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BIOLOGY

AN EVERYDAY EXPERIENCE

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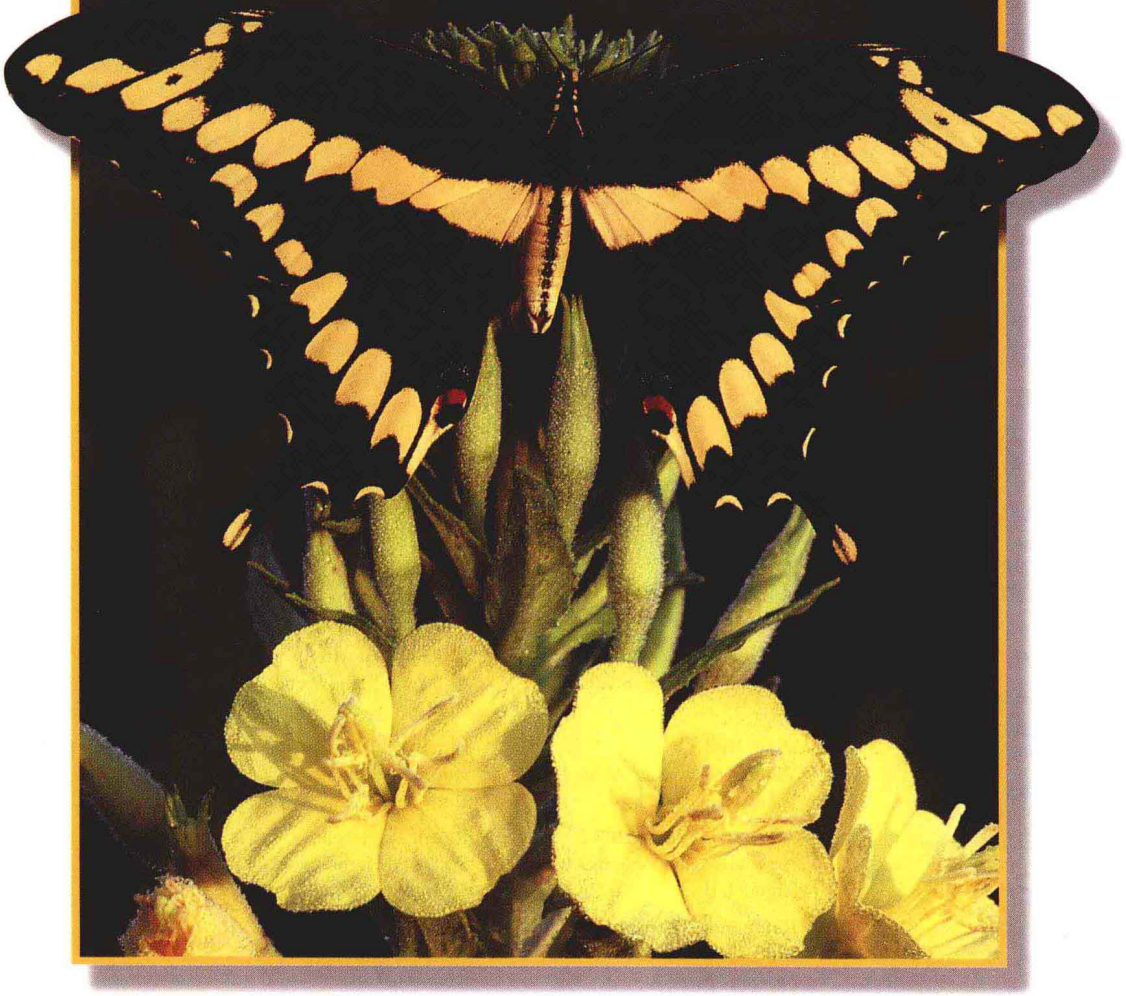

Albert Kaskel Paul J. Hummer, Jr. Lucy Daniel

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A MERRILL BIOLOGY PROGRAM

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Biology and You

Biology *is* an Everyday Experience

This is your life. Biology is not just another science class. It's a subject you already know well, because it's about life.

It's 10:00, do you know where your dinner is? Every day, you eat and drink to stay alive. Where do your food and water come from, and how does your body use them?

Appreciate the environment—it's the only one you have. Trees don't just stand there, they help supply you with oxygen, prevent soil erosion, and make some of your food.

The wonderful world of technology. The field of medicine is closely tied to biology. Advances in medical technology may present you with difficult decisions.

Biology happens! Biology is about every living thing in your world and the relationships among them. The more you learn about biology, the more you will realize that biology *is* an everyday experience.

Using *Biology: An Everyday Experience*— *a quick tour of your textbook*

Biology: An Everyday Experience not only presents information, it asks thought-provoking questions. Labs bring the text to life as you use scientific methods to solve problems. You will see how biology affects you as a consumer and learn about careers in biology. Take time now to see what your textbook offers.

