SCIENCE READERS

Lessons and Activities

Life Science

Table of Contents

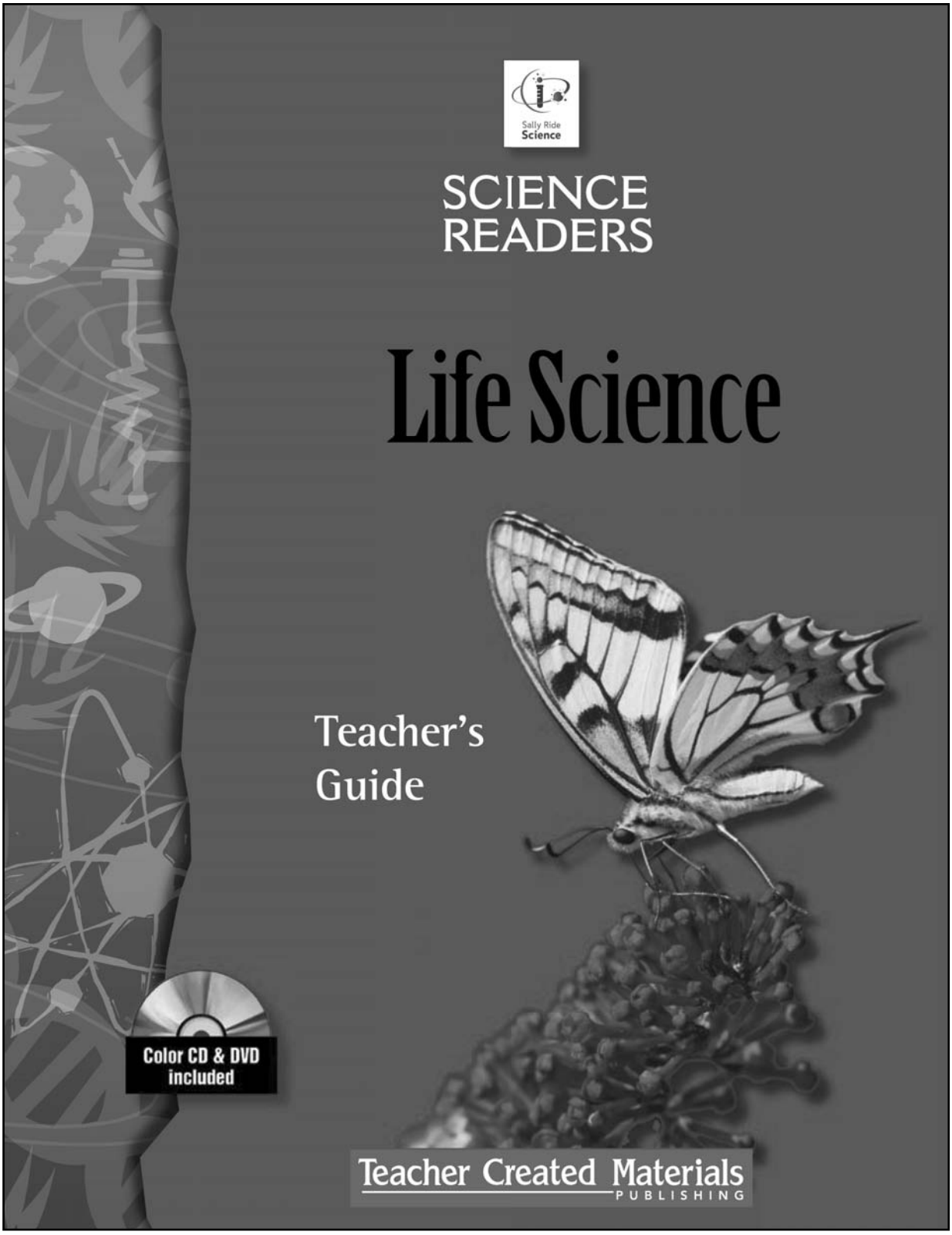
SCIENCE READERS

Life Science

Teacher's Guide

Color CD & DVD included

Teacher Created Materials



Authors
Jennifer Overend Prior, Ph.D.
and Kathleen Kopp, M.S. Ed.

Teacher Created Materials
PUBLISHING

Table of Contents

Table of Contents *(cont.)*

Why This Kit?

This kit was developed to provide teachers with a way to integrate their teaching of language arts and science while making accommodations for differences in student reading abilities and levels of understanding. Whether your students are above level, on level, or below level, or even English language learners, this program offers lessons and activities designed to meet standards for reading, writing, and science.

