**Dear Educator:**

Welcome to another school year! The September issue explores the world of geckos and their amazing adaptations. It delves into the kingdom of fungi and takes you on a tour of Mars, too. After reading the issue, use the **Comprehension Check** (page T22) to help your students review their understanding of the stories.

With the start of the new school year, we'd also like to introduce a few new features. We're introducing the **Academic Science World Wall** and the **Academic Vocabulary Log**. These tools will help enhance your students' learning of content words as they read NATIONAL GEOGRAPHIC EXPLORER! In this issue only, we also have included a wonderful exercise (see page T14) called **Know Your Magazine**. This activity helps students learn to navigate the magazine and know what to expect from each issue.

Of course, you already know what to expect: great photography and terrific stories. Don't forget to check out our new whiteboard content, too. Just click on the whiteboard link on the EXPLORER! website. Each issue comes with a free whiteboard lesson for one story. New this year, you also can purchase whiteboard content for all of the stories for just \$29.95 a year.

As always, if you need to reach me, feel free to email me at bmaloney@ngsp.com. Your feedback is very important to me.

Let the exploring begin!

Brenna Maloney
Editor, EXPLORER MAGAZINE

Lively Lizards, pages 2-9**Curriculum: Standards**

- **Life Science:** Behavioral and structural adaptations of a species; importance of a species in the food chain
- **Language Arts:** Use visualization as a strategy while reading; demonstrate comprehension from reading diagrams; develop academic vocabulary

Fungus Among Us, pages 10-17**Curriculum: Standards**

- **Science:** Classification by kingdoms of living organisms; life cycle of organisms
- **Language Arts:** Summarize content, identifying important ideas; recognize the use of similes; develop academic vocabulary

Mars Mysteries, pages 18-23**Curriculum: Standards**

- **Space Science:** Recognize characteristics of planets in our solar system; compare and contrast other planets with Earth
- **Language Arts:** Ask questions to self monitor reading; develop academic vocabulary; creative writing

NATIONAL GEOGRAPHIC Explorer!

What's New at EXPLORER?

As you begin a new school year, we would like to include some ideas and tools that will enhance your students' learning as they read NATIONAL GEOGRAPHIC EXPLORER! We hope you find these useful for your students.

Academic Science Word Wall

To supplement your students' learning of content words, designate an area to post new **Academic Science Vocabulary**. Add science content words from each issue of NATIONAL GEOGRAPHIC EXPLORER! to the Word Wall. Activities using the Word Wall could include:

- Call out the definition of a word and have students say or write the correct word. Reverse the activity by calling out a word and having students write down its meaning.
- Select three to five words for students to illustrate. Students can also work in pairs taking turns giving words to be illustrated from the Word Wall.
- As more words appear on the wall, give students different ways to sort the words such as by topic (space, animals, or plants), or reinforce language arts with word sorts of nouns and verbs, suffixes, prefixes, or syllables.

Academic Vocabulary Log

As your students read the science-based stories this year in NATIONAL GEOGRAPHIC EXPLORER!, they will be exposed to new academic vocabulary. To ensure students have the necessary background knowledge to understand each story, we will provide a short academic vocabulary lesson in each Teacher's Guide. Encourage students to start an *Academic Vocabulary Log* that they can add to each month. They may focus on the words listed in Wordwise at the end of each story or you may want to include other new or unfamiliar words from the text.

The *Academic Vocabulary Log* can be set up in a number of ways (see one example, below). Ideally, each page would represent one word so that students can sort them into ABC order, with the first letter of the word in the top, right-hand corner. They should be able to bind the logs in such a way that they can add pages (using a hole-punch and ribbon, for example). Explain to students what should be included on each page while modeling the process. For example:

- **Word:** Write a word in the first column as determined by the teacher or individual students.
- **Definition:** Write a short definition from Wordwise or a dictionary for the word.
- **My Own Words:** Ask students to write a few words or "hints" to help them remember what the word means.
- **Drawing:** Illustrate the word or create a symbol that can be associated with the word.
- **Use:** Write a sentence that shows how the word is used.

Watch for activities in future issues utilizing the words accumulating in the students' *Academic Vocabulary Logs*.

Academic Vocabulary Log				
Name: _____ Letter: _____				
Word	Definition	My Words	Drawing	Use the Word



Gecko Power!

About the Story

What creature has unmatched toe grip, the ability to climb upside down, and soar through the air? It is the incredible gecko. The gecko leads a life filled with danger, excitement, and a truckload of talent. In this story, students will learn about the adaptations geckos have to survive in their natural habitats. Students will find geckos full of surprises from their ability to lose their tails to their super night vision.

Before Reading

Preview and Make Connections Display the word *lizard*. Have students turn to a partner and discuss everything they know about lizards for one minute. Ask students for responses and display.

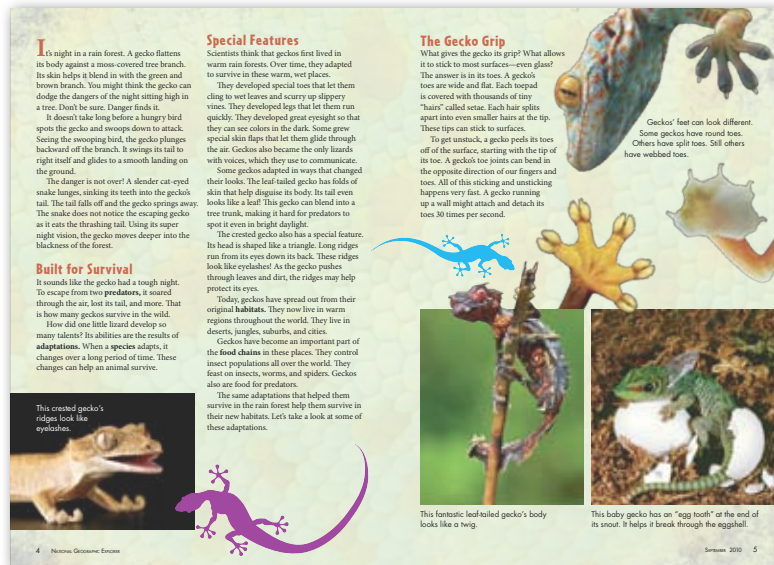
Next, have students preview the story's pictures, captions, and headings. Say: *As you preview the story, make connections with what you already know about lizards to help you think about what you are going to read. Then write down three things you want to find out about geckos from the story.* Ask several volunteers to share their questions.