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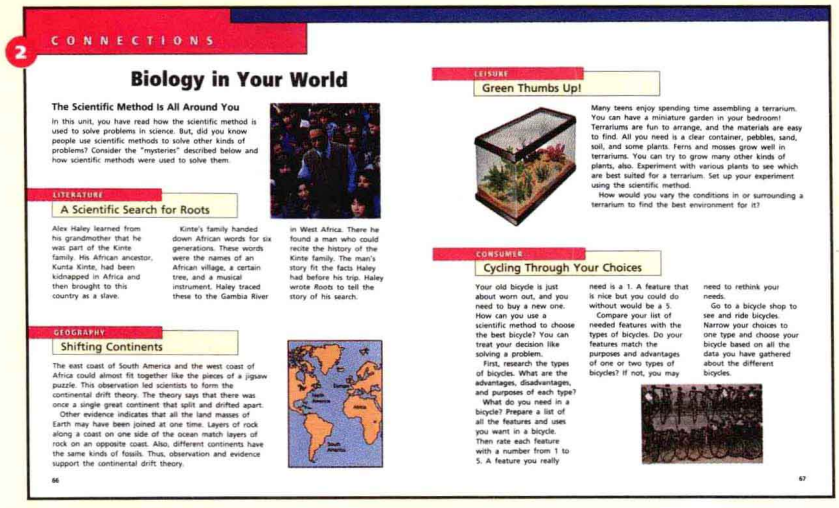
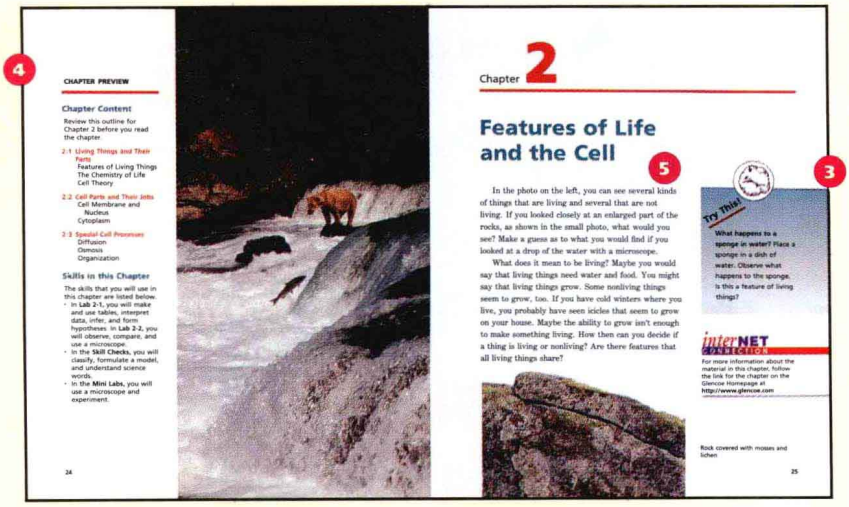
from beginning to end, you'll see how biology connects to the world around you

1 What would happen if. . . there were no mosquitoes? Have you ever thought about it? Each unit opener begins with a thought-provoking question like this. The unit introduction then shows you how even small differences in the relationships between living things can change your world in dramatic ways. So, what would happen if there were no mosquitoes? Read the opener to Unit 8 to find out.



2 What do biology and Alex Haley have in common? A lot, as you'll discover when you read the close to Unit 1. Each unit is closed with mini essays that make connections between biology and consumer issues, leisure activities, art, literature, and history.

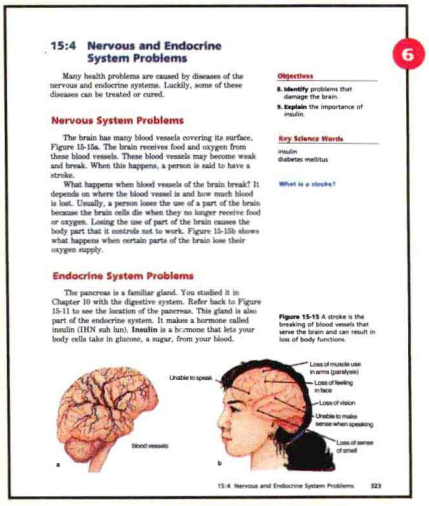
clearly organized to get you started and keep you going



3 Try This!
Each chapter begins with an easy activity to do right at your desk, or at home. It gets you ready for learning.

4 Listed for you in the **Chapter Preview** are the chapter contents. They tell what topics are covered and how they are organized. Study this before you dive into the chapter material. Also listed are skills that you will practice. A skill is something you get better at with practice. *Biology: An Everyday Experience* gives you all the practice you need to master skills that are important for success in biology, your other classes, and your everyday life.

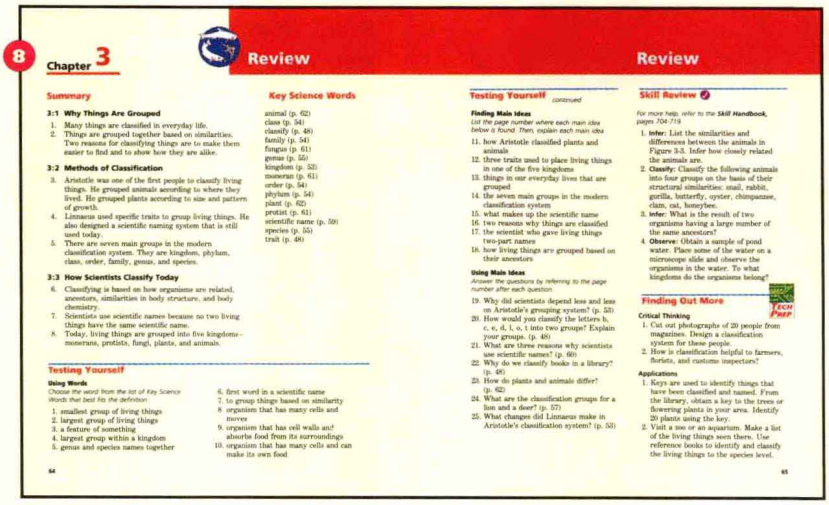
5 When was the last time you thought about what it means to be alive? Do small living things have the same life processes as large ones? These are the kinds of ideas you will ponder as you read the chapter openers. Each chapter opener has two photographs that are talked about in the introduction. As you read, think about what the photos mean and how they relate to the chapter.



