book is equally suited for people working in basic or translational science and likely provides even experts in this field with new or updated information—this book goes way beyond what can be found in other textbooks on rhabdoviruses. The only improvement I would like to suggest is to add an electronic version of the figures for teaching purposes or other presentations.

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The Physiology and Biochemistry of the Prokaryotes, 4th ed.

David White, James Drummond and Clay Fuqua (ed.). Oxford University Press USA, New York, 2011, 656 p., $122 (hardcover).

While many textbooks are available for introducing microbiology at the college level, and collections reviewing the latest research in specific organisms or environments are continually published for researchers, few options exist between these two ends of the spectrum. How do we get students from basic growth curves, key energetic strategies, and common cell structures to an understanding of the energetics and biochemistry driving these processes? The upper-level microbial physiology course has few resources to address this transition.

The Physiology and Biochemistry of the Prokaryotes, first published in 1995 by David White, and recently updated to a 4th edition with the aid of James Drummond and Clay Fuqua, represents one of the few texts that embrace this challenge. While microbiology has generated a massive amount of new data since this book was first published, it remains focused on the core tenets of microbial energetics and growth such as conservation of central metabolic pathways and storage of energy in membrane-based gradients. Layered onto these universal strategies are carefully chosen examples of genetic modules that allow microorganisms to sense and adapt to the environment.

The organization of this book illustrates this choice to revolve around energetic principles; after a short review of cell structures and growth kinetics, *Physiology* launches into chapters containing one of the few lessons in bioenergetics and proton potentials available today. Many students are only exposed to ion motive forces in the limited context of mitochondria, but the diversity of pH gradients, sodium gradients, and ion pumps is introduced as a foundation for understanding the diversity of respiratory and phototrophic life in subsequent sections.

The middle portion of the book summarizes metabolic pathways, moving out from core glycolytic/citric acid cycle pathways to biosynthetic reactions. Further evidence that the target audience is the upper-level student are the details describing the biochemistry underlying key reactions, or variants found in Archaea.

Significantly expanded in this new edition are a series of final chapters in which topics such as sensing, taxis, cell-cell communication, biofilms, and development receive additional attention. The theme is on paradigms one would encounter throughout the Bacterial domain; two-component regulatory systems, sigma factor cascades, signal transduction in chemotaxis, and classes of quoroum sensing compounds. Along with new material related to nucleic acid and protein synthesis, this updated information is a welcome addition that broadens the audience.

While it serves as constant reference on my desk to this day, this book is clearly written to be used as a teaching tool. At the end of every chapter, the text includes a series of study questions, detailed references, and notes. Topics are often introduced in chapters with a summary that introduces a "model," followed by "evidence for the model," or, in the case of metabolic pathways, "variations on the model." Figures remain simple, black-and-white diagrams that keep the focus on the big picture and are easily redrawn in class.

Any book that aims to summarize Earth's most diverse and abundant form of life must omit some material. Microbial evolution and phylogeny, specifically many molecular differences between Bacteria and Archaea, is largely left for another forum. Some metabolic strategies, such as new CO_2-fixation pathways, or lithotrophic inventions such as Annamox, also may not be discussed.

Physiology represents an important teaching and reference resource that presents the quantitative side of microbial energetics in an introductory manner, yet contains enough detail to remain on one's desk years afterwards. Even as it has been updated, the book remains just over 600 pages in length. This relatively compact tome should offer a foothold to students caught in the firehose of big data, a modern reminder that the core principles of Kluyver and Van Niel's metabolic unity hypothesis remain intact.

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