GreatHearts
Northern Oaks

Supplemental Distance Learning Packet

April 6 - 9, 2020

4th grade

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Biological Organization

Chapter 1

Look closely at your hand. What do you see? You see skin. Now squeeze your fingers and wrist with your other hand. You feel bones and some soft parts, too. Bones and skin are made up of even smaller parts called cells. A **cell** is the smallest unit of life. Cells are the basic unit of all living things.

Some tiny organisms consist of just one cell. These are called unicellular. These organisms are so small that you cannot see them without a microscope.

Many organisms, such as plants and animals, are made of many cells. They are called multicellular. Each type of cell has its own job. All the cells work together to help keep an organism alive.

Big Question

How are cells and tissues related in living things?

Vocabulary

cell, n. the smallest unit of life

Word Parts

The prefix *uni-* means one.

The prefix *multi-* means many.

Bacteria are organisms that consist of only one cell. An individual is called a bacterium.

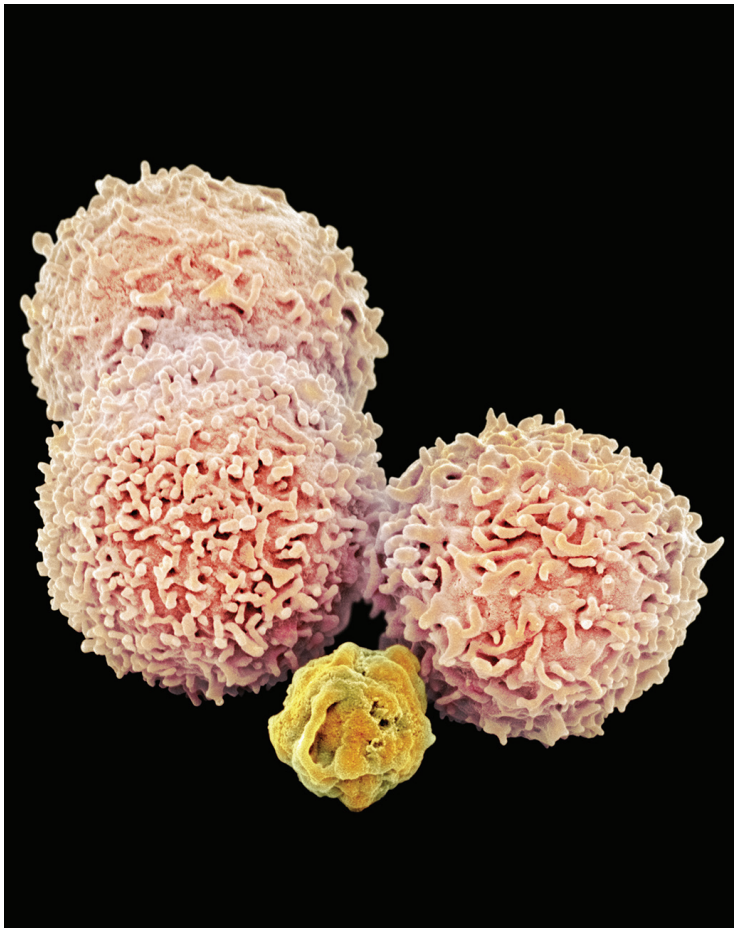
Cells Are the Building Blocks of All Animal Life

Animals are made of many kinds of cells. Each type of cell has its own role. Skin cells, blood cells, nerve cells, and muscle cells are just a few of the kinds of animal cells.

Skin cells form a layer. This layer covers the whole body. In this way, it protects all the parts inside an animal's body. Special skin cells make fur, hair, and nails.

Blood carries oxygen throughout an animal's body. Blood also contains cells that help to keep the animal from getting sick.

Nerve cells help to send messages to and from an animal's brain. They deliver these signals to the rest of the animal's body. Some nerve cells connect to muscles. Their signals tell the muscles to move. In turn, muscle cells help an animal to move. Special muscle cells cause the heart to beat.