6 Chapters are organized into two to four numbered sections. Each numbered section has several subsections that have red headings. The Objectives at the beginning of the numbered section tell you what major topics you'll be covering and what you should expect to learn about them. The Key Science Words are also listed in the order in which they appear in the section.

lots of ways to help you master important ideas and skills

7 Here's a chance to sharpen your skills. The **Skill Checks** and **Mini Labs** are good ways to practice skills. Each skill exercise requires only pencil and paper or simple materials you can find at home or get from your teacher. If you have trouble with the skill exercises in the Skill Checks or Mini Labs, there is a reference to the **Skill Handbook** at the back of the book. Here, you can find complete information about a particular skill.


Chapter 3 Review

Summary

3:1 Why Things Are Grouped
1. Many things are classified in everyday life.
2. Things are grouped together based on similarities. Two reasons for classifying things are to make them easier to find and to show how they are alike.

3:2 Methods of Classification
3. Aristotle was one of the first people to classify living things. He grouped animals according to where they lived. He grouped plants according to size and pattern of growth.
4. Linnaeus used specific traits to group living things. He also designed a scientific naming system that is still used today.
5. There are seven main groups in the modern classification system. They are kingdom, phylum, class, order, family, genus, and species.

3:3 How Scientists Classify Today
6. Classifying is based on how organisms are related, ancestors, similarities in body structure, and body chemistry.
7. Scientists use scientific names because no two living things have the same scientific name.
8. Today, living things are grouped into five kingdoms – monerans, protists, fungi, plants, and animals.

Key Science Words
animal (p. 62)
class (p. 54)
classify (p. 48)
family (p. 54)
fungus (p. 61)
genus (p. 55)
kingdom (p. 52)
moneran (p. 61)
order (p. 54)
phylum (p. 54)
plant (p. 62)
protist (p. 61)
scientific name (p. 59)
species (p. 55)
trait (p. 48)

Testing Yourself
Using Words
Choose the word from the list of Key Science Words that best fits the definition.
1. smallest group of living things
2. largest group of living things
3. a feature of something
4. largest group within a kingdom
5. genus and species names together
6. first word in a scientific name
7. to group things based on similarity
8. organism that has many cells and moves
9. organism that has cell walls and absorbs food from its surroundings
10. organism that has many cells and can make its own food

Testing Yourself continued
Finding Main Ideas
List the page number where each main idea below is found. Then, explain each main idea
11. how Aristotle classified plants and animals
12. three traits used to place living things in one of the five kingdoms
13. things in our everyday lives that are grouped
14. the seven main groups in the modern classification system
15. what makes up the scientific name
16. two reasons why things are classified
17. the scientist who gave living things two-part names
18. how living things are grouped based on their ancestors

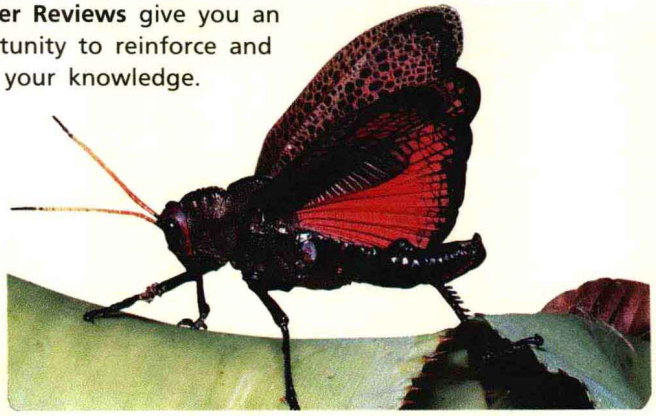
Using Main Ideas
Answer the questions by referring to the page number after each question.
19. Why did scientists depend less and less on Aristotle's grouping system? (p. 53)
20. How would you classify the letters b, c, e, d, l, o, t into two groups? Explain your groups. (p. 48)
21. What are three reasons why scientists use scientific names? (p. 60)
22. Why do we classify books in a library? (p. 48)
23. How do plants and animals differ? (p. 62)
24. What are the classification groups for a lion and a deer? (p. 57)
25. What changes did Linnaeus make in Aristotle's classification system? (p. 53)

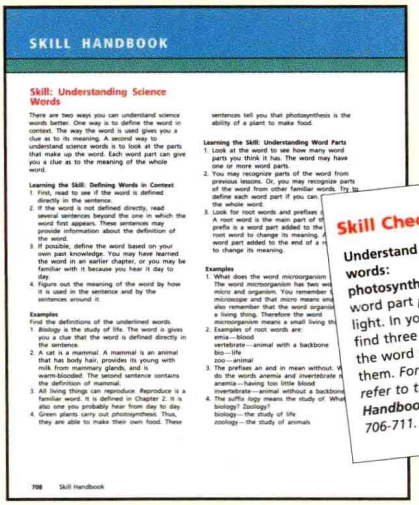
Skill Review
For more help, refer to the Skill Handbook, pages 704-719.
1. Infer: List the similarities and differences between the animals in Figure 3-3. Infer how closely related the animals are.
2. Classify: Classify the following animals into four groups on the basis of their structural similarities: snail, rabbit, gorilla, butterfly, oyster, chimpanzee, clam, cat, honeybee.
3. Infer: What is the result of two organisms having a large number of the same ancestors?
4. Observe: Obtain a sample of pond water. Place some of the water on a microscope slide and observe the organisms in the water. To what kingdoms do the organisms belong?

