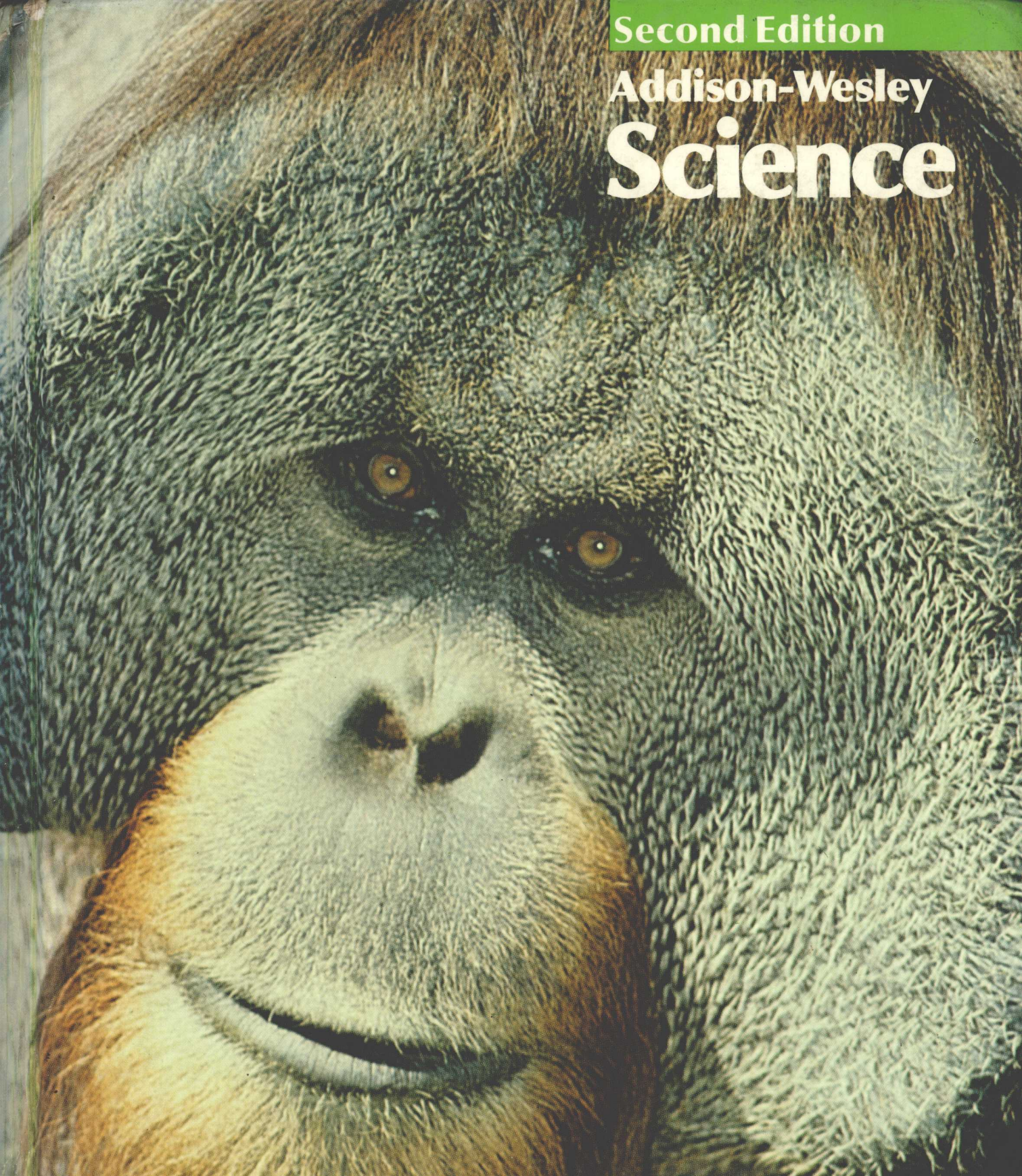


Second Edition

Addison-Wesley
Science



Second Edition

Addison-Wesley Science

0802464



30802464

Authors

Charles Barman, Ed.D.

Associate Professor of Science Education
Indiana University, Indianapolis

Michael DiSpezio, M.A.

