



PREFACE

As the century draws to a close, we are hurtling on a collision course. We are at the brink of fantastic new technology spawned from research in the life sciences, yet we will unleash it on a society that is woefully ill-prepared to comprehend it.

Fear of science and distrust of scientists is widespread, and we don't need surveys and studies to tell us this. Just look around. Many a teen avoids taking advanced science courses for fear of failing, or of succeeding and being labeled too "smart." Consumers rage at and reject foods from genetically engineered organisms, yet applaud gene therapy efforts, rarely realizing that the underlying technology is very much the same. My daughter, a fourth grader, learned in class just recently that bacteria, protozoa, algae, slime molds, and fungi are all plants—an idea that is as old as I am and quite incorrect.

The goal of *Life*, first edition, with its uniquely accessible style, was to tackle this science phobia. The goal continues in this edition, with some changes in focus and content suggested by many helpful reviewers.

What's New

Life the second time around has some changes in emphasis, but none in style. Exciting reports on real scientists doing real science are peppered throughout, gleaned from my many interviews as a science journalist.

The introduction explores what life is, what controversies it brings, and how we study it. Some areas have exploded with new discoveries since the first edition debuted, and this is reflected in the second edition. The Cell Biology unit is a strong example of this, with much added material on how cells communicate and interact with each other. Some chapters have been

reorganized to offer a more logical flow of information. This is particularly true of the Genetics unit. The organization now better reflects history—the order in which we made key discoveries. My experiences as a genetic counselor have greatly influenced these chapters.

Life, second edition, is much broader in scope, balancing coverage of humans and other species. For example, the tour through "lost worlds" in chapter 1 contrasts life in a desolate Siberian lake to that in a busy sea bottom, a tropical rain forest, and elsewhere. But the chapter also explores life and death with familiar "people" examples. The tour continues in chapter 35's sampling of ecosystems, taking the reader to a stark cliff in Canada, a turbulent fiord in New Zealand, a lake that forms almost overnight when heavy rains fall in southern Australia, the top half-inch of the ocean, and the thriving community beneath a New England snow. A rewritten Animal Biology unit continues the integrated diversity theme. Each chapter begins with a look at how diverse species meet similar life challenges, then concludes with analysis of the appropriate human organ system.

The "trek through the kingdoms" that was part of the second chapter of the first edition has been moved and expanded into a full, six-chapter supplement, "The Kingdoms of Life." The first chapter of the supplement, Taxonomy, offers a complete explanation of the new three-domain view of life, along with traditional treatment of the topic.

Many figures are "new and improved." One look at the camouflaged adder snake of figure 1.3 is worth the proverbial thousand words on adaptation. The new figure 3.27 captures the important but difficult-to-visualize "RNA world" view of life's origin. A repeating illustration of the connected

energy pathways with specific portions highlighted will take a reader unfamiliar with chemistry more easily through chapter 7.

The organization of *Life*, second edition, again follows the traditional microscopic to macroscopic approach, for this is how life originated and evolved, and how it makes the most sense to study it. There are a few internal shufflings and expansion. Energy is now three chapters, from the original one, offering a more leisurely and slightly more detailed look at how organisms obtain energy. Chapter 3 covers more aspects of chemistry. Evolution (Unit 5) appears earlier, after genetics. This stresses its importance and provides a framework for the animal and plant biology units that follow.

If It Isn't Broken—We Won't Fix It

A highly readable, anecdotal style remains *Life's* most distinguishing feature. A biology textbook will only have an impact if a student actually reads it. *Life* has redefined the concept of a textbook in this regard. "Stories" prevail, told from my dual perspective as a scientist and a journalist.

Perhaps the greatest "story" of all, how life began, sandwiches the necessary but fearsome chemistry of chapter 3. Another story, of gene discovery, came from a high school student's science fair project—which began when he noticed weirdly shaped toes among his relatives. Even the most reluctant student will be drawn to true tales of a woman who is a mother and a grandmother to the same child; to an injured crab whose blood led to a common medical test; to inventing ways to shuttle drugs into the brain; and to tracking the deadly hantavirus.