Finding Out More
Critical Thinking
1. Cut out photographs of 20 people from magazines. Design a classification system for these people.
2. How is classification helpful to farmers, florists, and customs inspectors?

Applications
1. Keys are used to identify things that have been classified and named. From the library, obtain a key to the trees or flowering plants in your area. Identify 20 plants using the key.
2. Visit a zoo or an aquarium. Make a list of the living things seen there. Use reference books to identify and classify the living things to the species level.

8 **Chapter Reviews** give you an opportunity to reinforce and apply your knowledge.




SKILL HANDBOOK

Skill: Understanding Science Words

There are two ways you can understand science words better. One way is to define the word in context. The way the word is used gives you a clue as to its meaning. A second way to understand science words is to look at the parts that make up the word. Each word part can give you a clue as to the meaning of the whole word.

Learning the Skill: Defining Words in Context
1. First, read to see if the word is defined directly in the sentence.
2. If the word is not defined directly, read several sentences beyond the one in which the word first appears. These sentences may provide information about the definition of the word.
3. If possible, define the word based on your own past knowledge. You may have learned the word in an earlier chapter, or you may be familiar with it because you hear it day to day.
4. Figure out the meaning of the word by how it is used in the sentence and by the sentences around it.

Examples
Find the definitions of the underlined words.
1. *Biology* is the study of life. The word *is* gives you a clue that the word is defined directly in the sentence.
2. A cat is a mammal. A mammal is an animal that has body hair, provides its young with milk from mammary glands, and is warm-blooded. The second sentence contains the definition of mammal.
3. All living things can reproduce. Reproduce is a familiar word. It is defined in Chapter 2. It is also one you probably hear from day to day.
4. Green plants carry out photosynthesis. Thus, they are able to make their own food. These sentences tell you that photosynthesis is the ability of a plant to make food.

Learning the Skill: Understanding Word Parts
1. Look at the word to see how many word parts you think it has. The word may have one or more word parts.
2. You may recognize parts of the word from previous lessons. Or, you may recognize parts of the word from other familiar words. Try to define each word part if you can. Then define the whole word.
3. Look for root words and prefixes and suffixes. A root word is the main part of the word. A prefix is a word part added to the beginning of a root word to change its meaning. A suffix is a word part added to the end of a root word to change its meaning.

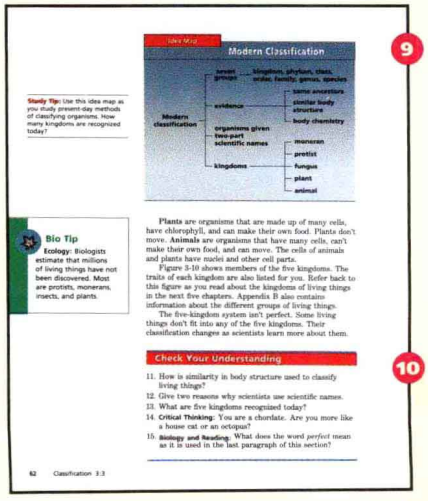
Examples
1. What does the word *microorganism* mean? The word microorganism has two word parts, *micro* and *organism*. You remember that a microscope and that micro means small. You also remember that the word organism means a living thing. Therefore the word microorganism means a small living thing.
2. Examples of root words are:
emia—blood
vertebrate—animal with a backbone
bio—life
zoo—animal
3. The prefixes an and in mean without. What do the words anemia and invertebrate mean?
anemia—having too little blood
invertebrate—animal without a backbone
4. The suffix *logy* means the study of. What is biology? Zoology?
biology—the study of life
zoology—the study of animals

708 Skill Handbook

Skill Check 7
Understand science words: photosynthesis. The word part *photo* means light. In your dictionary, find three words with the word part *photo* in them. *For more help, refer to the* ***Skill Handbook****, pages 706-711.*

9 If you have trouble remembering and understanding a lesson, help is on the way. Each major concept has an Idea Map that you can use as a study guide. Ideas are summarized in an easy-to-read format. The Idea Maps will help make your study of biology a success.

10 At the end of each major section are five **Check Your Understanding** questions. The first three questions reinforce what you have learned in the section. The fourth question challenges you to think critically about what you have read. The fifth question connects biology with reading, writing, or math.


Idea Map

Modern Classification

Modern classification
- seven groups: kingdom, phylum, class, order, family, genus, species
- evidence: same ancestors; similar body structure; body chemistry
- organisms given two-part scientific names
- kingdoms: moneran, protist, fungus, plant, animal

Study Tip: Use this idea map as you study present-day methods of classifying organisms. How many kingdoms are recognized today?

Bio Tip
Ecology: Biologists estimate that millions of living things have not been discovered. Most are protists, monerans, insects, and plants.

Plants are organisms that are made up of many cells, have chlorophyll, and can make their own food. Plants don't move. **Animals** are organisms that have many cells, can't make their own food, and can move. The cells of animals and plants have nuclei and other cell parts.

