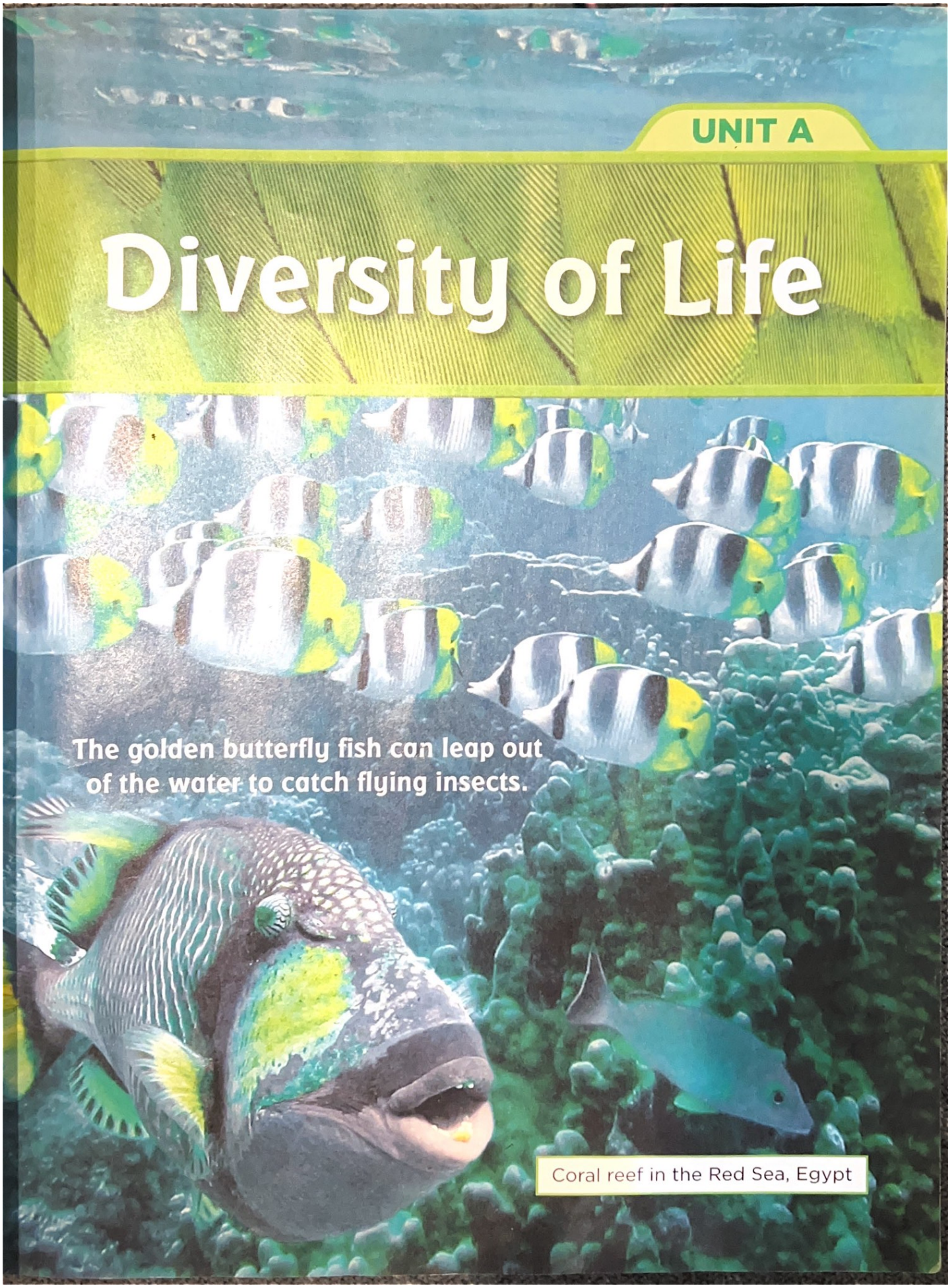
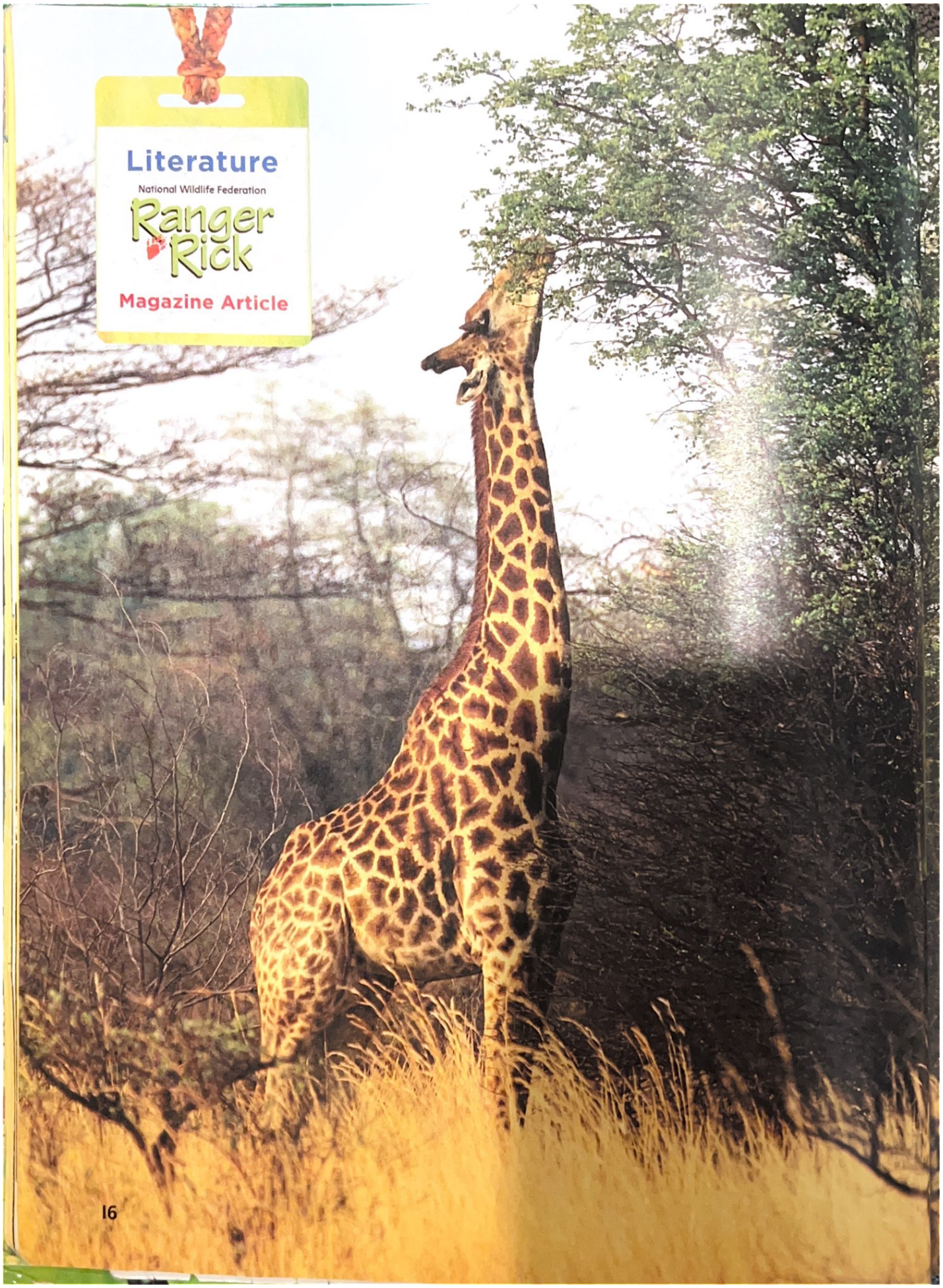