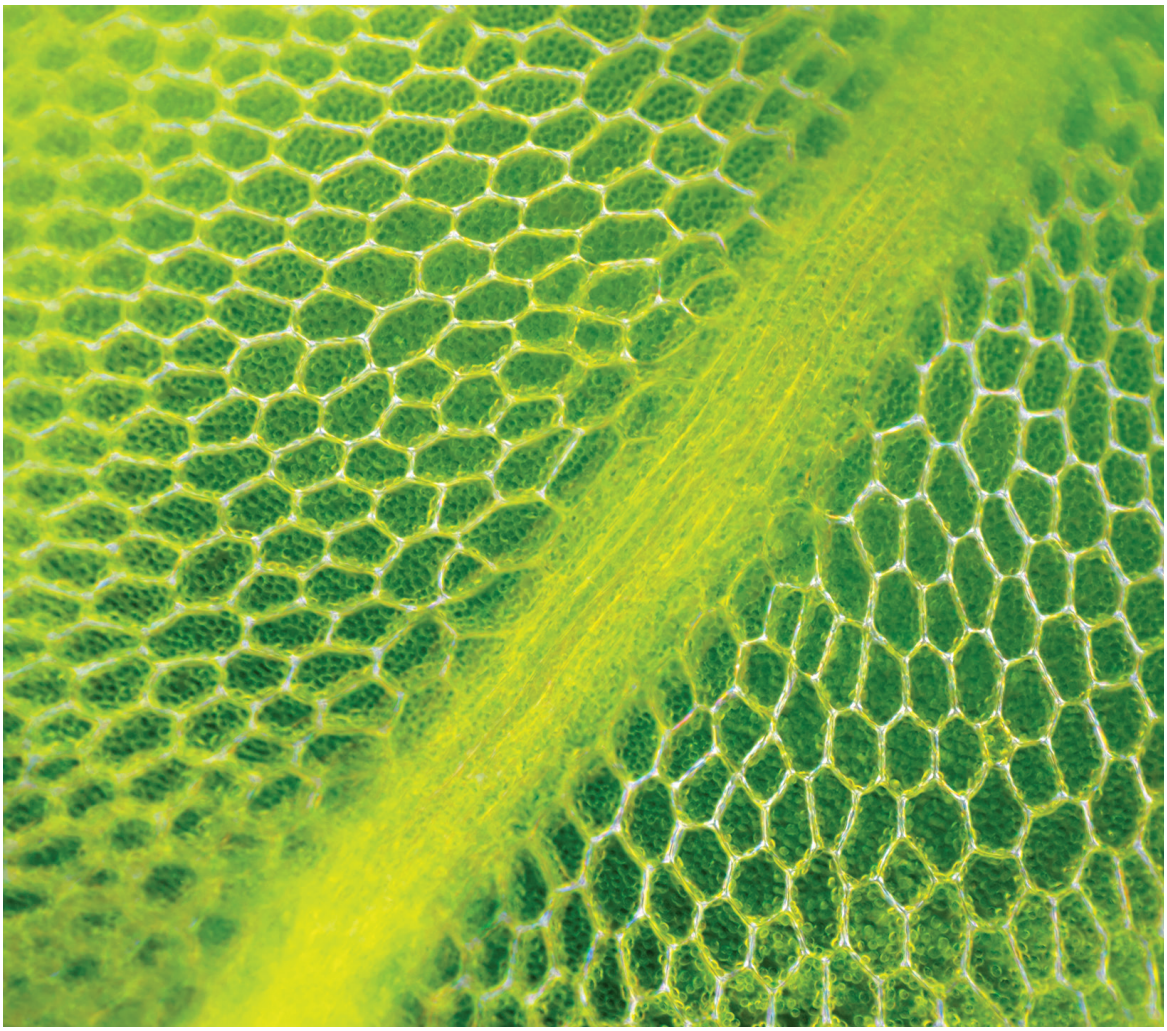


These are a type of cell found in blood. These cells fight infection throughout an animal's body.

Cells Are the Building Blocks of All Plant Life

Like animal cells, types of plant cells have their own jobs that help to keep plants alive. Leaves are made of cells. Some of these cells make or store food for the plant. Other leaf cells allow the plant to take in air that it needs. Another type of leaf cells form tubes that carry food from the leaves to the rest of the plant.

Stems and roots are made of cells, too. Bundles of cells make the stem stiff and strong. Tubes in the stem, which develop from cells, allow water to move. Root cells take in water from the soil. The water moves from roots through the stem to the leaves.



This photo taken through a microscope shows cells in the leaf of a plant.

Groups of Similar Cells Form Tissues

Groups of similar kinds of cells form **tissues**. In animals, groups of muscle cells that work together make up muscle tissue. Muscle tissue allows an animal to move.

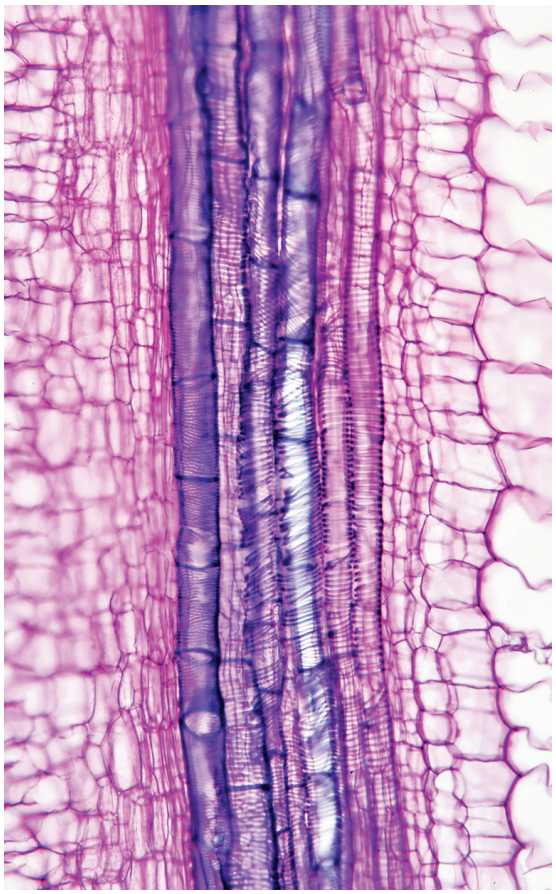
Vocabulary

tissue, n. a group of similar cells joined together

Bone tissues are made of bone cells. Bones protect soft parts inside an animal and help to add a rigid structure to give an animal shape. Connective tissues help hold different body parts together. Each of these types of tissues is made of a group of similar cells.

Plants have several tissues too. Some tissue forms the outside of a plant—its protective layer. Another kind of tissue transports water and nutrients to the plant's stems and leaves. Yet another type of tissue forms the growing parts of the plant at the tips of stems and roots. Each of these types of tissues is made of a group of similar cells.

