

Preface

Since the publication of the first edition nearly 30 years ago, well over 1 million students have used *Microbiology: An Introduction* at colleges and universities around the world, making it the leading textbook for non-majors microbiology. The twelfth edition continues to be a comprehensive beginning text, assuming no previous study of biology or chemistry. The text is appropriate for students in a wide variety of programs, including the allied health sciences, biological sciences environmental science, animal science, forestry, agriculture, home economics, and the liberal arts.

The twelfth edition has retained the features that have made this book so popular:

- **An appropriate balance between microbiological fundamentals and applications, and between medical applications and other applied areas of microbiology.** Basic microbiological principles are given greater emphasis, and health-related applications are featured.
- **Straightforward presentation of complex topics.** Each section of the text is written with the student in mind.
- **Clear, accurate, and pedagogically effective illustrations and photos.** Step-by-step diagrams that closely coordinate with narrative descriptions aid student comprehension of concepts.
- **Flexible organization.** We have organized the book in what we think is a useful fashion while recognizing that the material might be effectively presented in other sequences. For instructors who wish to use a different order, we have made each chapter as independent as possible and have included numerous cross-references. The Instructor's Guide provides detailed guidelines for organizing the material in several other ways.

NEW TO THE TWELFTH EDITION

The twelfth edition focuses on big-picture concepts and themes in microbiology, encouraging students to visualize and synthesize more difficult topics such as microbial metabolism, immunology, and microbial genetics.

The twelfth edition meets all students at their respective levels of skill and understanding while addressing the biggest challenges that instructors face. Updates to the twelfth edition enhance the book's consistent pedagogy and clear explanations. Some of the highlights follow.

- **Cutting-edge media integration.** MasteringMicrobiology (www.masteringmicrobiology.com) provides unprecedented,

cutting-edge assessment resources for instructors as well as self-study tools for students. Big Picture Coaching Activities are paired with the book's new Big Picture: Tough Topics and Big Picture: Disease features; Interactive Microbiology is a dynamic suite of interactive tutorials and animations that teach key concepts in microbiology; and MicroBoosters are brief video tutorials that cover key concepts that some students need to review or re-learn.

- **Big Picture "tough topic" features.** These two-page spreads focus on the most challenging topics for students to master: metabolism (Chapter 5), genetics (Chapter 8), and immunology (Chapter 16). Each spread breaks down these important concepts into manageable steps and gives students a clear learning framework for the related chapters. Each includes a quick-reference (QR) code that allows students to link to related MicroFlix videos with their smartphones.
- **Big Picture Disease features.** These two-page spreads appear within each organ-system disease chapter (Chapters 21–26) as well as Chapter 19 (Disorders of the Immune System). Each spread focuses on a particular disease and applies it to a related real-world challenge, many dealing with public health issues.
- **Reworked complement section in Chapter 16 (Innate Immunity: Nonspecific Defenses of the Host).** New art and more straightforward discussions make this challenging and critical material easier for students to understand and retain.
- **In the Clinic.** This new feature, appearing at the start of every chapter, includes critical thinking questions that encourage students to think as health care professionals would in various clinical scenarios and spark student interest in the forthcoming chapter content.
- **ASM guidelines.** The American Society of Microbiology has released six underlying concepts and 22 related topics to provide a framework for key microbiological topics deemed to be of lasting importance beyond the classroom. The twelfth edition explains the themes and competencies at the beginning of the book and incorporates callouts when chapter content matches one of these 22 topics. Doing so addresses two key challenges: it helps students and instructors focus on the enduring principles of the course, and it provides another pedagogical tool for instructors to assess students' understanding and encourage critical thinking.

CHAPTER-BY-CHAPTER REVISIONS

Every chapter in this edition has been thoroughly revised, and data in the text, tables, and figures have been updated. The main changes to each chapter are summarized below.

Chapter 1

- New sections on Middle East respiratory syndrome (MERS), coronavirus, and severe acute respiratory syndrome (SARS) have been added.
- A new table, Table 1.2, addresses representative discoveries of the Golden Age of Microbiology.

Chapter 2

- The section on activation energy has been revised.

Chapter 3

- Foundation Figure 3.2, Microscopes and Magnification, has been revised.

Chapter 4

- The discussion of facilitated diffusion has been revised.
- The cell art has been revised.

Chapter 5

- A new Big Picture feature, addressing metabolism, has been added.
- The discussion of enzyme specificity has been revised.
- Figure 5.25, showing photophosphorylation, has been revised.
- The discussion of chemoheterotrophs has been revised.

Chapter 8

- A new Big Picture feature, addressing genetics, has been added.
- The central dogma of genetics is described.
- Mutation and gene transfers are now included in a new section.

Chapter 9

- Vectors are defined.

Chapter 10

- Figure 10.9, showing the new EnteroPluri-test, is revised.

Chapter 11

- The order Thiotrichales is now included.
- Discussion of the new genus *Cronobacter* has been added.
- Several of the figures have been replaced with improved illustrations.
- The tables have been revised and simplified.
- Nomenclature has been updated.

Chapter 12

- The discussion of algal and protozoan taxonomy is updated.

Chapter 13

- A discussion of the use of oncolytic viruses to treat cancer has been added.
- The discussion of viral enzymes has been revised.

Chapter 14

- The chapter has been updated to reflect the use of the term *healthcare-associated infection*.

Chapter 16

- A new Big Picture feature, addressing immunity, has been added.
- A new figure and discussion of hematopoiesis have been added.
- Figure 16.14 has been revised.
- The discussions of the complement system and interferons have been extensively revised.

Chapter 17

- The introductory material has been revised.
- Several figures have been revised.

Chapter 18

- The tables showing vaccination schedules have been updated.
- A discussion of virus-like particle (VLP) vaccines has been added.
- Clinical Focus box has been rewritten and updated.
- The discussions of vaccination technologies and monoclonal antibodies have been updated.

Chapter 19

- A new Big Picture Disease feature, Human Microbiome and IBD, has been added.
- The discussion of HIV/AIDS has been updated with new, informative maps.
- The chemotherapy of AIDS section has been completely revised, including new figures depicting the action of HIV therapies.

Chapter 20

- The discussion of antiviral drugs has been updated.
- The discussion of antibiotics effective against dormant cells has been expanded.

Chapter 21

- A new Big Picture Disease feature, Fungal Keratitis, has been added.
- A discussion of hand-foot-and-mouth disease is now included.

Chapter 22

- A new Big Picture Disease feature, Neglected Tropical Diseases, has been added.
- The discussion of developments in testing for leprosy has been updated.

Chapter 23

- A new Big Picture Disease feature, Climate Change and Disease, has been added.
- Several of the maps have been updated.
- The discussion of sepsis and septic shock has been revised.
- The discussion of Lyme disease has been revised to include the topic of immunity to reinfection.

- A discussion of Kawasaki syndrome has been added.
- The discussion of dengue and severe dengue is updated.

Chapter 24

- A new Big Picture Disease feature, Pertussis, has been added.
- The discussion of melioidosis has been updated.

Chapter 25

- A new Big Picture Disease feature, Cholera After Natural Disasters, has been added.

Chapter 26

- A new Big Picture Disease feature, STI Home Test Kits, has been added.