Science Department Chairman
Cape Cod Academy, Massachusetts

Vallie Guthrie, Ph.D.

Director, Greensboro Area Math
and Science Education Center
North Carolina Agricultural and Technical
State University

Michael B. Leyden, Ed.D.

Professor of Education
Eastern Illinois University

Sheryl Mercier, M.A.

Elementary Science Specialist
Fresno Unified School District,
California

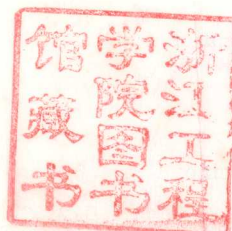
Karen Ostlund, Ph.D.

Associate Professor of Education
Southwest Texas State University

Reading Consultant

Bonnie Armbruster, Ph.D.

Associate Professor
Center for the Study of Reading and
Department of Elementary and Early
Childhood Education
University of Illinois



◆ **Addison-Wesley Publishing Company**

Menlo Park, California • Reading, Massachusetts • New York
Don Mills, Ontario • Wokingham, England • Amsterdam • Bonn
Sydney • Singapore • Tokyo • Madrid • San Juan

Content Consultants

Thomas H. Callen II, Ph.D.
Program Resource Manager
Albert Einstein Planetarium
National Air and Space Museum
Smithsonian Institution

Jym Ganahl
Chief Meteorologist
WCMH-TV, Columbus, Ohio

Edwin Harper, Ph.D.
Associate Professor of Biochemistry
Indiana University School of Medicine

Robert W. Hinds, Ph.D.
Professor of Geology
Slippery Rock University, Pennsylvania

Chelcie Liu, Ph.D.
Physics Instructor
City College of San Francisco

Luis A. Martinez-Perez, Ph.D.
Associate Professor of Science Education
Florida International University

Linda Medleau, D.V.M., M.S.
Assistant Professor
Department of Small Animal Medicine
University of Georgia

Larry K. Pickering, M.D.
Professor of Pediatrics and Director of
Pediatric Infectious Diseases
University of Texas Medical School at Houston

Linda Sanford
Curator of Youth Education
Morton Arboretum, Lisle, Illinois

Lydia Young, Ph.D.
Senior Engineer
Perkin-Elmer Electron Beam Technology
Hayward, California

Critical Thinking Consultant

Robert Swartz, Ph.D.
Director of Critical and Creative Thinking Program
University of Massachusetts, Boston

Safety Consultant

Jay A. Young, Ph.D.
Chemical Consultant
Silver Spring, Maryland

Testing Consultant

David P. Butts, Ph.D.
Aderhold Distinguished Professor
College of Education
University of Georgia

Cover Photos: Orangutans

Front Cover: E. P. I. Nancy Adams/Tom Stack & Associates

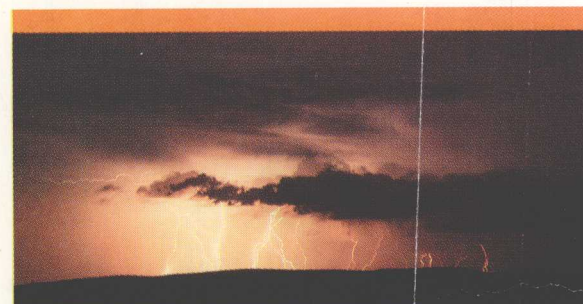
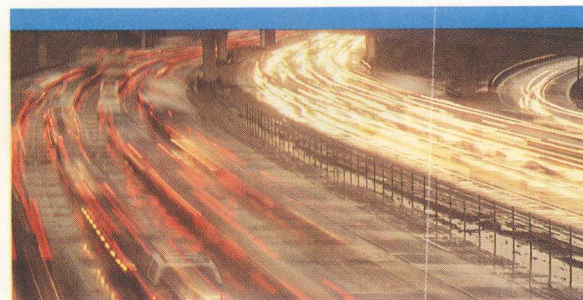
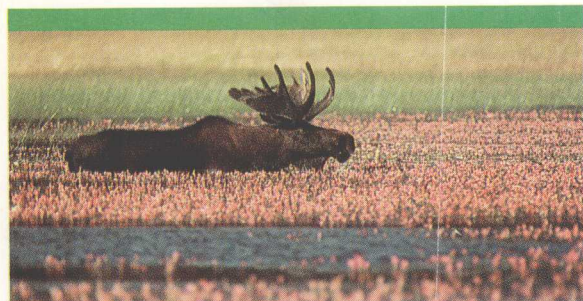
Back Cover: Kenneth W. Fink/Bruce Coleman Inc.

