

Focus

Overview

This section introduces students to cells, their discovery, and their diversity. Students will learn about the parts of a cell and the reason that cells are so small. Finally, students will learn about eubacterial, archaeobacterial, and eukaryotic cells.

Bellringer

Write the following questions on the board:

Why weren't cells discovered until 1665? What invention made their discovery possible? (Cells weren't discovered until 1665 because almost all cells are too small to be seen with the naked eye. The microscope is the invention that made their discovery possible.)

Motivate

Activity

GENERAL

Modeling Cell Discovery Before students begin this section, have them model Robert Hooke's discovery. Organize the class into small groups. Provide each group with a microscope and a prepared slide of cork cells. Have students describe and sketch their observations. **Visual**

SECTION

1

READING WARM-UP

Objectives

- State the parts of the cell theory.
- Explain why cells are so small.
- Describe the parts of a cell.
- Describe how eubacteria are different from archaeobacteria.
- Explain the difference between prokaryotic cells and eukaryotic cells.

Terms to Learn

cell	nucleus
cell membrane	prokaryote
organelle	eukaryote

READING STRATEGY

Reading Organizer As you read this section, create an outline of the section. Use the headings from the section in your outline.

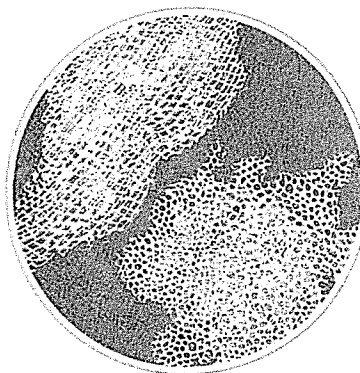
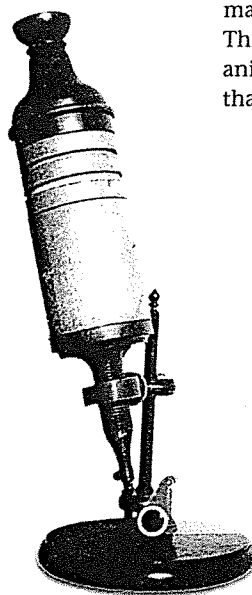


Figure 1 Hooke discovered cells using this microscope. Hooke's drawing of cork cells is shown to the right of his microscope.

The Diversity of Cells

Most cells are so small they can't be seen by the naked eye. So how did scientists find cells? By accident, that's how. The first person to see cells wasn't even looking for them.

All living things are made of tiny structures called cells. A cell is the smallest unit that can perform all the processes necessary for life. Because of their size, cells weren't discovered until microscopes were invented in the mid-1600s.

Cells and the Cell Theory

Robert Hooke was the first person to describe cells. In 1665 he built a microscope to look at tiny objects. One day, he looked at a thin slice of cork. Cork is found in the bark of cork trees. The cork looked like it was made of little boxes. Hooke named these boxes *cells*, which means "little rooms" in Latin. Hooke's cells were really the outer layers of dead cork cells. Hooke's microscope and his drawing of the cork cells are shown in **Figure 1**.

Hooke also looked at thin slices of living plants. He saw that they too were made of cells. Some cells were even filled with "juice." The "juicy" cells were living cells.

Hooke also looked at feathers, fish scales, and the eyes of houseflies. But he spent most of his time looking at plants and fungi. The cells of plants and fungi have cell walls. This makes them easy to see. Animal cells do not have cell walls. This absence of cell walls makes it harder to see the outline of animal cells. Because Hooke couldn't see their cells, he thought that animals weren't made of cells.

CHAPTER RESOURCES

Chapter Resource File

- Lesson Plan
- Directed Reading A **BASIC**
- Directed Reading B **SPECIAL NEEDS**