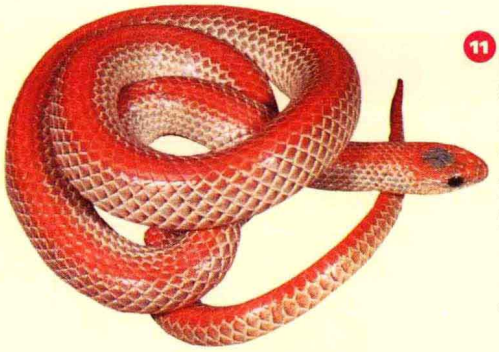
Figure 3-10 shows members of the five kingdoms. The traits of each kingdom are also listed for you. Refer back to this figure as you read about the kingdoms of living things in the next five chapters. Appendix B also contains information about the different groups of living things.

The five-kingdom system isn't perfect. Some living things don't fit into any of the five kingdoms. Their classification changes as scientists learn more about them.

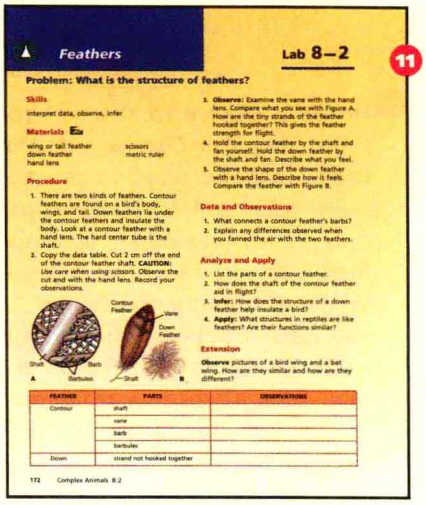
Check Your Understanding
11. How is similarity in body structure used to classify living things?
12. Give two reasons why scientists use scientific names.
13. What are five kingdoms recognized today?
14. Critical Thinking: You are a chordate. Are you more like a house cat or an octopus?
15. Biology and Reading: What does the word *perfect* mean as it is used in the last paragraph of this section?

62 Classification 3-3

really experience biology by observing, experimenting, asking questions



11 Every chapter has two step-by-step labs. Procedures are clear and easy to follow. Sample data tables are given to help you organize the information you collect. At the end of each lab are questions that help to reinforce what you learned in the lab. Doing a lab has never been so easy!



Feathers

Lab 8–2

Problem: What is the structure of feathers?

Skills

interpret data, observe, infer

Materials

wing or tail feather
down feather
hand lens
scissors
metric ruler

Procedure

1. There are two kinds of feathers. Contour feathers are found on a bird's body, wings, and tail. Down feathers lie under the contour feathers and insulate the body. Look at a contour feather with a hand lens. The hard center tube is the shaft.
2. Copy the data table. Cut 2 cm off the end of the contour feather shaft. **CAUTION:** *Use care when using scissors.* Observe the cut end with the hand lens. Record your observations.
3. **Observe:** Examine the vane with the hand lens. Compare what you see with Figure A. How are the tiny strands of the feather hooked together? This gives the feather strength for flight.
4. Hold the contour feather by the shaft and fan yourself. Hold the down feather by the shaft and fan. Describe what you feel.
5. Observe the shape of the down feather with a hand lens. Describe how it feels. Compare the feather with Figure B.

Data and Observations

1. What connects a contour feather's barbs?
2. Explain any differences observed when you fanned the air with the two feathers.

Analyze and Apply

1. List the parts of a contour feather.
2. How does the shaft of the contour feather aid in flight?
3. **Infer:** How does the structure of a down feather help insulate a bird?
4. **Apply:** What structures in reptiles are like feathers? Are their functions similar?

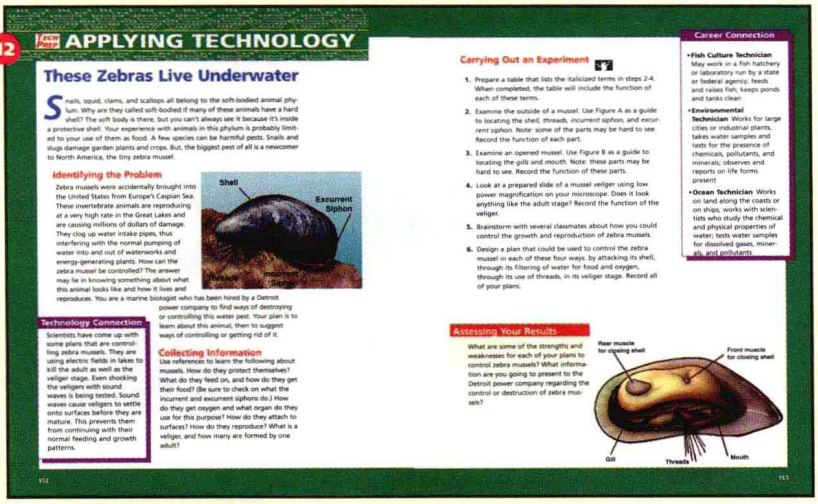
Extension

Observe pictures of a bird wing and a bat wing. How are they similar and how are they different?

FEATHER	PARTS	OBSERVATIONS
Contour	shaft	
	vane	
	barb	
	barbules	
Down	strand not hooked together	

172 Complex Animals 8-2

11



12 APPLYING TECHNOLOGY

These Zebras Live Underwater

Snails, squid, clams, and scallops all belong to the soft-bodied animal phylum. Why are they called soft-bodied if many of these animals have a hard shell? The soft body is there, but you can't always see it because it's inside a protective shell. Your experience with animals in this phylum is probably limited to your use of them as food. A few species can be harmful pests. Snails and slugs damage garden plants and crops. But, the biggest pest of all is a newcomer to North America, the tiny zebra mussel.