In all living things, cells make up tissues. This pattern of structure is what scientists call *biological organization*.



Tissues inside plants form tube-like structures. This type of tissue carries water from the roots, through the stem, and to the leaves.

Darkling Beetles

Darkling beetles are insects. They live in almost every part of the world, from the desert to the rain forest. There are many different kinds. In North America alone, there are 1,400 kinds of darkling beetles! One kind of darkling beetle is *Tenebrio*.

The adult *Tenebrio* beetle is about 1.9 centimeters (cm) long. It is dark brown to black and usually lives in dark, dry places. Like other insects, the darkling beetle has six legs and three body parts. These parts are the head, thorax, and abdomen. Like other beetles, it has two pairs of wings. The front wings cover and protect the back wings and abdomen. Even with wings, darkling beetles cannot fly.

Life Cycle

The darkling beetle goes through four stages in its life cycle. The stages are egg, larva, pupa, and adult beetle. Female beetles lay 500 to 1,000 eggs at a time. The eggs at 1 millimeter (mm) are almost too small to see. Tiny larvae hatch from the eggs in about a week.

The larvae of *Tenebrio* beetles are a yellow-gold color. They are called mealworms, but they are not worms at all. The larvae eat cereals and grains. They grow to a length of 3 cm. The larvae molt (shed their tough outer skin) several times in order to grow. After about 3 months, the larvae change into pupae.

The pupa is a resting stage. The insect's body begins to change into an adult beetle. The pupa stage lasts about 2 weeks. Then the beetle comes out as an adult. This cycle of changes is called complete metamorphosis.

A larva (mealworm)

An adult *Tenebrio* beetle

A pupa

Characteristics

Darkling beetles inherit most of their characteristics from their parents. Inherited characteristics pass from generation to generation. That's why parents and offspring look alike. Darkling beetles get their size and color from their parents. They get their head, antennae, thorax, and six legs from their parents.

Some characteristics are caused by the environment. Things can happen to change how a beetle looks. If a beetle gets into a fight, it might lose a piece of wing cover. It could even lose a leg. The beetle looks different.

If the beetle becomes a parent, what will its offspring look like? Will they have broken wing covers and five legs? No. Changes like these are caused by the environment. They are not passed on to offspring.

In the natural environment, *Tenebrio* beetles live in grasslands where there are plenty of seeds. They also make their homes near humans. They get into cupboards, pantries, and chicken farms. For this reason, darkling beetles might be thought of as pests. But they are harmless to humans.

Darkling beetles inherit most of their characteristics from their parents.

Other Beetles

What makes a beetle a beetle? The most important characteristic that all beetles share is their short, hard front wings called elytra. When a beetle folds its wings, the elytra cover its entire abdomen. This shell gives a beetle its armored appearance. When a beetle flies, it lifts its elytra so that its back wings can move.

All beetles go through the same four stages of growth as the darkling beetle. Females lay eggs that hatch into wormlike larvae. The larvae eat, grow, and pupate. Finally, the pupae change into adults. At least 250,000 kinds of beetles have been described by scientists. Beetles can be less than 1 cm to more than 15 cm long.

Beetles live in just about every environment on Earth. They live in rain forests, deserts, mountain lakes, rivers, and northern forests. They can live in people's homes and gardens. They can even live in sewers. The only environment they don't live in is the ocean.

Beetles eat almost everything. Some eat leaves, fruit, bark, seeds, and grains. Others are parasites and live on or in living animals. Some beetles are scavengers, living on dead animals or dung. Beetles can be helpful to humans. For example, beetles called ladybugs are predators. They eat small insects that destroy gardens and farm plants.