UNIT A
Diversity of Life
The golden butterfly fish can leap out of the water to catch flying insects.
Coral reef in the Red Sea, Egypt


Literature
National Wildlife Federation
Ranger Rick
Magazine Article

from *Ranger Rick*

Adventures in Eating

You just take a bite, chew, swallow, and that's that. Right? Well, dinner isn't always as cooperative as that. Some animals, like giraffes and anteaters, have special adaptations that help them succeed in their eating adventures!

How about dinner with a view? A giraffe uses its extra-long neck to stretch to the treetops. There, it munches on leaves—up to 34 kilograms (75 pounds) of them each day! Giraffes even eat the leaves of thorny acacia trees. The giraffe's long, flexible tongue weaves past the thorns, curls around a leaf, and tugs it free. If it grabs a thorn by mistake, thick, gooey saliva inside the giraffe's mouth and throat protects it from the sharp spines.

Giant anteaters have all the right tools to help them eat ants. Nose to the ground, the anteater sniffs out an ant nest. It makes a hole with a sharp claw, pokes in its long snout, and sticks out its tongue. This is no ordinary tongue. It is 2 feet long and covered with tiny spines and sticky saliva. It flicks in and out more than 150 times a minute, slithering through the tunnels where ants live and slurping as many as 30,000 of them a day.

Write About It

Response to Literature This article tells about different adaptations for eating. Research two more animals that have interesting adaptations. Write a report that explains how these adaptations help the animals eat. Compare these adaptations to the ones you read about in the article.

LOG ON e-Journal Write about it online at www.macmillanmh.com

CHAPTER 1

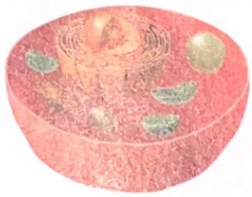
Cells and Kingdoms

How are living things similar?

Euglena

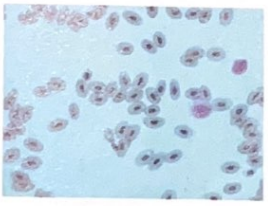
Key Vocabulary

organism
any living thing that can carry out its life on its own (p. 22)



cell
the smallest unit of living matter (p. 22)

unicellular
one-celled organism (p. 23)