Identifying the Problem

Zebra mussels were accidentally brought into the United States from Europe's Caspian Sea. These invertebrate animals are reproducing at a very high rate in the Great Lakes and are causing millions of dollars of damage. They clog up water intake pipes, thus interfering with the normal pumping of water into and out of waterworks and energy-generating plants. How can the zebra mussel be controlled? The answer may lie in knowing something about what this animal looks like and how it lives and reproduces. You are a marine biologist who has been hired by a Detroit power company to find ways of destroying or controlling this water pest. Your plan is to learn about this animal, then to suggest ways of controlling or getting rid of it.

Shell
Excurrent Siphon

Technology Connection

Scientists have come up with some plans that are controlling zebra mussels. They are using electric fields in lakes to kill the adult as well as the veliger stage. Even shocking the veligers with sound waves is being tested. Sound waves cause veligers to settle onto surfaces before they are mature. This prevents them from continuing with their normal feeding and growth patterns.

Collecting Information

Use references to learn the following about mussels. How do they protect themselves? What do they feed on, and how do they get their food? (Be sure to check on what the incurrent and excurrent siphons do.) How do they get oxygen and what organ do they use for this purpose? How do they attach to surfaces? How do they reproduce? What is a veliger, and how many are formed by one adult?

Carrying Out an Experiment

1. Prepare a table that lists the italicized terms in steps 2-4. When completed, the table will include the function of each of these terms.
2. Examine the outside of a mussel. Use Figure A as a guide to locating the shell, *threads*, *incurrent siphon*, and *excurrent siphon*. Note: some of the parts may be hard to see. Record the function of each part.
3. Examine an opened mussel. Use Figure B as a guide to locating the *gills* and *mouth*. Note: these parts may be hard to see. Record the function of these parts.
4. Look at a prepared slide of a mussel *veliger* using low power magnification on your microscope. Does it look anything like the adult stage? Record the function of the veliger.
5. Brainstorm with several classmates about how you could control the growth and reproduction of zebra mussels.
6. Design a plan that could be used to control the zebra mussel in each of these four ways: by attacking its shell, through its filtering of water for food and oxygen, through its use of threads, in its veliger stage. Record all of your plans.

Career Connection

- **Fish Culture Technician** May work in a fish hatchery or laboratory run by a state or federal agency; feeds and raises fish, keeps ponds and tanks clean
- **Environmental Technician** Works for large cities or industrial plants; takes water samples and tests for the presence of chemicals, pollutants, and minerals; observes and reports on life forms present
- **Ocean Technician** Works on land along the coasts or on ships; works with scientists who study the chemical and physical properties of water; tests water samples for dissolved gases, minerals, and pollutants

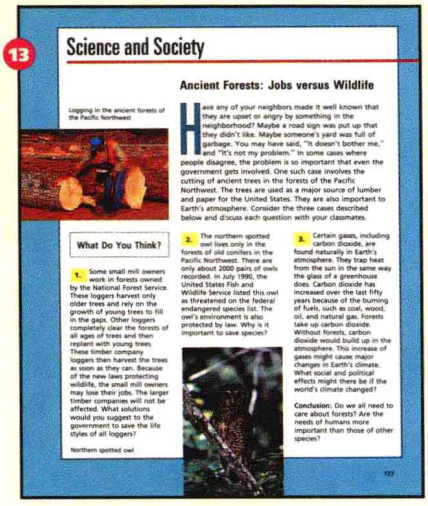
Assessing Your Results

What are some of the strengths and weaknesses for each of your plans to control zebra mussels? What information are you going to present to the Detroit power company regarding the control or destruction of zebra mussels?

Rear muscle for closing shell
Front muscle for closing shell
Gill
Threads
Mouth

12 Each unit has a two-page Applying Technology feature. Read the short background paragraph, do the activity, and read how it relates to technology and careers.

explore how biology impacts technology and news-making issues and offers career choices



13 Science and Society

Ancient Forests: Jobs versus Wildlife

Logging in the ancient forests of the Pacific Northwest

Have any of your neighbors made it well known that they are upset or angry by something in the neighborhood? Maybe a road sign was put up that they didn't like. Maybe someone's yard was full of garbage. You may have said, "It doesn't bother me," and "It's not my problem." In some cases where people disagree, the problem is so important that even the government gets involved. One such case involves the cutting of ancient trees in the forests of the Pacific Northwest. The trees are used as a major source of lumber and paper for the United States. They are also important to Earth's atmosphere. Consider the three cases described below and discuss each question with your classmates.

What Do You Think?

1. Some small mill owners work in forests owned by the National Forest Service. These loggers harvest only older trees and rely on the growth of young trees to fill in the gaps. Other loggers completely clear the forests of all ages of trees and then replant with young trees. These timber company loggers then harvest the trees as soon as they can. Because of the new laws protecting wildlife, the small mill owners may lose their jobs. The larger timber companies will not be affected. What solutions would you suggest to the government to save the life styles of all loggers?

2. The northern spotted owl lives only in the forests of old conifers in the Pacific Northwest. There are only about 2000 pairs of owls recorded. In July 1990, the United States Fish and Wildlife Service listed this owl as threatened on the federal endangered species list. The owl's environment is also protected by law. Why is it important to save species?

