

Microbiology is a biological science that has effectively wedded the old and the new. Some of the basic techniques of microbiology discovered over 100 years ago—the isolation of pure cultures, for example—are still practiced with regularity in the laboratory today. But today's microbiologists are also armed with sophisticated tools that facilitate detailed molecular analyses of microbial cells. These tools have fueled new discoveries that are thrusting microbiology into the limelight of disciplines as diverse as medicine, agriculture, and ecology. It is within this exciting period in microbiology that we present the tenth edition of *Brock Biology of Microorganisms (BBOM)*, a textbook of microbiology that blends fundamental principles (the old) with state-of-the-art science (the new) in a format that will appeal to both students and instructors.

What's New? Organization

This edition of *BBOM* contains many new organizational features that will help students better master the material and help instructors prepare stimulating presentations for the classroom. First, the book has been extensively reorganized into six major units: (1) Principles of Microbiology; (2) Evolutionary Microbiology and Microbial Diversity; (3) Metabolic Diversity and Microbial Ecology; (4) Immunology, Pathogenicity, and Host Responses; (5) Microbial Diseases; and (6) Microorganisms as Tools for Industry and Research. Each unit consists of several chapters whose content define the themes. Unit 1, The Principles, forms the heart of the general microbiology course as currently envisioned by the Education Division of the American Society for Microbiology (ASM); in other words, Unit 1 is the "core" material that every student should know. Included for the first time in this unit is an overview chapter (Chapter 2) on microbial diversity that introduces the major groups of microorganisms and their evolutionary relationships. This chapter will allow instructors who emphasize the medical or molecular aspects of microbiology the opportunity to give their students a taste of microbial diversity without the details. This chapter also covers some of the basic aspects of cell structure/function and is written in such a way that only a minimal background in chemistry and biology is necessary to follow the story.

Other chapters that have been revamped in Unit 1 include Chapters 9 and 10. Compared with previous editions of *BBOM*, Chapter 9 (Essentials of Virology) has been restructured and downsized to place emphasis on the *essential concepts* of virology, instead of viral diversity. The latter material still exists, however, in the

new Chapter 16 (Bacterial, Plant and Animal Viruses), for those instructors who wish to explore viral diversity in more detail. Another substantially reorganized chapter is Chapter 10, Bacterial Genetics. This chapter has been rewritten from two major standpoints, microbial genetics as it occurs in the intact organism (*in vivo*) and microbial genetics as it is practiced *in vitro*. To accomplish the latter, some material from the biotechnology chapter has been reworked and moved to this new chapter on genetics. Thus, Chapter 10 better reflects bacterial genetics as it is actually practiced today—a blend of *in vivo* and *in vitro* science.

As has been a tradition with *BBOM*, the material in each chapter is broken into several *numbered heads* to assist instructors in assigning reading material. But in addition, in parallel to the unit concept that pervades organization at the level of the entire book, the numbered heads within a chapter are themselves grouped into major themes. The latter are signaled by red headings set in all caps, and were introduced in this edition to better group related material within a chapter into logical pieces.

In summary then, the tenth edition of *BBOM* is organized to capture and distill the basics while deploying the full story of the science at those points where it will have maximum impact. The authors and publishers are confident that this new format will make *BBOM 10/e* an even stronger resource for students and instructors alike.

Content

Every three years the authors of this book face one major question: how do we add new material and still keep the book within bounds? Longtime users of *BBOM* will immediately recognize that the tenth edition is essentially no longer than the ninth. This feat was accomplished by balancing the needs of the new material with a careful reevaluation of the old. Nothing essential to a fundamental understanding of microbiology has been deleted from *BBOM*; the tenth edition is still a book built on basic principles and strong science. But streamlining of some chapters along with a first-class art program has given the authors the space necessary to paint an up-to-the-minute picture of the science of microbiology in a volume that does not require weight training to lift off the table.

Several *totally new* chapters will be found in *BBOM 10/e*. The new overview of microbial diversity chapter (Chapter 2) and the viral diversity chapter (Chapter 16) have already been mentioned in this regard. Also new to this edition are Chapter 15

(Microbial Genomics); Chapter 18 (Methods in Microbial Ecology); Chapter 22 (Essentials of Immunology); Chapter 23 (Molecular Immunology); Chapter 27 (Animal-Transmitted, Arthropod-Transmitted, and Soilborne Microbial Diseases); Chapter 28 (Wastewater Treatment, Water Purification, and Waterborne Microbial Diseases); and Chapter 29 (Food Preservation and Foodborne Microbial Diseases). All of these areas are "hot topics" in microbiology today and needed increased visibility and expanded coverage. These new chapters should accomplish just that.

The genomic revolution has transformed microbiology into a new science almost overnight. For the first time, scientists can inspect, almost in a routine fashion now, the entire genetic blueprint of a microorganism, and then compare the blueprint with those of other organisms, from viruses to humans. Genomics has revealed the great genetic unity and diversity of living organisms and has opened the door to new advancements in every discipline of biology. And combined with proteomic analyses, scientists can now ask sophisticated questions about *gene expression* in ways never before possible. Chapter 15 in *BBOM 10/e* tells the genomic story, but goes well beyond just listing organisms whose genomes have been sequenced. The chapter explains what genomics is, how the reams of DNA sequence data that are being generated can be used, and what the genomic revolution has revealed thus far in terms of both the genomic and proteomic capacities of key microorganisms.

