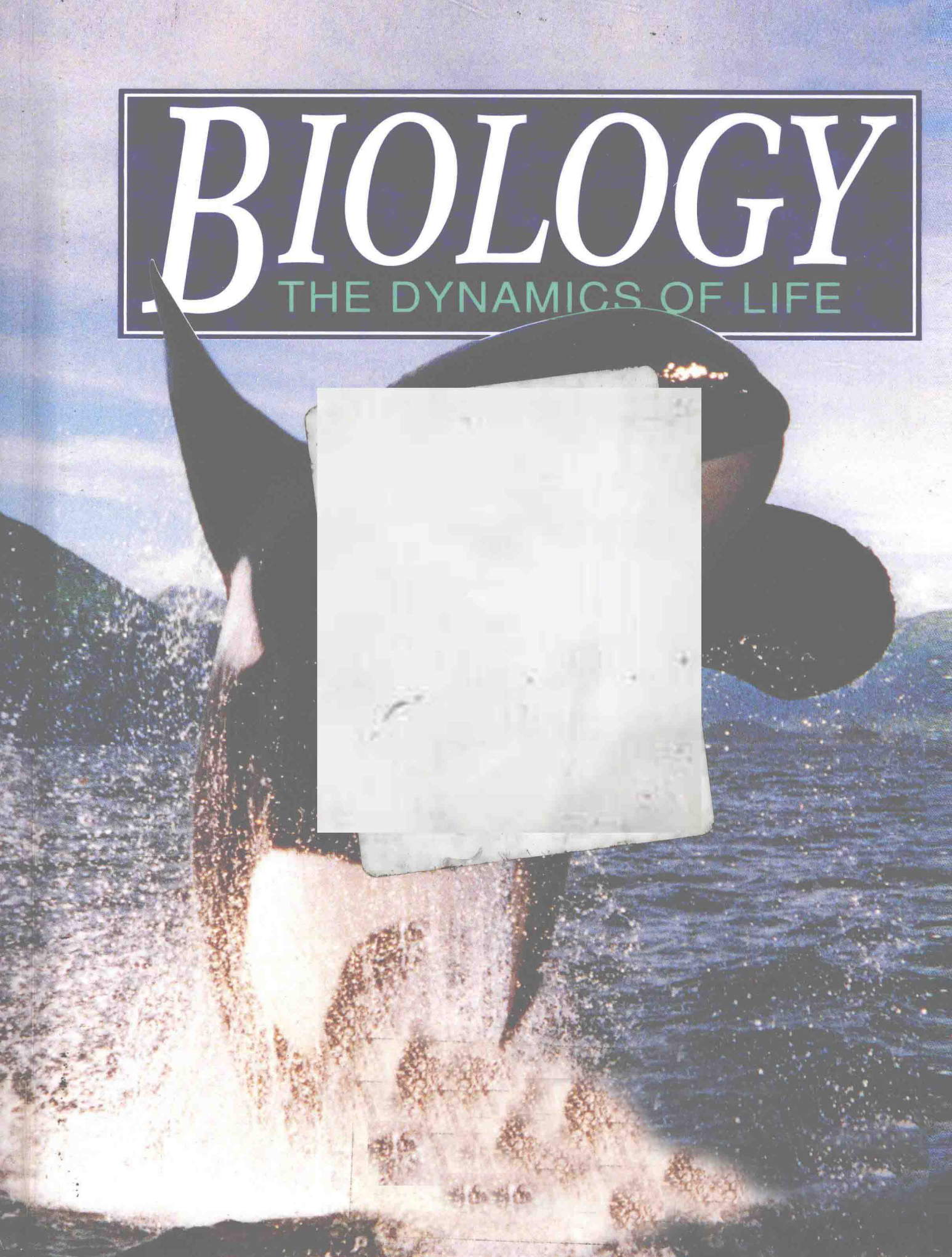


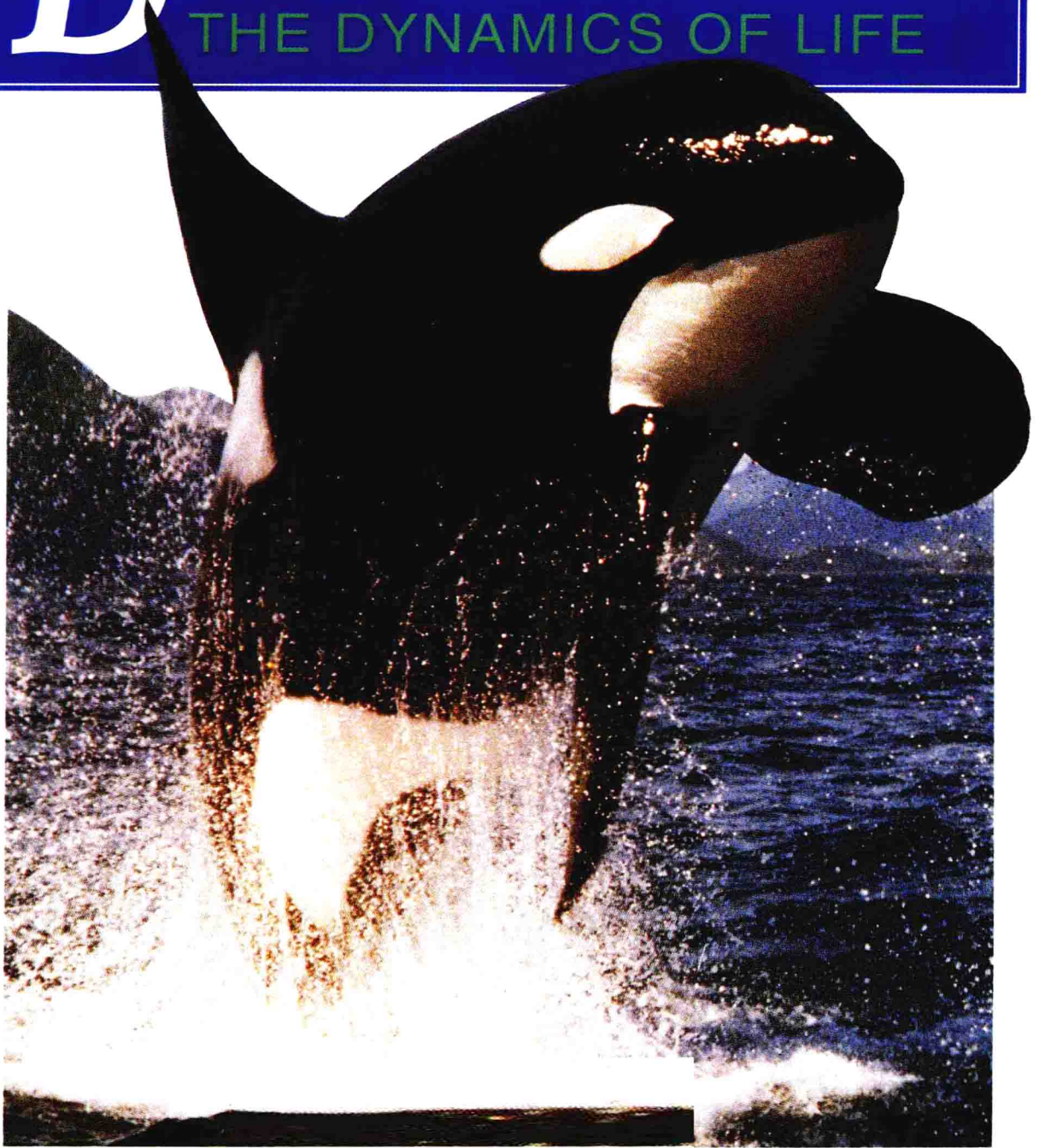
# BIOLOGY

THE DYNAMICS OF LIFE



# BIOLOGY

THE DYNAMICS OF LIFE



**GLENCOE**

McGraw-Hill

New York, New York Columbus, Ohio Woodland Hills, California Peoria, Illinois

**A GLENCOE PROGRAM**

**BIOLOGY: THE DYNAMICS OF LIFE**

*Student Edition*  
*Teacher Wraparound Edition*  
*Laboratory Manual, SE and TE*  
*Study Guide, SE and TE*  
*Chapter Assessment*  
*Lesson Plans*  
*Videodisc Correlations*  
*Science and Technology Videodisc Series,*  
*Teacher Guide*  
*Transparency Package*

*Transparency Masters*  
*Critical Thinking/Problem Solving*  
*Spanish Resources*  
*Concept Mapping*  
*Biolab and Minilab Worksheets*  
*Exploring Applications of Biology*  
*Great Developments in Biology*  
*Biology Projects*  
*Computer Test Bank*  
*IBM/APPLE/MACINTOSH*  
*English/Spanish Audiocassettes*

*Glencoe Science Professional Series:*  
*Exploring Environmental Issues*  
*Performance Assessment in the Biology Classroom*  
*Alternate Assessment in the Science Classroom*  
*Cooperative Learning in the Science Classroom*

Copyright © 1995 by Glencoe/McGraw-Hill.  
All rights reserved.

