

Preface

Those who have been teaching introductory biology for the last two or three decades have been burdened with the supposition that *absolutely everything* needs to be covered in a single course. Textbooks written in this tradition are weighty, encyclopedic works with a thousand or more pages and hefty pricetags. Students are exposed to the *results* of biology without gaining understanding of biology as a *process of discovery*. Students soon forget much of the information because it lacks meaning to them. Studies have shown that many students are discouraged from further biology courses by their experiences with introductory courses that use an encyclopedic approach.

Our book represents an attempt to get away from this “tyranny of coverage” by using an issues-oriented approach to the teaching of biology, one that emphasizes coherent understanding of selected issues rather than an attempt to cover everything. The issues we have chosen are current topics that students are likely to see in the news or to read about in books of general interest. It is our feeling that students (especially those not majoring in biology) are more likely to remember this material if it is meaningfully related to issues of concern to them. Our approach accordingly helps students to experience the connections among the fields of biology, the interdisciplinary nature of today’s biology, and the intimate connections between biological and social issues. We also hope to instill in students the feeling that biology is both interesting and relevant to their lives, and that a further understanding of biology can be a delight rather than a burden.

We are also committed as teachers to fostering understanding of biology, what some now call “bi-

ological literacy.” Thus, we have not overlooked the teaching of “facts,” but we have chosen to teach these facts in a context that emphasizes how these facts are produced, organized, and used to solve problems. Thus the issues we have selected are ones that are not only of current importance, but ones that lend themselves as vehicles for teaching the major concepts of biology. One such list of major concepts is contained in the pamphlet *Developing Biological Literacy*, issued by the Biological Sciences Curriculum Study (BSCS). As the table following this Preface shows, we have covered all of these concepts, some of them in several places. We have also endeavored to cover them in a way that enables students to see the connections between them, and we have provided a list of further connections at the end of each chapter.

Biology as a discipline has become fragmented to the extent that different perspectives on the same problem, for example, molecular perspectives and environmental perspectives, are often taught in separate courses with no reference to each other. We aim for a more comprehensive view of each issue. The current understanding of each issue is covered from different perspectives, which often include cellular and molecular perspectives, organismal or individual perspectives, and global or population perspectives, combined as appropriate. Coverage of each issue also includes its social context, both historical and contemporary. Phrasing ideas as “our current understanding” will help students to realize the ongoing nature of discovery and to identify the processes that are necessary for new ideas to be accepted. In no case should students assume that we have covered all there is to say on any issue.

One of the aims of our approach is to educate good citizens, biologists and nonbiologists alike, with an understanding that will enable them to evaluate scientific arguments and make appropriate decisions affecting their own lives and the well-being of society. We are committed to teaching science as a human activity that impinges upon other aspects of society and gives rise to social issues that require discussion. Citizens are increasingly called upon to deal with science-based issues throughout their lives, in the foods they choose to eat, the medicines they take, and the very air they breathe. Legislators, juries, and corporate managers need to make important decisions, affecting many lives, based in part on the findings of science. We think that all good citizens need to know science and the way that scientists work, and they also need to know how science can be used and how it can be misused.

We aim to stimulate critical thinking and questioning rather than memorization. Science cannot be learned by memorizing facts. Science is a process rather than a result, and it is an understanding of that process that we hope to instill in students, beginning in Chapter 1. To help students appreciate this process, we have presented multiple interpretations or points of view as much as possible. Societal and ethical issues will be mentioned wherever relevant, and Chapter 2 is devoted to an examination of ethical principles. We encourage teachers to set aside time for class discussions to further stimulate student thought, or for students to set up such discussions among themselves informally. We have included Thought Questions at the end of each section of each chapter with such class discussions in mind. A few thought questions have factual "right" answers; most do not. Some questions require students to do further reading; many questions encourage students to think about the limitations of available data or to think about the applications and implications of science. We encourage students with differing viewpoints to discuss these questions among themselves and to ask, "What further information would help us resolve our differences or reach decisions?" We also invite students and their instructors to write us at biobook@abacus.bates.edu with comments, questions, or suggestions.

In addition to the Table of Biological Concepts, this book contains the following study aids:

1. Chapter outlines and section headings:

The book is divided into sections, each of which begins with a section heading that states its major idea. These section headings and important subheadings also appear in the table of contents as a guide to both previewing and reviewing the contents of each chapter.

2. Illustrations: Since many of the concepts of biology can be understood and remembered visually, the book is well illustrated with photographs and drawings. The captions to these illustrations often provide another important avenue to understanding.

3. Tables: Some tables usefully summarize important sections of text; other tables provide specific examples of material mentioned in the text.

4. Boxes: Boxes provide the background for the material in the text. The material presented in boxes is just as important as the main text but is presented in this "stand alone" fashion so that it does not break the flow of the text.

5. Thought Questions: At the end of each major section of a chapter are a series of Thought Questions. Some of these are "check your understanding" questions for which the answers may be found in the text. More, however, are questions that ask students to think about the limits of data or about applications of biological findings in society. These questions can form the basis for discussion either in class or in informal study groups. Many will require further reading beyond what is presented in the text.

6. Chapter Summaries: The key ideas from each chapter are reviewed in a summary at the end of the chapter.

7. Key Terms: Important vocabulary is highlighted in bold type in the text. All of the Key Terms from a chapter are listed at the end of the chapter with page references. Key Terms are mainly concepts rather than specific examples (that is, neurotransmitter rather than the name of a specific neurotransmitter).

8. Connections to Other Chapters: At the end of each chapter, a series of sentences relate the concepts of that chapter to the material in other chapters.

9. A Classification of Organisms: A taxonomic summary appears as an appendix at the end of the book.

10. Bibliography: Suggestions for further readings are presented at the end of the book, organized by chapter.

11. Glossary: Each of the Key Terms is defined in the glossary at the end of the book.

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Eli C. Minkoff
Pamela J. Baker