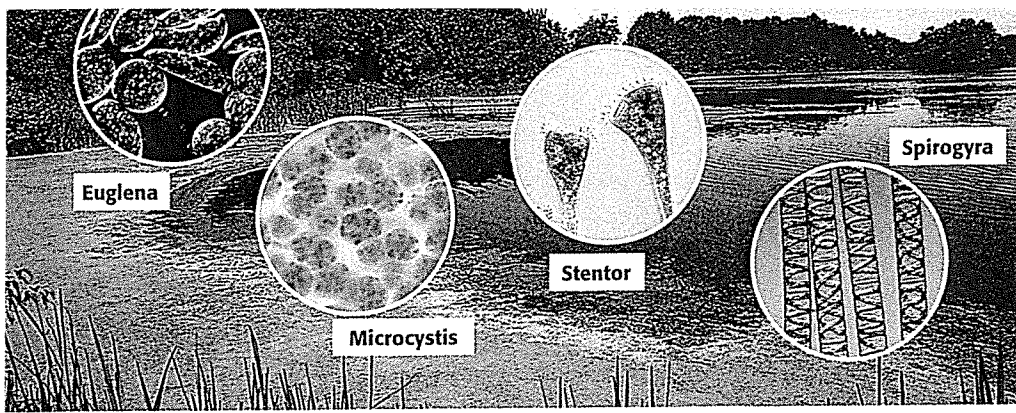
Technology

- Transparencies
- Bellringer

Cultural Awareness

GENERAL

Yeast Yeast is a fungus. Yeast used in baking is related to wild fungi living in the air around us. Strains of native yeasts vary regionally. For example, sourdough from San Francisco has its characteristic taste because bakers there use a yeast that is common in the air around that city. Not all breads require yeast. Many cultures have flat breads, such as tortillas from Mexico.



Finding Cells in Other Organisms

In 1673, Anton van Leeuwenhoek (LAY vuhn HOOK), a Dutch merchant, made his own microscopes. Leeuwenhoek used one of his microscopes to look at pond scum. Leeuwenhoek saw small organisms in the water. He named these organisms *animalcules*, which means "little animals." Today, we call these single-celled organisms protists (PROH tists). Pond scum and some of the protists it contains are shown in **Figure 2**.

Leeuwenhoek also looked at animal blood. He saw differences in blood cells from different kinds of animals. For example, blood cells in fish, birds, and frogs are oval. Blood cells in humans and dogs are round and flat. Leeuwenhoek was also the first person to see bacteria. And he discovered that yeasts that make bread dough rise are single-celled organisms.

The Cell Theory

Almost 200 years passed before scientists concluded that cells are present in all living things. Scientist Matthias Schleiden (mah THEE uhs SHLEE duhn) studied plants. In 1838, he concluded that all plant parts were made of cells. Theodor Schwann (TAY oh dohr SHVAHN) studied animals. In 1839, Schwann concluded that all animal tissues were made of cells. Soon after that, Schwann wrote the first two parts of what is now known as the *cell theory*.

- All organisms are made of one or more cells.
- The cell is the basic unit of all living things.

Later, in 1858, Rudolf Virchow (ROO dawlf FIR koh), a doctor, stated that all cells could form only from other cells. Virchow then added the third part of the cell theory.

- All cells come from existing cells.

Reading Check What are the three parts of the cell theory? See the Appendix for answers to Reading Checks.)

Figure 2 The green area at the edge of the pond is a layer of pond scum. This pond scum contains organisms called protists, such as those shown above.

cell in biology, the smallest unit that can perform all life processes; cells are covered by a membrane and have DNA and cytoplasm

CONNECTION TO Physics

Microscopes The microscope Hooke used to study cells was much different from microscopes today. Research different kinds of microscopes, such as light microscopes, scanning electron microscopes (SEMs), and transmission electron microscopes (TEMs). Select one type of microscope. Make a poster or other presentation to show to the class. Describe how the microscope works and how it is used. Be sure to include images.

ACTIVITY

Teach

INCLUSION Strategies

- Learning Disabled
- Attention Deficit Disorder
- Behavior Control Issues

Give students a chance to associate dates with specific familiar reference points.

Draw a timeline on the board. On opposite ends of the timeline, place "1492, Columbus sails to America" and "1879, Edison invents the electric light bulb."

Tell students to add dates and information for five major cell discoveries that happened between 1492 and 1879. Ask students with behavior control issues to add their teams' information to the timeline.

English Language Learners

Interpersonal

CONNECTION to Astronomy

GENERAL



Magnifiers Both biologists and astronomers use magnifiers. Biologists use

microscopes to see things that are too small to see with the unaided eye. Astronomers use telescopes to see planets, moons, and stars that are huge but too far away to view otherwise. Ask students to write a list of words that have the prefixes *micro-* and *tele-* and to use their examples to define those prefixes.

English Language Learners

Verbal

Answer to Reading Check

All organisms are made of one or more cells, the cell is the basic unit of all living things, and all cells come from existing cells.