Copyright © 1992 by Addison-Wesley Publishing Company, Inc.
All rights reserved. No part of this publication may be reproduced,
stored in a retrieval system, or transmitted, in any form or by any means,
electronic, mechanical, photocopying, recording, or otherwise, without
the prior written permission of the publisher. Printed in the United States
of America. Published simultaneously in Canada.

ISBN 0-201-28715-3

2345678910 - VH - 9594939291

Contents



Reading Science	6
Thinking About Science	8
Doing What Scientists Do	10
Safety in Science	12

Unit 1 Life Science 14

Chapter 1	
Animals Without Backbones	16
1 The Simplest Animals	18
2 Shell and Spiny Animals	24
3 Joint-Legged Animals	28

Chapter 2	
Animals with Backbones	40
1 Fish	42
2 Amphibians and Reptiles	46
3 Birds and Mammals	52

Chapter 3 Food from Plants	64
1 Plants Make Food	66
2 Energy from Food	74

Chapter 4 Ecosystems	82
1 Living in an Environment	84
2 Cycles in Ecosystems	90
3 Changing Ecosystems	94

Chapter 5 The Earth's Biomes	102
1 Climate and Life	104
2 Biomes on Earth	110
3 Water Ecosystems	120

Ask a Scientist	130
Careers & Science	131
Thinking Critically	132

Unit 2 Physical Science 134

Chapter 6

The Structure of Matter 136

- 1 Matter 138
- 2 Combining Elements 144
- 3 Different Mixtures 150

Chapter 7 Sound 160

- 1 How Sound Travels 162
- 2 Why Sounds Are Different 168
- 3 Making and Hearing Sounds 174

Chapter 8 Motion 184

- 1 Speed of Motion 186
- 2 Laws of Motion 190
- 3 Gravity and Friction 196

Chapter 9 Energy Resources 206

- 1 Today's Energy Resources 208
- 2 Future Energy Resources 216
- 3 Energy Conservation 222

Ask a Scientist 230

Careers & Science 231

Thinking Critically 232

Unit 3 Earth Science 234

Chapter 10

The Earth's History 236

- 1 Reading the Rock Record 238
- 2 Millions of Years Ago 246

Chapter 11

Oceans of the Earth 258

- 1 The Ocean Water 260
- 2 The Ocean Bottom 268
- 3 Ocean Resources 276

Chapter 12

The Changing Weather 284

- 1 The Causes of Weather 286
- 2 Storms 292

Chapter 13 Motion in Space 306

- 1 Movements of the Earth 308
- 2 Movements of the Moon 316

Ask a Scientist 328

Careers & Science 329

Thinking Critically 330

Unit 4 Health Science 332

Chapter 14 Transport Systems 334

- 1 The Circulatory System 336
- 2 The Respiratory System 344
- 3 Care of Transport Systems 348

Chapter 15

Drugs and Your Health 356

- 1 Helpful Drugs 358
- 2 Harmful Drugs 364
- 3 Drug Choice and Health 370

Ask a Scientist 378

Careers & Science 379

Thinking Critically 380

Data Bank 382

Science Fair 386

Double Check 388

Glossary 403

Index 410

Second Edition

Addison-Wesley Science

802464



30802464

Authors

Charles Barman, Ed.D.

Associate Professor of Science Education
Indiana University, Indianapolis

Michael DiSpezio, M.A.

Science Department Chairman
Cape Cod Academy, Massachusetts

Vallie Guthrie, Ph.D.

Director, Greensboro Area Math
and Science Education Center
North Carolina Agricultural and Technical
State University

Michael B. Leyden, Ed.D.

Professor of Education
Eastern Illinois University

Sheryl Mercier, M.A.