Unit	First Edition	Second Edition
1 Overview of Biology	Two chapters: "Thinking Scientifically" and "The Diversity of Life." "Chemistry of Life" completes the unit.	Two rewritten chapters: "What Is Life?" and "Thinking Scientifically about Life," (Chapters 1-3).
2 Cell Biology	Unit included only one chapter on Energy, Chapter 6.	Now three energetics chapters: "The Energy of Life," "Cellular Respiration," and "Photosynthesis," (Chapters 6-8).
3 Reproduction and Development	Three chapters that were more human oriented.	More comparative examples added to "Animal Development," (Chapter 11).
4 Genetics	Five chapters beginning with "Mendel's Laws" (Chapter 11) and moving to "Genetic Disease" (Chapter 15).	Completely updated and reorganized, beginning with "Transmission Genetics" and moving to "Chromosomes," "DNA Structure and Replication," "Gene Function," and ending with "Genetic Technology," (Chapters 13-17).
5 Evolution	A three chapter unit, placed after animal and plant biology units.	Still three chapters, but moved to follow genetics to stress its importance, as well as to make a more logical flow of material.
6 Animal Biology	Was twelve chapters, with a human emphasis.	Condensed into nine concise chapters. Much more comparative in approach. Each chapter begins with evolution and an explanation why the particular body system is necessary for survival, then discusses how various types of animals meet particular challenges. Six system chapters merged into three new ones: "The Nervous System," "Skeletal/Muscular System," and "Digestion and Nutrition."
7 Plant Biology	Was five chapters, including history of plants and biotechnology.	Condensed to three chapters. Plant biotechnology is incorporated throughout the chapter and plant history deleted on advice of reviewers.
8 Behavior and Ecology	Was five chapters, with outdated coverage.	Now four chapters, two "Behavior" chapters merged into one. Updated coverage of natural disasters discussed in the first edition.
The Kingdoms of Life	Briefly covered in Chapter 2.	New. A six-chapter volume to accompany the text includes chapters on taxonomy and each of the five kingdoms.

Pedagogy

New technology is tied directly to this edition of *Life*, providing instructors with excellent teaching aids and students with fascinating learning tools.

Many of *Life's* chapters correlate to a new interactive Explorations in Human Biology CD-ROM. These chapters end with a description of the module and several rel-

evant study questions. The CD includes 16 high interest topics like AIDS, Diet and Weight Loss, and Smoking and Cancer.

The animations figures throughout the text, indicated by an icon, direct the student to a Life Science Animations videorape. The processes that are so difficult to understand on the text page, such as oxidative respiration, muscle contraction, blood circulation, come alive when animated.

Response to the unique style of *Life* prompted a new feature — *Connections* essays that start each unit, linking the chapters within it. *Connections* range from "Guinea Pig Love" to "On Life's Resiliency" to my personal experience last year with cancer. All show the reader a sampling of the many ways that studying biology matters. *Connections* were fun to write, and, I hope, to read.

The Review Questions and To Think About questions continue to come from the scientific literature, interviews with scientists, real clinical experiences, and other creative sources. These questions often apply chapter concepts to novel situations, or ask for informed ethical decisions. Some are actually fun—see the Star Trek question of chapter 19.

Suggested Readings are also chosen with care, including magazines and journals that a nonscientist can understand and enjoy. This continues the accessibility that is the modus operandi of *Life*. Back by popular demand are also *Learning Objectives*, *Key Concepts*, and *Chapter Summaries*. Added are *Key Terms*.

Life and New Technology

You can now enhance your course, if you wish, with several new technology products, two of which are tied directly to the text.

Explorations CD-ROM,

Our new interactive CD-ROM, *Explorations in Human Biology* by George Johnson, includes 16 modules that are either of high student interest, such as the unit on drug addiction, or are difficult concepts to understand, such as the unit on active transport.

When an Exploration correlates to a chapter in *Life*, you'll find the CD-ROM icon  followed by a description of the module and relevant study questions at the end of that particular chapter. Following is a correlation chart that shows the Exploration topics and corresponding chapters.

Chapter	Exploration
5 Cellular Architecture	Active Transport
9 Mitosis	Smoking and Cancer
21 Animal Development	Life Span and Life Style
13 Transmission Genetics	Heredity in Families
14 Chromosomes	Constructing a Genetic Map
16 Gene Function	Cystic Fibrosis
21 The Nervous System	Drug Addiction Nerve Conduction Synaptic Transmission
23 The Endocrine System	Hormone Action
24 The Musculoskeletal System	Muscle Contraction
25 The Circulatory System	Evolution of the Human Heart
29 The Immune System	Immune Response AIDS
36 Environmental Concerns	Pollution of a Freshwater Lake