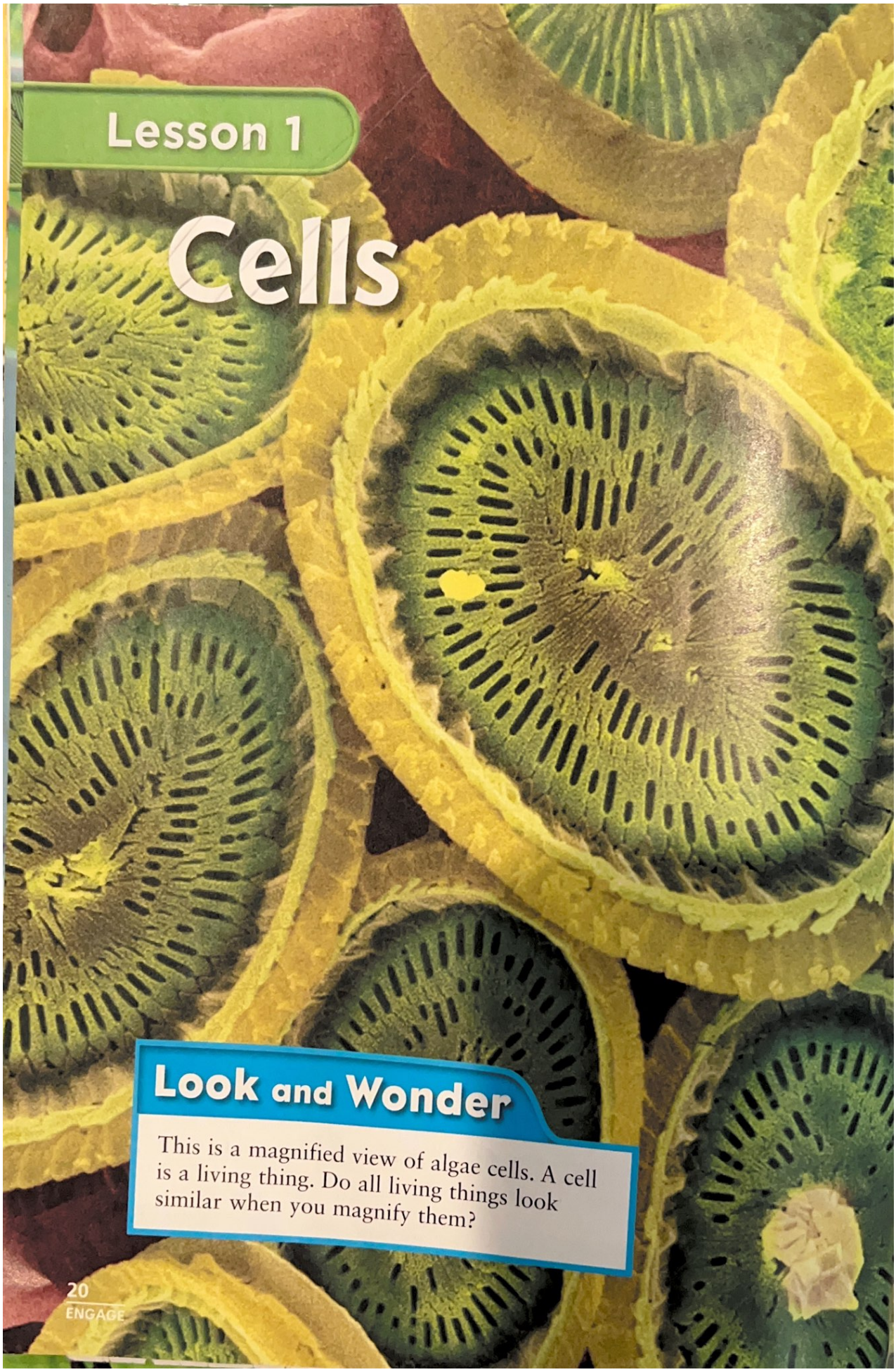
multicellular
many-celled organism (p. 23)

species
a group of similar organisms in a genus that can reproduce more of their own kind (p. 34)

photosynthesis
the food-making process in green plants that uses sunlight (p. 54)

More Vocabulary

chlorophyll, p. 27
tissue, p. 28
organ, p. 28
organ system, p. 28
vascular, p. 38
nonvascular, p. 38
gymnosperm, p. 49
angiosperm, p. 49
xylem, p. 53
phloem, p. 53
cambium, p. 53
transpiration, p. 54
cellular respiration, p. 56
radial symmetry, p. 62
bilateral symmetry, p. 63
skeletal system, p. 74
muscular system, p. 74
respiratory system, p. 78
circulatory system, p. 78
nervous system, p. 80



Lesson 1

Cells

Look and Wonder

This is a magnified view of algae cells. A cell is a living thing. Do all living things look similar when you magnify them?

Explore

Inquiry Activity

What are plants and animals made of?

Make a Prediction

Plants and animals are living things. Think about a plant and an animal you have seen. Do you think they are made of similar or different parts?

Test Your Prediction

1. **Observe** Look at the prepared slide of a plant leaf under the microscope. For help using the microscope, ask your teacher and look at page R5.
2. Draw what you see.
3. Look at the prepared slide of animal blood under the microscope.
4. Draw what you see. Compare your drawings.

Draw Conclusions

5. **Interpret Data** How were the plant slide and animal slide alike? How were they different?
6. **Communicate** Write a report explaining whether or not your observations supported your prediction.

Explore More

Examine the drawings you made and think about the living things they came from. Mushrooms are also living things. What do you think a mushroom slide looks like? Make a prediction and plan an experiment to test it.

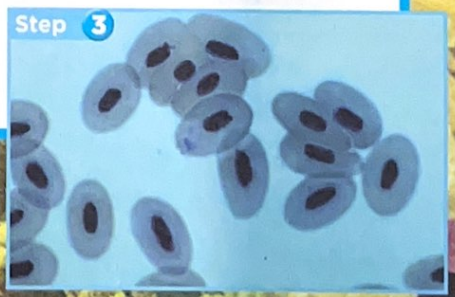
Materials

- microscope
- prepared slides of plant-leaf cells
- prepared slides of animal-blood cells

Step 1

Step 2

Step 3



Read and Learn

Main Idea

Living things are all made of the same basic building blocks—cells.

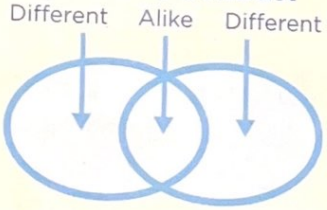
Vocabulary

organism, p. 22
cell, p. 22
unicellular, p. 23
multicellular, p. 23
chlorophyll, p. 27
tissue, p. 28
organ, p. 28
organ system, p. 28

