
PREFACE

This book was written with the objective of including it as a central part of a higher-education program that offers a semester course in microbial ecology. This book is appropriate for upper-level undergraduate or graduate students pursuing majors in biology, microbiology, ecology, or environmental science. In our presentation, we have assumed that students have backgrounds in chemistry, biology, and microbiology. Our approach is to present basic principles, provide an insight into relevant methodologies, and discuss interactions that are characteristic of microorganisms. We have used an integrative approach to relate new topics that are addressed in the book to the broader scientific field. As an outgrowth of our teaching numerous courses of microbiology, we understand the importance of providing specifics for different topics and, therefore, have included many examples associated with microbial ecology. We broadly cover the environments where microorganisms are found and include community activities in processes that are important in commercial and environmental events. Since this book is designed for use in teaching, each chapter contains a summary, bibliographic sources for additional reading, and review questions appropriate for class discussion. Numerous bibliographic references are cited throughout the text to provide access to additional information on topics covered. It is our hope that this book will stimulate the study of microbial ecology and development of new approaches to evaluate microbes in a natural setting.

We provide an overview of the field of microbial ecology, and while we focus on bacteria, we include numerous examples of other microorganisms. Chapter 1 provides a perspective on historical developments and more recent activities of microbial ecology. The diversity of the organisms in the "tree of life" and the distinctions between *Archaea* and *Bacteria* are covered in Chapter 2. To assist in the understanding of cellular processes for specific environments, Chapter 3 covers the structural, physiological, and metabolic characteristics of microorganisms. The ubiquity of microorganisms in various habitats and techniques for studying them are the topics of Chapters 4 and 5, respectively. Microbe-microbe interactions, including dominance in a population, are discussed in Chapter 6. Plant-microbial interactions are relatively unique, and features of these activities are discussed in Chapter 7. To illustrate the many different interactions between microorganisms and animals, we have provided information on several of these in Chapter 8. Community structure, colonization activities, and species diversity are covered in Chapter 9. Microorganisms are important in several of the major nutrient cycles, and in Chapter 10 we cover the influence of microorganisms on biogeochemical cycles. Since microorganisms may have considerable impact on the environment, we have designated Chapter 11 as a summary of the activities of biomineralization and microbial weathering. The beneficial activities of natural polymer decomposition and use of microbes in bioenergy production are discussed in Chapter 12. The final

chapter, Chapter 13, discusses the participation of microorganisms in various types of bioremediation and processes to achieve microbial detoxification of the environment.

We appreciate the support of our colleagues and friends who have contributed to this book. Most of the photographs and other images used in this text are original and were provided by many scientists working in microbial ecology. We also acknowledge these scientists for providing highlights of their microbial ecology activities, biographic and these sketches are presented in the chapters as microbial "spotlight" events. Selection of individuals for spotlights was based on our desire to cover a diversity of areas of microbial ecology, and we wish that we had more space to include additional spotlights. We gratefully acknowledge these contributors as follows:

• **Photographs provided by**

Esther Angert
Sue Barns
Sandra Barton
Dennis Bazylinski
Rebecca Bixby
Cliff Dahm
Airidas Dapkevicius
Armand Dichosa
Martin Dworkin
Jane Gillespie
Girhsorn
Dale Griffin
G. Hirson
Kenneth Ingham
Gordon Johnson
Brian Jones
Peter Jones
Leslie Melim
Yauoi Nishiyama
T.C. Onstott
Robin Renaut
Adam W. Rollins

Janet Shagam
Holly Simon
David Scott Simonton
Jessica Snider
Michael Spilde
Helga Stan-Lotter
Ward's Natural Science
John Waterbury

• **Microbial spotlights provided by**

Dominique Expert
Gill Geesey
Dale Griffin
Jared Leadbetter
Lynn Margulis
David Mills
Michael O'Connell
T.C. Onstott
Norman Pace
Anna-Louise Reysenbach
Mitch Sogin
Joseph Sufleta
Brad Tebo
Lily Young

We are most appreciative of the assistance, patience, and professional contributions of Karen Chambers and the editorial staff at John Wiley.

LARRY L. BARTON
DIANA E. NORTHUP