Elementary Science Specialist
Fresno Unified School District,
California

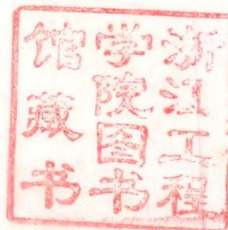
Karen Ostlund, Ph.D.

Associate Professor of Education
Southwest Texas State University

Reading Consultant

Bonnie Armbruster, Ph.D.

Associate Professor
Center for the Study of Reading and
Department of Elementary and Early
Childhood Education
University of Illinois



Addison-Wesley Publishing Company

Menlo Park, California • Reading, Massachusetts • New York
Don Mills, Ontario • Wokingham, England • Amsterdam • Bonn
Sydney • Singapore • Tokyo • Madrid • San Juan

Content Consultants

Thomas H. Callen II, Ph.D.
Program Resource Manager
Albert Einstein Planetarium
National Air and Space Museum
Smithsonian Institution

Jym Ganahl
Chief Meteorologist
WCMH-TV, Columbus, Ohio

Edwin Harper, Ph.D.
Associate Professor of Biochemistry
Indiana University School of Medicine

Robert W. Hinds, Ph.D.
Professor of Geology
Slippery Rock University, Pennsylvania

Chelcie Liu, Ph.D.
Physics Instructor
City College of San Francisco

Luis A. Martinez-Perez, Ph.D.
Associate Professor of Science Education
Florida International University

Linda Medleau, D.V.M., M.S.
Assistant Professor
Department of Small Animal Medicine
University of Georgia

Larry K. Pickering, M.D.
Professor of Pediatrics and Director of
Pediatric Infectious Diseases
University of Texas Medical School at Houston

Linda Sanford
Curator of Youth Education
Morton Arboretum, Lisle, Illinois

Lydia Young, Ph.D.
Senior Engineer
Perkin-Elmer Electron Beam Technology
Hayward, California

Critical Thinking Consultant

Robert Swartz, Ph.D.
Director of Critical and Creative Thinking Program
University of Massachusetts, Boston

Safety Consultant

Jay A. Young, Ph.D.
Chemical Consultant
Silver Spring, Maryland

Testing Consultant

David P. Butts, Ph.D.
Aderhold Distinguished Professor
College of Education
University of Georgia

Cover Photos: Orangutans

Front Cover: E. P. I. Nancy Adams/Tom Stack & Associates

Back Cover: Kenneth W. Fink/Bruce Coleman Inc.

Copyright © 1992 by Addison-Wesley Publishing Company, Inc.
All rights reserved. No part of this publication may be reproduced,
stored in a retrieval system, or transmitted, in any form or by any means,
electronic, mechanical, photocopying, recording, or otherwise, without
the prior written permission of the publisher. Printed in the United States
of America. Published simultaneously in Canada.

ISBN 0-201-28715-3

2345678910 - VH - 9594939291

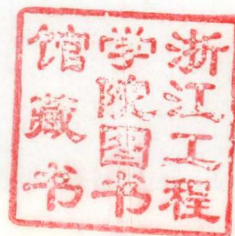
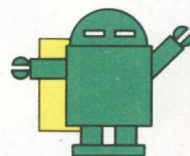
Getting to Know *Addison-Wesley Science*

This book has been made to help you learn science. It has many features to make learning science exciting. It will answer some questions you have and probably start you thinking about some new ones. Explore your book. See what features you can find.

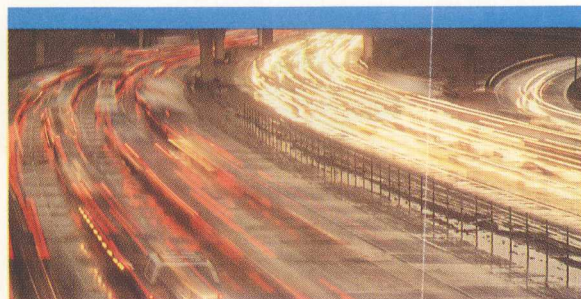
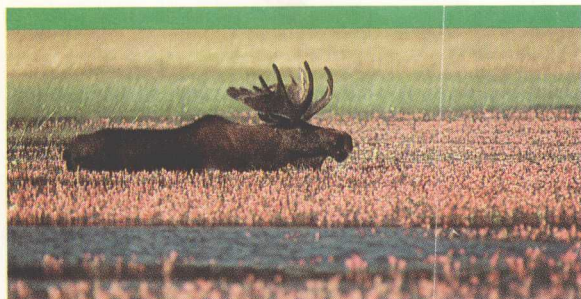
To make the most of *Addison-Wesley Science*, take some time to learn how it is organized. That will make science easier to understand. Find the table of contents. Notice that this book is divided into four units. Each unit focuses on a certain kind of science: life, physical, earth, or health science. Each unit consists of several chapters. Each chapter is made up of a few lessons.