LOG ON e-Glossary
at www.macmillanmh.com

Reading Skill

Compare and Contrast



Technology

SCIENCE QUEST

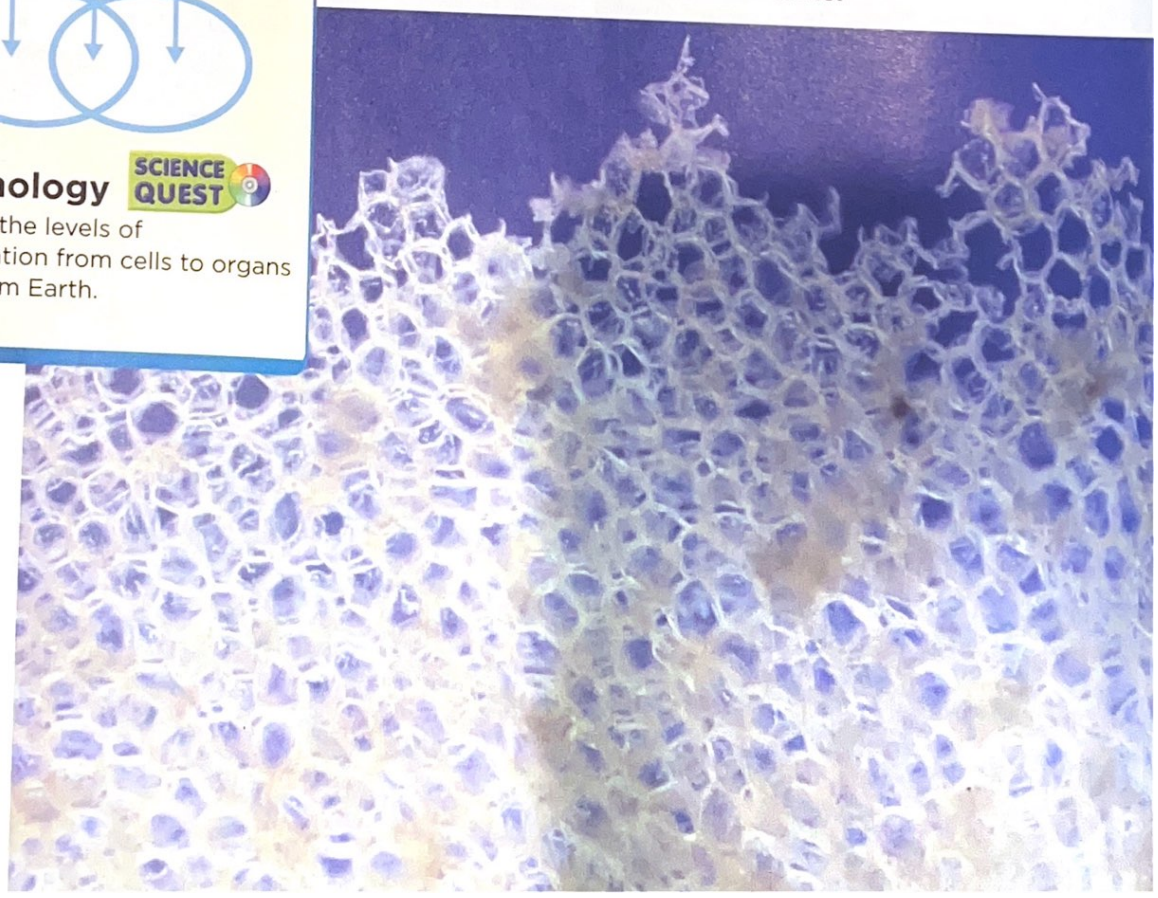
Explore the levels of organization from cells to organs with Team Earth.

What are cells?

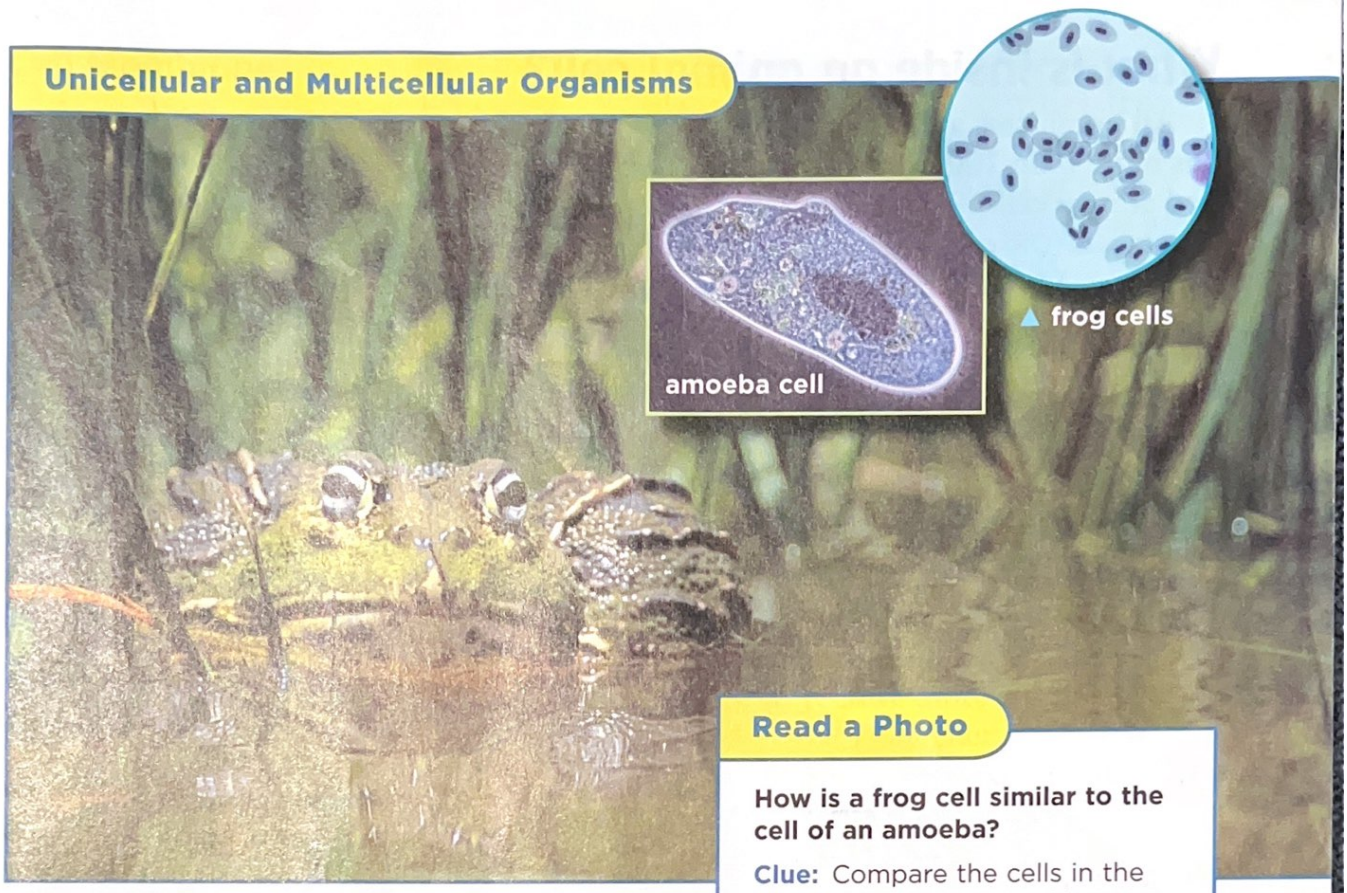
Earth is home to many different living things—big, small, strange, beautiful, and everything in between. You might think a microscopic amoeba and an 18.3-meter-long (60 foot) giant squid could have nothing in common. However, if you look closely through a microscope you will see how similar they are. A giant squid and an amoeba are both organisms (OR•guh•niz•uhmz). An **organism** is a living thing. They are made of the same tiny building blocks. From the smallest organism to the largest, they are all made of cells. A **cell** is the smallest unit of living things that can carry out the basic processes of life.

