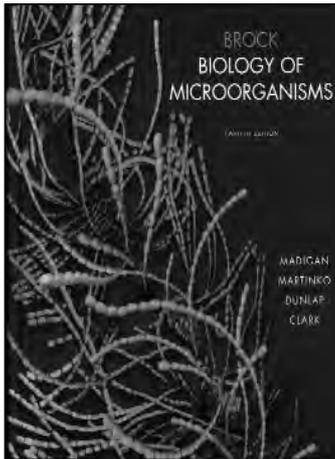


# BOOK REVIEWS

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## Brock Biology of microorganisms 12th edn.

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Microorganisms are present in every habitat on Earth and are crucial to the sustainability of life. Anton van Leeuwenhoek's observations, 325 years ago, were among the first of many startling insights that have elucidated the biology of microorganisms. In the 1960s, progress made in the fields of basic and applied microbiology resulted in the insights that ushered in the current era of molecular microbiology. Today, microbial research is close to defining the minimal genome (the minimum complement of genes necessary for a living cell) and thus, at least in biochemical terms, all of the prerequisites for life. Clearly, the study of microorganisms is essential for an understanding of all life on our planet. The careful reader of *Brock Biology of microorganisms* (BBOM) will be prepared to understand the microbial world, what microorganisms are, what they do. For professionals as well as students, the BBOM is an essential source of information about the latest discoveries in microbiology. The continuing success of this textbook, and evidence of the rapid advances in our understanding of microorganisms, is reflected in the new editions published every three years. Indeed, the history of this book goes back nearly 40 years! Thomas D. Brock authored the first edition in 1970; shortly thereafter, the book was translated into several languages, including the Spanish translation by Ricardo Guerrero, prepared as soon as in 1971. As a tribute to Brock, the book has incorporated his name into the title since the 8th edition.

The teaching function of this book begins with the cover photo, which shows the filamentous bacterium *Crenothrix*, and the information about this microorganism provided on the back cover. The text includes important pedagogical tools, such as sidebars, reviews of key terms, mini-reviews, review questions, and application questions, all of which are

aimed at reinforcing the topics discussed in each chapter. Additional information can be obtained from the book's website [[www.microbiologyplace.com](http://www.microbiologyplace.com)].

The textbook is organized into 37 chapters comprising nine units, with the four first constituting the body of the book. In this 12th edition, two co-authors (PV Dunlap and DP Clark) make their debut, and their contributions have greatly strengthened the chapters on molecular biology/genetics and evolution/systematics. The book's visual presentation is excellent: A fabulous photograph introduces each chapter. Illustrations and photomicrographs give readers a clear and fascinating view of the microbial world. Tables and figures have been completely redesigned to make the information easier to understand. Chapters included in a Unit are color-coded at the upper right-hand corner. Considerable improvements in the text have been made as well. Of note is the fact that this is the only general microbiology book that describes extensively the unique biology of *Archaea* (anatomy, flagella, molecular biology, replication, transcription and protein synthesis, regulation of gene expression, genetic exchange, and diversity).

Unit 1, "Principles of microbiology" (Chaps. 1–6), provides the student with a basic background in microbiology, including historical perspectives, microbial structure, structure and function of prokaryotic and eukaryotic cells, and the growth and nutritional requirements of microorganisms. One of the most significant advances in microbial biology in recent years has been the discovery of broadly conserved cytoskeletal elements in bacteria. Although the absence of a cytoskeleton was one of the features originally used to distinguish prokaryotes from eukaryotes, bacteria in fact contain many of the cytoskeletal elements that are found in eukaryotic cells, such as microtubules, actin, and intermediate-filament homologs (i.e., MreB, FtsZ, and crescentin), which have significant functions in diverse cellular processes. The book's discussion of cell division is supported by spectacular color photos.