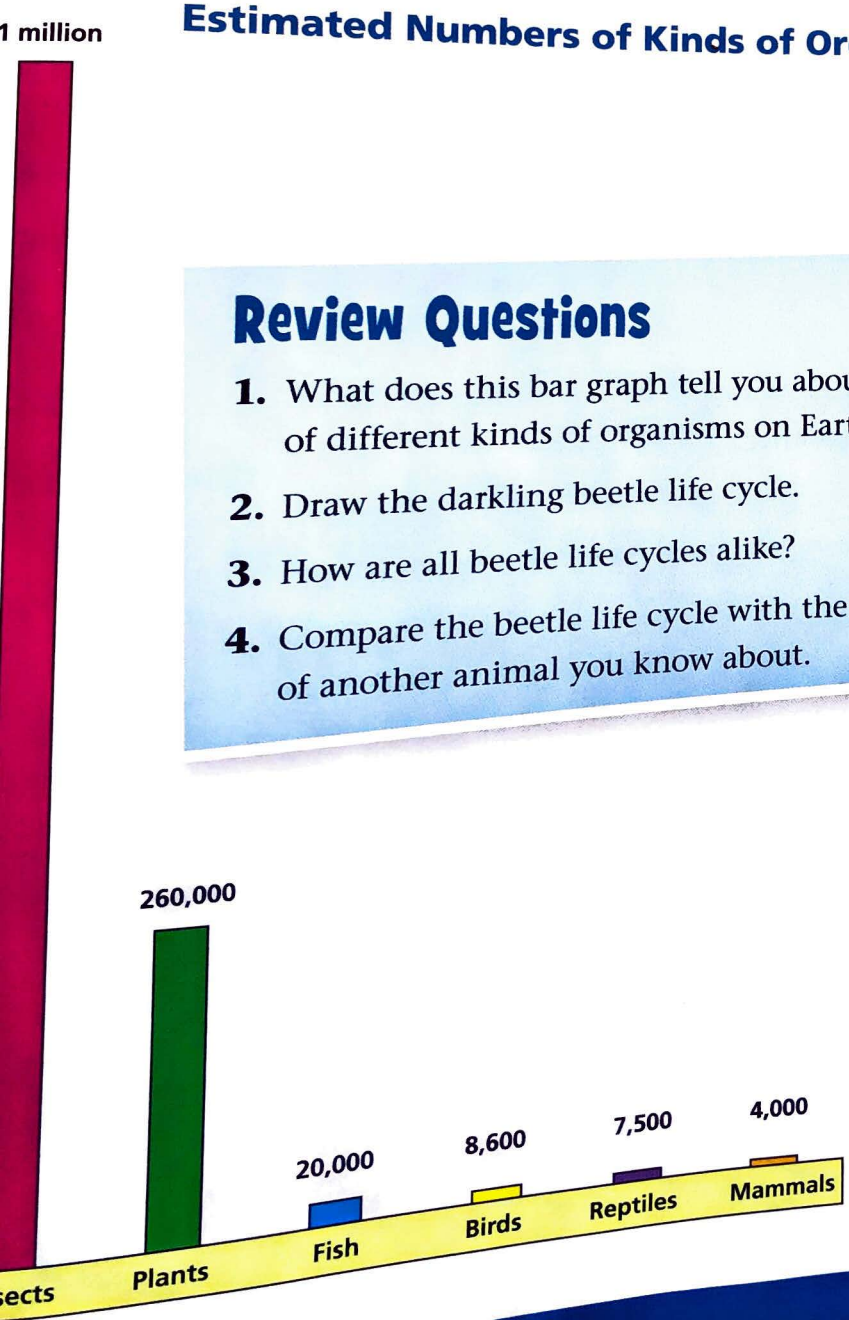
Another kind of darkling beetle

A metallic-green fig beetle

A ten-lined June beetle

What group of insects do you think is the most successful on Earth? ies? Mosquitoes? Ants? It's the beetles. There are more kinds of beetles an all the other kinds of insects added together.

And how many different kinds of insects are there? No one knows for re. About 1 million of the 1.3 million kinds of organisms that have en described by scientists are insects. The list of insects is growing at e rate of about 7,000 to 10,000 new kinds every year! Based on work ne in rain forests, some scientists think there may be 10 to 30 million ore kinds of insects to discover. The estimated numbers of kinds of nts, fish, birds, reptiles, and mammals seem quite small compared to e millions of insects.



Review Questions

1. What does this bar graph tell you about the numbers of different kinds of organisms on Earth?
2. Draw the darkling beetle life cycle.
3. How are all beetle life cycles alike?
4. Compare the beetle life cycle with the life cycle of another animal you know about.

Life Cycles

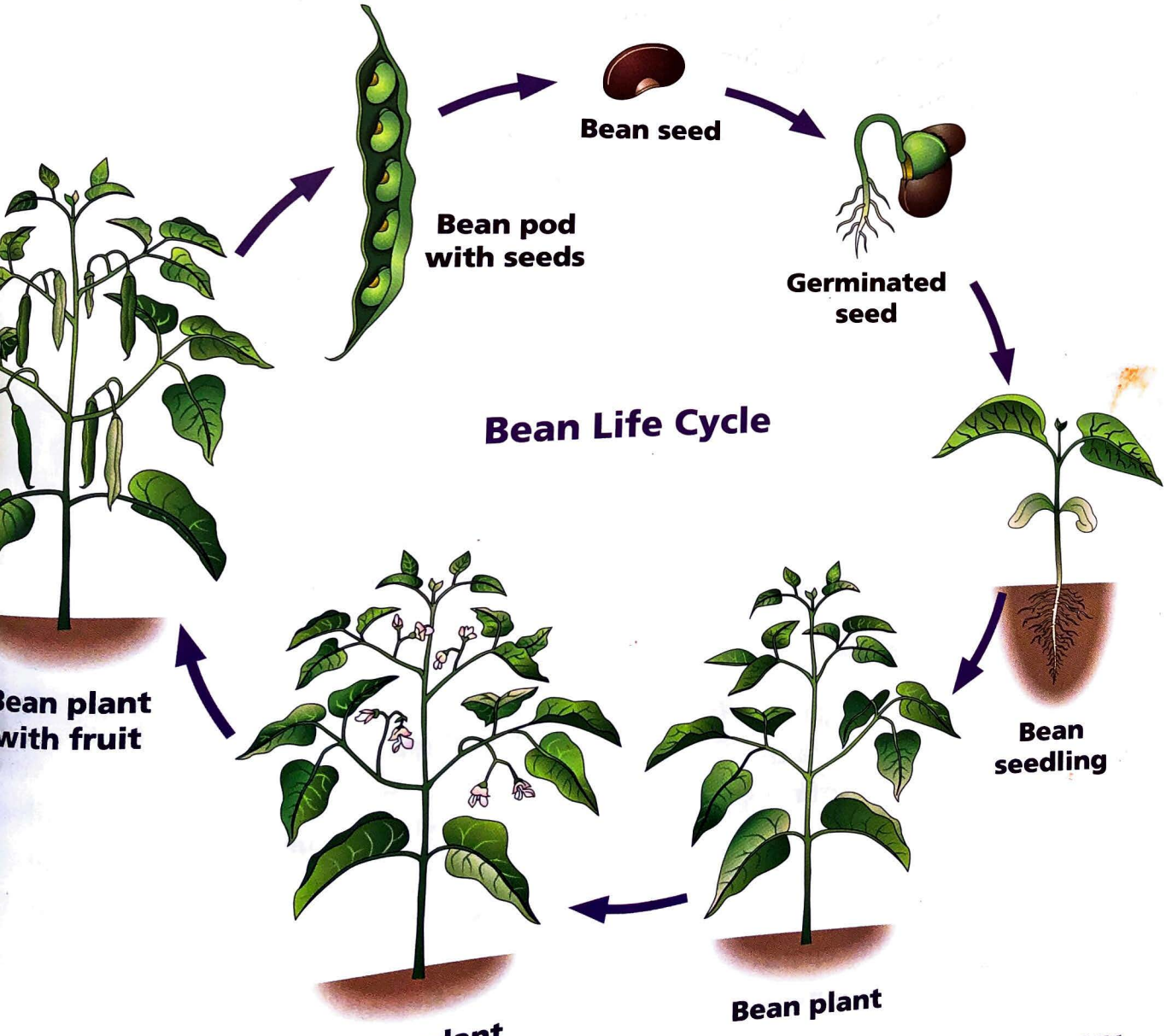
The word *cycle* means "go around." A wheel goes around. You can observe a wheel go through one cycle. Put a mark on a wheel. That's the beginning point. Turn the wheel and watch the mark go around. When the mark comes back to the beginning point, the wheel has completed one cycle. Another cycle is the one that happens every day, from sunrise one day to sunrise the next day. One year is a cycle. The Moon goes through a cycle of phases each month.