Comprehension Strategy

Visualize Explain to students that some stories are filled with sensory images. As they read, they need to create mental images from the author's words. Say: *To turn the story into a photo album or movie, use your own experiences in combination with the descriptive words to "see" the information.*

Further explain that while sight may be the first sense you use when reading, don't forget to be aware of words that make you hear, touch, taste, and smell. Then distribute the "Double Entry Journal" activity on page T16. Have students record sensory passages they come across in the story, then draw or describe what comes to mind. When finished, ask several students to share the most vivid images they found in the story.





Explore Science

Explain to students that geckos have amazing abilities that help them survive. Over time they have developed adaptations that help them escape an attacking predator as well as find food more easily.

Divide the class into thirds. Assign one group the first column on page 4; the next group, the second column, "Special Features" on page 4; and the third group, page 5. Have students write down features mentioned that are key to the gecko's survival. Then have students from each group share the facts they learned. Display key features as they are mentioned. Point out that these features evolved over time and are called *adaptations*.

Point out the picture on page 5 of the gecko emerging from its egg. Ask: *What other species hatch from eggs?* (possible answers: fish, reptiles, amphibians, birds)

Academic Vocabulary

Display the words: **adaptation**, **food chain**, **habitat**, **nocturnal**, **predator**, and **species**. Invite students to give definitions in their own words and compare with the ones in Wordwise on page 7. Then have students add these words to their **Academic Vocabulary Log**.

Next, have students write each word on a scrap of paper. In pairs, have students sort and group words in ways that make sense. Tell students to list each grouping and explain why they go together. Examples: species + habitat because each species lives in its own habitat. Challenge students to see how many sorts they can make with these academic vocabulary words. Can they fit three or more words together in one sort?

Fast Facts

- The word gecko comes from Javanese, ge'kok. Their name imitates the sounds they produce.
- There are nearly 2,000 gecko species. They live on all continents except Antarctica.
- The only substance found thus far that a gecko cannot stick to is Teflon.

Comprehension Quick Check

What important adaptations do geckos have?

(Examples: Toes that stick, super night vision, skin flaps that let them glide, voices to communicate, a detachable tail, etc.)



This series of images shows the movement of this gecko's body as it leaps.



This is the eye of a tokay gecko. At night, the pupil opens wide to let in more light.

A Terrific Tail

A gecko's toes help it stick to things. Its tail helps it get away. Its tail allows a gecko to balance when falling from a tree or climbing a slippery wall. Its tail also helps a gecko escape from hungry predators.

Some scientists recently learned of some of the ways this terrific tail works. They filmed a flat-tailed gecko climbing up a wall. They slowed the video down and noticed something no one had seen before.

When the gecko hit a slippery spot and started to fall backward, its tail acted like a fifth leg. In the blink of an eye, the tail flattened against the wall. The gecko got its balance back. The scientists also discovered that a gecko's tail helps it survive falls. If a gecko loses its grip and falls, the tail can help it land safely. The gecko twists, rotating its body and feet downward into a landing position. Then the gecko spreads its legs and glides, using its tail to steer. It drops gracefully to the ground.

A gecko uses its tail for more than balance and gliding. If a predator tries to take a bite out of a gecko's tail, the gecko simply releases its tail. The predator may have a mouthful of tail, but the main meal—the gecko—is safe.

Losing its tail is tough on a gecko. Because its tail plays a key role in balance, a gecko has a hard time climbing and gliding without it. The good news is a new tail grows back in a few months. The bad news is the new tail is not as long or as strong as the old one.

Night Vision

A gecko also can see in the dark. How did it develop this super adaptation? Scientists think that long ago, geckos were mostly active during the day. Most lizards are. Today, most geckos are nocturnal, or active at night. Being active at night led to other adaptations.

The gecko's eyes changed. The pupils, or openings in the center of the eye, became bigger to let in more light at night. Deep inside the gecko's eye, other changes slowly happened, too. The result? Nocturnal geckos can do something few living creatures can—they see colors in the dark.

A nocturnal gecko's eye structure is different from that of other lizards. Most vertebrates, or animals with backbones, have two kinds of cells in their eyes that sense light. These are called rods and cones. Rods pick up only black and white. Cones detect colors, but only when there's lots of light.

Lizards do not have rods, only cones. Geckos that come out at night have three kinds of super-size cones. These cones give nocturnal geckos their super color vision.

It's important for a gecko to protect its eyesight. Most geckos have no eyelids and cannot blink. If dust gets in a gecko's eyes, it uses its tongue to lick them clean!

Head to Tail

Geckos aren't silent. They're the only lizards that use their voices to communicate. They "talk" to find mates, ward off predators, and send messages to one another. They don't use words, of course. Depending on the species of gecko, they bark, squeak, hiss, or croak.

As you've seen, communicating is just one of a gecko's many terrific talents. From leaping and gliding to walking upside down, these leaping lizards are built to survive.

Which gecko adaptation would you like to have?

WORDWISE

adaptation: behavior or body part that helps an animal survive

food chain: how food energy passes from one organism to another

habitat: place where a plant or animal lives

nocturnal: active at night

predator: animal that hunts and eats other animals

species: type of plant or animal






This gecko can't blink. It uses its tongue to lick and clean its eyes.

Explore Science

Display the words *fly*, *glide*, and *leap*. Explain that *fly* can mean to move through the air using wings; *glide* can mean to move through the air seemingly without effort and at a downward angle; and *leap* means to jump. Ask students what is similar about those three words (they all involve moving through the air.) Then ask students to categorize animals such as birds, frogs, and flying squirrels by whether they fly, glide, or leap. Urge them to use information in the story such as the photo on page 6, to figure out where to list geckos (glide and leap).