Unit 2, "Molecular biology of microorganisms" (Chaps. 7–13), describes essential and current topics of microbial genetics and molecular biology in *Bacteria*, *Archaea*, and *Eukarya* and provides an overview of viruses and prions. It also underlines the revolution in molecular biology that has resulted from the development of modern in vitro molecular methods, such as cloning and genetic engineering. BBOM has also expanded its coverage of the regulation of gene expression, with special emphasis on *Bacillus* sporulation and the life cycle of *Caulobacter*.

Unit 3, "Microbial diversity" (Chaps. 13–19), provides an evolutionary and systematic foundation for the diversity of

microbial life, from the earliest cells to eukaryotes. The discussion encompasses the major bacterial groups (phyla), such as proteobacteria, gram-positive bacteria, and cyanobacteria, as well as *Archaea*, *Eukarya* (protists, fungi and unicellular algae), and viral diversity, from bacteriophages to animal and plant viruses.

Unit 4, "Metabolic diversity and microbial ecology" (Chaps. 20–24), strongly emphasizes the idea that, in prokaryotes, diversity is expressed in terms of metabolism rather than structure, as evidenced by the ability of microorganisms to make use of a wide range of energy sources and electron acceptors. The long-standing inability to enrich or detect organisms capable of anaerobic growth on methane and ammonium compounds led to the idea that ammonium and methane were inert under anoxic conditions; however, it is now apparent that this is not true. Recent studies using molecular techniques have shown that the syntrophic consortium of an archaeon and a sulfate-reducing bacterium is involved in anaerobic methane oxidation, and that anaerobic ammonium oxidation ("anammox") contributes significantly to biological nitrogen cycling in the world's oceans—up to 50% of marine  $N_2$  production. BBOM outlines the basic principles of microbial ecology and examines the types of habitats where microorganisms are found, along with nutrient cycles, bioremediation, and symbioses. Also included are reviews of current methods to study the diversity and activities of microorganisms.

Unit 5, "Putting microorganisms to work" (Chaps. 25 and 26), describes applications of microbial activities (fermentations) to food and industrial production, and the use of biotechnology for industrial or commercial processes, such as the production of hormones, proteins (enzymes), genetically engineered vaccines, and transgenic organisms. Genetic engineering can make plants resistant to certain insects, e.g., through the introduction of genes encoding the protein toxin of *Bacillus thuringiensis*, Bt-toxin. This same technique can yield improvements in product quality (i.e., enrichment of vitamins or some amino acids).

Unit 6, "Antimicrobial agents and pathogenicity" (Chaps. 27 and 28), shifts the focus to the relationships between humans and microorganisms. First, the major methods of microbial control, i.e., the use of physical treatments (heat, radiation and filtration) and chemical biocides (alcohols, aldehydes, antimicrobial metals, and halogens), to achieve microbial disinfection and sterilization of surfaces or materials are discussed. Antimicrobial agents (antibiotics) used for treating infectious diseases and the challenges posed by antibiotic resistance are described. In addition, the unit offers overviews of the microorganisms that inhabit the healthy human body, the harmful interactions that cause disease, and the mechanisms of pathogenesis.

Units 7–9 (Chaps. 29–37) start off with the subject of immunology—specifically, with the immune response that has evolved in humans to recognize and destroy dangerous pathogens. Both innate and adaptive (acquired) immunity are described. Unit 8, "Diagnosing and tracking infectious diseases", discusses a major objective of the clinical microbiologist, to identify the microorganisms that cause illness, and the culture, immunologic, and molecular methods used to achieve this goal. In Unit 9, "Microbial diseases," microbial infectious diseases are grouped within each chapter according to their mode of transmission.

The BBOM not only contains fundamental knowledge essential to an introductory course on general microbiology, but also information for students seeking to expand or update their knowledge of the current state of microbiology. As the evolutionary biologist Stephen J. Gould put it, we are living on "Planet Bacteria". It is an exciting time to be a part of the science of microbiology—as BBOM once again well reminds us.

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