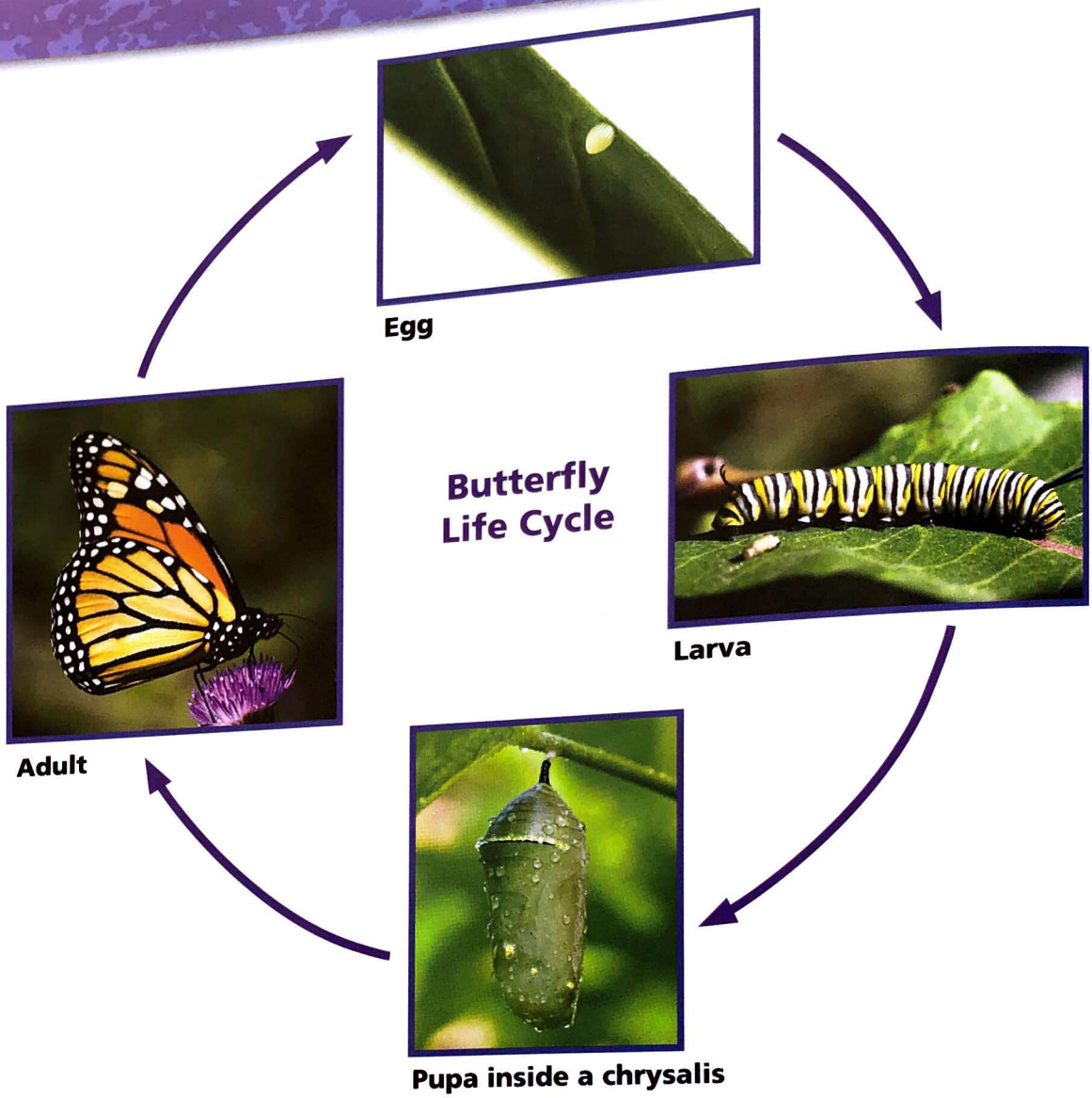
Organisms go through **life cycles**. But an organism's life cycle is a little different than going around in a circle. Like all cycles, a life cycle has a beginning, things happen, and then you find yourself back at the beginning again.

