeleton is an area of intense research and we are in danger of drowning in a sea of facts. What should we try to teach our students about it? . . . 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

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#### About the Author

JONATHON HOWARD is Professor of Physiology and Biophysics at the University of Washington in Seattle, USA.

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