For each of the eight units provided in this kit, you'll find two different readers related to the topic. One reader is designated for students who are on- or above-level readers and the other is designated for students who read below level.

Unit Organization

Each unit is structured in a similar manner. First, you'll find an overview of the unit with a suggested time line. Then you'll see the reading, writing, and science objectives for the unit. These objectives are the same for both readers, but the activities themselves have been adapted to be appropriate for both struggling learners and for those who need more of a challenge.

Following the time line and objectives, you'll find a section that provides a whole-class Introductory Activity and other components of the unit, as well as a whole-class Concluding Activity for the end of the unit. Each unit includes a lab activity related to the topic featured in the readers. The lab provides detailed instructions for conducting the activity. There is also a lesson plan that serves as a guide for you as you lead students through this exciting activity.

Next in the unit, you'll find differentiated lesson plans for the two readers. These provide step-by-step instructions for leading the students through the process of reading the text. This instruction highlights the specified objectives. Each lesson also incorporates the use of data analysis activities on reproducible pages as well as a follow-up quiz to check for comprehension.

All Together: Science, Language Arts, Inquiry, and Literacy

As the expectations for student achievement in both science literacy and reading skills continue to rise, so does the need for quality materials that teach content-area knowledge and critical-reading skills through meaningful literature. The *Science Readers* address both these needs through a series of leveled readers each focused on a single strand: physical, earth and space, and life science. Students journey through a complete and comprehensive unit of study which includes all the components of complete guided reading instruction and concept application through data analysis and hands-on lab activities. Students see, hear, read, touch, and think the concepts presented in each lesson. They are offered numerous opportunities to explore the ideas presented and build upon their previous experiences to gain new knowledge. Students then construct and share personal insights and opinions regarding the advancements in science and their effects on the Earth and society. By participating in the lessons in these units, students will become scientifically literate.

Why a Focus on Science?

Over three decades ago, the American Association for the Advancement of Science began a three-phase project to develop and promote science literacy: Project 2061. The project was established with the understanding that *more* is not *effective* (1989, p. 4). Shortly thereafter, in 1993, the Association developed benchmarks for science literacy. Since every state has its own science standards, these benchmarks were prepared as a tool to assist in the revision of the states' science, mathematics, and technology curricula (1993, p. XV).

Values, Attitudes, and Skills

Scientists work under a distinctive set of values. Therefore, according to the American Association for the Advancement of Science, science education should do the same (1989, p. 133). Students whose learning includes data, a testable hypothesis, and predictability in science will share in the values of the scientists they study. Additionally, "science education is in a particularly strong position to foster three [human] attitudes and values: curiosity, openness to new ideas, and skepticism" (1989, p. 134). *Science Readers* addresses each of these recommendations by engaging students in thought-provoking, open-ended discussions and projects. Throughout their study, students continuously reflect on the contributions of important scientists and the advancements they have brought to society.

Within the recommendations of skills needed for scientific literacy, the American Association for the Advancement of Science suggests attention to computation, manipulation and observation, communication, and critical response. These skills are best learned through the *process* of learning, rather than in the knowledge itself (1989, p. 135). This is exactly what happens when students engage in lesson labs and review labs conducted by others in the *Science Readers* program. Students follow formulas and calculations to compute numbers; they use calculators to apply computation skills quickly and accurately; they manipulate common materials and tools to make scientific discoveries; they express findings and opinions both orally and in writing; they read tables, charts, and graphs to interpret data; they are asked to respond critically to data and conclusions; and they use information to organize their own data and draw their own conclusions.

Inquiry-Based Learning

Project 2061 recommends pedagogical practices where the learning of science is as much about the process as the result or outcome (1989, p. 147). Following the nature of scientific inquiry, students ask questions and are actively engaged in the learning process. They collect data and are encouraged to work within teams of their peers to investigate the unknown. This method of process learning refocuses the students' learning from knowledge and comprehension to application and analysis. Students may also formulate opinions (synthesis and evaluation) and determine whether their processes were effective or needed revision (evaluation). The National Science Education Standards view inquiry as "central to science learning" (p. 2 of Overview). In this way, students may develop their understanding of science concepts by combining knowledge with reasoning and thinking skills. Kreuger and Sutton (2001) also report an increase in students' comprehension of text when knowledge learning is coupled with hands-on science activities (p. 52).