You studied the life cycle of a bean plant. The life cycle started with a bean seed. Inside the bean seed was the dormant embryo of a bean plant. When the bean seed **soaked** up water, the seed germinated. The bean plant started growing.

The root was the first structure to appear. Soon after that, the first leaves appeared on the end of a stem. The baby bean plant had developed into a bean seedling. For several weeks the bean plant got bigger and grew more leaves and stems.

When the bean plant was mature, it developed **flowers**. The flowers changed into fruits, called green beans. Seeds developed inside the fruits. When the fruits were mature, there was a crop of new bean seeds. The bean plant had gone through its life cycle. The plant started as a seed and completed the cycle when it produced new seeds. The seeds might grow into new plants. The life cycle repeats over and over again.





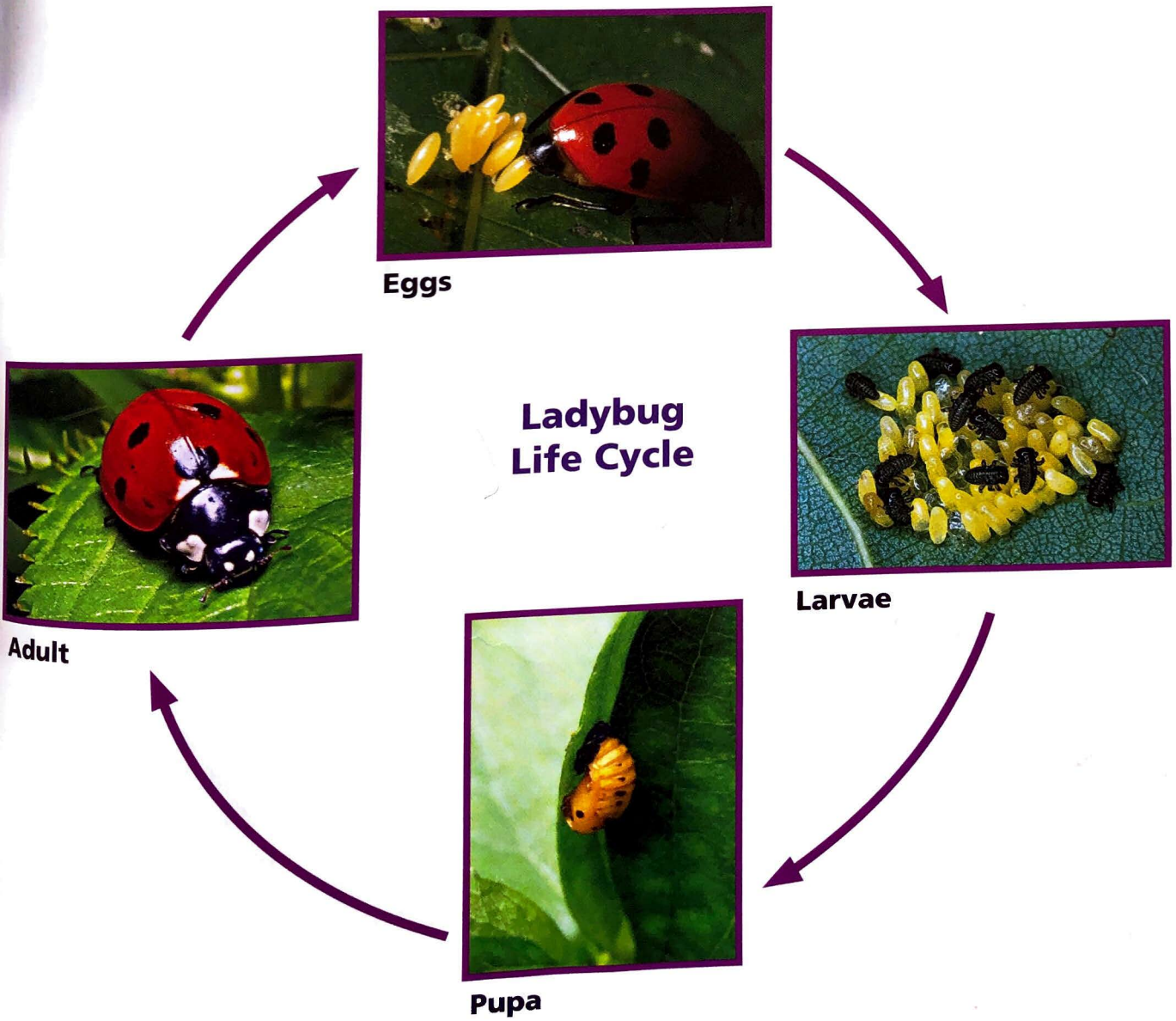
Butterfly Life Cycle

Other organisms have life cycles, too. But animal life cycles can be very different from the life cycle of a bean plant. Some animals are born alive, and some animals hatch from eggs. They all grow up to be adults. The adults mate and produce offspring. The life cycle of the monarch butterfly starts with an egg. A tiny larva called a caterpillar hatches out of the egg. The caterpillar eats and grows. When it is about as big as your finger, the caterpillar changes into a pupa inside a **chrysalis**. In a couple of weeks, the adult butterfly breaks out of the chrysalis and flies away. In a year, the female lays eggs, completing the life cycle.