Northern spotted owl

3. Certain gases, including carbon dioxide, are found naturally in Earth's atmosphere. They trap heat from the sun in the same way the glass of a greenhouse does. Carbon dioxide has increased over the last fifty years because of the burning of fuels, such as coal, wood, oil, and natural gas. Forests take up carbon dioxide. Without forests, carbon dioxide would build up in the atmosphere. This increase of gases might cause major changes in Earth's climate. What social and political effects might there be if the world's climate changed?

Conclusion: Do we all need to care about forests? Are the needs of humans more important than those of other species?

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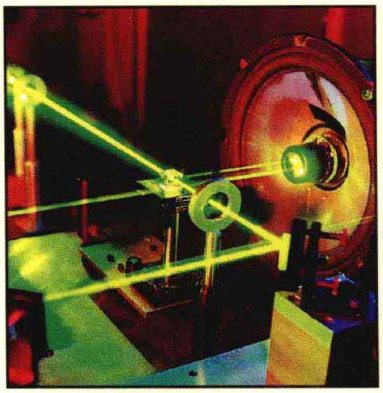
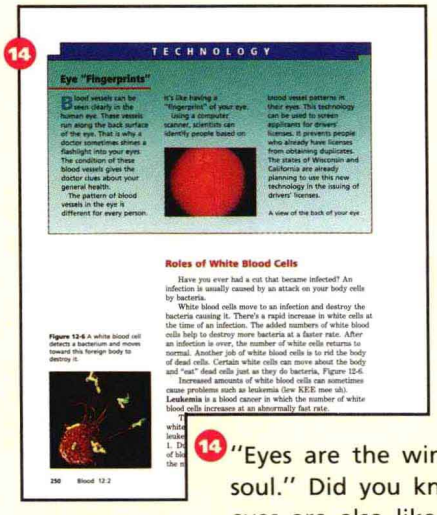
13 Are animal experiments necessary? Who decides which person in need of an organ transplant gets one? As you read the Science and Society features, you'll find that the answers to these and other questions are not so easy. The Science and Society features bring you closer to current issues and let you see the impact of technology on society. They prepare you for the day when you may need to participate in making decisions that affect your community and your environment.





14 TECHNOLOGY

Eye "Fingerprints"

Blood vessels can be seen clearly in the human eye. These vessels run along the back surface of the eye. That is why a doctor sometimes shines a flashlight into your eyes. The condition of these blood vessels gives the doctor clues about your general health.

The pattern of blood vessels in the eye is different for every person. It's like having a "fingerprint" of your eye. Using a computer scanner, scientists can identify people based on blood vessel patterns in their eyes. This technology can be used to screen applicants for drivers' licenses. It prevents people who already have licenses from obtaining duplicates. The states of Wisconsin and California are already planning to use this new technology in the issuing of drivers' licenses.

A view of the back of your eye

Roles of White Blood Cells

Have you ever had a cut that became infected? An infection is usually caused by an attack on your body cells by bacteria.

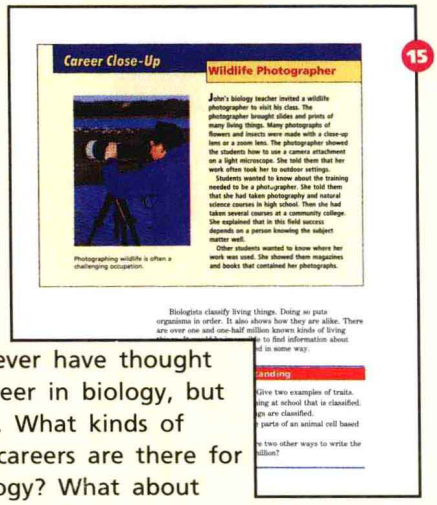
White blood cells move to an infection and destroy the bacteria causing it. There's a rapid increase in white cells at the time of an infection. The added numbers of white blood cells help to destroy more bacteria at a faster rate. After an infection is over, the number of white cells returns to normal. Another job of white blood cells is to rid the body of dead cells. Certain white cells can move about the body and "eat" dead cells just as they do bacteria, Figure 12-6.

Increased amounts of white blood cells can sometimes cause problems such as leukemia (lew KEE mee uh). **Leukemia** is a blood cancer in which the number of white blood cells increases at an abnormally fast rate.

Figure 12-6 A white blood cell detects a bacterium and moves toward this foreign body to destroy it.

250 Blood 12.2

14 "Eyes are the windows to the soul." Did you know that your eyes are also like fingerprints? The patterns made by the vessels in the back of your eye are unique and can be used to identify you. No other person has eyes like you. This and other recent discoveries appear in the Technology features. The Technology features tie together biology and applications of the most recent research in biology. They make biology meaningful to *you*.



15 Career Close-Up

Wildlife Photographer

Photographing wildlife is often a challenging occupation.

John's biology teacher invited a wildlife photographer to visit his class. The photographer brought slides and prints of many living things. Many photographs of flowers and insects were made with a close-up lens or a zoom lens. The photographer showed the students how to use a camera attachment on a light microscope. She told them that her work often took her to outdoor settings.

Students wanted to know about the training needed to be a photographer. She told them that she had taken photography and natural science courses in high school. Then she had taken several courses at a community college. She explained that in this field success depends on a person knowing the subject matter well.

Other students wanted to know where her work was used. She showed them magazines and books that contained her photographs.

