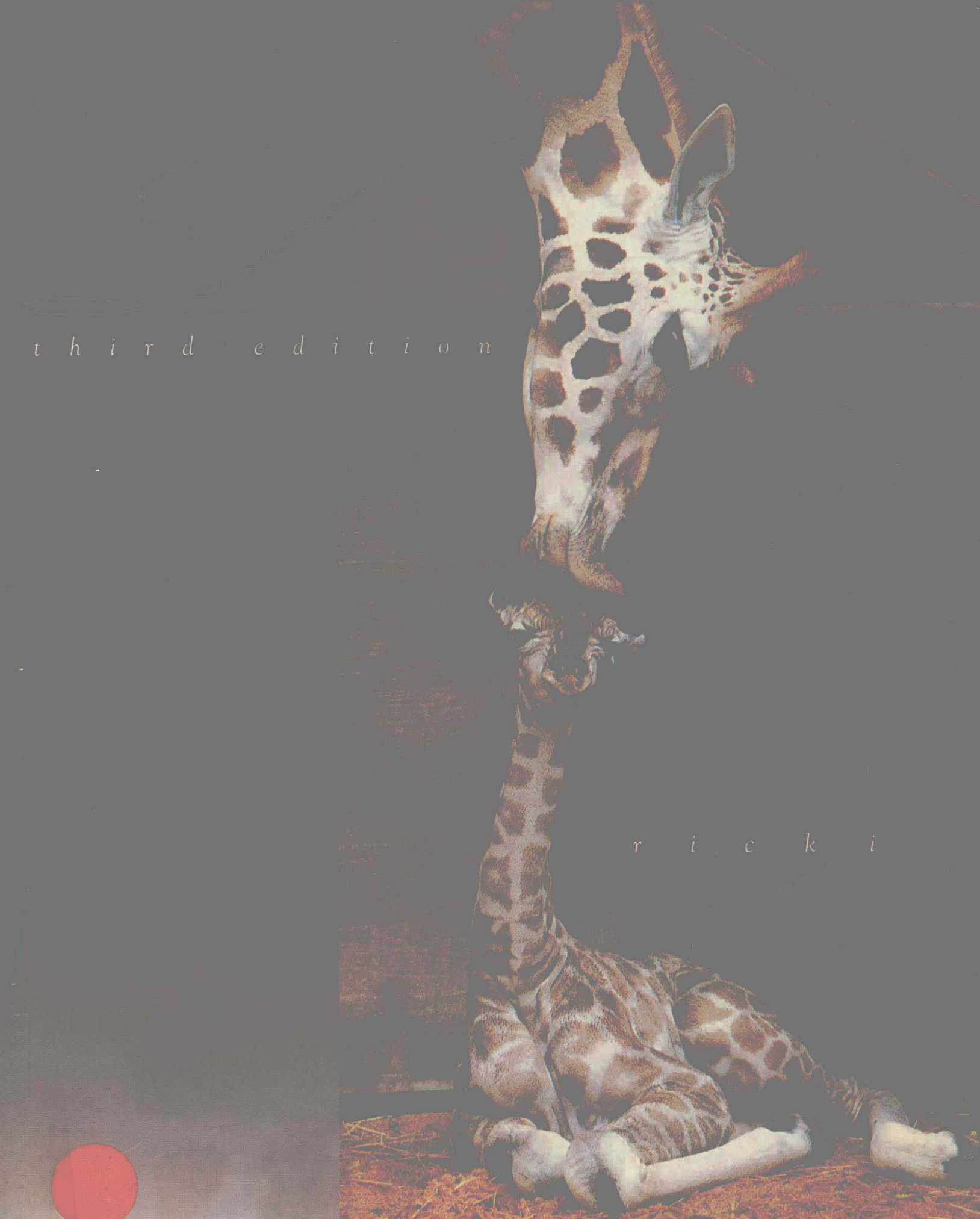
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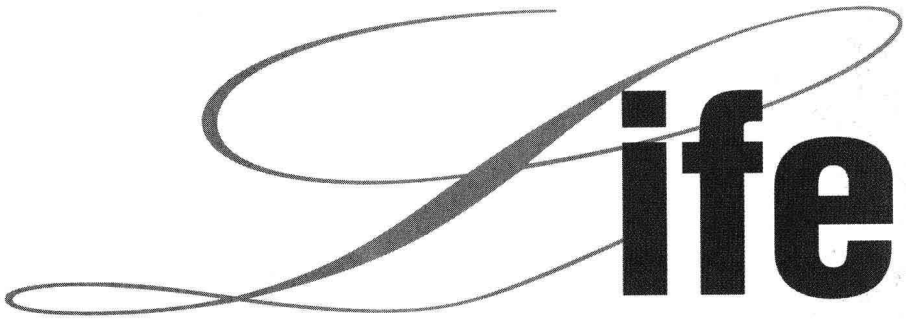