Ladybug Life Cycle

Ladybugs, like monarch butterflies, are insects. Ladybugs and butterflies have similar stages in their life cycles. This life cycle is shared by a number of other kinds of insects.

The ladybug life cycle starts when adult ladybugs mate and the female lays eggs. When an egg hatches, a larva comes out. The black larva is the offspring, but it doesn't look like its parents. The larva eats and grows for 3 or 4 weeks before it pupates. Inside the pupa, the larva is changing. When the pupa opens, an adult ladybug comes out. Adult ladybugs are red with black spots. Now the ladybug offspring looks just like its parents.



Eggs

Adult trout

Trout Life Cycle

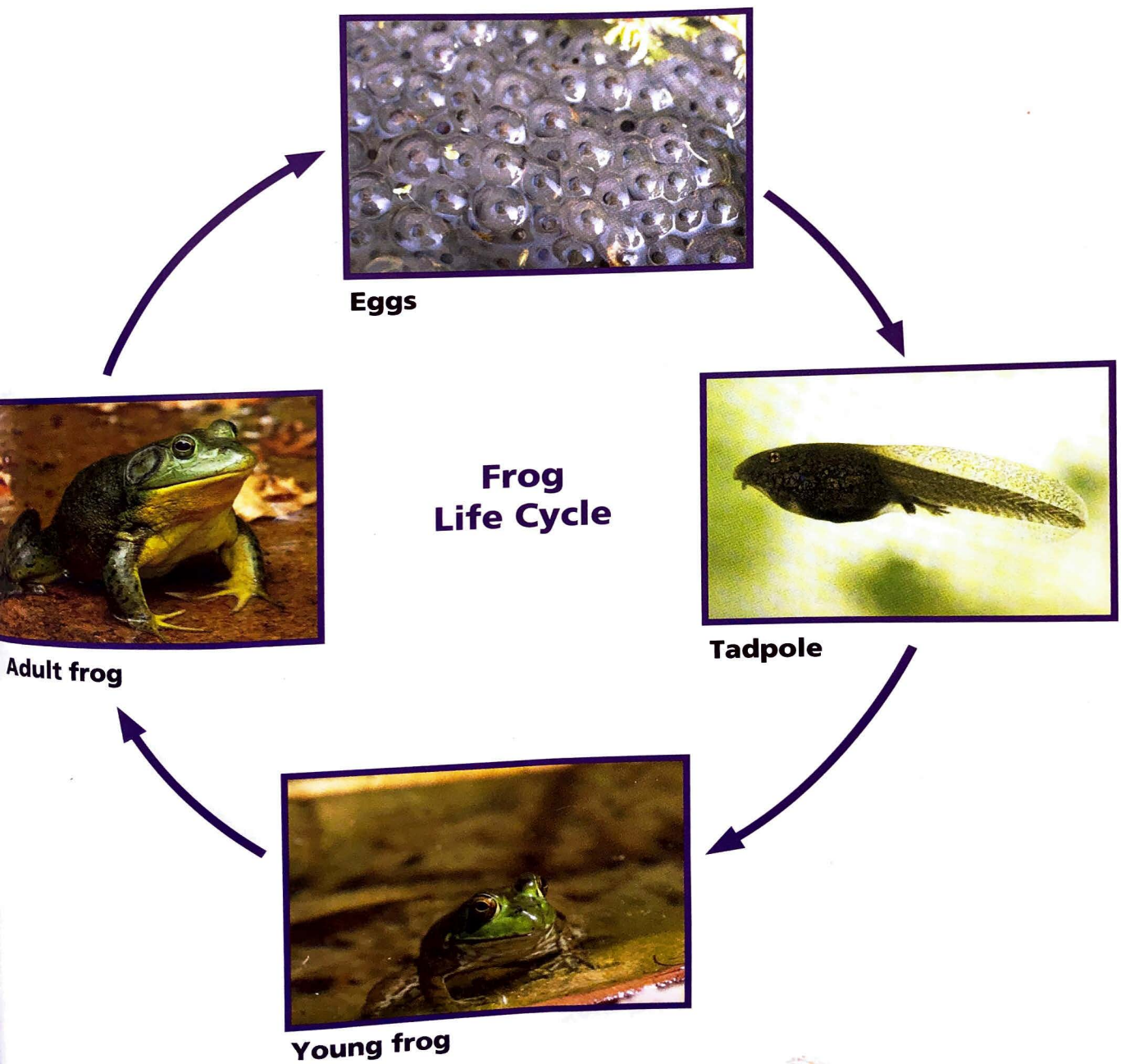
Young trout

Trout Life Cycle

Trout lay eggs in streams. After 6 to 8 weeks, the eggs hatch. Tiny, fat babies swim out. You can see that they are fish. But they don't look like their parents yet. For the next year, they grow up little by little. In 2 years, they are adults. They look just like their parents. They mate and lay eggs in the stream. Can you describe the trout life cycle?

Frog Life Cycle

Frogs lay eggs in water, too. When an egg hatches, a tadpole swims out. It looks more like a fish with a big head than a frog. A tadpole doesn't look like its parents. The tadpole eats and grows. In a few weeks, the tadpole starts to change. Its long, flat tail gets shorter, and its legs start to grow. In a few more weeks, the tadpole has grown into a frog. Now it looks just like its parents.