Each unit in the *Science Readers* program provides an engaging lab activity at the end of the reader, complete with a lesson plan that includes activities before, during, and after the lab. In addition, the data analysis activity pages reconstruct related experiments and share data the students can analyze to apply their learning from the readers. This program offers students multiple opportunities to engage in both personal hands-on activities and related experiments described in full detail.

Nonfiction ≠ Textbooks

As Project 2061 began, researchers questioned the appropriateness and effectiveness of science textbooks and methods of instruction. Since textbook instruction puts more emphasis on learning correct answers and less on exploration, collaboration, and inquiry, the Association asserts that this manner of instruction actually "impedes progress toward scientific literacy" (1989, p. 14). This same concern resurfaced over a decade later by Daniels and Zemelman (2004) who call textbooks "unfriendly." When most adults are choosing literature, they do not pick up their son's or daughter's science textbook. Daniels and Zemelman assert that today's textbooks are best used as reference books when students need large amounts of information on a particular topic within a subject area. Instead they recommend the use of "authentic, real-world nonfiction."

Likewise, researchers and educators alike suggest using quality nonfiction materials, which "provide the reader with a sense of discovery" (Nevett, 2004). Nevett also cautions teachers to consider the design of the books, the author's style, and the author's ability to excite the reader. Each of the leveled readers in *Science Readers* provides just that. Both the on- and below-level readers for each unit include real-life photos, charts, illustrations, and sidebars. Although the books present facts and information, they are written to tell a story about their subject. The information is presented in an interesting manner to foster students' curiosity and encourage continued exploration of a concept.

Videos from The Futures Channel

On the included DVD, you can find eight short videos from The Futures Channel. These videos are ideally suited to introducing concepts, activating prior knowledge, and inspiring interest in sometimes complex and abstract content.

Bats

Running Time: 1 minute, 51 seconds

Bert Grantges talks about his passion: bats. He describes the role that bats play in ecosystems, how they roost, and how chiropterists like him monitor their numbers.

Discussion Question: Bats perform a number of vital functions. What would happen if they were to go extinct?

Cheetahs

Running Time: 2 minutes, 7 seconds

As an endangered species, cheetahs are bred in captivity with difficulty. This video shows a zoologist working with cheetahs and monitoring their behavior to help them reproduce and maintain their numbers.

Discussion Question: Zoologists are working to keep cheetahs from going extinct. What might a long-term plan to do so look like?

Forest Rangers

Running Time: 1 minute, 44 seconds

Foresters Arnold Wilson and Brad Washa talk about the importance of fire in ecosystems, and how the National Forest Service uses prescribed burns and controlled fires to maintain balance in forests.

Discussion Question: What are the advantages of using controlled fires? What would happen if the Forest Service stopped any fire that started?

Growing Bugs

Running Time: 1 minute, 17 seconds

Jan Dietrick grows bugs. Her "good bugs" eat the "bad bugs" that may interfere with agriculture. This video presents how the bugs are "grown" as well as how beneficial insects can be used to combat pests.

Discussion Question: Using natural predators of pests is an alternative to using pesticides. What might be the advantages of doing this? What might be the disadvantages?

Videos from The Futures Channel *(cont.)*

Healing Injured Wild Animals

Running Time: 2 minutes, 8 seconds
Mark Pokus describes what goes into his job of caring for injured wild animals that are brought into his clinic. Veterinary medicine involves a combination of physics, chemistry, pharmacology, and math.

Discussion Question: What differences would there be between the training required by a veterinarian and the training for a doctor that works on humans?

Life Under the Ocean

Running Time: 3 minutes, 19 seconds
George Matsumoto talks about his work as a marine biologist at the Monterey Bay Research Institute. Using their robotic submarine, George and his colleagues research the plants and animals of the ocean as well as marine snow and the benthic environment.

Discussion Question: Why is English an important topic for future scientists to study?

The Lundberg Farms

Running Time: 4 minutes, 8 seconds
Bryce Lundberg gives a tour of his organic farm. He introduces what organic farming means and describes the process of growing a crop of rice and getting it ready for the market.

Discussion Question: Ask if anyone in the class tries to eat only organic fruits and vegetables. Discuss the reasons, advantages, and disadvantages behind such a decision.

Testing the Robotic Arm

Running Time: 2 minutes, 45 seconds
Two roboticists work on a robotic arm and hand which mimicks the function of a human hand. Everything from math to physiology is incorporated in the design.

Discussion Question: What other body functions and parts can robots be designed to perform? How might those robots be useful?