Except as permitted under the United States Copyright Act, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database retrieval system, without prior written permission of the publisher.

Send all inquiries to:  
Glencoe/McGraw-Hill  
8787 Orion Place  
Columbus, OH 43240-4027

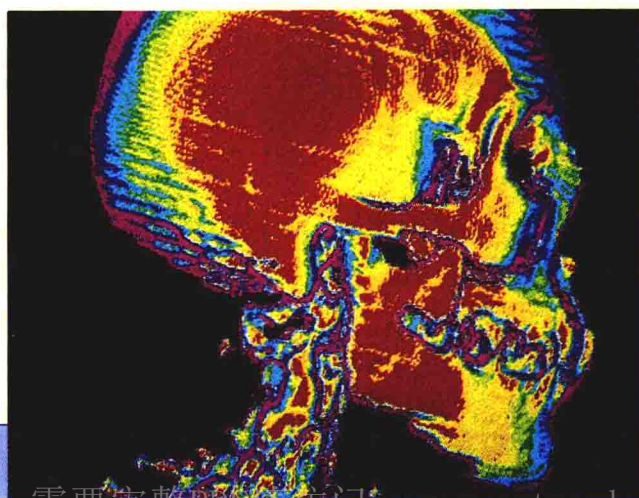
ISBN 0-02-826647-1  
Printed in the United States of America.

10 11 12 13 14 15 071/046 04 03 02 01 00



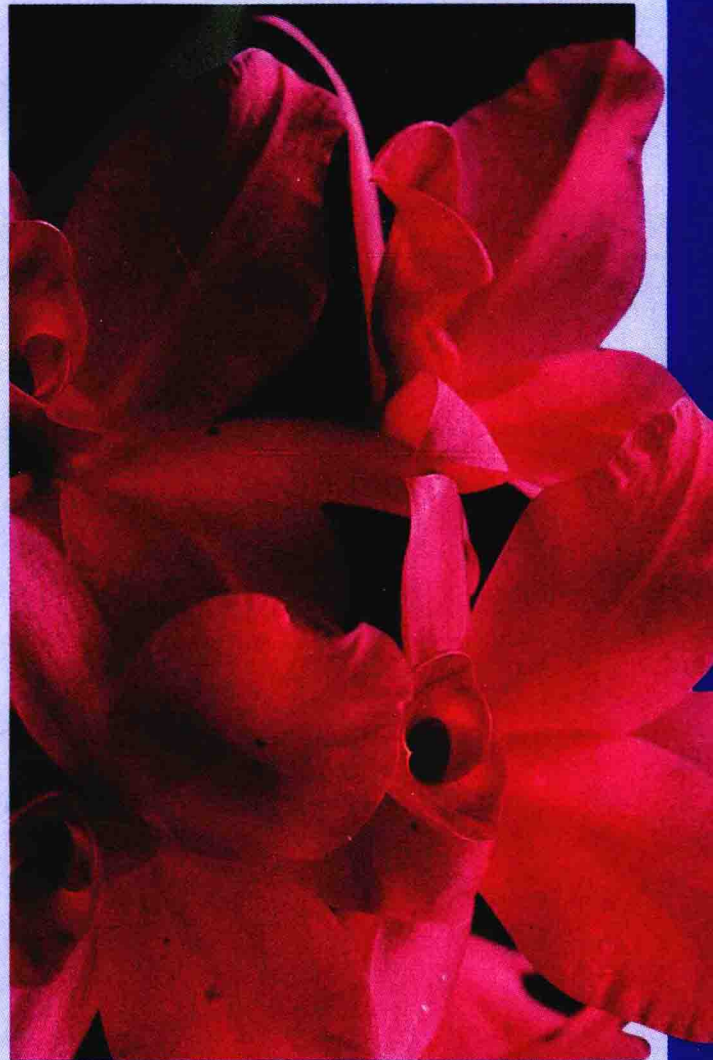
**TECHNOLOGY**

Computers in Biology	47
The View from on High	109
Clean Water	153
Scanning the Mind	185
Natural Fiber—Natural Color	209
Frozen in Time	233
Collecting the Sun	257
Replacement Skin	279
A Rose Is a Rose—Or is it?	305
Communication and Computers	475
Computers and Cladistics	499
Helping Nature Help Us	529
Growing Plants Without Soil	679
Marine Biologists and the Battle Against Birth Defects	709
Sunscreens from Coral	737
Superglue from the Sea	757
Milking Spiders	783
Guide Dogs Help Disabled	919
Hip-replacement Surgery	947