Pick a chapter that sounds interesting. What unit is it a part of? Turn to the beginning of that unit. Each unit begins with a preview of the chapters in it. Read what your chapter is about.

Now turn to the chapter. At the beginning of each chapter, you will find a yellow box. It tells you what you will learn in the chapter. What can you look forward to learning when your class studies your chapter?



Contents



Reading Science	6
Thinking About Science	8
Doing What Scientists Do	10
Safety in Science	12

Unit 1 Life Science 14

Chapter 1 16

Animals Without Backbones 16

1 The Simplest Animals	18
2 Shell and Spiny Animals	24
3 Joint-Legged Animals	28

Chapter 2 40

Animals with Backbones 40

1 Fish	42
2 Amphibians and Reptiles	46
3 Birds and Mammals	52

Chapter 3 Food from Plants 64

1 Plants Make Food	66
2 Energy from Food	74

Chapter 4 Ecosystems 82

1 Living in an Environment	84
2 Cycles in Ecosystems	90
3 Changing Ecosystems	94

Chapter 5 The Earth's Biomes 102

1 Climate and Life	104
2 Biomes on Earth	110
3 Water Ecosystems	120

Ask a Scientist	130
-----------------	-----

Careers & Science	131
-------------------	-----

Thinking Critically	132
---------------------	-----

Unit 2 Physical Science 134

Chapter 6

The Structure of Matter 136

- 1 Matter 138
- 2 Combining Elements 144
- 3 Different Mixtures 150

Chapter 7 Sound 160

- 1 How Sound Travels 162
- 2 Why Sounds Are Different 168
- 3 Making and Hearing Sounds 174

Chapter 8 Motion 184

- 1 Speed of Motion 186
- 2 Laws of Motion 190
- 3 Gravity and Friction 196

Chapter 9 Energy Resources 206

- 1 Today's Energy Resources 208
- 2 Future Energy Resources 216
- 3 Energy Conservation 222

Ask a Scientist 230

Careers & Science 231

Thinking Critically 232

Unit 3 Earth Science 234

Chapter 10

The Earth's History 236

- 1 Reading the Rock Record 238
- 2 Millions of Years Ago 246

Chapter 11

Oceans of the Earth 258

- 1 The Ocean Water 260
- 2 The Ocean Bottom 268
- 3 Ocean Resources 276

Chapter 12

The Changing Weather 284

- 1 The Causes of Weather 286
- 2 Storms 292

Chapter 13 Motion in Space 306

- 1 Movements of the Earth 308
- 2 Movements of the Moon 316

Ask a Scientist 328

Careers & Science 329

Thinking Critically 330

Unit 4 Health Science 332

Chapter 14 Transport Systems 334

- 1 The Circulatory System 336
- 2 The Respiratory System 344
- 3 Care of Transport Systems 348

Chapter 15

Drugs and Your Health 356

- 1 Helpful Drugs 358
- 2 Harmful Drugs 364
- 3 Drug Choice and Health 370

Ask a Scientist 378

Careers & Science 379

Thinking Critically 380

Data Bank 382

Science Fair 386

Double Check 388

Glossary 403

Index 410

Reading Science

Reading a science textbook is not like reading a story. You may not need to work hard to understand a story. You may not need to remember a story for a long time, either. But when you read science, you are reading to learn something new. You will need to think about what you read. You will also need to remember as much as you can. You may just *read* a story. But you will need to *study* your science textbook.

Here is a way to help you study. Following these steps will help you understand science.

1 Skim

Skim means look over. Read all the titles in the chapter. Notice the science words. Look at the pictures. These things will tell you what the chapter is about.