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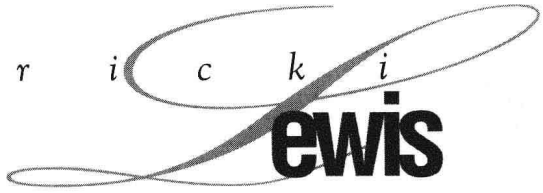

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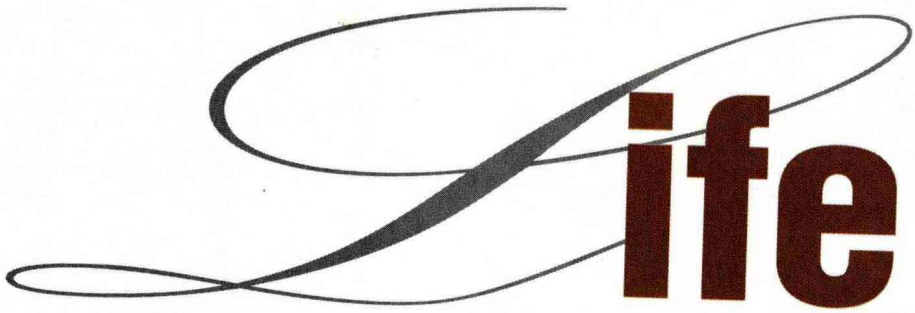

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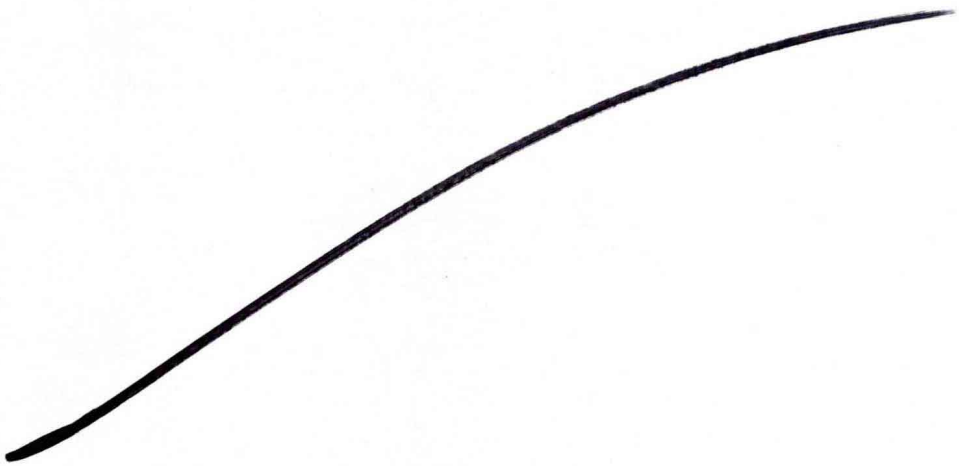