Have students consider the importance of tails to different species. Allow time for students to talk with a partner and note several examples before sharing their ideas with the class. (Example: Opossums use their tail to hang in trees.) Review with students that a gecko uses its tail to balance and steer when gliding, balance on a slippery surface, and as a means of escape from a predator by detaching it.

Engage Students

Divide students into four groups. Tell students that they are astronauts in the 31st century. The Intergalactic Space Agency is sending them on important missions to one of four newly discovered planets. Each group will explore a different alien world. One group will visit a planet covered by rain forests. It is always warm and rainy there. The second group will visit a world covered in ice. The third group will blast off to a world covered by a sandy, hot desert. And the fourth group will go to a world covered by an ocean.

Distribute the “Alien Adaptations” activity on page T17. Tell students they have discovered a new animal species that no one has ever seen before. Have them describe the animal by answering the questions on the left-hand page of the Explorer’s Notebook. Then have them draw the animal on right-hand page, labeling the animal’s unique adaptations that let it survive on its planet.

Comprehension Quick Check

How does the gecko use its tail?

(possible answers: to help it maintain balance, steer when gliding, or escape a predator by detaching it when attacked)





Explore Science

Display the gecko side of the poster. Invite students to study the matching gecko diagram on pages 8-9 and think about each label. Then, zeroing in on the gecko's special features, have students synthesize what they've learned and they know to answer the following questions:

Which adaptation is the most important to the gecko's survival? Why?

Which adaptation could the gecko lose and still survive fairly well? Why?

Answers will vary.

Extend the Learning

Adaptations Remind students that all living things have adaptations that help them survive in their habitats. These may include: ability to camouflage in their environment, survive in extreme climates, special ways to get food or defend themselves from predators. Have students work alone or in pairs to consider the following animals and what special adaptations they have acquired for survival (elephant, giraffe, kangaroo, shark, skunk, lion, others students may list).

Critical Thinking Explain to students that scientists are trying to create a super glue to be used for medical purposes based upon the gecko's toes and a mussel's ability to stick to things. Ask students to consider the following creature features and "invent" a new product that could be associated with them. Animals to consider: Spiders' webs, turtles' longevity, chameleons' colors, eagles' vision, dogs' hearing, rattlesnakes' rattles, bees' hive building. Share student inventions and decide which would be the most useful in our world. (You may want to explain that this is a real field of science called biomimicry. See the April 2008 issue of NATIONAL GEOGRAPHIC MAGAZINE or the January-February 2009 issue of EXPLORER!)

Creative Thinking What's in a title? Have students consider all that they learned in this story and review the title, "Lively Lizards." Explain that authors select titles that tell a little about the topic and will also create interest in the reader. Have students write three other titles that think would have been good for this story. Take a class vote on the one students find the best fit.

National Geographic Connections

Visit the National Geographic Museum in Washington, D.C., to see "Geckos: Tails to Toepads." The exhibit, which includes live geckos, runs from Sept. 24, 2010, to Jan. 5, 2011. For more information, go to: <http://events.nationalgeographic.com/events/exhibits/2010/09/24/geckos/>



Fungus Among Us

About the Story

Eating a slice of mushroom pizza for lunch probably doesn't make you think about fungi. But in this story, students will learn that mushrooms belong to a kingdom that is neither plant nor animal. Scientists have determined that as many as 1.5 million kinds of fungi grow from the Antarctic to the deserts, even inside the space station. Students will explore how fungi turn dead material into food. They will also learn how spores spread and their role in the life cycle of a mushroom.

Before Reading

Preview and Set Purpose In pairs, ask students to preview the story, "Fungus Among Us." Remind them to look at photographs, captions, headings, and diagrams. Invite students to use what they learn in the preview to create three questions. For example, say: "*Spreading Spores*" is the title of one section. Questions from that title could be: "What are spores? or How are spores spread?" Explain that these questions become their purpose for reading that section.

Have students jot down their questions on the left-hand side of a piece of paper. Allow time for some questions to be shared aloud. Then tell students they will return to their paper after reading the story and write the answers they discovered.

Comprehension Strategy

Determine Importance—Summarizing Tell students that after they read "Fungus Among Us," they will be asked to summarize the story. Explain that summarizing keeps you focused on what's important and helps you remember what you read. Distribute the "Fungus Among Us" activity on page T18, for students to use as they read.

- As you read, identify the main idea in each section or page. Ask yourself: *What ideas or information did the writer emphasize?* Take notes on the activity page.
- Write a summary by reviewing your notes. In your own words, begin with a main idea statement that sums up the focus of the story. Then add other important ideas and information you determined was important to know.



Explore Science

Ask students to look at the photos on pages 12 and 13. In pairs, have students discuss how the mushrooms are similar and how they are different. Invite students to share responses. (Most have a similar shape. They grow out of the ground around leaves and trees. They are different shapes and colors.)

Invite a volunteer to read the third paragraph under "A Kingdom of Their Own." Ask: *Why do you think scientists group organisms into kingdoms? What other organisms are grouped into kingdoms besides fungi?* (There are five kingdoms: animals, plants, fungi, protists, and bacteria.)

Ask students to think of other species that live in different habitats like fungus. Share examples. Then ask: *How can one species survive in so many different environments?*

Academic Vocabulary

Explain to students that it is important to become familiar with new words that might make their reading of the story more difficult. Display the words: **decomposer**, **fungi**, **observe**, **spore**, and **kingdom**. Using self-stick notes, have students mark one or two places each word is used in the story.

In pairs, have students read aloud to each other the sentences that contain the academic vocabulary words. Taking turns, have students explain what they think each word means in their own words. If they are not sure, have them check the Wordwise definition or a dictionary.

Then have students add these words to their **Academic Vocabulary Log**.

Fast Facts

- Scientists believe they have discovered only five to ten percent of the 1.5 million fungus species that exist.
- A truffle is a very expensive fungus prized for its taste. Truffles grow underground and pigs or dogs are used to sniff them out.
- In 1929, Sir Alexander Fleming developed penicillin from a mold, a kind of fungus. Today, the antibiotic is used to cure many infections.

Comprehension Quick Check

Why are fungi considered neither plants nor animals? (Unlike plants, they cannot make their own food and, unlike animals, they cannot move on their own.)

