

PREFACE

Microbiology has something for everyone. Because microorganisms are so abundant and widespread, their impacts on us and our environment are numerous and profound. Because some of them are so easy to cultivate and manipulate, their study has led to some of the most important discoveries in basic biology. Because they are so biochemically versatile, their use has spawned new industries and expanded agricultural productivity. Because only such a small fraction of them has been discovered (some say less than 1 percent), the field of microbiology continues to expand and reveal new terrain. In spite of the wealth of information that makes up the subject, microbiology is still a young, rapidly expanding science driven by the real and pressing needs of our time. So whatever your particular interest—health, the environment, basic science, business, agriculture, or microorganisms themselves—you'll undoubtedly gain new insight during your upcoming exploration of the microbial world.

We hope you'll find this book to be a helpful, congenial guide and the trip to be interesting and rewarding. We'll visit all aspects of microbiology—basic and applied, including medical, environmental, agricultural, and industrial. One primary emphasis is medical: two entire parts (Parts III and IV) of the book deal with microbial diseases. These follow a consideration of the basic science of microbiology (Part I) and a survey of the various kinds of microorganisms (Part II). Finally, we examine the way humans use microorganisms and the essential roles they play in Earth's ecology (Part V).

Second Edition

In this second edition, we maintained the approach and attitude of the first, including emphasis on the why of metabolism and genetics as well as the what and reliance on actual case studies to relate medical microbiology to the lives of people and to provide an organizing framework for its myriad facts. However, there are changes. Some of these reflect the scientific progress that has occurred since publication of the first edition. To name just one example of progress, great advances have been made in the treatment of AIDS and in the under-

standing of its causative agent, human immunodeficiency virus. We've also expanded the number of case studies. We've altered the presentation of metabolism and genetics to make these important topics more readily accessible. We've also added a CD-ROM and cross-referenced it to the text, added a new class of questions, and reorganized the boxes.

Student-Support Features

The book contains a number of features designed to assist your learning and organize your study.

Learning Goals. Each chapter begins with a succinct list of Learning Goals to help you focus on its overall aims.

Boldface Terms. Certain terms are highlighted in boldface type the first time they occur. We consider them important and suspect they might be new to you. They are defined in the context in which they occur, and those that might not be adequately defined in a dictionary are included in the Glossary at the back of the book.

Boxes. We've included three kinds of boxes—Case Studies, Sharper Focus, and Larger Field.

- **Case Studies** explore real clinical cases (most from Catherine Ingraham's medical practice). We hope these stories will help you remember the details of the text material more easily. These Case Studies occur throughout the text. Those at the beginning of each disease chapter play a critical role: they set the stage for much that follows in the chapter. You'll probably want to refer back to these from time to time as you progress through the material that follows.
- **Sharper Focus** boxes examine a chapter topic in more detail. Just as you can see greater level of detail by focusing a microscope, these boxes (which appear in every chapter) reveal more information about interesting chapter topics.
- **Larger Field** boxes connect text material to our world. Just as you can expand a microscope's field to see more background around an organism, these boxes expand a chapter topic to its larger context—environmental aspects, history, news events, etc. They emphasize the connections of microbiology

to all facets of our lives—beyond the medical aspects explored in the Case Studies.



CD Connection. In most chapters there are one or more “CD Connections” marked by a CD-ROM icon and carrying directions to particular sites on the CD-ROM as well as a brief account of what the site shows. For the most part the designated sites are film loops that quickly convey information that might be difficult to grasp from words alone. For example, one shows how the many flagella on certain bacterial cells coalesce into a single structure that propels the cell through its liquid environment. One look explains it all.

Suggested Readings. Each chapter contains suggested readings. To save space these references to books and scientific journals have been pruned to include only the most helpful and informative sources of information, most of which will lead you to more highly specialized information.

Chapter Summaries. You’ll find some summaries within chapters that reiterate in a different way material that you might find difficult to grasp in a single reading. In addition, each chapter ends with a somewhat detailed summary. These are provided to help you recall and organize the material you read in the chapter.

Questions. We’ve included three kinds of questions at the end of each chapter—review, correlation and essay.

- Review Questions are just that. They’re not designed to make you think, only to recall and to reassure yourself that you’ve assimilated the material contained in the chapter.
- Correlation Questions are meant to offer a greater challenge. They ask you to collate different pieces of information and compare them or apply them to a new problem. A correct answer to these questions should assure you that you have gained a thorough understanding of the material. Congratulations are in order.
- Essay Questions ask you to deal with larger portions of a subject and add your own opinions.

ADDITIONAL LEARNING AIDS

Study Guide

This helpful manual contains chapter outlines, key terms, a new feature called “Study Tips,” study exercises of various question types, multiple-choice questions, discussion questions, and an answer key. (ISBN: 0-534-55225-0).

InfoTrac® College Edition

Available exclusively from Brooks/Cole, this online library offers you unlimited access to more than 700 publications—at any time of the day. With *InfoTrac*, you can search for complete articles from periodicals including *Science*, *Discover*, *Annual Review of Microbiology*, and *Bioscience*. The password-protected site is updated daily, and a 4-month subscription is offered free to students who purchase new texts. An online student guide correlates each chapter in this text to InfoTrac articles. (ISBN: 0-534-55224-2).

Virtual Molecular Biology Lab CD/Web Site

Explore the world of molecular biology with a fun, accessible, and uniquely powerful CD-ROM. This virtual laboratory environment allows you to make the connection between the lab and the classroom by performing virtual experiments and correlating the experiments to concepts presented in the classroom. The virtual environment allows you to “use” equipment to conduct ten of the most common molecular techniques, giving you a sense of being in a live lab to either augment or replace live lab time. Concept and textbook correlations presented throughout the experiments reinforce the relationship between scientific concepts and how science is conducted. Manipulate live data from GenBank to perform cutting edge research!

Electronic Companion to Accompany Beginning Microbiology, from Cogito Learning Media, Inc.

This interactive CD-ROM, authored by John Ingraham, includes a comprehensive tutorial, quizzes, and exercises about microbiology. This CD-ROM allows you to study the details of microbiology and to visualize the complex processes you learn about in the course. “CD Connections” in the textbook guide you to the CD-ROM for further study.



How to Classify Microorganisms

Classifying microorganisms has always been a moving target. Classification schemes become obsolete as rapidly as significant new information becomes available, and the rate of generating new information continues to accelerate. Large amounts of new classification-relevant information have become available since the first edition

was published, which is reflected in this edition's consideration of classification and nomenclature. However, at this very moment massive amounts of new information are pouring out from the many microbial equivalents of the human genome project that's being followed so closely by the press. Undoubtedly, this new information will change our ideas about microbial classification, perhaps slightly, perhaps profoundly. It is too soon for us to

know exactly how. The words of the most famous microbiologist of all, Louis Pasteur (1822-1895), which seemed appropriate at the time of the first edition, are even more relevant now: "*Messieurs, c'est les microbes qui auront le dernier mot.*" ("The microbes have the last word.") We'll have to wait to see what they tell us.

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Each author brings a unique perspective to the text.

John's background is in microbiology and immunology. He has worked in the laboratory of Dr. Robert L. Metcalf, who is a leading expert in the field of host defense mechanisms. Catherine's background is in microbiology and immunology. She has worked in the laboratory of Dr. Robert L. Metcalf, who is a leading expert in the field of host defense mechanisms.

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