Unit 1: *Looking Inside Cells* and *Early Cell Scientists: Identifying Cells*

Time Line for the Unit

	Looking Inside Cells	*Early Cell Scientists: Identifying Cells*
Day 1	Complete the **Introductory Activity** (page 24) as a class.	
	Before Reading activities (page 29) in groups	**Before Reading** activities (page 37) in groups
Day 2	**During Reading** activities (page 30) in groups. Use: *A Peek Inside a Cell* worksheet (page 32) *A Peek Inside a Cell* transparency	**During Reading** activities (page 38) in reading groups. Use: *Close Up* worksheet (page 40) *Close Up* transparency
Day 3	**After Reading** activities (page 31) in groups. Use: *What's the Password?* worksheet (page 33) *Plant and Animal Cells* worksheet (page 34) *Reader Quiz* (page 35)	**After Reading** activities (page 38) in groups. Use: *How Small is a Micrometer?* (page 41) *Give Me Energy* worksheet (page 42) *Reader Quiz* (page 43)
Day 4	Complete the **Lab Activity** (page 28) as a class.	
Day 5	Complete **Concluding Activity** (page 25) as a class.	

Unit Learning Objectives (McREL)

- Students use context clues to determine word meanings (Nonfiction Reading Objective).
- Students write expository compositions, stating a thesis and supporting details (Writing Objective).
- Students explore concepts related to cells (Science Content Objective).

Unit Overview

Introductory Activity

1 Lead a discussion about what students know about cells. Have them draw what they believe a cell looks like on a sheet of paper. Allow students to share their drawings with three neighbors. Discuss how the students' illustrations compare with one another. Ask the students if they think all cells look the same. Do the students think cells are alive? What are they for? How do they function? Record students' predictions for review after the reading.

2 If possible, provide microscopes and prepared slides to each pair or group of three students, or place one microscope and set of slides in the room for students to investigate. As the students make their observations through the microscope, what do they make of the images and this experience? Is it easy or difficult to see and focus? How do the organisms in the slides compare at different magnification levels?

3 Explain that the students will learn about microscopes and cells during their reading.

Using the Readers

4 Divide students by reading levels into two groups. Students on or above a fifth-grade reading level should read *Looking Inside Cells*. Students who need a lower-level book should read *Early Cell Scientists: Identifying Cells*.

Within these groups, complete the activities described in each lesson plan.

Looking Inside Cells (pages 29–36)

Early Cell Scientists: Identifying Cells (pages 37–44)

5 At the end of the unit, bring the students back together as a class to complete the lab and concluding activities on the next page.

Unit Overview *(cont.)*

Using the Transparencies

6 One transparency per reader (two in all) supports an interactive class activity guided by student worksheets (pages 32 and 40 for the readers in this unit). Use these transparencies to support and extend the information and concepts presented in the before, during, after, or concluding activities, as presented in the lesson.

Completing the Lab

7 Following the **After Reading** activities, students complete a lab activity. Each reader includes a themed lab activity on pages 28 and 29. See page 28 in this Teacher's Guide for the lab of this unit.

Concluding Activity

Complete the following concluding activity as a whole class following completion of the lab activity.

8 Have students create their own picture dictionaries featuring new words and terminology learned throughout the unit.

9 Provide students with half sheets of paper and have each student staple several together.

10 On each page, a student writes one of the words from the reader. Then the student writes a definition using his or her own words.

11 The student completes each page with an accompanying illustration.

12 Have students from different reading groups share their picture dictionaries and how the terms relate to the reader they were assigned to read.

Unit Overview *(cont.)*

Differentiation Strategies

Above Grade Level—Student Directed

For those students who have a solid understanding of the science concepts in this unit, encourage them to apply the knowledge and information they have. Suggested enrichment activities include:

1. Have students conduct research about cells. Encourage students to use reference books and an Internet search engine for gathering information. Invite students to share new facts with the class.
2. Have students create their own mini-books sharing information presented in the reader. Encourage them to use terminology learned in the reader and to provide examples that better explain the concepts to their readers.
3. After completing *A Peek Inside a Cell*, have students work together to create an oral presentation about cells. Have the students use the transparency to point out information shared in the presentation. Encourage students to share their presentations with parents or students in other classes.

ELL or Below Grade Level—Teacher Directed

Teacher directed activities that may assist students to comprehend the concepts include:

Take time to discuss vocabulary words that are new to the students. Have students illustrate their understanding of selected words. Help students understand the meanings of the words as they relate to the text in the reader.