Where do cells come from? The simple answer is that cells come from other cells! Every cell in every living thing on Earth originally came from another cell. A cell divided, or split into two new cells, and so did the cell before that, and so on.

In 1665, English scientist Robert Hooke looked at a slice of cork in his microscope and saw many "little boxes" like these that he called cells.



Unicellular and Multicellular Organisms



Read a Photo

How is a frog cell similar to the cell of an amoeba?

Clue: Compare the cells in the photos. How are they alike? How are they different?

A **unicellular** (ew•nuh•SEL•yuh•luhr), or one-celled, organism is made of a single cell that carries out its life processes. Life processes include growing, responding to an environment, reproducing, and getting food. **Multicellular** (mul•ti•SEL•yuh•luhr), or many-celled, organisms are made of more than one cell. Multicellular organisms include frogs, trees, and you!

In multicellular organisms, every cell carries out its own life process. The cells also work together to take care of different functions for the organism. For example, all of your heart muscle cells carry out their own life processes, and they work together to keep your heart beating.

How plentiful are unicellular and multicellular organisms? More than $1\frac{1}{2}$ million kinds of organisms have been identified. That number is small compared to the estimated number of unicellular organisms that exist and have not been identified. Scientists estimate that there are more than 1 billion kinds of unicellular organisms!

Quick Check

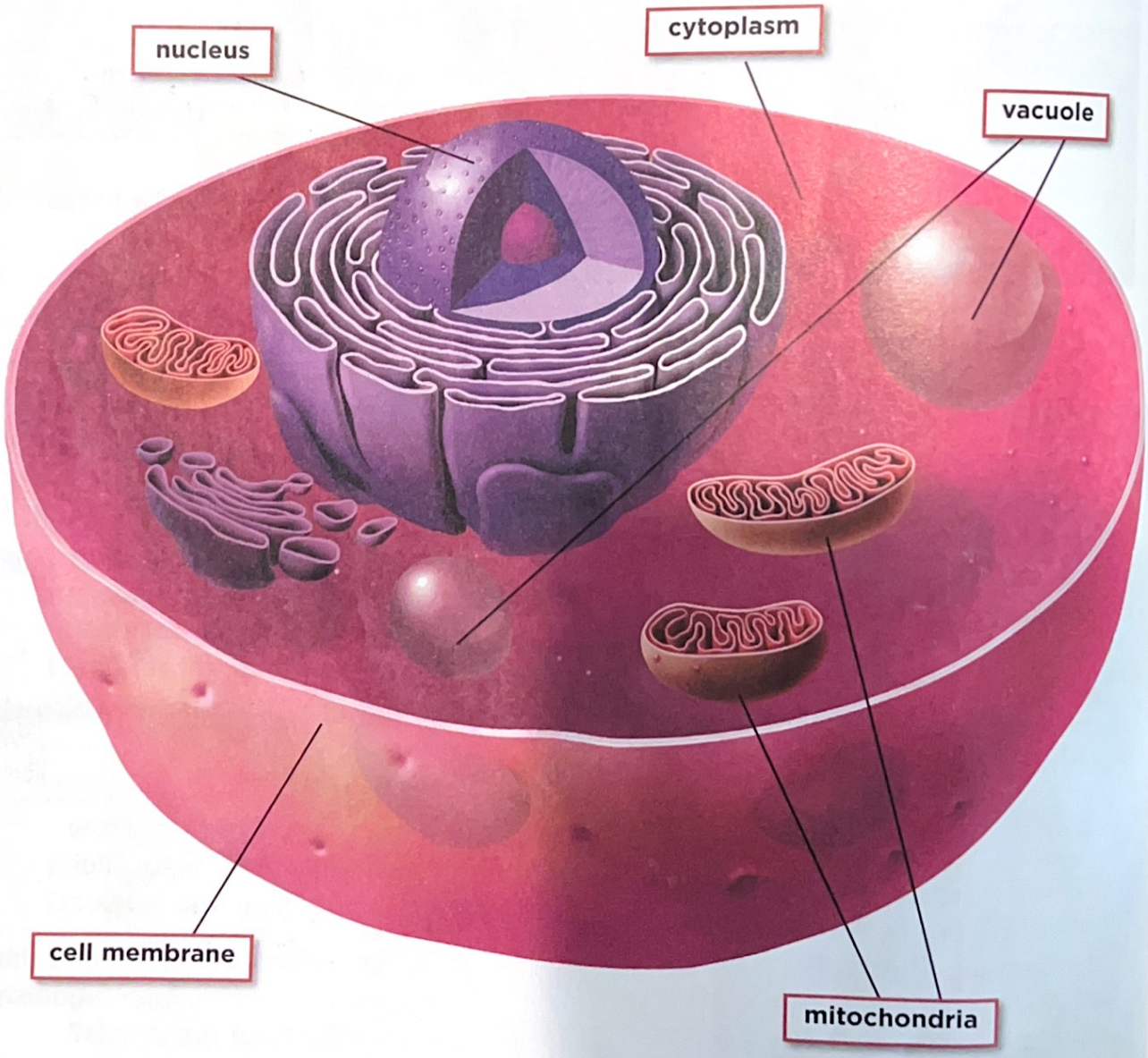
Compare and Contrast How are unicellular and multicellular organisms similar and different?