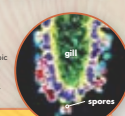
Hidden World

Fungi are mysterious, too. Most of the time, they lurk out of sight. You don't see them—but they're there. Take a typical mushroom fungus, the beautiful but poisonous fly agaric. It spends most of its life cycle underground. It starts with a tiny spore, a part needed to make new fungi. First, the spore sprouts under the ground. It grows a thread. The thread grows longer and longer in the moist soil. It branches and spreads. Eventually it forms a thick mat. When the threads from two different spores join together, they can grow "fruitbodies." You know them as mushrooms.

The fruitbody pushes up out of the ground. It grows a sturdy stem (or stalk) and a red or yellow cap with spots. The cap looks like a ball. Then it opens like a miniature umbrella.

Thin plates called gills line the inside of the cap. They look like the spokes of a bicycle wheel. The gills of just one mushroom can hold millions of spores. The spores ripen and fall from the gills. Fungus spores are so light, they can float away in the wind. Some travel 1,000 kilometers (1,000 miles) before dropping to the ground.

This microscopic picture shows spores on a mushroom gill.



Spreading Spores

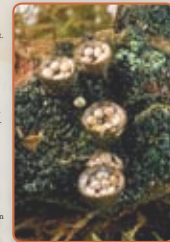
Other fungi spread spores in different ways. A stinkhorn, for instance, smells like rotting meat. That attracts flies. Spores stick to a visiting fly's feet. The fly buzzes off, carrying the spores. When the fly lands, some spores may rub off. Someday, a new stinkhorn may pop up where the fly landed.

Then there's a bird's nest fungus. It looks just like a nest with eggs, except it's the size of a pea! Each egg-shaped part is packed with spores. When a raindrop lands in the nest, the eggs splash out onto the ground. Some break open. Soon new bird's nest fungi will grow.

I love the delicate bird's nest fungus, but my all-time favorite is the hat-thrower fungus. To find them, I pick a sunny day to explore near my house. I also listen really carefully as I walk through the woods.

Soon I hear a sharp pop, then another. Down at my feet, I see a tiny hat-thrower. This fungus has a small air sac tucked below its cap. The sun warms the air. The hot air expands. The sac grows bigger and bigger, like a balloon. Suddenly, it explodes! The cap flies into the air. So do the spores.

Some spores stick to leaves. Rabbits, deer, and other animals munch on the leaves and swallow the spores. That's perfect! Hat-thrower spores can start to grow only after passing through an animal's digestive system.



Each bird's nest fungus is about the size of a pea.

Heat makes the bubble on the side of this hat-thrower pop. The black spore cap flies off.



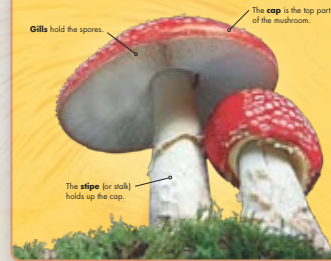
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Meet a Mushroom

Gills hold the spores.

The cap is the top part of the mushroom.

The stem (or stalk) holds up the cap.



14 Patricia Gossamer, Entomologist

Explore Science

Have students turn to a partner and explain in their own words how a spore creates a new mushroom. Then have them check paragraph two on page 14 to see if they included all the details.

Direct students to fold a blank piece of paper into fourths. Then have them draw and label at least four ways they learned spores could spread. (float in the wind, carried off on a fly's feet, dispersed by the rain, or pop out of a cap and be eaten by animals and re-entered into the cycle through the animal's digestive system)

Engage Students

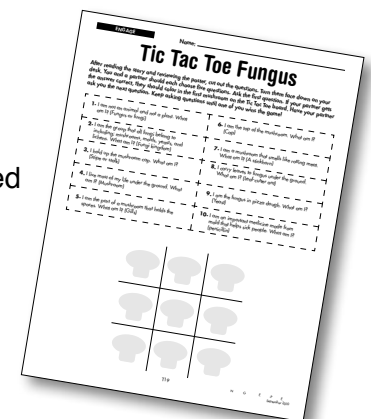
After students have read the story, distribute "Tic Tac Toe Fungus" activity on page T19. Divide the class into pairs. Have students cut the questions out. Each student gets five questions. Have students take turns asking and answering questions. (**Note:** Some information comes from the Fun Fungi poster.) If a student answers a question correctly, they can color in one of the mushroom figures on the tic tac toe board. Each student should use a separate color. The students should keep playing until there is a winner or they run out of questions. As an added challenge, encourage students to use the story and poster to come up with additional questions and answers to use in the game.

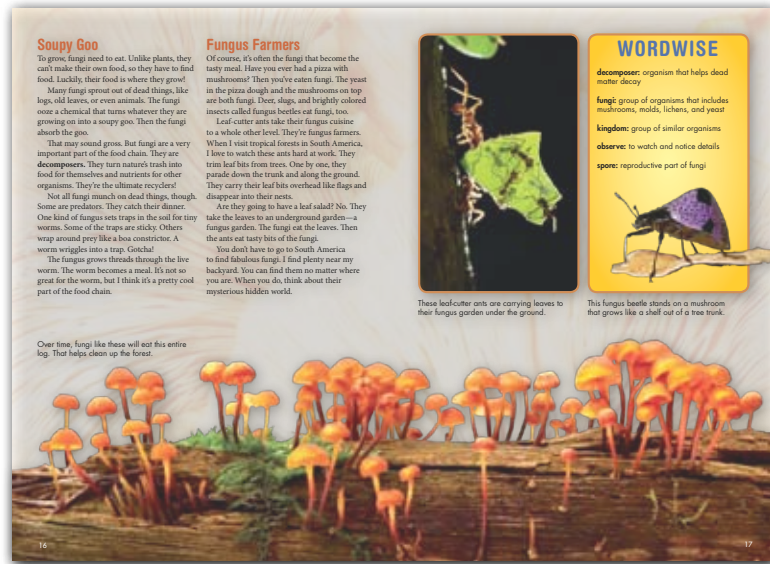
Grow Mold: Students can watch mold grow right in class. Use different types of food like bread, cheese, or fruit. Have students place each food in a resealable plastic bag and sprinkle a small amount of water inside. Then lay it on a shelf, observing changes each day and making notes in a log. Do the molds look the same? Are they different colors? What do they look like under a microscope?