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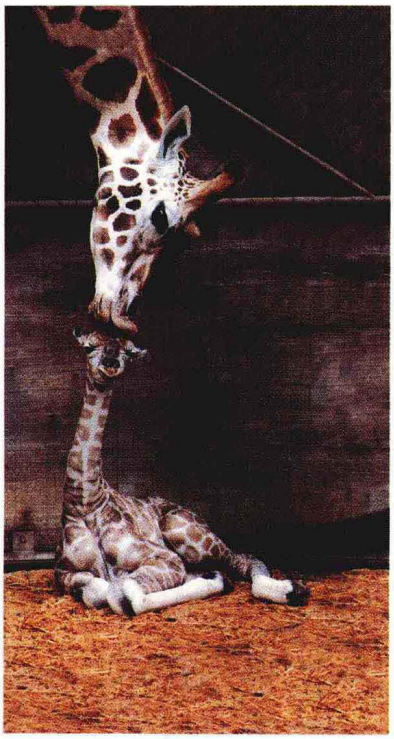


Full-Color Customization

In this third edition of Life, *your options are unlimited!* You can now create the ideal text for your course. Take a look at the contents of *Life.* Are there some chapters you don't address in your course? If so, select just those chapters that you do cover. Then let WCB/McGraw-Hill professionally print and bind the *full-color* general biology text that is right for your classroom.

Of course, you can still select the standard, full-color text. It's your choice. Contact your WCB/McGraw-Hill sales representative.

Recycled Paper

Life is printed on recycled paper stock. All of its ancillaries, as well as all advertising pieces for *Life,* will also be printed on recycled paper. In addition, when possible, the inks used in printing are soy based.

Our goal in using these materials for *Life* and its ancillary package is to minimize the environmental impact of our products.

Preface

It's a great time to study *Life!* The late 1990s will be remembered as the time when the press proclaimed "the biology textbooks will have to be rewritten."

The call for textbook authors to get back to work referred to the Archaea, the cells that represent a third form of life on earth. Although biologists have known about these organisms for years and have long puzzled about their place in our organizational scheme of life, it was exciting to see the "news" burst into the public consciousness. Ironically, the announcement of the genome sequencing of an archaeon was dwarfed by the discovery of chemical smudges on Mars that resembled, some researchers hypothesized, microbial life.

Bracketing the archaean/Martian discoveries were others with the same theme—discovering new life. Researchers found microorganisms thriving in rocks, and an immense heated lake beneath the ice of Antarctica that might also house microscopic life. Chemical evidence of metabolic processes in ancient Greenland sediments set back the first signs of life to nearly 4 billion years ago. The message is clear: we still have a lot to learn about life.

To today's biology students, the scientific method is no longer just a dull list of steps to be memorized and spit out on an exam—it is a powerful way of thinking that can explain natural phenomena. To today's textbook authors, writing a new edition no longer means finding a better way to depict mitosis or the carbon cycle, but creating a knowledge base that students can use to put into perspective the exciting discoveries they read about on a daily basis.

The goal of *Life* is to convey both the knowledge and excitement, with a unique flavor and readability. "Science literacy" is a current educational buzzword—but it has always been *Life*'s raison d'être (reason for being). In many places, the book pairs classical topics with news or technology. For example, in chapter 18, Darwinian evolution segues smoothly into discussions of emerging infectious diseases and antibiotic resistance, topics students will certainly have heard of, but not necessarily connected to evolution. Similarly, the new chapter on tissues (chapter 30) leads into a discussion of ways to replace damaged tissue (transplants and tissue engineering).

What's New to the Third Edition

Organizational Changes

If you compare this new table of contents with that of the second edition, you will immediately recognize the changes in emphasis in this third edition. New chapters and material expand the scope and coverage of Lewis' *Life.*