Biologists classify living things. Doing so puts organisms in order. It also shows how they are alike. There are over one and one-half million known kinds of living to find information about ed in some way.

anding

Give two examples of traits. ing at school that is classified. ups are classified. parts of an animal cell based two other ways to write the illion?

15 You may never have thought about a career in biology, but think again. What kinds of interesting careers are there for you in biology? What about wildlife photography? How about being an athletic trainer? Each career feature focuses on one career, telling you the daily ins and outs of the job. Even if you want to work as soon as you graduate from high school, you'll find there are many careers that will let you do just that. Information about career training is given so that if you're interested, you can start planning now.

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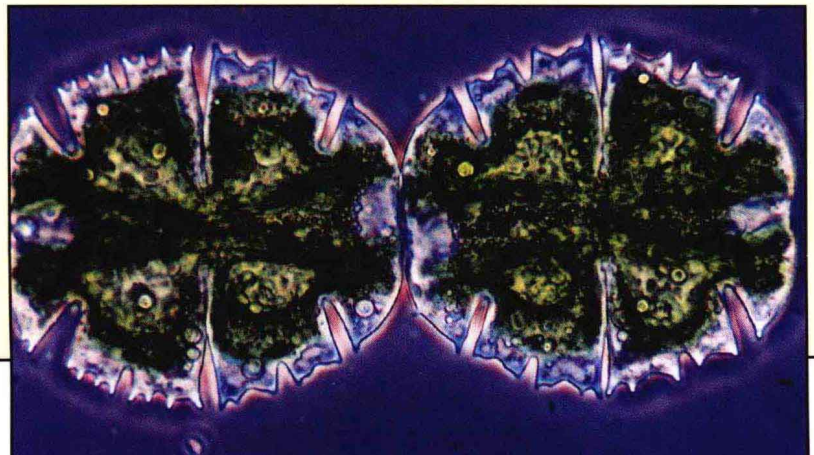

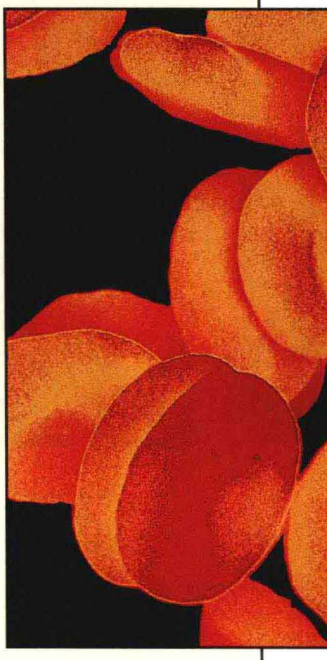

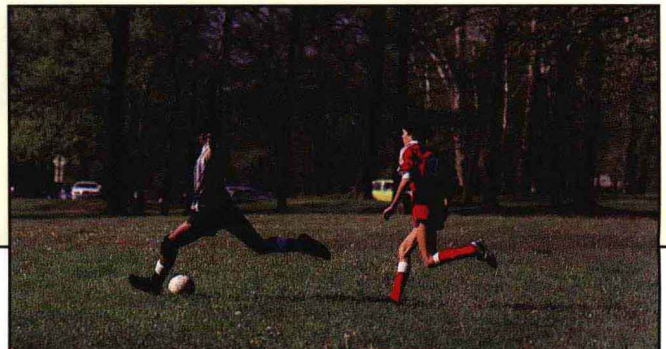

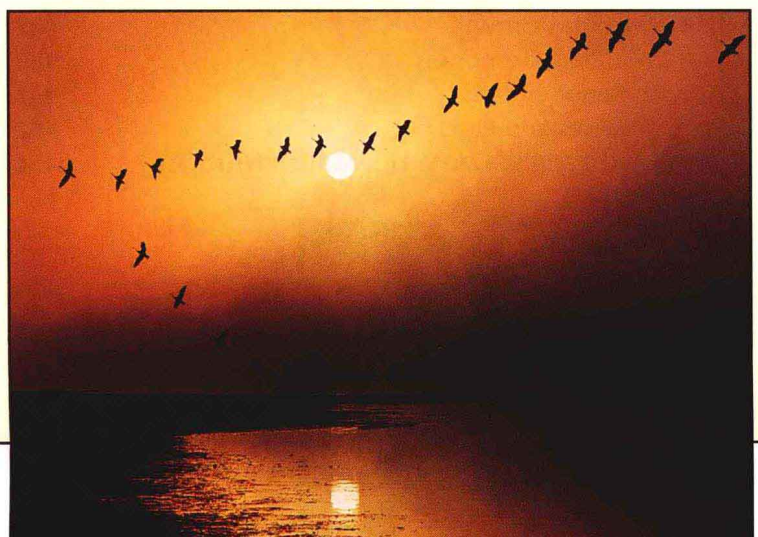

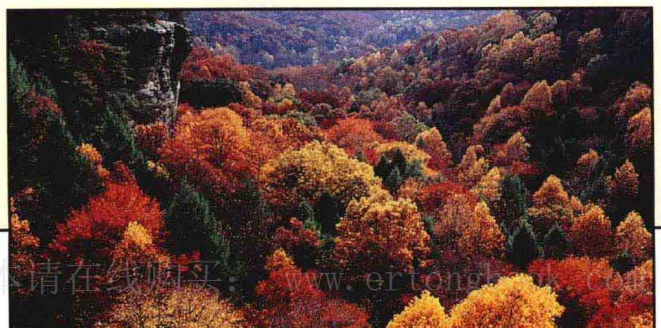

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