Comprehension Quick Check

Explain at least three ways spores are spread.

(float in the wind, carried off on a fly's feet, dispersed by the rain, or pop out of the cap and be eaten by animals on leaves and re-entered into the cycle through their digestive system)





Extend the Learning

Similes Display the sentences: “The (mushroom) cap looks like a ball. Then it opens like a miniature umbrella.” Discuss the meaning, asking students to explain what they visualize when they read those sentences. Point out that the author uses two common words (ball and umbrella) to give the reader a better understanding of how the mushroom changes. Explain that a comparison that uses words *like* or *as* is called a *simile*. Have students skim pages 14 and 15 and show a thumbs-up when they have found two more similes. Invite volunteers to read the similes aloud. (“They (gills) look *like* the spokes of a bicycle wheel.” “A stinkhorn, for instance, smells *like* rotting meat.”) Ask students to identify the two things the author is comparing in each sentence and to explain the meaning.

Fun Fungi Poster Invite volunteers to come up and read aloud the captions. On a piece of paper, have students list one fact from the poster for each of the following displayed words: *amazing*, *unbelievable*, *surprising*, *interesting*.

Explore Science

Aks: *Unlike plants that are able to make their own food, and animals that can move to find food, how do fungi eat? (They release a chemical that changes whatever they are growing on, like leaves, logs, or dead animals, into a goo that they absorb.)*

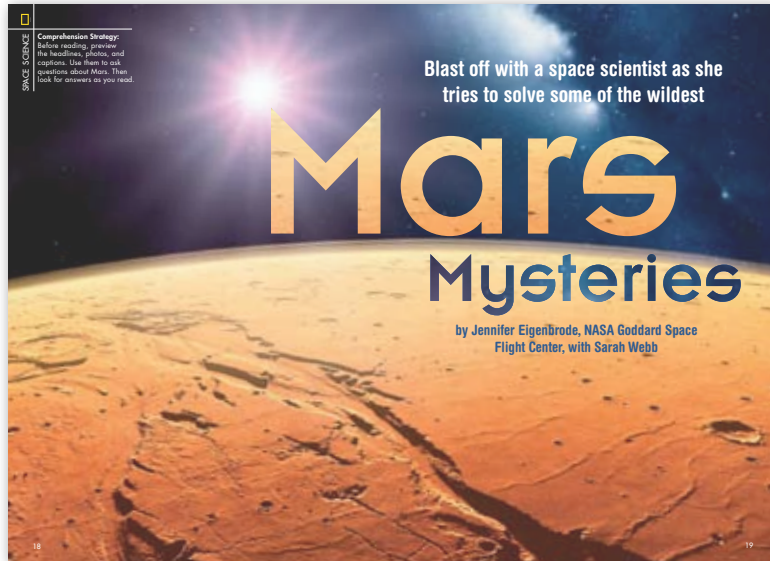
Ask: *Why do you think fungi are called the ultimate recyclers? Why are decomposers like fungi so important to our food chain? (They turn nature's trash into food; they help get rid of dead leaves and other dead matter.)*

Say: *Explain what you learned about the reciprocal relationship leaf-cutter ants and fungi maintain. (Leaf-cutter ants carry leaf bits underground to a fungus garden where the fungi eat the leaves and the ants nibble on the fungus. It's a win-win for both.)*

Comprehension Quick Check

How would our world be different without decomposers like fungi in our food chain?

(Dead and decaying leaves, trees, even animals might accumulate and pile up, over-running many areas of Earth.)



Mars Mysteries

About the Story

Scientists are eager to learn more about the red planet. While we know that Mars has extreme weather, a desert landscape, and the largest volcano in our solar system, scientists still have many questions. In this story, students will learn from NASA's Jennifer Eigenbrode what we know, what we want to find out, and how the landing of a new rover on Mars in 2011 may help solve the big question: Was there ever life on Mars?

Before Reading

Activate Prior Knowledge Explain to students that scientists often start with what they think they know about a subject, but are open to changing their views based on facts or what they learn over time. Good readers can use a similar strategy to help them understand what they read. Have students think silently or brainstorm together about what they already know about Mars.

Distribute the KWL chart on p. T20. Before reading, have students write down what they **Know** about Mars and what they **Want** to learn about Mars. Tell them that they will have an opportunity to come back to the chart after reading the story to write down what they **Learned** about Mars.

Comprehension Strategy

Ask Questions Remind students that most nonfiction texts provide new information and important facts. One way to make sure they understand what they are reading is to stop periodically to ask and answer questions as they read.

Have students read the story in pairs, pausing after each section to ask themselves these two questions: *What are the most important facts or ideas?* and *What information do I need to remember?* Tell students that if they can't answer both questions, they should reread the section to clarify their understanding. Point out that it is not unusual for students or adults to not "get" something they read the first time and need to reread it.

	K What do you know about Mars?	W What do you want to know about Mars?	L What did you learn about Mars?
1.			
2.			
3.			
4.			
5.			

Have you ever been to Mars? Me neither. Compared to Earth, Mars is a cold and bare desert. It's not a comfortable place for a human explorer. Mars is also far away and hard to reach. No human has ever made that trip. As a scientist, I have many questions about Mars. I want to know if life ever lived there. Answering this question is a challenge.

Mars on Earth

That's one reason why I'm here in the Arctic near the North Pole with a team of scientists. This place has features similar to Mars. There's another reason I'm here. It has to do with rocks. If we walked on Mars, we'd likely find black rocks under the red sand. Inside these rocks are green crystals. They grew when melted rock from deep in the planet erupted from a volcano and cooled. Later, a meteorite slammed into Mars, tossing chunks of this rock into space. One of those rocks made it to Earth. In 1966, scientists found it in Antarctica.

When scientists looked at this Mars rock using special tools, they found super small worm-like features. The scientists thought they might be signs of ancient life. Could this be proof that there once was life on Mars?



Mars is about half the diameter of Earth.