Prediction Guide Before students read this page, ask them to choose one of the following reasons for why they think cells are so small:

1. There isn't enough microscopic food available for them.
2. There isn't enough room in a multicellular organism.
3. another reason (ask for suggestions)

Have students evaluate their answer after they read the page. **Logical**

MISCONCEPTION ALERT

Molecular Mix-Up The physical relationship between molecules and cells may be confusing to students. Molecules are not alive and are much smaller than cells. Cells and cell structures are made of molecules.

Answer to Reading Check

If a cell's volume gets too large, the cell's surface area will not be able to take in enough nutrients or get rid of wastes fast enough to keep the cell alive.

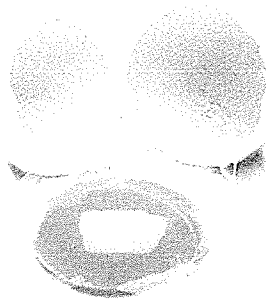


Figure 3 The white and yolk of this chicken egg provide nutrients for the development of a chick.

Cell Size

Most cells are too small to be seen without a microscope. It would take 50 human cells to cover the dot on this letter i.

A Few Large Cells

Most cells are small. A few, however, are big. The yolk of a chicken egg, shown in **Figure 3**, is one big cell. The egg can be this large because it does not have to take in more nutrients.

Many Small Cells

There is a physical reason why most cells are so small. Cells take in food and get rid of wastes through their outer surface. As a cell gets larger, it needs more food and produces more waste. Therefore, more materials pass through its outer surface.

As the cell's volume increases, its surface area grows too. But the cell's volume grows faster than its surface area. If a cell gets too large, the cell's surface area will not be large enough to take in enough nutrients or pump out enough wastes. So, the area of a cell's surface—compared with the cell's volume—limits the cell's size. The ratio of the cell's outer surface area to the cell's volume is called the *surface area-to-volume ratio*, which can be calculated by using the following equation:

$$\text{surface area-to-volume ratio} = \frac{\text{surface area}}{\text{volume}}$$

Reading Check Why are most cells small?

MATH FOCUS

Surface Area-to-Volume Ratio Calculate the surface area-to-volume ratio of a cube whose sides measure 2 cm.

Step 1: Calculate the surface area.

$$\text{surface area of cube} = \text{number of sides} \times \text{area of side}$$

$$\text{surface area of cube} = 6 \times (2 \text{ cm} \times 2 \text{ cm})$$

$$\text{surface area of cube} = 24 \text{ cm}^2$$

Step 2: Calculate the volume.

$$\text{volume of cube} = \text{side} \times \text{side} \times \text{side}$$

$$\text{volume of cube} = 2 \text{ cm} \times 2 \text{ cm} \times 2 \text{ cm}$$

$$\text{volume of cube} = 8 \text{ cm}^3$$

Step 3: Calculate the surface area-to-volume ratio.

$$\text{surface area-to-volume ratio} = \frac{\text{surface area}}{\text{volume}} = \frac{24}{8} = \frac{3}{1}$$

Now It's Your Turn

1. Calculate the surface area-to-volume ratio of a cube whose sides are 3 cm long.
2. Calculate the surface area-to-volume ratio of a cube whose sides are 4 cm long.
3. Of the cubes from questions 1 and 2, which has the greater surface area-to-volume ratio?
4. What is the relationship between the length of a side and the surface area-to-volume ratio of a cell?

CHAPTER RESOURCES

Technology



Transparencies

- Math Focus: Surface Area-to-Volume Ratio

Answers to Math Focus

1. Surface area of cube (SA) =

$$(3 \text{ cm} \times 3 \text{ cm}) \times 6 = 54 \text{ cm}^2$$

Volume of cube (V) =

$$3 \text{ cm} \times 3 \text{ cm} \times 3 \text{ cm} = 27 \text{ cm}^3$$

$$\text{SA:V ratio} = 54:27 \text{ or } 2:1$$

2. SA = $(4 \text{ cm} \times 4 \text{ cm}) \times 6 = 96 \text{ cm}^2$

$$V = 4 \text{ cm} \times 4 \text{ cm} \times 4 \text{ cm} = 64 \text{ cm}^3$$

$$\text{SA:V} = 96:64 \text{ or } 1.5:1$$

3. the cube whose sides are 3 cm long
4. The larger the cell is, the smaller the surface-to-volume ratio is.

arts of a Cell

ells come in many shapes and sizes. Cells have many different nctions. But all cells have the following parts in common.

he Cell Membrane and Cytoplasm

ll cells are surrounded by a cell membrane. The **cell membrane** a protective layer that covers the cell's surface and acts as a arrier. It separates the cell's contents from its environment. he cell membrane also controls materials going into and out f the cell. Inside the cell is a fluid. This fluid and almost all f its contents are called the **cytoplasm** (SIET oh PLAZ uhm).

rganelles

ells have organelles that carry out various life processes. **Organelles** are structures that perform specific functions within e cell. Different types of cells have different organelles. Most rganelles are surrounded by membranes. For example, the lgal cell in **Figure 4** has membrane-bound organelles. Some rganelles float in the cytoplasm. Other organelles are attached o membranes or other organelles.