Critical Thinking Why do you think there are more unicellular organisms than multicellular organisms?

What is inside an animal cell?

All organisms are made of cells. Your own body has more than 200 different kinds of cells. Plant and animal cells have several basic structures, called *organelles* (OR•guh•nelz), that help them perform life processes. Organelles have functions that help keep the cell alive.

Animal Cell



Cell Membrane

Animal cells are surrounded by a flexible wrapping called a *cell membrane*. The cell membrane is a layer around the outside of the cell. It wraps around the cell in somewhat the same way your skin wraps around you. It gives the cell its shape.

The cell membrane controls what materials move into and out of the cell. Only certain substances are able to enter and leave the cell.

Cytoplasm

The cell membrane is filled with a gel-like liquid called *cytoplasm* (SYE•tuh•plaz•uhm). It occupies the region from the nucleus to the cell membrane. Cytoplasm is made mostly of water. A variety of organelles float in the cytoplasm.

The cytoplasm supports all the cell's structures. It is constantly moving through the cell in a stream-like motion. Some of the cell's life processes take place in the cytoplasm.

Nucleus

The *nucleus* (NEW•clee•uhs) is the cell's control center. It is a large, round organelle usually found in the center of the cell. It has a membrane with pores, or openings, that allow certain materials to pass in and out.

The nucleus contains the master plans for all the cell's activities. It sends signals to all other parts of the cell. Cells grow, move, and at some point may divide. These functions are controlled by a cell's nucleus.

Mitochondria

Mitochondria (mye•tuh•KON•dree•uh) are oval, membrane-covered organelles that supply energy for the cell. Each mitochondrion is a tiny power plant. They break down food, which releases energy for the cell to use.

Some cells are more active than others and require more energy. Cells that require a lot of energy, such as muscle cells, usually have a great many mitochondria.

Vacuoles

A *vacuole* (VAK•yew•ohl) is a membrane-covered structure used for storage. It can store water, food, and wastes. The nucleus can signal a vacuole to release whatever it is storing. Some animal cells have many small vacuoles and some may not have any vacuoles.