Searching for Signs of Life

Back in the Arctic, I stand at the base of an ancient volcano. Ice glaciers surround me. I spy some dark rocks at my feet. I pick one up. I bring my hammer down hard, cracking the rock open. I find small green crystals inside. This is one of the few places on Earth that has rocks similar to the famous rock from Mars. Here we can study Mars while still on Earth.

We also observe Mars from Earth. Have you ever seen Mars in the night sky? It's a red dot. That's because it's a planet.

Mars is the fourth planet from the sun. Even at its closest, the red planet is still about 55 million kilometers (34 million miles) from Earth. It is only half the diameter of our planet. Size and distance aren't the only differences between Earth and Mars. From Mars, Earth looks like a pale blue dot. With a closer view from the International Space Station, we'd see white clouds, blue oceans, green forests, and brown deserts. Mars looks nothing like this. Mars has reddish rocks and sand.

The weather on Mars is extreme, too. Temperatures can drop to -125° Celsius. That's 195° below zero Fahrenheit. Every day, the sun warms the air. The change in temperature causes strong winds and sandstorms to dance across the planet. Scientists even have seen sandstorms that cover almost half the planet! These storms can last for months.



A swirling sandstorm dances across the face of Mars.



In 2001, a storm blanketed Mars in red sand. It lasted for months.



My partner and I take samples in the Arctic because it is a little like Mars here.

20 Northern Hemisphere October

September 2010 21

Explore Science

Have students look at the pictures on pages 20 and 21 and read the captions. Ask: *What do you think it would be like to live on Mars?* (Answers will vary.)

Invite a volunteer to read aloud the third paragraph on page 20. Then ask: *When scientists talk about life on Mars, what does that mean?* (Help students understand that looking for “life” on Mars means anything that was a living organism, not necessarily humans.)

Have students scan the section, “Searching for Signs of Life.” Say: *Using what you know and what you learned, how do Earth and Mars compare?* (possible answers: Mars is smaller, has red rocks and sand, intense sandstorms; Earth is bigger; Earth has blue oceans and green trees.)

Academic Vocabulary

Use a content web to help students focus on key academic words they will encounter in this story. First display the words *solar system*. Ask: *How is the “Mars Mysteries” story related to our solar system?* (It is about a planet in our solar system.) Then display the following words connected to the solar system: **meteorite**, **orbit**, and **planet**. In pairs, have students discuss each word and what they know about them. Then ask students to use their own words to define each vocabulary word to their partner. Ask: *Why do you think these words could show up in a story about Mars?*

Next have students add these words to their **Academic Vocabulary Log**.

Fast Facts

- Mars was named after the Roman God of War, probably because it is known as the red, fiery planet.
- Mars has two moons named after the Greek mythological sons of the God of War: Deimos (“flight”) and Phobos (“fear”).
- Mars has seasons because it has nearly the same axial tilt as Earth.
- NASA is an acronym for **N**ational **A**eronautics and **S**pace **A**dministration.

Comprehension Quick Check

What do we know about the Martian landscape and weather?
(Extreme cold, desert, sand storms, strong winds, tornadoes, etc.)



These rocky mountains in Utah's sandstone look very similar to some rocks found on Mars (inset).

A Curious Mission

Scientists like me are especially interested in water on Mars. Why? All life needs water to survive. Water on ancient Mars is one key clue that Mars might have supported life. Sources of energy and other nutrients also are needed. Did ancient Mars have these, too?

To try to answer these questions, NASA is planning to launch *Curiosity*, a new rover that will land on Mars. The countdown has already started. The rocket carrying *Curiosity* to space should blast off in October 2011. It will take about ten months to reach Mars.

Curiosity is big. It is the size of a large pickup truck. Small rovers can be bounced across the surface in balloons for a safe landing. *Curiosity* is too big for bouncing. It will be gently lowered to the surface by a type of crane. Once on the ground, it will start exploring.

Rolling Out the Rover

I am really excited about the rover and what we might discover on Mars. You see, *Curiosity* will do more than just take pictures. It contains an entire laboratory in its belly. It will measure the chemicals in the air and the rocks. Here's an even bigger thrill for me: I designed one of the experiments on this mission. This experiment may help us learn whether life could have existed on Mars.

The rover will study rocks formed by water. It will test them to see if they have certain chemicals that life can use to survive. Some of these chemicals also could have been formed by life. If we discover them, then we may have a sign that simple life forms once lived on Mars.

Soon we may know if life exists or existed on our neighbor in space. If so, who knows where else we might find life in our solar system?

Missions to Mars

From Earth, telescopes can measure the temperature of Mars and what gases are in the atmosphere. Spacecraft have told us almost everything else.

The first spacecraft sent toward Mars was launched in the 1960s. Since then, dozens of spacecraft have been launched toward Mars. Some never made it or broke down. Some orbited the planet. Others landed. Some of the landers had rovers that could move around.

Although Mars is very different from Earth, scientists study photos of features on Mars and compare them to similar features on Earth. Scientists think that the same kinds of forces formed geologic features on both planets.

For a small planet, Mars has some superlative features! It has the largest volcano in our solar system. Olympus Mons rises 26 kilometers (16 miles) above the surrounding surface. No volcano or mountain on Earth compares to this giant. It is three times taller than Mount Everest, Earth's highest mountain.

A Grand Canyon?

These super volcanoes are matched by mega-size canyons. The biggest one cuts across the middle of the planet. Known as Valles Marineris, the canyon stretches for about 4,000 kilometers (2,500 miles). That's close to the width of Australia! This Martian canyon dwarfs Earth's Grand Canyon in every way. It's wider, longer, deeper, and older. It is, by far, the grandest canyon we have ever discovered.

Not all features on Mars are astronomical in size. Mars also has features that look like dried-up riverbeds. They twist and turn across the surface much like rivers on Earth. In some places, they formed canyons, exposing rocky cliff walls. These ancient riverbeds show that Mars once had flowing water.

Other features also tell a story of water on Mars. Ripples formed by moving water, such as waves along a shoreline, are captured in the rocks of Burns Cliff. Scientists also think that at some point, lakes formed in many of the craters scattered across the surface of Mars.