Reading Check What are organelles?

enetic Material

ll cells contain DNA (deoxyribonucleic acid) at some point in eir life. **DNA** is the genetic material that carries information eeded to make new cells and new organisms. DNA is passed n from parent cells to new cells and controls the activities f a cell. **Figure 5** shows the DNA of a bacterium.

In some cells, the DNA is enclosed inside an organelle alled the **nucleus**. For example, your cells have a nucleus. In ontrast, bacterial cells do not have a nucleus.

In humans, mature red blood cells lose their DNA. Red ood cells are made inside bones. When red blood cells are rst made, they have a nucleus with DNA. But before they enter e bloodstream, red blood cells lose their nucleus and DNA. hey survive with no new instructions from their DNA.

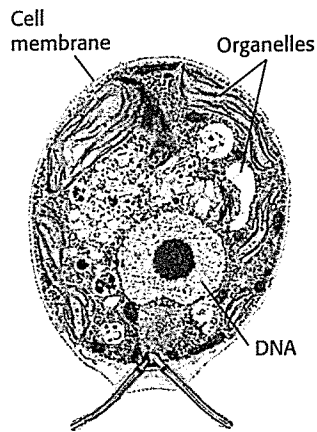
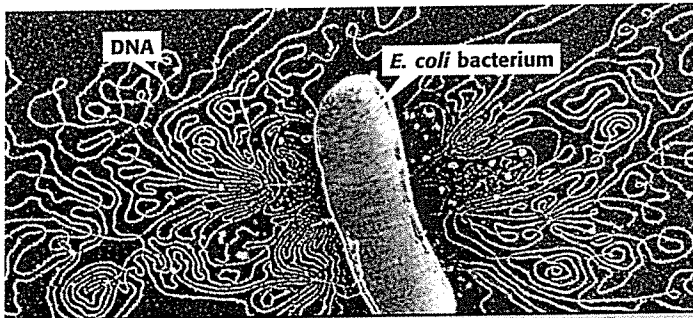


Figure 4 This green alga has organelles. The organelles and the fluid surrounding them make up the cytoplasm.

cell membrane a phospholipid layer that covers a cell's surface; acts as a barrier between the inside of a cell and the cell's environment

organelle one of the small bodies in a cell's cytoplasm that are specialized to perform a specific function

nucleus in a eukaryotic cell, a membrane-bound organelle that contains the cell's DNA and that has a role in processes such as growth, metabolism, and reproduction

Figure 5 This photo shows an *Escherichia coli* bacterium. The bacterium's cell membrane has been treated so that the cell's DNA is released.



READING STRATEGY

GENERAL

Prediction Guide Before students read this page, ask them if the following statement is true or false: At some point, all cells contain DNA. (true; Even though some cells, such as red blood cells, lose their DNA when they mature, all cells have DNA at some point.)

Ask students to explain the reasons for their answer. Have students evaluate their answer after they read the page. **Verbal**

MISCONCEPTION ALERT

DNA and Complexity

Students may believe that larger or more-complex organisms have more DNA. This is not the case. In general, eukaryotes have more DNA than bacteria or viruses do. Among eukaryotes however, there is no strong correlation between body size or measures of complexity and DNA content. Although the fruit fly *Drosophila melanogaster* has about one-fourth as much DNA as a human, the protist *Amoeba dubia* has about 200 times more DNA than a human being does! Part of the reason for this apparent discrepancy is that some DNA does not code for any genes. Species with very large genomes have a lot of non-coding DNA.

CONNECTION to Language Arts

GENERAL



Smallest Living Thing Is the smallest living thing an organism called a *Mycoplasma genitalium*? Or is it something called a "nanobacteria"? Have students conduct Internet or library research and write a report on the smallest living thing. (Scientists are not certain. "Nanobacteria" do not always show all the characteristics of living things. More research may settle the issue.) **Verbal/Logical**

Answer to Reading Check

Organelles are structures within a cell that perform specific functions for the cell.