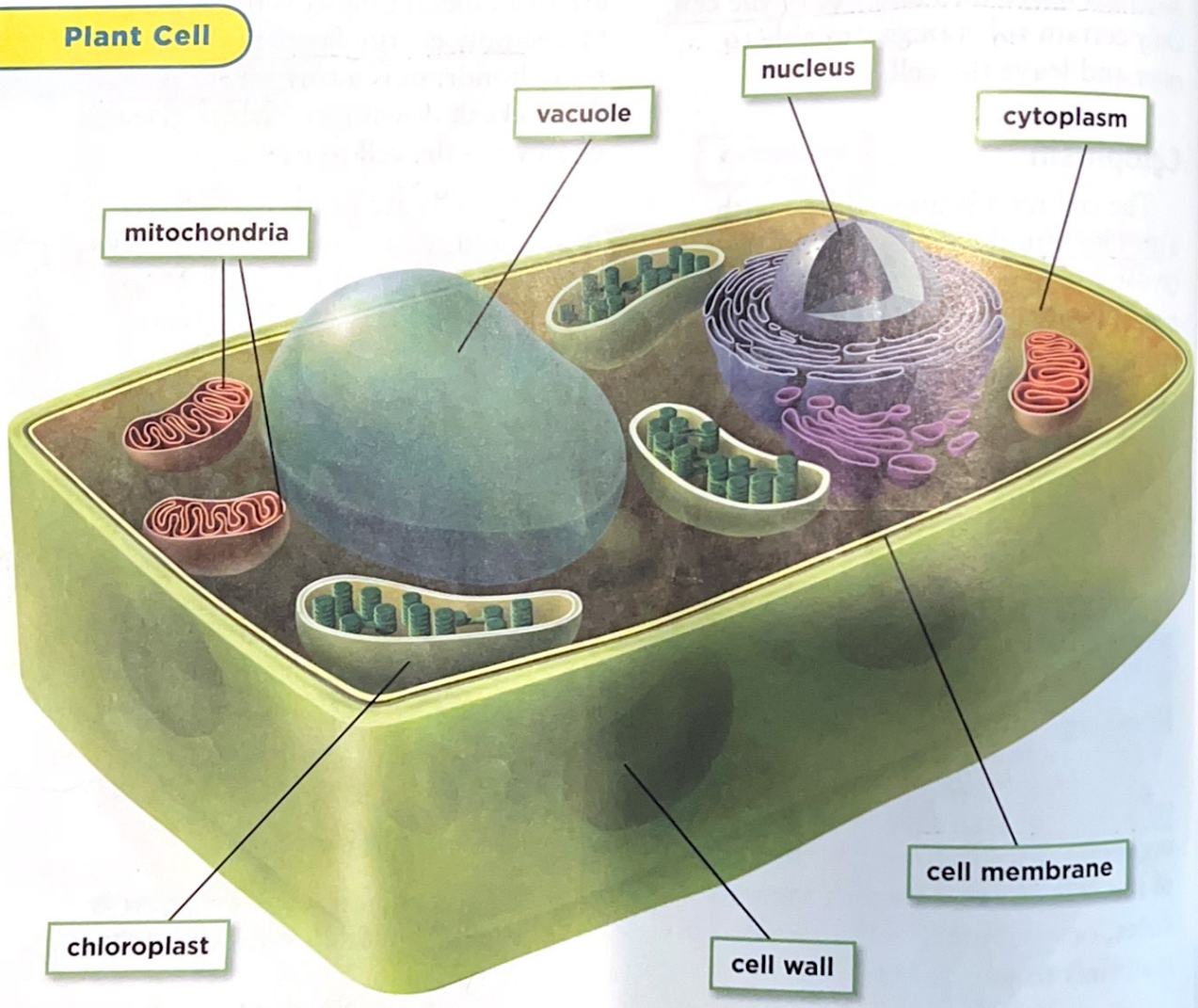
Quick Check

Compare and Contrast How is a mitochondrion similar to a tiny power plant?

Critical Thinking Do you think a cell would function without a nucleus? Explain your answer.

What is inside a plant cell?

Plant cells have many of the same structures and organelles as animal cells. However, plant cells often have a box-like shape and are a bit larger than animal cells. They also have some additional organelles that animal cells do not have.



Read a Diagram

Which structures in plant and animal cells are the same? Draw a Venn diagram to answer the question.

Clue: Look for key differences between plant and animal cells.

Cell Wall

Plant cells have an additional outer covering around the outside of the cell. This layer is called the *cell wall*. The cell wall is a stiff structure outside the cell membrane. It provides the plant cell with strength and extra support.

Vacuole

Unlike animal cells, plant cells usually have one large, central vacuole. In plant cells this vacuole stores excess water and provides extra support. The extra water in the vacuoles of plant cells keeps the plant from drying out. When a plant needs extra water the vacuoles release the water they have stored into the cells.

Chloroplast

Plants make their own food in structures inside their cells called *chloroplasts* (KLOR•uh•plastz). A chloroplast is a green structure where the energy from sunlight is used to produce food for the plant. Chloroplasts are green because they contain a chemical called chlorophyll (KLOR•uh•fil). **Chlorophyll** is able to use the energy in sunlight.

Many plant cells are green because of the chlorophyll in their chloroplasts. Plant cells that lack chloroplasts are not green. Chloroplasts are mainly found in the cells of leaves and stems of plants.

Quick Lab

Plant and Animal Cells

1. **Make a Model** Put one plastic bag in a storage container. This is a plant cell. Use another plastic bag as an animal cell.
2. Using a spoon, carefully put gelatin in both bags until the bags are almost full.
3. Choose vegetables that look the most like the plant-cell and animal-cell organelles.
4. Place the vegetables that you have picked into the appropriate container and seal the bags.
5. Try to stack your models. How well do the plant cells stack compared to the animal cells?
6. **Communicate** Discuss with your classmates which vegetables you selected for your organelles and explain why.

Quick Check

Compare and Contrast Which cell has a stronger outer covering—a plant cell or an animal cell?

Critical Thinking A plant cell has a thick cell wall and large vacuoles. However, it does not seem to have chloroplasts. What part of the plant might this cell be from?

How are cells organized?

For unicellular organisms, organization is simple. The organism has only one cell that performs all life functions. Multicellular organisms are more specialized. Your own body contains many different cell types that have specific functions. Muscle cells, for example, specialize in movement. Red blood cells, on the other hand, carry oxygen to other cells.

In a complex organism like a salamander, organization starts at the cell level. Cells are the building blocks of the body. Similar cells working together at the same job, or function, form a **tissue** (TISH•ew). A group of tissues that work together to perform a specific function form an **organ** (OR•guhn). The salamander's heart, liver, brain, and skin are organs.

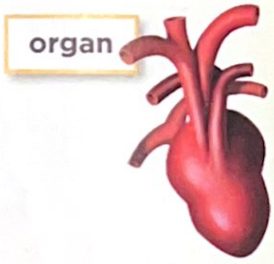
Organs that work together to perform a certain function make up an **organ system**. For example, the salamander's circulatory system includes its heart, blood, and blood vessels. These work together to bring food, oxygen, and other materials to the salamander's cells. Some organ systems work together with other organ systems. The digestive system sends food to the circulatory system. The blood vessels in the circulatory system bring this food to the salamander's cells. All of the cells, tissues, organs, and organ systems form an organism.

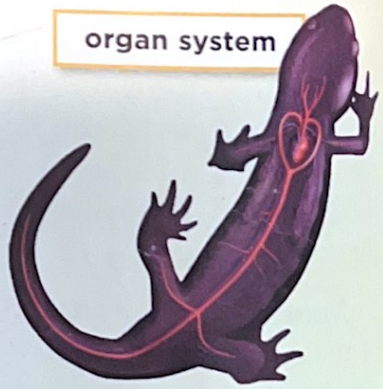
Quick Check

Compare and Contrast How do organs compare to organ systems?

Critical Thinking How are complex organisms organized?

From Cells to Organisms





Lesson Review

Visual Summary

Cells are the basic building blocks of all living things.

Animal cells and plant cells share some **organelles**, but animal cells do not have cell walls, chloroplasts, or large vacuoles.

Organisms can exist as single cells, or they can be organized into **tissues, organs,** and **organ systems**.