# Contents in Brief

<b>Unit 7</b>	<b>PLANTS</b>	<b>580</b>
24	What Is a Plant?	582
25	Ferns and Gymnosperms	604
26	Flowering Plants	630
27	Reproduction in Flowering Plants	654
<b>Unit 8</b>	<b>INVERTEBRATES</b>	<b>688</b>
28	What Is an Animal?	690
29	Sponges, Cnidarians, Flatworms, and Roundworms	712
30	Mollusks and Segmented Worms	740
31	Arthropods	760
32	Echinoderms and Invertebrate Chordates	786
<b>Unit 9</b>	<b>VERTEBRATES</b>	<b>806</b>
33	Fishes and Amphibians	808
34	Reptiles and Birds	834
35	Mammals	868
36	Animal Behavior	894
<b>Unit 10</b>	<b>HUMAN BIOLOGY</b>	<b>922</b>
37	Protection, Support, and Locomotion	924
38	Digestion and Nutrition	950
39	Respiration, Circulation, and Excretion	974
40	The Nervous System and the Effects of Drugs	1000
41	Reproduction and Development	1036
42	Immunity from Diseases	1066
<b>Epilogue</b>		
43	Biology and the Future	1094
<b>APPENDICES</b>		<b>1120</b>
<b>SKILL HANDBOOK</b>		<b>1133</b>
<b>GLOSSARY</b>		<b>1149</b>
<b>INDEX</b>		<b>1168</b>



# Contents

## UNIT

### 1

### What Is Biology?

2

#### Chapter 1

#### Biology: The Science of Life 4

- 1.1 What Is Biology? 6
- 1.2 What Is Life? 12

#### Chapter 2

#### Scientific Methods in Biology 24

- 2.1 Problem-Solving Methods  
in Biology 26
- 2.2 The Nature of Biology 41



## UNIT

### 2

### Ecology

50

#### Chapter 3

#### Principles of Ecology 52

- 3.1 Organisms and Their  
Environments 54
- 3.2 How Organisms Interact 64

#### Chapter 4

#### Community Distribution 82

- 4.1 Homeostasis in Communities 84
- 4.2 Biomes 91

#### Chapter 5

#### Population Biology 112

- 5.1 Population Dynamics 114
- 5.2 Human Population Growth 124

#### Chapter 6

#### Wise Use of Our Resources 132

- 6.1 Effects of Human Activities  
on Our Resources 134
- 6.2 Maintaining the Natural  
Balance 140

# Contents



## UNIT

### 3

## The Life of Cells

156

### Chapter 7

#### The Chemistry of Life

158

- 7.1 Elements and Atoms 160
- 7.2 Interactions of Matter 164
- 7.3 Life Substances 176

### Chapter 8

#### A View of the Cell

188

- 8.1 The Discovery of Cells 190
- 8.2 Eukaryotic Cell Structure 196

### Chapter 9

#### Homeostasis and the Plasma Membrane

214

- 9.1 The Plasma Membrane 216
- 9.2 Cellular Transport 223

### Chapter 10

#### Energy in a Cell

236

- 10.1 ATP: Energy in a Molecule 238
- 10.2 Photosynthesis: Trapping Energy 242
- 10.3 Getting Energy to Make ATP 250

### Chapter 11

#### Cell Reproduction

260

- 11.1 Cell Growth and Reproduction 262
- 11.2 Control of the Cell Cycle 276



# Contents

## UNIT

### 4

### Genetics

282

#### Chapter 12

##### Mendel and Meiosis 284

- 12.1 Mendel's Laws of Heredity 286
- 12.2 Meiosis 298

#### Chapter 13

##### Genes and Chromosomes 308

- 13.1 DNA: The Molecule of Heredity 310
- 13.2 From DNA to Protein 316
- 13.3 Genetic Changes 324

#### Chapter 14

##### Patterns of Heredity 332

- 14.1 When Heredity Follows Different Rules 334
- 14.2 Applied Genetics 344

#### Chapter 15

##### Human Heredity 354

- 15.1 Simple Mendelian Inheritance of Human Traits 356
- 15.2 Complex Inheritance of Human Traits 363

#### Chapter 16

##### DNA Technology 374

- 16.1 Recombinant DNA Technology 376
- 16.2 The Human Genome 386



## UNIT

### 5

### Evolution

394

#### Chapter 17

##### The History of Life 396

- 17.1 The Record of Life 398
- 17.2 The Origin of Life 410

#### Chapter 18

##### Evolution 422

- 18.1 Natural Selection and the Evidence for Evolution 424
- 18.2 Mechanisms of Evolution 435