- **New Diversity Unit**
  Unit 6, "The Diversity of Life," is new to the third edition and presents an overview of diversity in Chapter 21, "Classifying Life" and five chapters that survey the five kingdoms (chapters 22–26). The survey chapters provide representative but interesting organisms without going overboard in detailed information.
- **Reorganized Coverage of Evolution**
  A new chapter, Chapter 17 entitled "The Origin and Diversification of Life," appears in Unit 5, "Evolution." Previously, this information was presented earlier in the book in the context of the chemical nature of life. By moving this material to Unit 5, it provides a wonderful introduction to the study of evolution but also reinforces the "chemistry" in biology that is usually lost on students after they pass chapter 3. The information on the origins of life and the primordial soup experiment has been updated. New and interesting information has also been added to expand the discussion about the diversification of life on earth.
- **Expanded Coverage of Animal Biology**
  A new chapter, Chapter 30 entitled "Animal Tissues," opens Unit 8, "Animal Life," and provides fundamental information about tissue types before discussing body systems. Consideration of tissue types leads into a look at two new medical technologies, transplants and tissue engineering.
- **Expanded Coverage of Ecology**
  A separate chapter on Biomes, Chapter 43, expands coverage of diverse biomes. Chapter 42, "Communities and Ecosystems," has also been expanded and updated.
- **Streamlined and Integrated Genetics Coverage**
  The second edition contained a separate chapter on Genetic Technology, chapter 17, which has been integrated into related topics in the third edition. The discussions of genetic technologies now accompany explanations of the processes that gave rise to them. For example, PCR and DNA fingerprinting are discussed in chapter 15 with DNA Structure and Replication; recombinant DNA, gene therapy, transgenics, antisense, and knockouts are discussed in chapter 16 with Gene Function.

Pedagogical Changes

The third edition has many more summary charts, new examples, more questions, updated references, and updated material. To help students learn, several new features are in this edition:

- **Mastering Concepts**
  Short lists of questions follow each major text section and help the student understand what was just covered. These replace the Learning Objectives and Key Concepts from the

Running on Empty

Michael P. was noticeably weak from birth. He didn't move much, had "floppy" muscles, had difficulty breathing, and grew exhausted merely from the effort of eating. At the age of two-and-a-half months, he suffered his first seizure, staring and jerking his limbs for several frightening minutes. Despite medication, his seizures continued more and more frequently.

The doctors were puzzled because most of Michael's many medical tests showed normal results—with one notable exception. His cerebrospinal fluid (the fluid that bathes the brain and spinal cord) was unusually low in glucose and a small organic chemical called lactic acid. How could these deficits explain the baby's disturbing symptoms?

to be continued . . .

Running on Empty

continued from page 126.

The lack of glucose and pyruvic acid in Michael P.'s cerebrospinal fluid told physicians that his cells were not performing glycolysis or fermentation. Hypothesizing that a profound lack of ATP was causing the boy's symptoms, medical researchers decided to intervene beyond the block in the boy's metabolic pathway and take a detour to energy production. When Michael was seven-and-a-half months old, he was placed on a diet rich in certain fatty acids. Within 4 days, he appeared to be healthy for the very first time in his life!

The diet reactivated aerobic respiration at the point of acetyl CoA formation by supplying an alternative to glucose. Other children with similar symptoms have since enjoyed spectacular recoveries thanks to similar dietary interventions, but we do not yet know the long-term effects of the therapy. This medical success story, however, illustrates the importance of the energy pathways—and how valuable our understanding of them can be.

second edition but are more valuable because they require the student to be more active in the learning process. They accomplish more in less space, and don't "give" the students easy answers.

- **Split Vignettes**
  True tales open each chapter but stop at a precipice which launches the student into the chapter material. When the cliffhanger continues at the chapter's end, the content level is slightly higher, and includes chapter concepts. With the split vignettes, students need never ask, "Why do we have to know this?" The "split vignette" from chapter 7 is reproduced here.
- **"Bioethics Connections"**
  Because of biology's intimate ties to human health care, students will have to make many life decisions that will call upon their knowledge of how the human body works. Bioethics Connections prepare them for coming changes in medicine. These boxes consider such "hot topics" as nicotine addiction, melatonin hype, embryo and cloning research, and how to use human genome project information. The "Bioethics Connections" box 11.1 is reproduced here.

11.1 bioethics connections

Preembryos as Research Subjects

The needle piercing a secondary oocyte in figure 11.A will deliver a sperm cell into the oocyte in an effort to help the people who donated these cells become parents. This procedure, discussed in chapter 12, would not have been possible without experiments that followed the fate of fertilized ova, for a few cell divisions, in laboratory glassware.

Biology or Politics?