Goose Life Cycle

Eggs | Young geese (goslings) | Adult goose

Other Animal Life Cycles

The goose's life cycle starts with an egg. When the egg hatches, a baby gosling comes out. Soon, the offspring grows and matures. In a year, the female goose is ready to lay eggs. The life cycle is complete.

Mammals, such as mice, do not lay eggs. Baby mice grow inside the mother just like humans. The offspring are born alive. Newborn mice are pink, hairless, and blind. You can see that they are mice, but they don't look like their parents yet. In a few days, the babies open their eyes, and their fur starts to grow. In a few months, the offspring will be adults. They will be ready to continue the life cycle and have babies of their own.

The elephant's life cycle starts with the birth of a baby elephant. The baby elephant eats and grows for years. When a female elephant is 12 or 13 years old, she will have her first baby. With the birth of her baby, the life cycle is complete.

Mouse Life Cycle

Baby mice | Young mouse | Adult mouse

Life Is a Repeating Cycle

Plants, insects, fish, frogs, birds, mammals, and all other living things have life cycles. An organism's life cycle is defined by stages. The organism goes through these important stages between the time it is born and the time it produces offspring. The life cycle of the bean takes a few weeks. The life cycles of the monarch butterfly and the frog take about a year. The life cycle of the elephant takes more than 10 years. All these life cycles are different. Think about the time the life cycle takes for each organism and the stages the organism goes through. Both the time and the stages are different for every different kind of organism.

Review Questions

1. What is a life cycle?
2. Illustrate and compare the life cycles of butterflies, frogs, and beans.

Odysseus in Disguise

So the Phaeacians helped Odysseus by returning him to Ithaca while he slept. When he awoke, he was addressed by Athena, who advised him to first assess the situation in Ithaca in disguise and find those who were loyal to him. There were 108 men in Ithaca who were pursuing Odysseus' wife, Penelope, and if these suitors learned that Odysseus had returned, they might try to kill him. Athena then gave Odysseus the form of an old man.

Now, when Odysseus had gone away to wage war against the Trojans, he had left a slave named Eumaeus in charge of his herds of pigs. Odysseus knew Eumaeus was loyal, so he was the first person Odysseus sought out. He found Eumaeus at home making sandals. Eumaeus didn't recognize Odysseus because of the disguise, but he treated him well, showing the virtue of hospitality. Odysseus thank him and asked Eumaeus about his master. Eumaeus expressed his wish that his master, Odysseus, would return, but he didn't really think that such a thing could happen after all this time. Remember, Odysseus had been away from home for 20 years – 10 years fighting against the Trojans and 10 years wandering around the world trying to get home!

Odysseus in disguise promised Eumaeus that his master would return soon – before the next new moon, in fact, but Eumaeus just couldn't believe it.

Odysseus stayed the night with Eumaeus. The next day, he heard the sound of footsteps outside the front door. He turned and saw his son, Telemachus. Now, Telemachus did not recognize Odysseus, because of his disguise, but Odysseus recognized Telemachus, even though Telemachus had been an infant when Odysseus had left for Troy. Eumaeus the swineherd jumped up from his place and ran to greet Telemachus, embracing him and kissing him as a father greets a son who has been long away. Odysseus would have, too, but he knew that Telemachus would not have accepted it from the stranger that Odysseus appeared to be. "Who is this stranger?" Telemachus asked.

"He is a stranger who has asked for my help," Eumaeus replied. "But now I'm passing him over to you, because I am a slave and you are my master."

"I'm no master," Telemachus said bitterly. "Am I master in my own home so long as those suitors are there devouring everything in my house? I'll provide food and clothing, but let him stay here in your house, Eumaeus. The suitors are too haughty and abusive, and I won't allow this poor stranger to endure their abuse."

Odysseus spoke up. "Why don't you get rid of them?"

"I would if I had any kin," Telemachus replied. "But my father was an only child, and I am an only child, so I have no kinsmen to call upon to help me remove them by force. Plus, my people are good people, but they are slow to help against the suitors."

Telemachus told Eumaeus to go the palace and tell his mother, Penelope, that he had returned from Sparta. This left Odysseus and Telemachus alone in Eumaeus' house. Athena suddenly appeared to Odysseus, though Telemachus could not see her. She beckoned Odysseus to go outside.

"Do not hide yourself from your son," Athena said once they were outside. "Tell him who you are and plan with him how you may slay the suitors." She touched Odysseus with her golden wand, and suddenly Odysseus looked his normal, complete with new clothes.
Odysseus re-entered the house, and Telemachus gasped. "Stranger, this is not the way you looked before. Are you are a god?"

"No, not a god. I am your father, Odysseus. The goddess Athena is helping me to return to Ithaca and retake my home. Her power gave me the disguise you saw before." They embraced one another and wept. Afterwards, they plotted how they would approach the problem of the suitors. "Tomorrow," Odysseus instructed his son, "you must return to the palace and take your place. I will appear there as a beggar. The suitors will abuse me, but let it be for now. Their time is approaching when they will be punished as they deserve. But when I give you the signal, I want you to have all the weapons in the dining hall removed. If anyone asks you why you are doing this, reply that they are being taken away for cleaning. But keep two swords and two spears close at hand.

Before Eumaeus returned, Odysseus resumed his beggarly shape.