#### Chapter 19

##### Human Evolution 452

- 19.1 Primate Adaptation and Evolution 454
- 19.2 Human Origins 463

# Contents

## UNIT

### 6

## The Diversity of Life 478

### Chapter 20

<b>Organizing Life</b>	<b>480</b>
20.1 Classification	482
20.2 The Five Kingdoms	490

### Chapter 21

<b>Viruses and Monerans</b>	<b>502</b>
21.1 Viruses	504
21.2 Monerans	512

### Chapter 22

<b>Protists</b>	<b>532</b>
22.1 The World of Protists	534
22.2 Algae: Plantlike Protists	542
22.3 Funguslike Protists	551

### Chapter 23

<b>Fungi</b>	<b>558</b>
23.1 The Life of Fungi	560
23.2 The Diversity of Fungi	566

## UNIT

### 7

## Plants 580

### Chapter 24

<b>What Is a Plant?</b>	<b>582</b>
24.1 Adapting to Life on Land	584
24.2 Bryophytes	594

### Chapter 25

<b>Ferns and Gymnosperms</b>	<b>604</b>
25.1 Seedless Vascular Plants	606
25.2 Gymnosperms	613

### Chapter 26

<b>Flowering Plants</b>	<b>630</b>
26.1 What Is an Angiosperm?	632
26.2 Angiosperm Structures and Functions	638

### Chapter 27

<b>Reproduction in Flowering Plants</b>	<b>654</b>
27.1 What Is a Flower?	656
27.2 Flowers and Reproduction	669