Basic research on human prenatal development provides new infertility treatments and contraceptives. However, many people object to using prenatal humans in the experiments that make reproductive technologies possible. As a result of the controversy over the ethics of this type of experimentation, the U.S. government, at the time of this writing, does not fund such research.

In 1993, when President Clinton lifted a ban on government-funded human embryo research begun in 1980, the National Institutes of Health (NIH) established a Human Embryo Research Panel, consisting of scientists, ethicists, and attorneys. The panel outlined the goals

- It defined when i include when the not occur any ot fewest possible e
- It determined tha abdominal surge informed consen
- It recommended 14 days of devel

The NIH recomm servative outcome o stituted the ban on ceived solely for res (R-Calif.) led the co a letter that more tha "The issue of huma Given the new realit will presumably fee to use every legislat being spent on grot

- **"Chemistry Explains Biology"**
  These are short boxes unique to the chemistry chapter that ease understanding and introduce relevancy of the material presented. This chapter was evaluated by students, who compared it point-by-point to the competition and gave it a grade of "A".
- **New Figures**
  Several new figures connect concepts within chapters. For example, figure 20.7 clarifies at a glance the effects of migration, mutation, genetic drift, and natural selection on populations—and *shows* clearly that Hardy-Weinberg equilibrium is more theoretical than realistic. Figures 32.2 and 32.3 do what other books do not—show in one place, up front, what the human senses have in common at the cellular and molecular levels. Many new summary charts in the genetics unit help students learn difficult concepts and master terminology.
- **Scientific Method/Experiments**
  Chapter 2 introduces the scientific method in terms of the multi-level problem of environmental estrogens. By the chapter's end, students will see how women with certain cancers, eagles with misshapen beaks, and alligators with stunted penises are related—while learning how scientists work.

  Woven throughout the narrative, in the split vignettes, To Think About questions, Biology in Action boxes, and Bioethics Connections, abound diverse examples of researchers in action, conducting individual laboratory experiments to large-scale epidemiological investigations. Figure 18.3, for example, depicts an elegant experiment that demonstrates evolution happening right now. The new Biology in Action 44.3, "Adding Iron to the Ocean," describes a large-scale, intriguing experiment.

By touching on the scientific method throughout the book—and not just in one chapter—students become comfortable with this approach, see how they use it to think in their everyday lives, and glimpse the bigger picture of biology that experiments taken together reveal.

- **Summary**
  The end of chapter summary is now in list form which makes it easier for students to identify and review key concepts.
- **References and Resources**
  As always, suggested readings are eclectic and interesting and are often the source material for a chapter's examples. Many are written by the author and are available on the *Life* home page. These selected readings are indicated with an icon in the "References and Resources" lists.

denotes articles by author Ricki Lewis that may be accessed via *Life*'s home page /http://www.mhhe.com/sciencemath/biology/life/.

Supplemental Material

Instructor's Manual and Test Item File

The Instructor's Manual, written by Roberta Meehan and Joe Coelho, has been completely rewritten and includes for each chapter: an overview of chapter objectives, list of key terms, an annotated outline, teaching tips, answers to end of chapter review questions ("To Review" and "To Think About"), and additional topics for discussion. The test item file has been completely updated and revised.

Microtest Computerized Testing Program

The printed test bank is available in a computerized format for Windows and Macintosh platforms.

Student Study Guide

The study guide, written by Donald Breakwell and Allan Stevens, contains a list of key terms, student activities to help reinforce chapter concepts, multiple choice questions for review, and answers to all activities and review questions.

Transparencies

A set of 300 transparencies of key figures in the text is available to adopters. A list of transparencies is available in the Instructor's Manual.

Laboratory Manual

The lab manual, written by Alice Jacklet, has been updated and may be customized in full color. It follows the new organization of *Life,* 3d edition and so is a valuable supplement to that text but it can be used in conjunction with any introductory biology textbook.

Laboratory Resource Guide

A separate laboratory resource guide is now available with the laboratory manual and assists the professor in setting up and performing the laboratory exercises.

Technology

WCB/McGraw-Hill offers a wide range of technology products to assist you in teaching and can improve student learning. A correlation table provided on the next page indicates where related material for each chapter can be found on various WCB/McGraw-Hill Multimedia CD-ROM products. Also provided are descriptions of these and other WCB/McGraw-Hill technology products for your introductory general biology course.