Make a FOLDABLES™ Study Guide

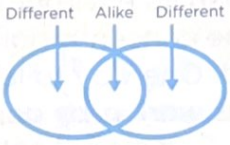
Make a Three-Tab Book. Use the titles shown. Tell about the topic on the inside of each tab.

Think, Talk, and Write

1. **Main Idea** What is the main difference between the ways unicellular and multicellular organisms are organized?

2. **Vocabulary** The cell's power plants are the _____.

3. **Compare and Contrast** How can you tell the difference between a typical plant cell and a typical animal cell?



4. **Critical Thinking** Do bigger organisms have bigger cells? What kind of test could you do to answer this question?

5. **Test Prep** **Which of the following exists in both plant and animal cells?**
   - **A** chloroplast
   - **B** cell wall
   - **C** mitochondrion
   - **D** chlorophyll

6. **Test Prep** **Which of the following is the cell's control center?**
   - **A** cytoplasm
   - **B** nucleus
   - **C** cell membrane
   - **D** vacuole

Math Link

Dividing Bacteria

A single unicellular bacterium divides every half hour. How many bacteria cells will exist after 3 hours?

Social Studies Link

The Plague

The Plague was a disease that killed many in the Middle Ages. Write a report on this disease. What kind of organism caused plague—unicellular or multicellular?

LOG ON e-Review Summaries and quizzes online at www.macmillanmh.com

Focus on Skills

Inquiry Skill: Experiment

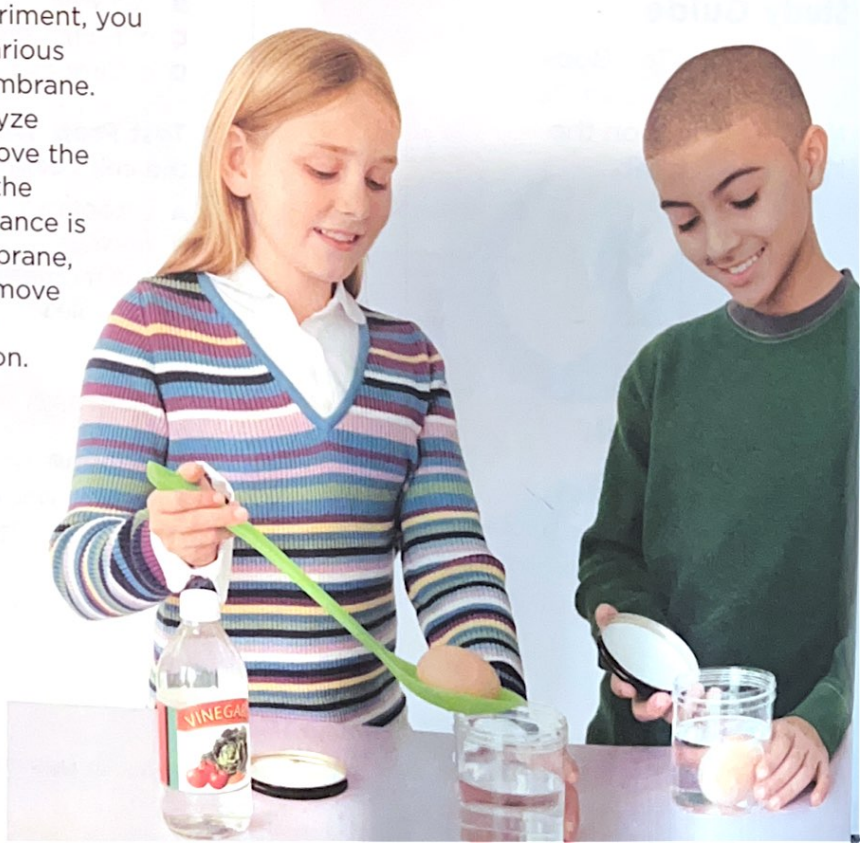
All living things are made up of cells. Every cell has a cell membrane. The cell membrane is a layer around the cell that lets substances in and out.

Substances move in or out of a cell depending on their concentrations, or amounts. Substances move from areas where they are crowded to areas where they are less crowded. For example, if a cell has a higher concentration of water than its environment, water will flow out of the cell until the concentration on the inside and outside is balanced. One way to learn more about how cell membranes work is by doing an **experiment**.

▶ Learn It

An **experiment** is a test that supports or does not support a hypothesis. To carry out an experiment you need to perform a test that examines the effects of one variable on another using controlled conditions. You can then use your data to draw a conclusion about whether or not the hypothesis has been supported.

In the following experiment, you will test the effects of various substances on a cell membrane. You will gather and analyze data to support or disprove the following hypothesis: If the concentration of a substance is higher outside the membrane, then the substance will move inside the membrane to balance the concentration.



Try It

Materials **2 eggs, balance, 2 glass jars with lids, vinegar, spoon, 2 beakers, water, corn syrup**

1. Measure two eggs using a balance. Record the measurements in a chart.
2. Pour 200 mL of vinegar into two jars with lids. Carefully lower the two eggs into the jars of vinegar. Tighten the lids and leave the eggs inside for two days.
3. Use a spoon to carefully remove the eggs. Rinse the eggs under water.
4. Measure each egg and record the data in your chart.
5. Pour 200 mL of water into a beaker and 200 mL of corn syrup into another beaker. Carefully lower an egg into each beaker. Leave the eggs inside for one day.
6. Use the spoon to carefully remove the eggs. Rinse the eggs under water.
7. Measure each egg and record the data in your chart.

Apply It

1. Now it is time to analyze your data and observations. Use your chart to compare the masses of the eggs.
2. Did the mass of both eggs change? Explain why the masses changed.
3. Did this **experiment** support or disprove the hypothesis?

	First Measurement	Second Measurement	Third Measurement
Egg #1			
Egg #2			