WORDWISE

meteorite: small space rock

orbit: to move around a star, planet, or other object in space

planet: object that moves in an orbit around a star such as the sun

solar system: the sun and everything that orbits around it



An artist's drawing shows Mars's great canyon cutting across the planet.

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Explore Science

Ask students what interesting facts they learned about features on Mars. (Mars has the largest volcano in the solar system. It is three times taller than Mount Everest. Mars's largest canyon is almost as wide as Australia.)

Explain that scientists who study Mars are particularly interested in finding signs that water once existed there. What evidence have they found that supports this idea? (ancient riverbeds, rocks showing ripple marks from moving water, craters that may have been ancient lakes)

Explain that scientists are hoping to gather even more information about Mars. Distribute the "Mars Mysteries" activity on page T21. Have students fill in one column with what scientists **know** about Mars and the second column with what scientists still **want to find out**.

Engage Students

Creative Writing Tell students that they are NASA scientists examining the rocks collected by the *Curiosity* mission to Mars. In their analysis of the rocks, they were shocked to find...what? Invite students to share their stories with the class. Discuss which stories seem like science fiction and which ones seem possible.

Extend the Learning

Research Have students find online or print diagrams of our solar system. Ask students to draw their own diagram of the planets, making sure to display the planets accurately and in proportion to their size. Label each planet and add other details they find, such as number of moons, distance from the sun, etc.

Language Arts/ESL Tell students that in English we use the endings of *-er* and *-est* to compare things we are talking about. Example: Red Mountain is tall. It is taller than Blue Mountain. Green Mountain is the tallest of the three. Explain that *-er* means *more* and *-est* means *most*. Then have students scan page 22 to find all the comparative examples they can. Invite students to read aloud the examples in context. (Comparatives in story: largest, taller, highest, biggest, wider, longer, deeper, older) Ask: *How does the use of these comparisons help create a picture in your mind as you read?*

Comprehension Quick Check

We already know many facts about Mars, but what information are scientists still hoping to learn from *Curiosity*?

(If chemicals found on Mars could have supported life or been formed by life.)

NAME _____

Mars Mysteries

After reading the story, think about what information you already know about Mars. Use facts to fill in the first column. Then think about questions scientists still have about Mars and fill in the second column.

What scientists know about Mars	What scientists want to find out about Mars

Challenge

1. Write questions about Mars or the *Curiosity* mission you'd most like to have scientists answer?

2. What part of our solar system do you think scientists should explore next? Why? What do you need to know?

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Get to Know Your Magazine

Get to know NATIONAL GEOGRAPHIC EXPLORER! Use your magazine to answer the questions below.

1. What is the name of this edition of NATIONAL GEOGRAPHIC EXPLORER? Where did you find the answer?

2. Where can you find the titles of the three stories and the page number each starts on in one place?

3. What is the title of the second story and on which page does it start?

4. Who is the author of "Lively Lizards?"

5. What did you learn about the author of "Mars Mysteries" from the story's title page?

6. Where in each story can you find information about new or difficult words? List two words you notice that may be new to you.

7. The deck is a short, interesting lead into the story. Read the one for "Leaping Lizards" on page 2. What facts did you learn from the deck?

8. EXPLORER is filled with fascinating photos. What does the author add to the photos to give readers more information?

9. What stories will be in the October issue of EXPLORER?

10. What is the website address for NATIONAL GEOGRAPHIC EXPLORER? Have you checked it out for more photos, games, and information?

NATIONAL GEOGRAPHIC Explorer!

Get to Know Your Magazine

Get to know NATIONAL GEOGRAPHIC EXPLORER! Use your magazine to answer the questions below.

1. What is the name of this edition of NATIONAL GEOGRAPHIC EXPLORER? Where did you find the answer?

Pathfinder; on the cover of the magazine

2. Where can you find the titles of the three stories and the page number each starts on in one place?

The cover

3. What is the title of the second story and on which page does it start?

Fungus Among Us, page 10

4. Who is the author of "Lively Lizards?"

Lana Costantini

5. What did you learn about the author of "Mars Mysteries" from the story's title page?

She works at NASA.

6. Where in each story can you find information about new or difficult words? List two words you notice that may be new to you.

Wordwise, answers will vary

7. The deck is a short, interesting lead into the story. Read the one for "Leaping Lizards" on page 2. What facts did you learn from the deck?

They can go up trees, run upside down, and glide.

8. EXPLORER is filled with fascinating photos. What does the author add to the photos to give readers more information?

Captions

9. What stories will be in the October issue of EXPLORER?

Weird and Wonderful, Kaboom!, Thirsty Planet

10. What is the website address for NATIONAL GEOGRAPHIC EXPLORER? Have you checked it out for more photos, games, and information?