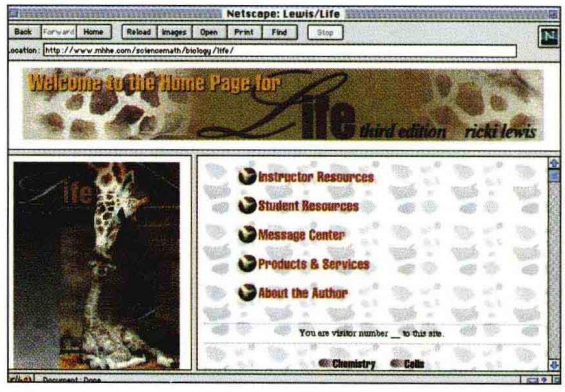
Exploring the Internet

http://www.mhhe.com/sciencemath/biology/life/

The *Life* Home Page allows students and teachers from all over the world to communicate. By visiting this site, students can access additional study aids, explore links to other relevant biology sites, catch up on current information including articles written by Ricki Lewis, and pursue other activities. The site includes frequently-updated suggested readings listed by chapter and study questions based on popular movies and television programs. The inside back cover of the text provides directions for accessing the *Life* Home Page.

The Internet Primer by Fritz J. Erickson and John A. Vonk

This short, concise primer shows students and instructors how to access and use the Internet. The guide provides enough information to get started by describing the most critical elements of using the Internet.

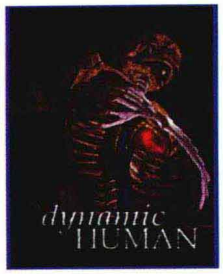


The third edition of *Life* has three technology learning tools that are correlated to the chapters. The guide on pg. xxiv indicates where the multimedia programs can supplement the material in the text. The Correlation Guide refers to *Life Science Animations* videotape series, *Explorations in Human Biology* CD-ROM, *Explorations in Cell Biology and Genetics* CD-ROM, and *Dynamic Human* CD-ROM.

Technology Correlation

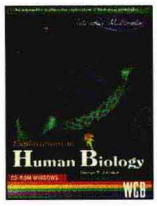
Lewis Chapter	Explorations in Cell Biology & Genetics	Explorations in Human Biology	The Dynamic Human	Life Science Animations
3	Module 1			tape 1, concept 1
4	Module 2			tape 1, concepts 2,4
5	Modules 3, 4	Module 2		tape 1, concepts 3, 4
6	Module 6			tape 1, concept 11
7	Module 8			tape 1, concepts 5, 6, 7
8	Module 9			tape 1, concepts 8, 9, 10
9	Module 5	Module 6		tape 2, concept 12
10	Module 10		Reproductive System/ Anatomy, Explorations	tape 2, concepts 13, 14, 19, 20
11		Module 3		tape 2, concept 21
12			Reproductive System/ Clinical Concepts	
13	Modules 11, 13	Module 14		tape 4, concept 40
14	Module 12	Module 15		
15	Module 14			tape 2, concept 15
16	Module 16	Module 1		tape 2, concepts 16, 17, 18
20				tape 4, concept 45; tape 5, concept 53
27				tape 5, concepts 46, 47, 48
28				tape 5, concept 50
29				tape 5, concept 49
31		Modules 8, 9, 10	Nervous System/ Anatomy, Explorations	tape 3, concepts 22, 23, 24, 25
32			Nervous System/Explorations	tape 3, concepts 26, 27
33		Module 11	Reproductive System/ Explorations & Endocrine System/Clinical Concepts, Explorations	tape 3, concept 28
34		Module 4	Skeletal & Muscular Systems/ Explorations	tape 3, concepts 29, 30, 31
35		Module 5	Cardiovascular System/ Explorations; Lymphatic System/Anatomy	tape 3, concept 32; tape 4, concepts 37, 38, 39
36			Respiratory System/ Anatomy, Explorations	
37			Digestive System/ Explorations	tape 3, concepts 33, 34, 35; tape 4, concept 36
38			Urinary System/ Anatomy, Explorations	
39		Modules 12, 13	Lymphatic System/Clinical Concepts, Explorations	tape 5, concepts 41, 42, 43, 44
42				tape 5, concepts, 51, 52
44		Module 16		