# Contents

## UNIT

# 8

## Invertebrates

688

### Chapter 28

What Is an Animal? 690

28.1 Typical Animal Characteristics 692

28.2 Body Plans and Adaptations 701

### Chapter 29

Sponges, Cnidarians, Flatworms, and Roundworms 712

29.1 Sponges 714

29.2 Cnidarians 718

29.3 Flatworms 727

29.4 Roundworms 734

### Chapter 30

Mollusks and Segmented Worms 740

30.1 Mollusks 742

30.2 Segmented Worms 750

### Chapter 31

Arthropods 760

31.1 Characteristics of Arthropods 762

31.2 The Diversity of Arthropods 772

### Chapter 32

Echinoderms and Invertebrate Chordates 786

32.1 Echinoderms 788

32.2 Invertebrate Chordates 797



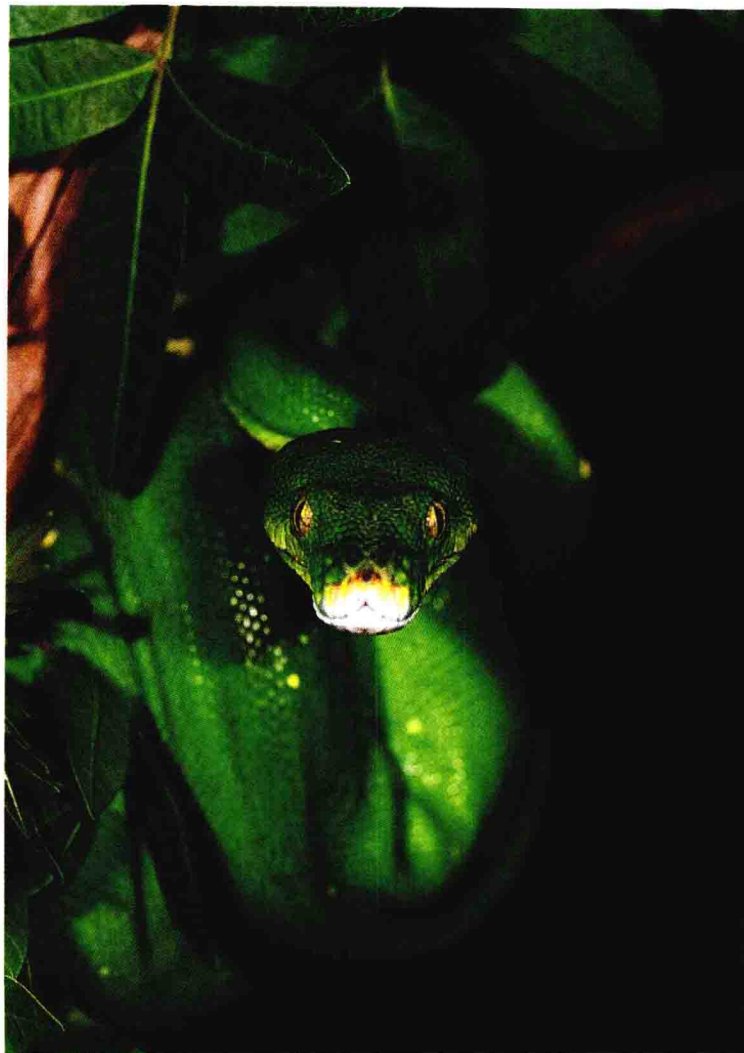
# Contents

## UNIT

# 9

## Vertebrates

<b>Chapter 33</b>	<b>806</b>	<b>Chapter 35</b>	
<b>Fishes and Amphibians</b>		<b>Mammals</b>	<b>868</b>
33.1 Fishes	810	35.1 Mammal Characteristics	870
33.2 Amphibians	820	35.2 The Diversity of Mammals	882
<b>Chapter 34</b>		<b>Chapter 36</b>	
<b>Reptiles and Birds</b>	<b>834</b>	<b>Animal Behavior</b>	<b>894</b>
34.1 Reptiles	836	36.1 Innate Behavior	896
34.2 Birds	846	36.2 Learned Behavior	907



# Contents

## UNIT

# 10 Human Biology

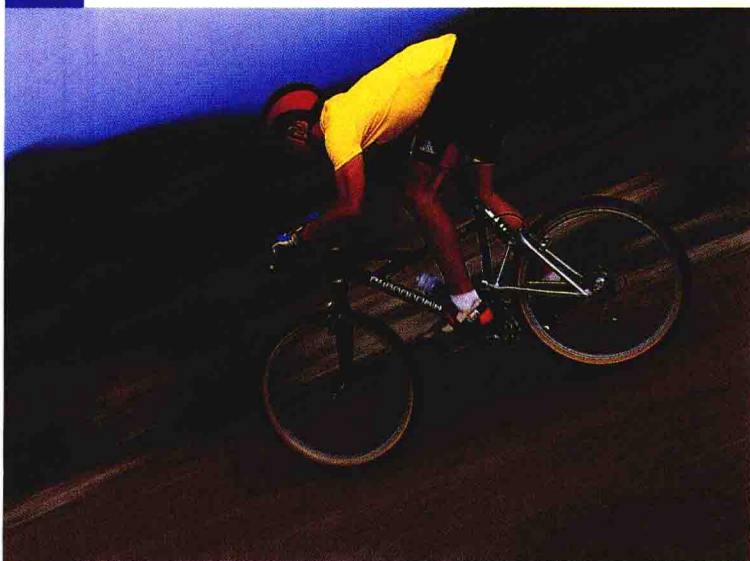
922

### Chapter 37

#### Protection, Support, and Locomotion

924

- 37.1 Skin: The Body's Protection 926
- 37.2 Bones: The Body's Support 932
- 37.3 Muscles for Locomotion 938



### Chapter 38

#### Digestion and Nutrition

950

- 38.1 Following Digestion of a Meal 952
- 38.2 The Control of Digestion and Homeostasis 959
- 38.3 Nutrition 963

### Chapter 39

#### Respiration, Circulation, and Excretion

974

- 39.1 The Respiratory System 976
- 39.2 The Circulatory System 981
- 39.3 The Urinary System 993

### Chapter 40

#### The Nervous System and the Effects of Drugs

1000

- 40.1 The Nervous System 1002
- 40.2 The Senses 1011
- 40.3 The Effects of Drugs on the Body 1017

### Chapter 41

#### Reproduction and Development

1036

- 41.1 Human Reproductive Systems 1038
- 41.2 Development Before Birth 1048
- 41.3 Birth, Growth, and Aging 1056

### Chapter 42

#### Immunity from Diseases

1066

- 42.1 The Nature of Disease 1068
- 42.2 Defense Against Infectious Diseases 1076