Take just a few minutes to skim. Then, think of what you already know about the topic.

Each lesson begins with a purpose question in the margin. After you read the lesson, you should be able to answer the question.

A lesson is divided into sections. Each section begins with a title in dark print.

Within a section, important science words are in dark print. You need to remember what each science word means.

Lesson 2

Shell and Spiny Animals

■ How are mollusks and spiny-skinned animals alike and different?

What things do the three animals in the pictures have in common? They may look very different, but they are all alike in certain ways. The garden snail, the scallop, and the octopus are all invertebrates. They belong to a group of invertebrates called **mollusks**. A mollusk is an animal with a soft body, usually covered by a shell. Like other groups of invertebrates, mollusks have bodies that are alike in certain ways.

Mollusks Like segmented worms, mollusks have two body openings. Look for other common body parts in the drawing on page 25. Mollusks also have a heart, blood vessels, and digestive system. Unlike worms, many mollusks have eyes, a shell, and a "foot."

You may have seen garden snails creeping along on their bellies. Actually, this belly is a thick, muscular foot. Most mollusks have a foot. They use the foot to crawl, dig, and catch food.



Snail



Scallop



Octopus

2 Read

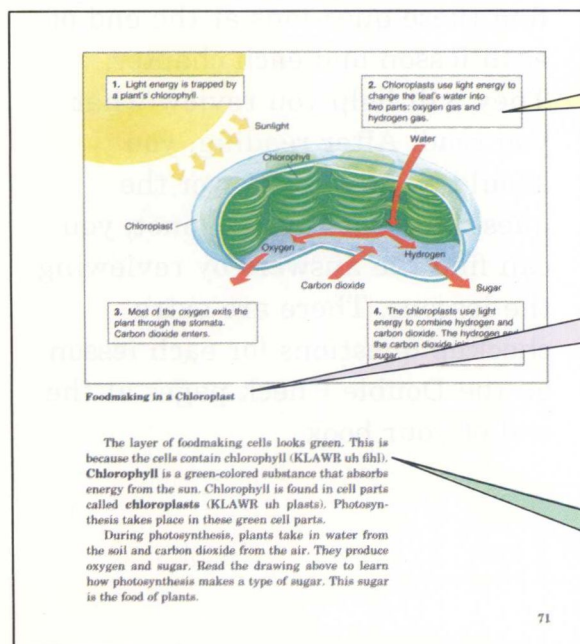
Carefully read one section at a time. Try to find the main ideas. Learn what the science words mean. Try to pronounce the new words that are respelled. Look at all the pictures. Read the labels and captions.

If you do not understand what you are reading, try this. Read the confusing part plus what came right before it again. If that does not help, read on a little. If you still do not understand, ask for help.

3 Review

Review means look back over. Read all the section titles again. Look at the pictures again, too. Make sure you can define all the science words in your own words.

Review the chapter at least twice. First, review each lesson right after you finish reading it. Then review the whole chapter a day or two later. The more times you review, the more you will remember.



Some drawings have labels. The labels tell what is happening in the drawings.

All of the pictures have captions. A caption is a title or description. Sometimes it is a question to make you think about the picture.

Some words are respelled. The respelling tells you how to pronounce the word that comes before it.

Thinking About Science

As you study science, you will probably ask a lot of questions. You will have to answer a lot of questions, too. You will run into some questions as you read. When you do, you should stop and think about the answers. Some captions are questions. You should think about the answers when you look at the pictures.

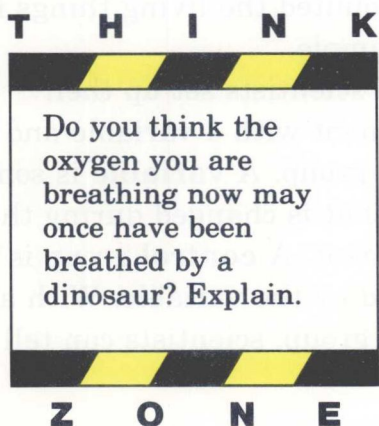
Knowing more about questions will help you be a better question answerer. Here is one way to look at questions. Think about where you will find the answers.



You may find the answers in this book. Two kinds of questions in *Addison-Wesley Science* are answered in the book.