Read through the text with struggling readers, pausing regularly to discuss the concepts presented. Ask students to relate the information to things they already know.

Spend time reviewing sidebar information as these illustrate key concepts in the reader. Point out that the author provides main text and then provides examples through pictures, photos, diagrams, and additional text.

Have students work in pairs to read and discuss the text.

Make an audio recording of the text and allow students the opportunity to listen and follow along with the text.

Lab Lesson Plan: Make Your Own Light Microscope

Before the Lab

1 Review with students what they learned about light microscopes. How did scientists studying cells use this type of microscope?

Introduce the Lab

2 Read the introductory sentence with students. How will this lab help students learn about scientists' examinations of their specimens?

3 Read the list of materials. Provide each lab group with the necessary materials. Alternately, place them at a central location for students to use as they enter the classroom or have free time during class.

4 Read through all the procedures with the students at least once before they engage in the lab. Check for understanding of the required steps.

5 Have students predict what they think will happen.

6 Have each lab group create a record sheet with three circles. In each circle they will record their observations in Steps 2, 3, and 5.

Conduct the Lab

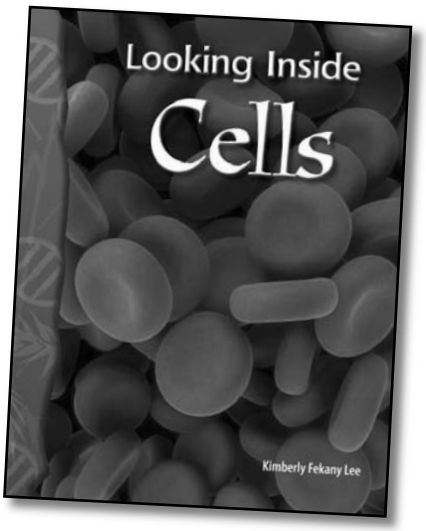
7 Allow time for lab groups to conduct the lab.

8 Instruct students to record their results in Steps 2, 3, and 5 on their record sheet.

After the Lab

9 Have each lab group share its results. Did all the lab groups make the same observations? Discuss how this lab compares with early scientists and their study of cells.

Looking Inside Cells Reader



Learning Objectives

Students use context clues to determine word meanings (Nonfiction Reading Objective).

Students write expository compositions, stating a thesis and supporting details (Writing Objective).

Students explore concepts related to cells (Science Content Objective).

Resources

- paper and pencils
- chalkboard/whiteboard
- chalk/wipe-off markers
- *A Peek Inside a Cell* worksheet and transparency (page 32)
- *What's the Password?* worksheet (page 33)
- *Plant and Animal Cells* worksheet (page 34)
- materials for Lab (see page 28)
- *Reader Quiz* (page 35)

Before Reading

1. Complete the Introductory Activity on page 24 with the whole class. Then divide the students into reading groups. The students who read this book should be reading on or above level.

2. Display the cover of the reader—*Looking Inside Cells*. Ask students to share what they already know about cells. Ask why it might be important to learn more about cells.

3. Engage students in a discussion about the scientific study of cells. Why would scientists want to do research in this area? How can knowledge of cells make a difference in the lives of people?

4. Read aloud pages 4 and 5. Then encourage students to add this new information to their discussion about cells and scientific research in this area.

5. Explain to students that they will encounter words in the reader that may be unfamiliar to them. Ask students what they usually do when they encounter words they don't know. Tell them that one way to determine a word's meaning is to pay attention to the way it is used in the text. This is called using context clues to determine word meaning.

Before Reading *(cont.)*

6 Walk them through the process of using context clues with the first word on the list below. Read aloud the first paragraph on page 8 of the reader. Draw attention to the word *membrane*. Tell students to pay attention to the description the author gives. Based on this, what do they think membrane is? What would it look like? What about the texture?

- membrane
- botanist
- diffusion
- nucleus
- pigment
- appendages
- biochemist

Write the words above on the board and instruct students to locate each one as they read and then write a definition based on its use in context.

During Reading

7 Have the students read the book independently. Ask students to consider how the information in *Looking Inside Cells* enhances or changes what they felt they knew prior to reading.

8 Remind students to look for the identified words in step 6 and use the context of the book to determine each word's meaning. Have students work together to determine the meanings of any words they were not able to define.

9 Different cells serve different functions. They also take on very different appearances. Reread pages 6 and 7 with the students. Discuss how cells are alike and different.