Quick Lab

MATERIALS

FOR EACH STUDENT

- cotton swab
- coverslip, plastic
- microscope
- microscope slide, plastic
- water
- yogurt with active culture

Answer

- Drawings should depict rod-shaped bacteria.

CONNECTION to Earth Science

GENERAL



Subsurface Cells Astronomers are interested in the work of scientists who investigate bacteria and other microscopic organisms in Earth's crust. Microbiologists have drilled deep into the crust and found microbes nearly 3 km below the surface, where the temperature is 75°C (167°F). Because other planets have surface conditions similar to the harsh environment within the Earth's crust, astronomers believe that microbes may live elsewhere in the solar system. Have students research and write a brief report on the conditions in Earth's crust, and have students learn about the organisms that live there. **LS Verbal**

Quick Lab

Bacteria in Your Lunch?

Most of the time, you don't want bacteria in your food. Many bacteria make toxins that will make you sick. However, some foods—such as yogurt—are supposed to have bacteria in them! The bacteria in these foods are not dangerous.

In yogurt, masses of rod-shaped bacteria feed on the sugar (lactose) in milk. The bacteria convert the sugar into lactic acid. Lactic acid causes milk to thicken. This thickened milk makes yogurt.

- Using a **cotton swab**, put a **small dot of yogurt** on a **microscope slide**.
- Add a **drop of water**. Use the cotton swab to stir.
- Add a **coverslip**.
- Use a **microscope** to examine the slide. Draw what you observe.

prokaryote an organism that consists of a single cell that does not have a nucleus

Two Kinds of Cells

All cells have cell membranes, organelles, cytoplasm, and DNA in common. But there are two basic types of cells—cells without a nucleus and cells with a nucleus. Cells with no nucleus are *prokaryotic* (proh KAR ee AHT ik) cells. Cells that have a nucleus are *eukaryotic* (yoo KAR ee AHT ik) cells. Prokaryotic cells are further classified into two groups: *eubacteria* (yoo bak TIR ee uh) and *archaebacteria* (AHR kee bak TIR ee uh).

Prokaryotes: Eubacteria and Archaebacteria

Eubacteria and archaebacteria are prokaryotes (pro KAR ee OHTS). **Prokaryotes** are single-celled organisms that do not have a nucleus or membrane-bound organelles.

Eubacteria

The most common prokaryotes are eubacteria (or just *bacteria*). Bacteria are the world's smallest cells. These tiny organisms live almost everywhere. Bacteria do not have a nucleus, but they do have DNA. A bacteria's DNA is a long, circular molecule shaped sort of like a rubber band. Bacteria have no membrane-covered organelles. But they do have ribosomes. *Ribosomes* are tiny, round organelles made of protein and other material.

Bacteria also have a strong, weblike exterior cell wall. This wall helps the cell retain its shape. A bacterium's cell membrane is just inside the cell wall. Together, the cell wall and cell membrane allow materials into and out of the cell.

Some bacteria live in the soil and water. Others live in, on, other organisms. For example, you have bacteria living on your skin and teeth. You also have bacteria living in your digestive system. These bacteria help the process of digestion. A typical bacterial cell is shown in **Figure 6**.

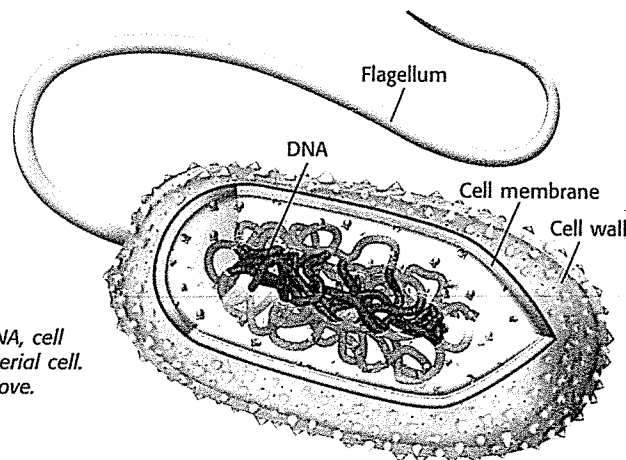


Figure 6 This diagram shows the DNA, cell membrane, and cell wall of a eubacterial cell. The flagellum helps the bacterium move.