1. **Purpose question** Read the question in the margin before you read a lesson. It tells you the purpose of the lesson. Read the question again after you have read the lesson. If you cannot answer the question, you should read the lesson again.
2. **Checkup questions** You will find these questions at the end of each lesson and each chapter. They will help you review what you read. After reading, you should be able to answer the questions, but if you cannot, you can find the answers by reviewing the lessons. There are extra checkup questions for each lesson on the Double Check pages at the end of your book.

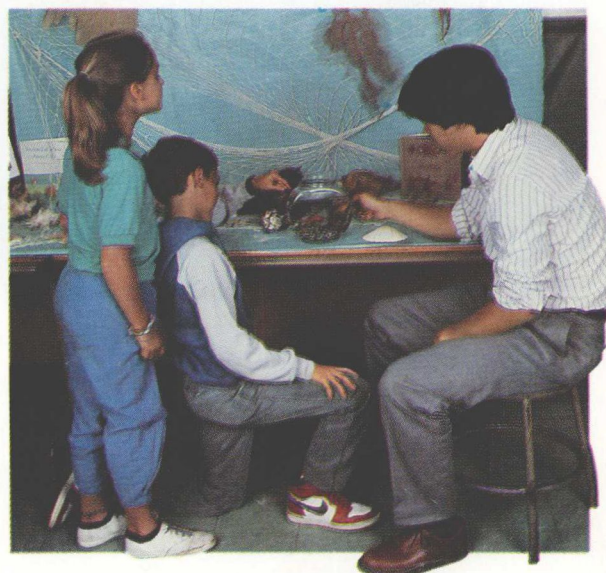
Four other kinds of questions in *Addison-Wesley Science* are not answered entirely in this book.



1. **Think Zone** appears once in each lesson. It is always in the margin.
2. **Think Critically!** always appears at the end of each lesson.
3. **Think About It** appears in the Technology Today at the end of each chapter.
4. **Problem Solving** always appears at the end of each chapter.

You will need to use some information from the lesson to answer these questions. But you will also have to think about what you know. These questions may not have only one right answer. So do not worry about whether your answer is right. Just say what you think.

As you come across questions in *Addison-Wesley Science*, think about where you will find the answers. Remember that you may find some answers in this book and a lot in your head! Always answer questions in your own words. That will help you remember what you have learned.



Doing What Scientists Do

Scientists ask a lot of questions. Sometimes the answers are not in any book. There may not be anyone who knows the answers. Then scientists use scientific methods to find answers.

A factory wants to dump waste water into a nearby bay. The waste water is clean, but it is hot. Two scientists were asked, "Will the factory's waste water harm living things in a bay?" The pictures show the scientific methods they used to find the answer.

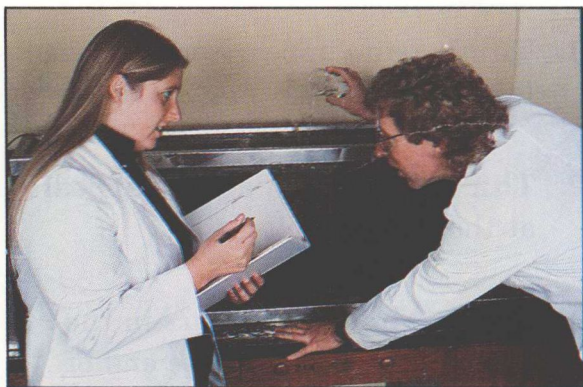
Before the experiment, the scientists measured the temperatures of the bay and waste water. Then they collected several samples of each. They counted the living things in each sample.

The scientists set up their experiment with a variable and a control group. A **variable** is some factor that is changed during the experiment. A **control** group is not changed by the variable. With a control group, scientists can tell



1 Problem

Will the factory's waste water harm living things in the bay? The scientists guessed that it would. This guess is called a hypothesis.



2 Experimenting

The scientists added waste water to three bay samples and nothing to three others. This last group was the control. The variable was waste water.

whether the variable caused the results or if the results would have happened anyway. In this experiment, the scientists could not conclude that the hot waste water was harmful to fish if fish had died in the control group, too.