10 Display the transparency showing several different types of cells. Have students point out the similarities and differences they listed in their discussion. Discuss how the cells' structures may contribute to their function. For example, what do stomach and skin cells do, and how do their appearances compare with their functions? Identify the nucleus, cell membrane, and cytoplasm in each cell. What other cell parts do the students observe?

11 Keep the transparency displayed and distribute *A Peek Inside a Cell* (page 32) to students. Allow the students time to complete the page. Afterwards, discuss which cells on the transparency the students found the most interesting and why.

After Reading

12 Have students reflect on the content of the reader. What was the main purpose of the reader and what information did the author include to support this purpose?

13 Instruct each student to write a thesis statement expressing the main idea of the text. Then have each student add to the statement by writing four or five pieces of interesting information that would better explain cells to someone who hadn't read the text.

14 Discuss how people acquire what they need to live (air, food, water). How does this compare with how a cell acquires what it needs to live? Reread pages 8 and 10 about the cell membrane and diffusion.

15 Distribute *What's the Password* (page 33) to students. Read the directions together, and demonstrate how to use symbols to show the passing nutrients. Allow time for students to complete the worksheet. Summarize what cells and people have in common with regard to how they acquire what they need to live.

16 Students learned several parts of both plant and animal cells that help the cell to function and live. Divide the class into six groups. Assign each group one pair of pages between 12 and 23 to review. Have each group use a 5 x 8 note card to identify and describe the organelles on their assigned pages. They should create a simple rhyme to help their classmates learn the organelles' functions. (Example: Cells move at a good clip; the flagella help it like a whip.) Post the note cards on a science vocabulary bulletin board.

17 Distribute *Plant and Animal Cells* (page 34) to students. Read the introductory information together, then allow time for students to complete the worksheet independently. Following, complete a class Venn Diagram comparing animal and plant cells. List the structures they have in common where the circles intersect. List the structures unique to each in the proper circle.

18 Use the *Reader Quiz* on page 35 to further assess student learning.

19 Gather students together as a whole class to complete the Lab (page 28).

20 As a whole class, complete the Concluding Activities described on page 25.

A Peek Inside a Cell

Different cells have different functions. They can also look very different, both in size and shape. Many times the structure of a cell can indicate its function.

Directions: Look at the cells on the transparency. Use information from the book to compare how these cells are alike and different. Write at least three comparisons in each column.

How the cells are alike	How the cells are different
1.	1.
2.	2.
3.	3.

Directions: Illustrate one of the cells from the transparency in the space below. Label the nucleus, cytoplasm, and membrane. What can you tell about the function of this cell from its structure?

Reader Quiz

Directions: Use what you learned from reading *Looking Inside Cells* to choose the best answer for each question.

1. What feature of a cell can you use to determine its function?
   a. its organelles
   b. its substances
   c. its shape
   d. its color

2. What process helps a cell rid itself of waste products?
   a. equilibrium
   b. facilitated diffusion
   c. photosynthesis
   d. Brownian motion

3. Which organelle is present in plant cells but not animal cells?
   a. nucleus
   b. mitochondria
   c. lysosomes
   d. chloroplast

4. Which cell structure holds DNA?
   a. nucleus
   b. organelles
   c. endoplasmic reticulum
   d. Golgi body

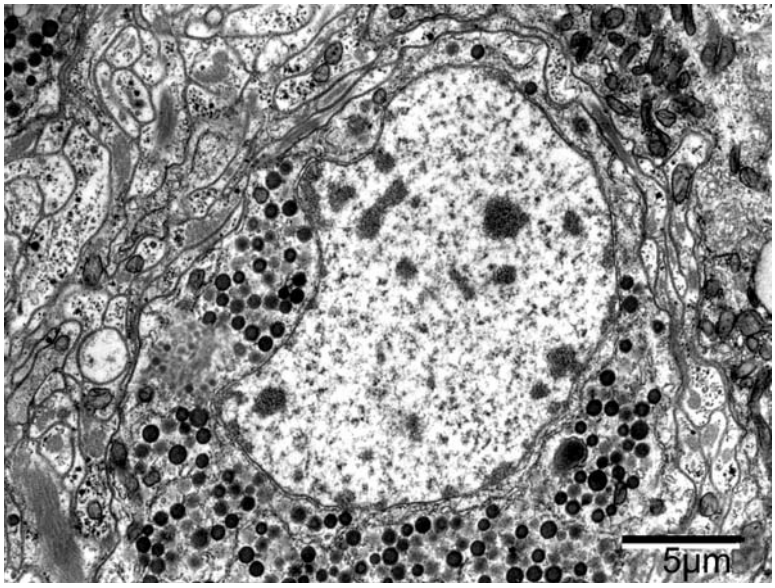
5. Which cell structure controls entry into an animal cell?
   a. cell wall
   b. cell membrane
   c. protein
   d. nucleus