Group Activity — ADVANCED

Archaebacteria Have students work in pairs to find out if archaebacteria are more similar to eubacteria or eukaryotes. What kinds of evidence do scientists use to answer this question? Have students make a poster or other visual presentation of their results. **LS Visual/Interpersonal**

WEIRD SCIENCE

In 1969, the *Apollo 12* crew retrieved a space probe from the moon that had been launched nearly 3 years earlier. NASA scientists found a stowaway in the probe's camera. The bacterium *Streptococcus mitis* had traveled to the moon and back. Despite the rigors of space travel, more than 2.5 years of radiation exposure, and freezing temperatures, the *Streptococcus mitis* was successfully reconstituted.

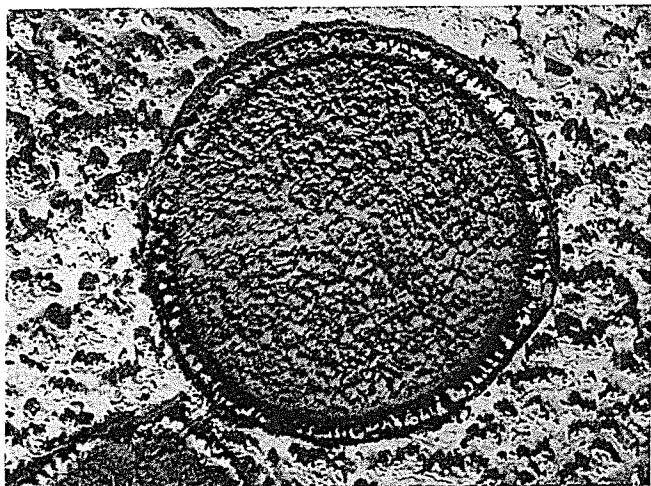


Figure 7 This photograph, taken with an electron microscope, is of an archaeobacterium that lives in the very high temperatures of deep-sea volcanic vents. The photograph has been colored so that the cell wall is green and the cell contents are pink.

Archaeobacteria

The second kind of prokaryote are the archaeobacteria. These organisms are also called *archaea* (ahr KEE uh). Archaeobacteria are similar to bacteria in some ways. For example, both are single-celled organisms. Both have ribosomes, a cell membrane, and circular DNA. And both lack a nucleus and membrane-bound organelles. But archaeobacteria are different from bacteria. For example, archaeobacterial ribosomes are different from bacterial ribosomes.

Archaeobacteria are similar to eukaryotic cells in some ways, too. For example, archaeobacterial ribosomes are more like the ribosomes of eukaryotic cells. But archaeobacteria also have some features that no other cells have. For example, the cell wall and cell membranes of archaeobacteria are different from the cell walls of other organisms. And some archaeobacteria live in places where no other organisms could live.

Three types of archaeobacteria are *heat-loving*, *salt-loving*, and *methane-making*. Methane is a kind of gas frequently found in swamps. Heat-loving and salt-loving archaeobacteria are sometimes called extremophiles. *Extremophiles* live in places where conditions are extreme. They live in very hot water, such as in hot springs, or where the water is extremely salty. **Figure 7** shows one kind of methane-making archaeobacteria that lives deep in the ocean near volcanic vents. The temperature of the water from those vents is extreme: it is above the boiling point of water at sea level.

Reading Check What is one difference between eubacteria and archaeobacteria?

Is That a Fact!

The archaeobacteria *Pyrodictium* prefers to live at 105°C. That temperature is 5°C hotter than the boiling temperature of water (at sea level)!

Answer to Reading Check

One difference between eubacteria and archaea is that bacterial ribosomes are different from archaeobacterial ribosomes.

CONNECTION to Earth Science

GENERAL



Discovering Ancient Earth

The work of paleontologists helps us understand the antiquity of unicellular and multicellular life on Earth. Some paleontologists specialize in ancient plant life, and some specialize in ancient climates. Have students conduct Internet or library research and write a report on different types of paleontologists. **IS Verbal**

MISCONCEPTION ALERT

Extreme Bacteria? Students may believe that all archaeobacteria live in extreme environments because biology books often highlight the unusual and extreme environments in which some archaeobacteria live. In these environments, other types of organisms cannot survive. In fact, many archaeobacteria live in “normal” environments along with other eubacterial and eukaryotic species.

CONNECTION TO Social Studies

Where Do They Live?

While most archaeobacteria live in extreme environments, scientists have found that archaeobacteria live almost everywhere. Do research about archaeobacteria. Select one kind of archaeobacteria. Create a poster showing the geographical location where the organism lives, describing its physical environment, and explaining how it survives in its environment.