Sometimes finding the answer to a question brings up other questions. For example, how hot does the water have to be to harm fish? How would you solve this problem? What would your variable be?

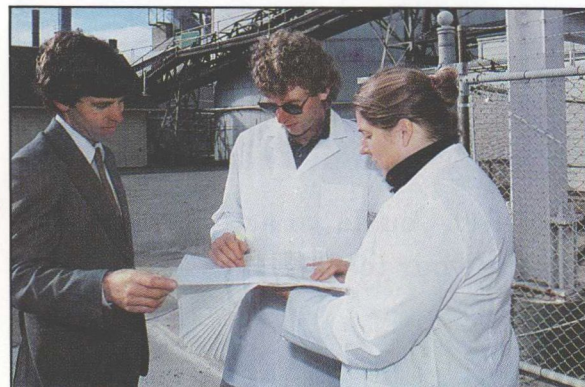
You probably wonder about many things. You are like a scientist. You may have questions that are not answered in your textbook. You may find the answers in other books. Sometimes your teacher will know the answers. Or you might ask a scientist. Sometimes you can use scientific methods to find the answers.

Whenever you think about science, do not be afraid to ask questions. Then think about where you can find the answers.



3 Recording Data

The scientists counted the living things in each sample every day for a week after the experiment. They kept track of all this data.



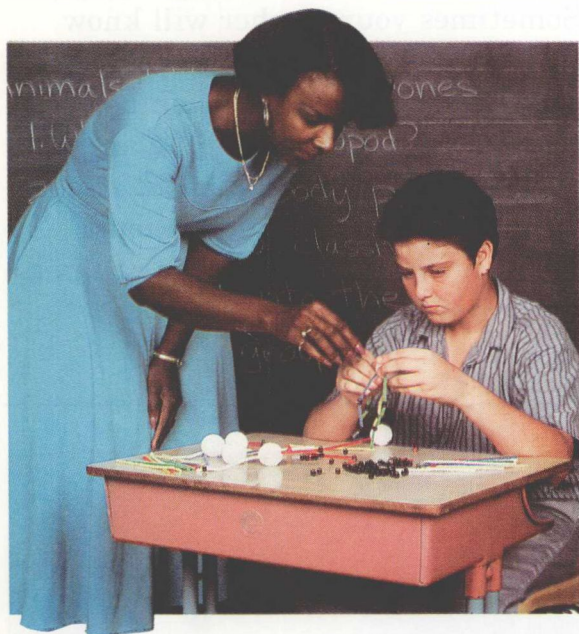
4 Drawing Conclusions

The scientists found no changes to the control group but a few dead fish in the other group. They concluded that the waste water was harmful to fish.

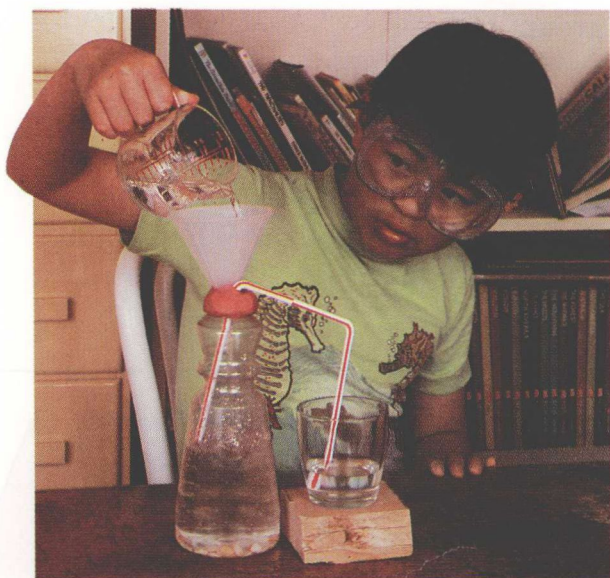
Safety in Science

 **WEAR GOGGLES!**

Scientists are careful when they work. You need to be careful in science, too. Here are some safety tips to remember.



1. Before you do an activity, make sure your teacher says it is okay to do it.
2. Read all the directions before you start. If you do not understand them, ask your teacher for help.



3. As you do the activity, follow the directions carefully. Tell your teacher if you make a mistake.