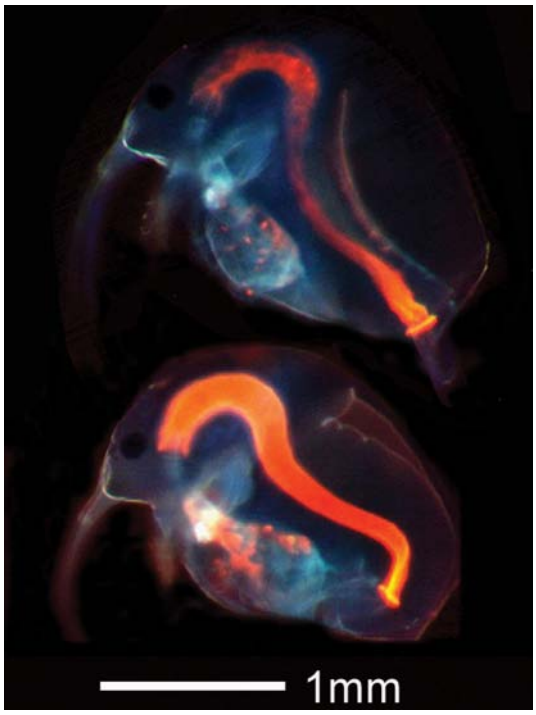
6. Which cell structures do antibiotics attack in a bacterial cell?
   a. ribosomes
   b. endoplasmic reticulum
   c. Golgi body
   d. nucleus

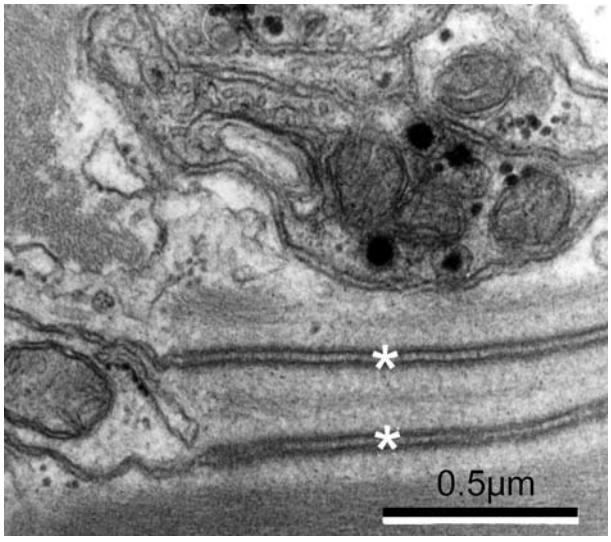
7. Describe one function that is performed by one organelle within a cell. Use details from the book to explain your answer.

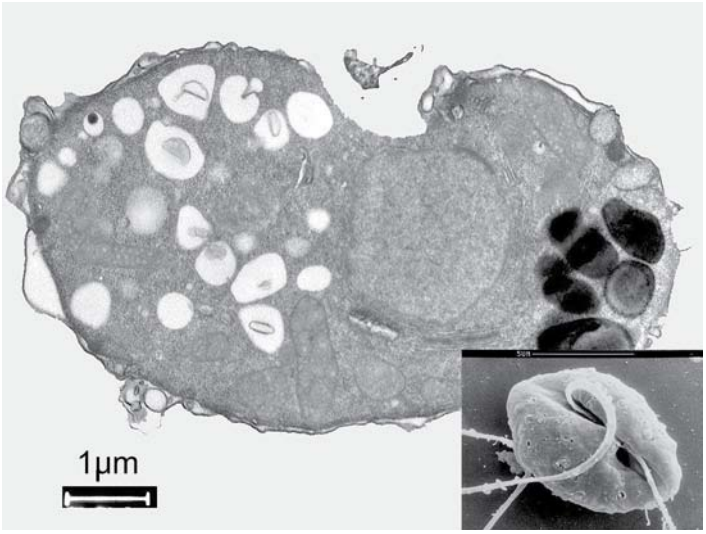
8. How is the process you described in question 7 related to another part of the cell and its function? Use details from the book to explain your answer.