The new chapters in immunology were written to provide both the basics and the details of this important science. Chapter 22 (Essentials of Immunology) presents the basic principles of immunology without delving into too much detail. This chapter should therefore be a very student-friendly and readily teachable overview of immunology. We reserve the molecular details of immunology for the rather short Chapter 23. This chapter places the essentials material (Chapter 22) within a molecular context for those students and instructors whose background and interests support the study of immunology at this level. In Chapter 24 (Clinical Microbiology and Immunology) we have expanded our coverage of immunoassays to include more information about the basic mechanisms behind precipitation, agglutination, and antibody production. For those instructors who teach immunology only as a diagnostic or investigative tool, we have also included a very short summary of immune principles here. Thus, with the material on immunology organized as it is, the science of immunology can be integrated into introductory microbiology classes at all levels.

The new chapters in medical microbiology are expansions of this material originally covered in only two

chapters in previous editions. This has given the authors the opportunity to develop this important material in a more thorough way. And in this day and age where foodborne and waterborne illnesses are major public health problems (even in developed countries), and new threats to health and security, such as bioterrorism, are a fact of life, the unit on medical microbiology and immunology will be both a source of basic principles and a reference for keeping up with events in the news.

In summary, long-time users of *BBOM* will find the tenth edition to be the reliable friend they've always known. New users will find it to be the most current, accurate, and complete coverage of microbiology available in a textbook today. Coupled with an excellent set of teaching aids (see below) *BBOM 10/e* should set the standard in the field for years to come.

Pedagogical Aids

Art and photos are the mainstay of any textbook in the biological sciences. And frankly speaking, we think *BBOM 10/e* has the best in the business in both regards. The art program has once again been delivered by Imagineering of Toronto, Canada. Virtually every piece of art has seen some modification in order to maximize its impact and clarity. Some stylistic improvements have also been introduced into the art program, including a beautiful new rendering of all graphs in the book. High quality photos and photomicrographs have been a mainstay in *Biology of Microorganisms* since the first edition appeared in 1970, and *BBOM 10/e* proudly carries on this tradition with the inclusion of nearly 50 new B&W and color photos. And, as usual, these photos have been supplied by top researchers in the field.

BBOM 10/e once again employs a variety of student study aids to weave together the concepts and strengthen the learning experience. Instead of placing summary and quiz material only at the end of a chapter (as many textbooks like to do), *BBOM 10/e* contains two review tools—concept checks and concept links—*built right into* each chapter. Each **Concept Check** consists of a short summary of the material in the previous numbered head along with a short series of questions that together, reviews the major points in that section. **Concept Links** (signaled by the blue link icon, ) are the ties between the current text and related material found elsewhere in the book. In addition, readers will find the popular **Working Glossary**—a dictionary of essential terms—at the opening of each chapter. The Working Glossary is the student's lifeline to the *language* of microbiology, an understanding of which is a key to mastering the concepts. Finally, and as in previous editions, the end of each chapter contains a number of review and application questions, many new to

this edition; the questions are designed to probe a student's retention of important concepts and ability to solve problems.

Supplements

A number of supplements accompany this book. Totally new to the tenth edition of *BBOM* are a series of online media tutorials that are found in the *Companion Website* (www.prenhall.com/brock). These cover a number of conceptually challenging topics in microbiology, including basic processes in molecular biology, genetics, medical microbiology and immunology, and microbial metabolism. These unique instructional resources include animations, interactive exercises, and self-quizzes, and will be a major supporting feature for the material in Unit I of *BBOM 10/e*, the heart of the introductory course in microbiology.

These tutorials are designed to guide students' understanding of various fundamental concepts through animations, interactive exercises, and self-assessment. Each concept that is the subject of an Online Media Tutorial is identified by an icon similar to the one in the margin next to this paragraph, placed alongside the relevant figure in the text. Also on the website are additional materials for each chapter along with the popular *Virtual Exam*, first introduced with *BBOM 9/e*. The Virtual Exam is a large pool of questions (written in an objective format, multiple choice, true-false, matching, and the like) keyed to individual chapters that students can use as a resource to help prepare for their real exams in the classroom. Virtual Exam questions have been assembled from actual examinations given in introductory microbiology courses in the United States that assign *BBOM* as a textbook. With the Virtual Exam, students can take an exam online and receive instant feedback on their readiness for exam day.

A variety of supplements are available for instructors. First, a set of over **350 Full Color Transparencies**, far more than is available with any other textbook of microbiology, accompany every adoption of *BBOM 10/e*. Although computer lectures are becoming the norm in many classrooms, the transparency is still the visual aid workhorse for many instructors. To help instructors in this regard, all of the most teachable figures in the book are covered in the transparency set. Second, a first-rate *Instructor's Resource* CD-ROM is available that contains virtually all of the art and photos from *BBOM 10/e* in Microsoft PowerPoint® to assist instructors in tailoring computer presentations to the goals and objectives of their particular course. In addition, all of the animations and exercises that appear on the student website will be on the Instructor's Resource CD-ROM. Whether one uses transparencies or CD-ROMs, the *BBOM 10/e* instructor package offers all of the necessary tools for de-

veloping clear, compelling, and stimulating presentations for the classroom.

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Any errors in this book, either those of commission or omission, are, of course, solely the responsibility of the authors. In this regard, we list author contact information and would greatly appreciate receiving comments, suggestions, and corrections from users. The entire author team has been with the book through a number of editions now and have through the years developed rather "thick skins" to criticism. Thus, we would sincerely enjoy receiving the frank input of users concerning how the book could be made even better in the future.

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