Ancillary	Changes in the Second Edition
New Technology Products	Now two technology products directly tied to the text, <i>EXPLORATIONS IN HUMAN BIOLOGY</i> CD-ROM, and <i>LIFE SCIENCE ANIMATIONS</i> videotape/videodisc.
Instructor's Manual	Completely revised to include "Teaching Tips," and more extensive chapter outlines. The test item file has been almost 100% revised.
MicroTest III	We now offer a new computerized testing program, MicroTest III. The test items and their answers appear in the Instructor's Manual as well as on disk.
Student Study Guide	Completely revised, key additions include a section called "Study Questions" that contain a variety of exercises that test students' understanding. Also new to the second edition are crossword puzzles.
Bilingual Student Study Guide	For the first time, the Student Study Guide that accompanies <i>Life</i> is available in Spanish and English for those students where English is a second language.
Transparencies	Now 300 full-color transparencies of key figures in the text, increased from 200 in the first edition.
Electronic Acetates	Nearly all the text's illustrations appear on CD-ROM, in full color.
Student Study Art Notebook	A new and innovative supplement that includes all 300 images from the transparency in a notebook format. It is packaged FREE with each new copy of <i>LIFE</i> purchased from WCB.
Laboratory Manual Lab Resource Guide	The lab manual has been updated and may now be customized in full-color, just like the main text. The lab resource guide has been revised to include approximate time requirements for each lab.
MediSim Electronic Study Guide	A study aid that includes chapter quizzes. At the end of each quiz, the student sees a listing of questions missed, including chapter page references for further study.
The Kingdoms of Life	A new six-chapter volume that covers taxonomy and each of the five kingdoms.

Life Science Animation Videotapes

These videotapes bring movement and multi-dimension to approximately 50 images of often difficult-to-understand physiological processes—processes that can only be shown in a limited, step-by-step way in the textbook. However, with the use of the animation tapes, these visual moving representations of key processes assist the instructor and enhance student learning.

Figures within the text that are represented on the Animations tapes can be quickly identified by the videotape icon  printed beside the figure number.

BioSource Videodisc

Our new BioSource[®] videodisc features nearly 10,000 full-color illustrations and photos, many from Wm. C. Brown Publishers' general biology textbooks in addition to twenty minutes of animations.

Biology StartUp Software

Biology StartUp is a five-disk set of interactive Macintosh tutorials designed to help nonmajor or returning students master often-challenging chemical and cell biology concepts related to general biology. Authored by Myles Robinson and Kathleen Pace, both of Grays Harbor College, these tutorials can be a valuable addition to a resource center and especially helpful to students with little or no science background.

The Life Ancillary Package

The Kingdoms—A New Volume to Accompany *Life*

Six new chapters covering biological diversity are now available as a separate volume, in answer to those of you who looked at the first edition of *Life*—liked what you saw—but wanted material on the kingdoms for your students.

The Kingdoms

Chapter 37	Taxonomy
Chapter 38	Monera
Chapter 39	Protista
Chapter 40	Fungi
Chapter 41	Plants
Chapter 42	Animals

Written by Ricki Lewis, with contributions in their areas of specialty from Randall Moore (The University of Akron), Holly Ahern (The University at Albany), and Barbara Abraham (Hampton University), you can now add this inexpensive, one-color volume to your text package.

And for those instructors who choose to customize *Life*, using only those chapters from *Life* that fit their course, the diversity chapters can also be selected and bound into a customized version of the text by our Customized Services Department.

Other Life Ancillaries

1. Student Study Art Notebook. Contains all the images in the transparency acetates set and is packaged free with every new textbook purchased from WCB.
2. Instructor's Manual with Test Item File. Prepared by Barbara Yelverton of the University of New Mexico, the IM features the following for each text chapter.
 - a. Teaching Tips that suggest possible ways to present the chapter's information. This section also suggests questions for generating class discussion.
 - b. Student Learning Objectives
 - c. List of Key Concepts
 - d. Key Terms
 - e. Expanded Chapter Outline—also available on disk
 - f. Answers to both sets of chapter questions (Review Questions and To Think About)
 - g. A list of relevant audiovisual materials
3. MicroTest III. Computerized test bank, also prepared by Barbara Yelverton.
4. Student Study Guide. This illustrated study guide was prepared by Donald Breakwell and Allan Stevens, both of Snow College. It contains the following features:
 - a. All of the answers to the end-of-chapter questions (Review Questions and To Think About)
 - b. Key Concepts
 - c. Chapter Outline
 - d. Learning Objectives
 - e. A section called Study Questions containing a variety of exercises, including labeling, that test the students' understanding.
 - f. Crossword puzzles

Bilingual Student Study Guide available in English with Spanish translation.

5. Laboratory Manual written by Alice Jacklet of The University at Albany—now customizable in full color.
6. Instructor's Manual to Accompany the Lab Manual
7. A set of 300 full-color transparencies, which includes figures from the text. Free to all adopters.
8. Electronic acetates, which comprise nearly all of the text's illustrations on CD-ROM, in full color.
9. MediSim computerized study guide prepared by Donald Breakwell and Allan Stevens.

Acknowledgments

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Finally, many, many thanks to my wonderful family and our various beasts for supporting me through the craziness of writing a textbook.

Ricki Lewis

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