## Epilogue

### Chapter 43

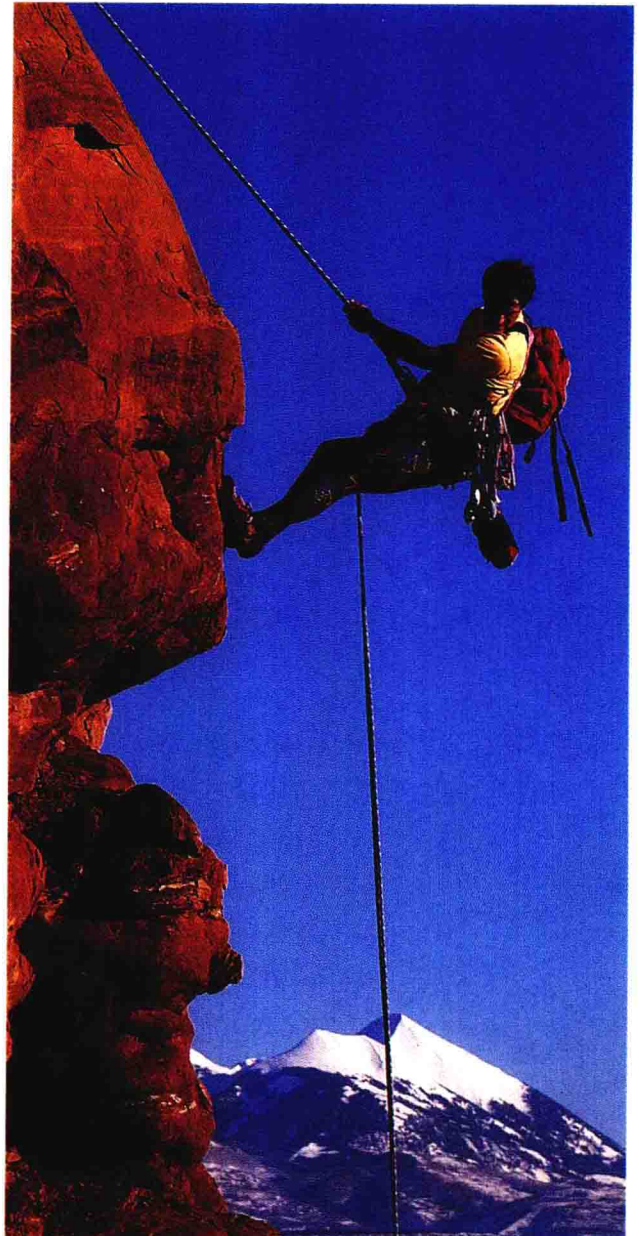
#### Biology and the Future

1094

- 43.1 Biology: The Dynamics of Life 1096
- 43.2 Technology and Society: Keeping the Balance 1108

# Contents

<b>Appendices</b>	<b>1120</b>	<b>Glossary</b>	<b>1149</b>
A. The Five-Kingdom Classification	1121	<b>Index</b>	<b>1168</b>
B. Origins of Scientific Terms	1124	<b>Credits</b>	<b>1184</b>
C. Safety in the Laboratory	1128		
D. The Periodic Table	1130		
E. SI Measurement	1132		
<b>Skill Handbook</b>	<b>1133</b>		
<b>Thinking Critically</b>			
Observing and Inferring	1134		
Comparing and Contrasting	1134		
Recognizing Cause and Effect	1135		
Interpreting Scientific Illustrations	1135		
Calculating Magnification	1136		
<b>Practicing Scientific Methods</b>			
Care and Use of the Microscope	1137		
Making a Wet Mount Slide	1138		
Measuring in SI	1138		
Forming a Hypothesis	1141		
Designing an Experiment	1141		
Separating and Controlling Variables	1142		
<b>Organizing Information</b>			
Classifying	1143		
Sequencing	1143		
Concept Mapping	1144		
Making and Using Tables	1146		
Making and Using Graphs	1146		

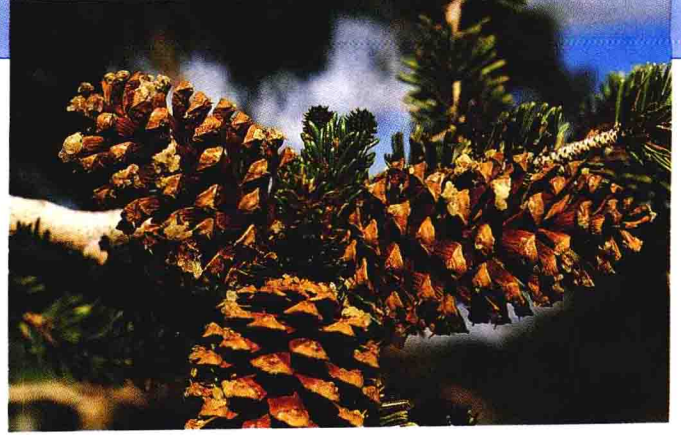


# BioLabs

*Working in the lab is often the most enjoyable part of biology. BIOLABS give you an opportunity to act like a biologist and develop your own plans for studying a question or problem. Whether you're designing experiments or following well-tested procedures, you'll have fun doing these lab activities.*