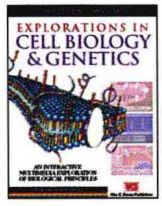
The Dynamic Human CD-ROM



This guide to anatomy and physiology interactively illustrates the complex relationships between anatomical structures and their functions in the human body. Realistic, three-dimensional visuals are the premier feature of this exciting learning tool. The program covers each body system, demonstrating to the viewer the anatomy, physiology, histology, and clinical applications of each system. The correlation chart in this edition of *Life* indicates where material in the text can be supported by this interactive program.

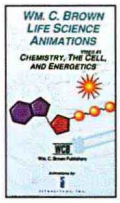
Explorations in Human Biology CD-ROM; Explorations in Cell Biology and Genetics CD-ROM

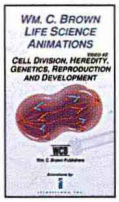


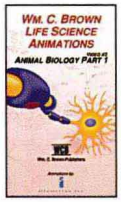


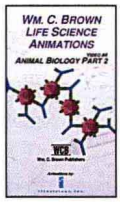
These interactive CDs, by George Johnson, feature fascinating topics in biology. *Explorations in Human Biology* and *Explorations in Cell Biology and Genetics* have 33 different modules that allow students to study a high-interest biological topic in an interactive way. The correlation chart in this edition of *Life* indicates where material in the text can be supported by this interactive program.

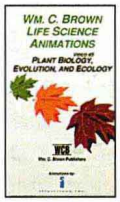
Life Science Animations Videotape





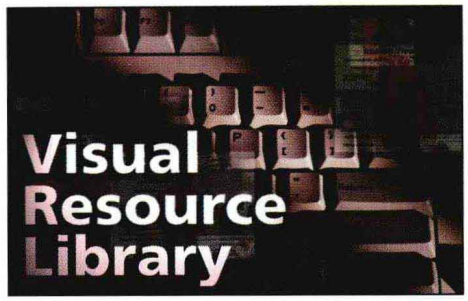






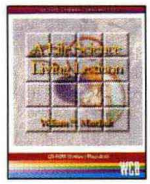
Fifty-three animations of key physiological processes are available on videotapes. The animations bring visual movement to biological processes that are difficult to understand based on the static image in the text. The correlation chart in this edition of *Life* indicates where material in the text can be supported by the animations in this video series.

The WCB/McGraw-Hill Visual Resource Library



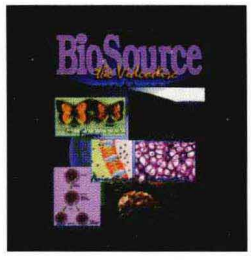
Nearly all text illustrations will be available on CD-ROM for use in the classroom. The user-friendly program allows you to easily pull the art files into PowerPoint or other presentation tools in order to prepare your own, customized classroom presentations. Several QuickTime movies are available summarizing key biological processes to make your lecture even more dynamic.

Life Science Living Lexicon CD-ROM



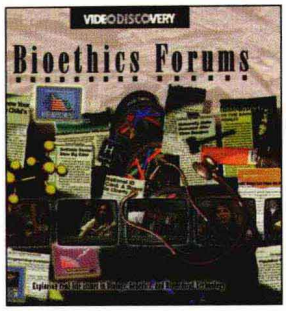
A *Life Science Living Lexicon* CD-ROM, by William Marchuk contains a comprehensive collection of life science terms, including definitions of their roots, prefixes, and suffixes as well as audio pronunciations and illustrations. The *Lexicon* is student-interactive, providing quizzing and note-taking capabilities. It contains 4,500 terms, which can be broken down for study into the following categories: anatomy and physiology, botany, cell and molecular biology, genetics, ecology and evolution, and zoology.

