with population structure and species diversity on scales greater than generation times, suffer most from these problems.

Overall, Harris has succeeded in demonstrating the importance of scale in studying the dynamics of phytoplankton populations. This book should serve as a somber reminder that the major limitation to a better understanding of phytoplankton in nature is not what we can perceive but what we can measure.

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Bioenergetics Extended

The Vital Force. A Study of Bioenergetics. FRANKLIN M. HAROLD. Freeman, New York, 1986. xx, 577 pp., illus. $37.95.

One aim of this provocative book is to provide an up-to-date account for a wide audience of traditional topics in bioenergetics, such as oxidative and photosynthetic phosphorylations and other processes encompassed by usual treatments of chemiosmotic theory. The first two-thirds of the book are devoted to this purpose, in an authoritative, first-rate summary that draws on the microbial world to illustrate the diversity of successful applications of chemiosmotic principles. Harold is unmatched as an expositor in this arena and is just as good at outlining the underlying details of biochemistry and biophysics. I liked best the discussions of electron transport reactions (including Mitchell's Q cycle) and how they might be coupled to proton movements. To be sure, those who work in these areas do not always agree on the details, but Harold knows the field well enough to distinguish for us the debatable material from the rest. It is especially useful to have his broad perspective on these matters, since specialized reviews typically have too narrow a focus and general texts of biochemistry or physiology usually fail to look beyond their own disciplines. Even on its own, this is a valuable contribution.

The book has, however, a more substantial agenda. We are alerted to this early on by the comment that "bioenergetics has become too important, and too interesting, to be relegated to bioenergeticists," and the implied promise is fulfilled by the concluding 180 pages. At that point the boundaries of bioenergetics are suddenly extended, and to balance the earlier "bacterial paradigm" Harold now emphasizes molecules peculiarly eukaryotic (actin, myosin, tubulin, and so on) and activities normally associated with cell and developmental biology (cell motility, signal transduction, morphogenesis). I suspect his attempt to link bioenergetics and motility will be no more fruitful than past efforts to draw parallels between the performance of chemical and mechanical work. But the appropriation of signal transduction mechanisms (emphasizing Ca^{2+} transport) and morphogenesis (with an eye to Jaffe's circulating currents) now makes perfect sense—and exciting reading. Indeed, Harold gives us a new appreciation of the value of bioenergetics in interpreting more general aspects of membrane function. The book is exceptionally well written, and Harold's delightful array of biological examples adds unexpected charm to the entire work.

Harold has succeeded in writing a book suited to many readers, beginning with the interested undergraduate and extending to the professional. The book has serious lessons for any committed cell biologist.

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