Research

GENERAL



Be a Good Host

Have students select one type of bacterium (such as the *Streptococcus mutans*, which causes tooth decay) that lives on or in the body, conduct Internet or library research on it, and then write and illustrate a report on the bacterium they have selected. **IS Verbal/Visual**

Reteaching BASIC



Drawing Cells Ask students to create a short picture book. Have them draw a picture of a typical prokaryotic cell on one page. Have them draw a picture of a typical eukaryotic cell on the next page. Students should label all the parts of both cells.

 **Visual**

Quiz GENERAL

1. When Robert Hooke saw "juice" in some cells, what was he looking at? (cytoplasm)
2. Why did Hooke think that cells existed only in plants and fungi and not in animals? (Plant and fungal cells have cell walls. Hooke's microscope wasn't strong enough to view the more delicate cell membranes of animal cells.)

Alternative Assessment GENERAL

 **Vocabulary Game** Organize the students into groups, and assign two or three vocabulary words to each group. Ask students to write a descriptive statement about each word without using the vocabulary word in the sentence. Each group should challenge the other groups to guess the word described. For example, if "genetic material" is the definition, "What is DNA?" is the correct response.  **Verbal**

eukaryote an organism made up of cells that have a nucleus enclosed by a membrane; eukaryotes include animals, plants, and fungi, but not archaeobacteria or eubacteria

INTERNET ACTIVITY

For another activity related to this chapter, go to go.hrw.com and type in the keyword **HL5CELW**.

Eukaryotic Cells and Eukaryotes

Eukaryotic cells are the largest cells. Most eukaryotic cells are still microscopic, but they are about 10 times larger than most bacterial cells. A typical eukaryotic cell is shown in **Figure 8**.

Unlike bacteria and archaeobacteria, eukaryotic cells have a nucleus. The nucleus is one kind of membrane-bound organelle. A cell's nucleus holds the cell's DNA. Eukaryotic cells have other membrane-bound organelles as well. Organelles are like the different organs in your body. Each kind of organelle has a specific job in the cell. Together, organelles, such as the ones shown in **Figure 8**, perform all the processes necessary for life.

All living things that are not bacteria or archaeobacteria are made of one or more eukaryotic cells. Organisms made of eukaryotic cells are called **eukaryotes**. Many eukaryotes are multicellular. *Multicellular* means "many cells." Multicellular organisms are usually larger than single-cell organisms. So, most organisms you see with your naked eye are eukaryotes. There are many types of eukaryotes. Animals, including humans, are eukaryotes. So are plants. Some protists, such as amoebas, are single-celled eukaryotes. Other protists, including some types of green algae, are multicellular eukaryotes. Fungi are organisms such as mushrooms or yeasts. Mushrooms are multicellular eukaryotes. Yeasts are single-celled eukaryotes.


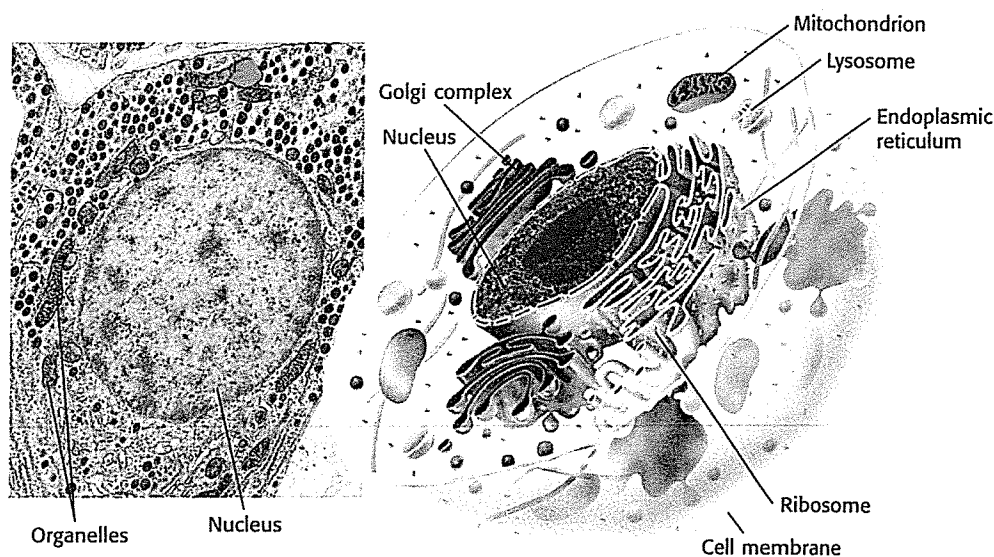
 **Reading Check** How are eukaryotes different from prokaryotes

Figure 8 Organelles in a Typical Eukaryotic Cell



Answer to Reading Check

The main difference between prokaryotes and eukaryotes is that eukaryotic cells have a nucleus and membrane-bound organelles and prokaryotic cells do not.