## Chapter

1	<b>Design Your Own Experiment:</b> How does temperature affect a living thing?	18
2	<b>Design Your Own Experiment:</b> How does fertilizer affect early plant development?	36
3	<b>Design Your Own Experiment:</b> How can one population affect another?	66
4	<b>Design Your Own Experiment:</b> Do abiotic factors affect succession in a puddle community?	88
5	Population Growth in <i>Paramecium</i>	116
6	Degrading Time of Packing Materials	150
7	<b>Design Your Own Experiment:</b> Does temperature affect an enzyme reaction?	182
8	Sizing Cells and Cell Structures	206
9	<b>Design Your Own Experiment:</b> Are plastic bags selectively permeable?	218
10	<b>Design Your Own Experiment:</b> What factors influence photosynthesis?	246
11	The Time for the Cell Cycle	274
12	<b>Design Your Own Experiment:</b> How can phenotypes and genotypes of plants be determined?	292
13	RNA Transcription	320
14	<b>Design Your Own Experiment:</b> What is the pattern of cytoplasmic inheritance?	340
15	Constructing Pedigrees to Trace Heredity	366
16	Modeling Recombinant DNA	380
17	Making Microspheres	416
18	Natural Selection and Allelic Frequency	442
19	Comparing Skulls of Three Primates	466
20	Making a Dichotomous Key	496
21	<b>Design Your Own Experiment:</b> How sensitive are bacteria to antibiotics?	518



## Chapter

22	<b>Design Your Own Experiment:</b> How do <i>Paramecium</i> and <i>Euglena</i> respond to light?	544
23	<b>Design Your Own Experiment:</b> Does temperature affect the metabolic activity of yeast?	572
24	Alternation of Generations in Mosses	598
25	<b>Design Your Own Experiment:</b> How can you make a key for identifying conifers?	622
26	Growth of Stems	646
27	Examining the Structure of a Flower	662
28	<b>Design Your Own Experiment:</b> What is an animal?	696
29	How Planarians Respond to Stimuli	730
30	<b>Design Your Own Experiment:</b> How do earthworms respond to their environment?	754
31	<b>Design Your Own Experiment:</b> Do flowers produce insect repellents?	768
32	Comparing Sea Urchins and Lancelets	798
33	Development of Frog Eggs	824
34	<b>Design Your Own Experiment:</b> What is the ideal length and width for a bird's tail?	850
35	<b>Design Your Own Experiment:</b> Is blubber a good insulator?	876
36	<b>Design Your Own Experiment:</b> What makes a good feeding puppet for sandhill crane chicks?	910
37	<b>Design Your Own Experiment:</b> Does fatigue affect the ability to do work?	940
38	Testing for Nutrients in Foods	968
39	Measuring Respiration	978
40	<b>Design Your Own Experiment:</b> What drugs affect the heart rate of <i>Daphnia</i> ?	1020
41	Average Growth Rate in Humans	1058
42	AIDS and Its Effect on the Immune Response	1086



# MiniLabs

*Do you often ask how, what, or why about the living world around you? Sometimes it takes just a little time to find out the answers for yourself. These short activities can be tried on your own at home or with help from a teacher at school. When you're feeling inquisitive, try a MINILAB.*

## Chapter

2	How can you use inductive reasoning?	30
	How do you decide which paper towel to buy?	42
3	How can you measure water loss by plants?	57
	What type of symbiosis is found in a lichen?	69
4	How can you create a closed ecosystem?	86
	How much humus is in your soil?	103
5	How fast do populations use resources?	118
	How does the population density of weeds in an area affect other plants?	121
6	Can you observe particulates from car exhaust?	141
	What pollutants do you have at home?	149
7	How does liquid soap affect the surface tension of water?	168
	How can you determine the pH of common household items?	173
8	What do cork cells look like?	191
	Which parts of a sperm cell are visible in a transmission electron micrograph?	204
9	How many contractile vacuoles does a paramecium contain?	227
	What happens to plant cells in a hypertonic solution?	229
10	Do aquariums contain measurable amounts of CO <sub>2</sub> ?	253
	Will apple juice ferment?	255

## Chapter

11	How quickly does diffusion occur?	263
	What happens to the surface area of a cube as the volume increases?	264
12	How do you cross plants?	287
	How does sample size affect results?	294
13	What does DNA look like?	311
	How do gene mutations affect proteins?	326
14	How is leaf width inherited?	338
	How can you illustrate a pedigree?	346
15	What colors and patterns can you detect in eyes?	364
	How is height inherited in humans?	365
16	Why does recombinant DNA require palindromes?	378
	How is splicing wires similar to splicing genes?	379
17	How do scientists interpret fossils?	400
	How can you plot the appearance of organisms on a time line?	408
18	How variable are traits?	426
	How is camouflage an adaptive advantage?	429
19	How useful are primate adaptations?	457
	How do human proteins compare with those of other primates?	471
20	How can you classify seeds?	488
	How is a dichotomous key used?	495
21	What does a bacteriophage look like?	506
	What are the shapes of bacteria?	514