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Book Review

Muscle Contraction, by C. R. Bagshaw, Methuen, Inc., New York, New York, 1982.

This book is a recent addition to a series of inexpensive paperbacks called *Outline Studies in Biology.* This series is aimed at the advanced undergraduate or beginning graduate student and is designed, according to the editors, to fill a need for "short but authoritative introductions" to areas of modern biological research not dealt with in sufficient detail by standard texts. To a great degree, this book has accomplished this aim. Its eight short chapters are clearly written and each addresses a key aspect of muscle physiology or biochemistry. Particularly useful are the author's efforts to correlate information derived from different experimental approaches—mechanical, biochemical, and ultrastructural—wherever possible and to describe experimental techniques that have played key roles in our current knowledge.

The first four chapters of the book are largely introductory. After a brief outline in Chapter 1, the second chapter introduces the student to the diversity of muscle fiber types, defines the various physiological states of muscle (i.e., isometric and isotonic contraction, rigor, fusion of twitches, tetanus, etc.), outlines the process of muscle activation, and discusses muscle energetics and fuel sources. Chapters 3 and 4 introduce the subcellular structure of muscle, the former describing both membranous and filamentous components of the sarcomere and introducing the sliding filament model of contraction, and the latter examining the structure of the protein components of thick and thin filaments and their interactions. Most of this material can be found in currently available physiology or medical physiology textbooks although without the detail and, in some cases, historical perspective in this treatment.

The next two chapters deal with the mechanism of ATP hydrolysis and the molecular basis of muscle contraction and bridge a wide gap between the information available in the standard textbook and that in the research literature. Chapter 5 addresses concisely but comprehensively the kinetics of myosin and actomyosin ATPase activity and shows how rapid kinetic measurements employing quenched flow and stopped-flow instrumentation have contributed to the elucidation of the reaction steps. The Lymn–Taylor kinetic scheme and its possible correlation with the crossbridge states in an

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attachment–detachment cycle are clearly presented. Chapter 6 opens with evidence for the view that myosin crossbridges act as independent force generators in contraction and the rest of the chapter catalogs the structural (electron micrographic and X-ray) and mechanical investigations that have sought to describe their structure and movements. The final chapters in the book present current ideas on actin- and actomyosin-linked regulation (Chapter 7) and outline some of the key problems in muscle that await solution (Chapter 8).

The preface suggests that a glance at the contents of the book will indicate to the reader the author's prejudices. Indeed, those sections on ATP hydrolysis and the nature of the crossbridge structure and movement, the author's own areas of interest, are the most extensive. However, insofar as these topics are often the most inadequately covered in the standard textbooks, the student will be the richer for their emphasis here. On the other hand, the structure and function of the thin filament seems to receive rather short shrift. While myosin structure and assembly is covered in some detail in Chapter 4, even to the inclusion of fluorescence anisotropy decay and saturation transfer EPR data to address the problem of its flexibility, actin polymerization is only briefly mentioned without any allusion to the considerable body of work on nucleation and polymerization kinetics that has appeared in the last decade. The author quotes the recent work of Suck *et al.* indicating the bilobed shape of the actin monomer but fails to discuss the emerging model of F-actin as a single rather than a double chain. Again in Chapter 7, thin filament structure and regulation is only afforded brief mention although considerable structural and biochemical evidence has called into question our understanding of regulation as embodied in the steric blocking model. Some discussion of the possible azimuthal binding positions of troponin–tropomyosin and myosin on the F-actin surface and of the important studies of Eisenberg and his colleagues on the biochemical aspects of regulation would have been helpful. Some of these omissions are at least partially compensated for by the inclusion of suggested readings at the end of each chapter and by a carefully selected reference list at the end of the book. I would recommend the book to the student interested in gaining insight into the current status of muscle structure and the contractile mechanism.

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