INTERNET ACTIVITY GENERAL

Brochure For an internet activity related to this chapter, have students go to go.hrw.com and type in the keyword **HL5CELW**.

SECTION Review

Summary

Cells were not discovered until microscopes were invented in the 1600s.

Cell theory states that all organisms are made of cells, the cell is the basic unit of all living things, and all cells come from other cells.

All cells have a cell membrane, cytoplasm, and DNA.

Most cells are too small to be seen with the naked eye. A cell's surface area-to-volume ratio limits the size of a cell.

- The two basic kinds of cells are prokaryotic cells and eukaryotic cells. Eukaryotic cells have a nucleus and membrane-bound organelles. Prokaryotic cells do not.
- Prokaryotes are classified as archaeobacteria and eubacteria.
- Archaeobacterial cell walls and ribosomes are different from the cell walls and ribosomes of other organisms.
- Eukaryotes can be single-celled or multicellular.

Using Key Terms

- In your own words, write a definition for the term *organelle*.
- Use the following terms in the same sentence: *prokaryotic*, *nucleus*, and *eukaryotic*.

Understanding Key Ideas

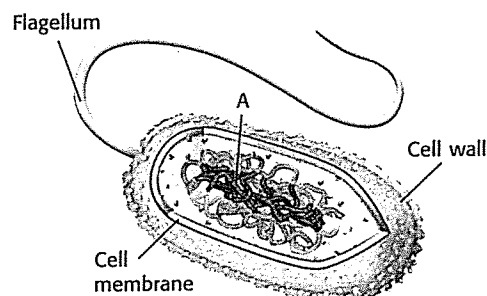
- Cell size is limited by the
 - a. thickness of the cell wall.
 - b. size of the cell's nucleus.
 - c. cell's surface area-to-volume ratio.
 - d. amount of cytoplasm in the cell.
- What are the three parts of the cell theory?
- Name three structures that every cell has.
- Give two ways in which archaeobacteria are different from bacteria.

Critical Thinking

- **Applying Concepts** You have discovered a new single-celled organism. It has a cell wall, ribosomes, and long, circular DNA. Is it a eukaryote or a prokaryote cell? Explain.
- **Identifying Relationships** One of your students brings you a cell about the size of the period at the end of this sentence. It is a single cell, but it also forms chains. What characteristics would this cell have if the organism is a eukaryote? If it is a prokaryote? What would you look for first?

Interpreting Graphics

The picture below shows a particular organism. Use the picture to answer the questions that follow.



9. What type of organism does the picture represent? How do you know?
10. Which structure helps the organism move?
11. What part of the organism does the letter A represent?

SciLinks **NSTA**

Developed and maintained by the
National Science Teachers Association

For a variety of links related to this chapter, go to www.scilinks.org

Topic: Prokaryotic Cells
SciLinks code: HSM1225

Answers to Section Review

1. Sample answer: An organelle is a structure inside a cell that performs a specific function for the cell.
2. Sample answer: Eukaryotic cells have a nucleus, but prokaryotic cells do not.
3. c
4. All organisms are made of one or more cells, the cell is the basic unit of all living things, and all cells come from existing cells.
5. Every cell has a cell membrane, DNA, and cytoplasm.
6. Sample answer: The cell walls and the ribosomes of archaeobacteria are different from those structures in eubacteria.
7. Sample answer: The cell is probably a prokaryote; The key is that it does not appear to have a nucleus and its DNA is long and circular.
8. Sample answer: eukaryote: whether the chains were a multicellular organism or a collection of individual cells, membrane-bound organelles, certain types of ribosomes and certain materials in the cell membranes, where the DNA is located, and a nucleus; prokaryote: other types of ribosomes and cell membrane materials, and the structure of the DNA; The first thing I would look for is a nucleus.
9. a typical eubacterial cell; It has no nucleus, and its DNA is long and circular.
10. the flagellum
11. the cell's DNA

CHAPTER RESOURCES

Chapter Resource File

- Section Quiz **GENERAL**
- Section Review **GENERAL**
- Vocabulary and Section Summary **GENERAL**
- Reinforcement Worksheet **BASIC**

Technology

- Transparencies
- A Typical Eukaryotic Cell