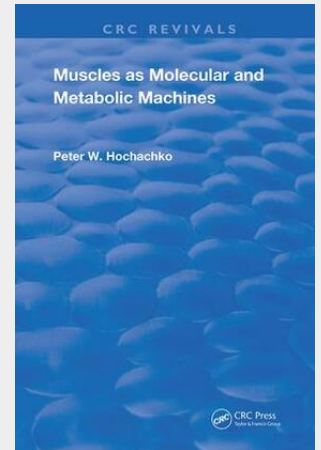


Hochachka

MUSCLES AS MOLECULAR METABOLIC MA

First published in 1994, this book explores the paradigm of muscles as molecular and metabolic machines in which all structures and functions are exquisitely integrated and matched to each other. The analysis begins with a standard reductionist approach—reviewing the integrated machine parts. The key working components of the complete muscle machine are proteins (soluble, organelle, or membrane localized), and a conservative count indicates that today more than 100 such machine parts are known, essentially all occurring as cell specific isoforms. Random assortment of these machine parts or protein isoforms could generate an astronomical number of "muscle machines" and an equally enormous number of muscle fiber types. The question is, why aren't such large numbers ever seen? To attack this problem, the reductionist approach is complemented with an integrationist/adaptational one. Evidence is presented that the more highly specialized the muscle type, the further one moves from the above extreme; in the most highly specialized muscles, typically only one fiber type is found. It is argued that instead of random assortment of isoforms or machine parts, only specific and often unique combinations can work in appropriate fashion. A few established examples of this fundamental principle are reviewed, but emphasis is placed on the fact that we know dreadfully little about why this is so and what kinds of further studies are needed. The issue of why the very large numbers of fiber types theoretically possible are never even approximately realized has never before been addressed. Indeed, it is rarely recognized. Muscles as Molecular and Metabolic Machines is the first work of its kind on the subject.



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