Biosource Videodisc



BioSource Videodisc, by WCB/McGraw-Hill and Sandpiper Multimedia, Inc., features 20 minutes of animations and nearly 10,000 full-color illustrations and photos, many from leading WCB/McGraw-Hill biology textbooks.

Bioethics Forums Videodisc



Bioethics Forums is an interactive program that explores societal dilemmas arising from recent breakthroughs in biology, genetics, and biomedical technology. The scenarios are fictional, but the underlying science and social issues are real. *Bioethics Forums* encourages students to explore the science behind decisions as well as the processes of ethical reasoning and decision making. This would enhance the "Bioethics Connections" in this edition of *Life.*

The Secret of Life Video Modules WGBH, Boston and BBC-TV

WGBH has produced eight 15-minute video modules that illuminate the biological universe with unique stories and animation. Each module concludes with a series of stimulating questions for class discussion.

The Secret of Life Videodisc WGBH, Boston

A two-sided videodisc will be available as a companion to *Life,* third edition. Topic coverage includes biotechnology, human reproduction, portraits of modern science and research, and human genetics.

Virtual Biology Laboratory CD-ROM by John Beneski and Jack Waber, West Chester University

This CD-ROM is designed primarily for nonscience major students. The exercises (10 modules) are designed to expose students to the types of tools used by biologists, allow students to perform experiments without the use of wet lab setups, and support and illustrate topics and concepts from a traditional biology course.

HealthQuest CD-ROM

This is an interactive CD-ROM designed to help students address the behavioral aspects of personal health and wellness. **HealthQuest** allows users to assess their current health and wellness status, determine their health risks and relative life expectancy, explore options and make decisions to improve the behaviors that impact their health.

Virtual Physiology Laboratory CD-ROM

Virtual Physiology Lab CD-ROM features ten simulations of the most common and important animal-based experiments ordinarily performed in the physiology component of your laboratory. This revolutionary program allows students to repeat laboratory experiments until they adeptly master the principles involved. The program contains video, audio, and text to clarify complex physiological functions.

Our CD-ROM products may be packaged with the text at a cost savings. Contact your WCB/McGraw-Hill sales representative for details.

From WCB/McGraw-Hill

How to Study Science, 2nd Edition *by Fred Drewes, Suffolk County Community College*

This excellent new workbook offers students helpful suggestions for meeting the considerable challenges of a college science course. It offers tips on how to take notes, how to get the most out of laboratories, and how to overcome science anxiety. The book's unique design helps students develop critical thinking skills while facilitating careful note taking. (ISBN 0–697–15905–1)

A Life Science Living Lexicon by William N. Marchuk, Red Deer College

This portable, inexpensive reference helps introductory-level students quickly master the vocabulary of the life sciences. Not a dictionary, it carefully explains the rules of word construction and derivation, in addition to giving complete definitions of all important terms. (ISBN 0–697–12133–X)

Biology Study Cards by Kent Van De Graaff, R. Ward Rhees, and Christopher H. Creek, Brigham Young University

This boxed set of 300 two-sided study cards provides a quick yet thorough visual synopsis of all key biological terms and concepts in the general biology curriculum. Each card features a masterful illustration, pronunciation guide, definition, and description in context. (ISBN 0–697–03069–5)

Critical Thinking Case Study Workbook

Written by Robert Allen, this ancillary includes 34 critical thinking case studies that are designed to immerse students in the "process of science" and challenge them to solve problems in the same way biologists do. The case studies are divided into three levels of difficulty (introductory, intermediate, and advanced) to afford instructors greater choice and flexibility. An answer key accompanies this workbook. (ISBN 0–697–34250–6)

The AIDS Booklet
Frank D. Cox

This booklet describes how AIDS is commonly spread so that readers can protect themselves and their friends against this debilitating and deadly disease. This booklet is updated quarterly to give readers the most current information. Also visit the Mader Home Page for additional AIDS material. (ISBN 0–697–26261–8)

Chemistry for Biology
Carolyn Chapman

This workbook is a self-paced introduction or review of the basic principles of chemistry that are most useful in other areas of science. (ISBN 0–697–24121–1)

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*These elements appear in every chapter.