A Peek Inside a Cell Transparency









Life Science Readers: Looking Inside Cells

Publishing Credits

Editorial Director
Dona Herweck Rice

Creative Director
Lee Aucoin

Associate Editor
Joshua BishopRoby

Illustration Manager
Timothy J. Bradley

Editor-in-Chief
Sharon Coan, M.S.Ed.

Publisher
Rachelle Cracchiolo, M.S.Ed

Science Contributor
Sally Ride Science™

Science Consultants
Thomas R. Ciccone, B.S., M.A.Ed.
Chino Hills High School
Dr. Ronald Edwards,
DePaul University

Teacher Created Materials Publishing
5301 Oceanus Drive
Huntington Beach, CA 92649-1030
http://www.tcmpub.com

ISBN 978-0-7439-0583-1

Table of Contents

red blood cells

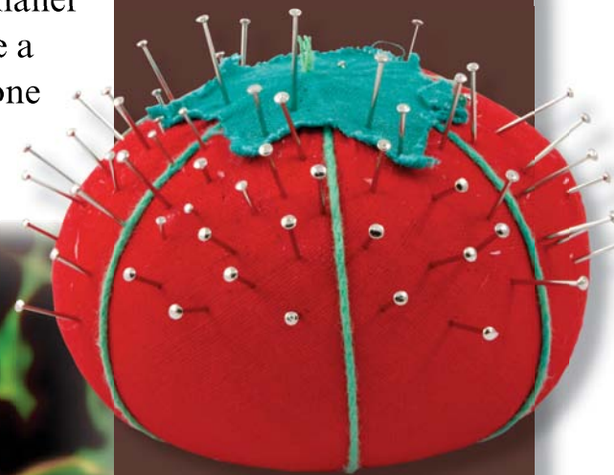
Cell Shape and Size

In both plants and animals there are different types of cells. Cells with different **functions** often have different shapes that match their jobs. Animals have red blood cells. These cells must travel quickly through small tubes. So, they are shaped like balls that have been squeezed in the middle. Another type of animal cell is a nerve cell. These send signals to and from our brains. These signals must often travel long distances. Nerve cells are usually long and skinny.

You may think that large cells are better than small cells. Actually, the opposite is true. If cells get too big, then they cannot function well. A larger surface area means that there is more area for **substances** to enter and exit cells. A smaller inside area means that substances have a smaller distance to travel to get from one side of a cell to the other.

How Big Is That?

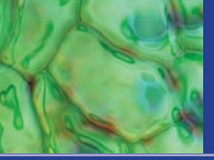
Most human cells are about 20 micrometers across. These cells are so small that it would take 10,000 human cells to cover the head of a pin.



Long Cells

Some nerve cells in your body are over a meter long. There are nerve cells that reach from the base of your spine all the way to your toes!

nerve cells



Inside the Cell

Cytoplasm and Organelles

Plant and animal cells are filled with fluid that is like gelatin. The fluid is called **cytoplasm** (SY-toh-plaz-uhm). It is made of cytosol (SY-toh-sawl). Cytosol is like a special soup that has everything the cell needs to live.

A cell must do many different jobs to survive. Inside the fluid, there are many different cells parts called organelles (or-guh-NELS). Each **organelle** does a different job. Some organelles turn food into energy. Other organelles store water. Most organelles are separated from the cytosol by a membrane. The membrane is like a skin that only lets in what the organelle needs. Everything else is kept outside.

One special kind of organelle is called **chloroplast**. Plant cells have these. Chloroplasts turn sunlight into energy that the rest of cell can use. Animals do not have chloroplasts. They must get their energy from eating other things.

plant cell ← → animal cell

Plant and Animal Cells
Plant cells contain less cytoplasm than animal cells. However, they contain more water.

Lab: Make Your Own Light Microscope

Make this simple light microscope to see how early biologists examined their specimens.

Materials

- two magnifying glasses
- a newspaper article
- a photograph
- a paper and pen to record your results

Procedure

1. Hold one magnifying glass just above the surface of the newspaper article. Then, hold it above the photo. The print and image should appear larger.

2. Move the magnifying glass higher. See how the print and photo change. They should become blurred as you move the magnifying glass higher.

3. Return the magnifying glass to the original position. Place it just above the newspaper article.

4. Get the second magnifying glass. Place it between the first magnifying glass and your eyes.

5. Move the second magnifying glass up and down. Get the print in clear focus. How does it look?

6. Describe what happens. Does the print appear larger or smaller than it does when you used a single magnifying glass?

7. Record your results.

8. Repeat, using the photograph.