ngpathfinder.org

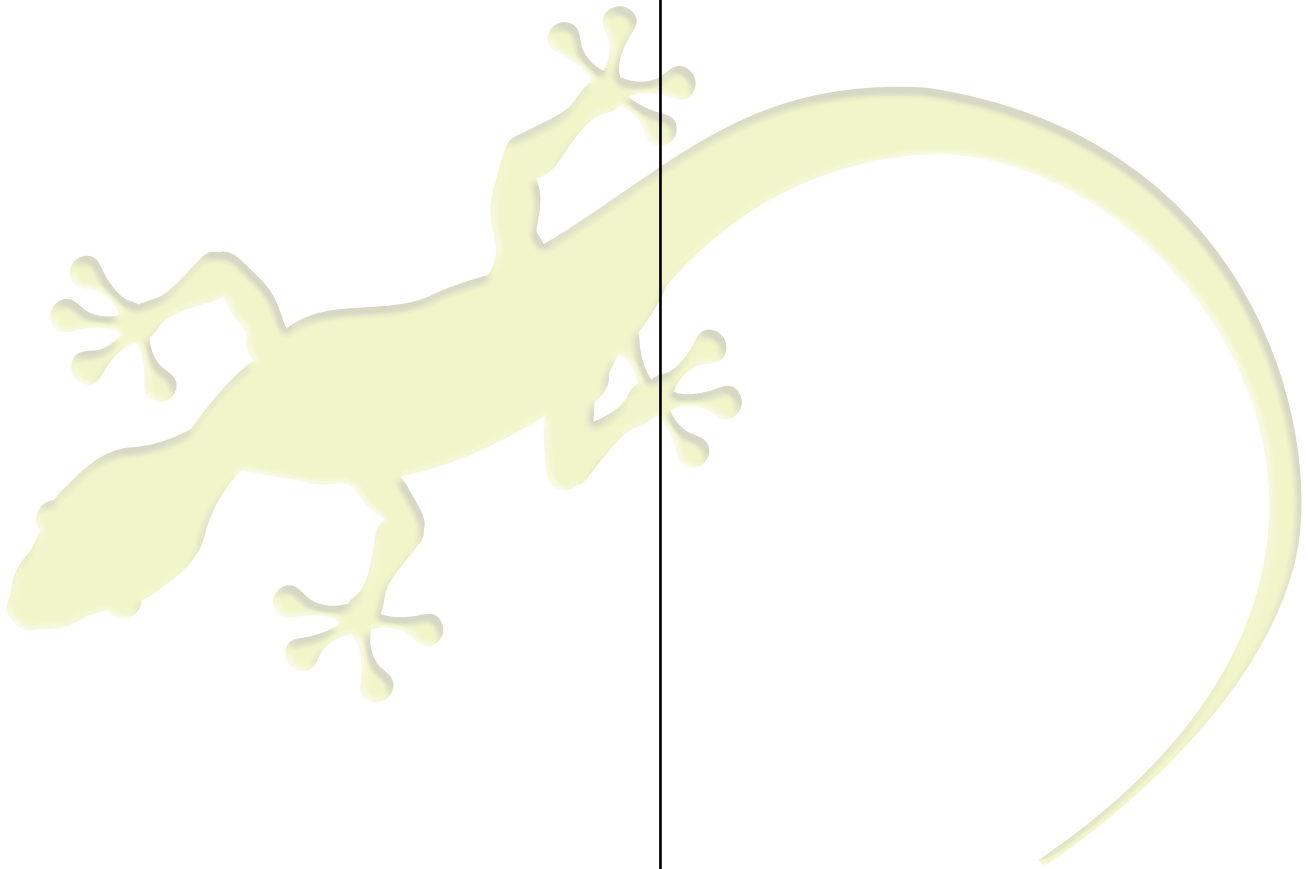
Lively Lizards

Double Entry Journal

As you read, look for phrases or sentences that tap into your senses (what you see, hear, feel, etc.) Write the words in the first column. In the second column, draw a picture of what you saw in your mind as you read those words.

What I Read

What I Imagined



Lively Lizards

Alien Animal Adaptations

Imagine you're an explorer visiting a planet with an extreme environment. Use this explorer's notebook page to explain where you are, and to describe and draw a species you find. Name your animal and label its adaptations.

- Describe the environment on this planet.
- What does the animal look like (size, color, etc.)?
- How does it stay warm or cool?
- Describe its home.
- How does it protect itself from predators?
- What other adaptations does it have and why?

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Fungus Among Us

After previewing the story, identify the topic. Then as you read the story list details that are important to remember. When finished, review the details and make additions or deletions as needed. Then start your summary with a topic sentence, followed by facts and details written in your own words. Use the back of this paper if needed.

Topic:

Details:

- 1.
- 2.
- 3.
- 4.
- 5.

Summary

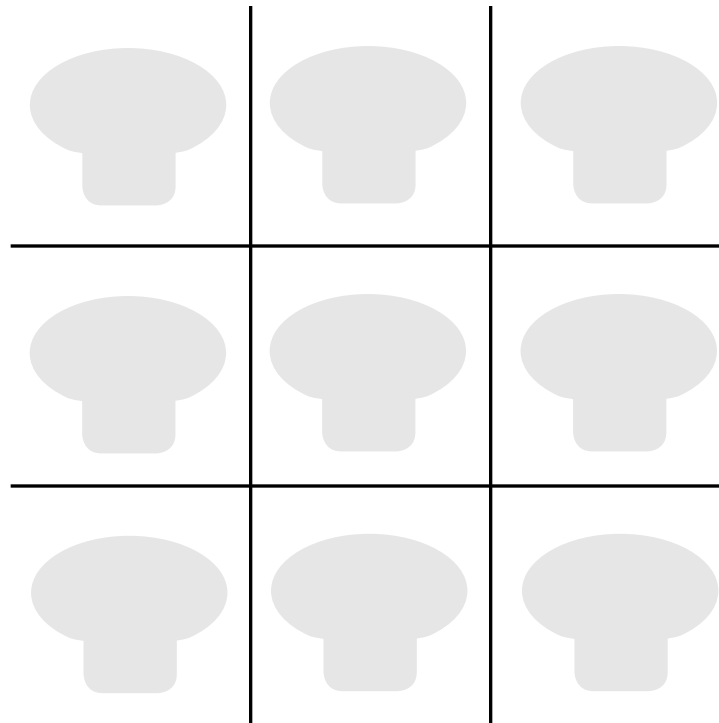
Topic Sentence: _____

Add details in your own words: _____

Tic Tac Toe Fungus

After reading the story and reviewing the poster, cut out the questions. Turn them face down on your desk. You and a partner should each choose five questions. Ask the first question. If your partner gets the answer correct, they should color in the first mushroom on the Tic Tac Toe board. Have your partner ask you the next question. Keep asking questions until one of you wins the game!

1. I am not an animal and not a plant. What am I? (Fungus or fungi)	6. I cover a mushroom's gills and spores. What am I? (Cap)
2. I am the group that all fungi belong to including mushrooms, molds and lichens. What am I? (Fungi kingdom)	7. I am a mushroom that smells like rotting meat. What am I? (A stinkhorn)
3. I can hold millions of spores. What am I? (Gills)	8. I am an organism that helps dead matter decay—the ultimate recycler. What am I? (Decomposer)
4. I am a combination of algae and fungus. What am I? (Lichen)	9. I am the fungus in pizza dough. What am I? (Yeast)
5. I am the reproductive part of a mushroom. What am I? (Spores)	10. I am an important medicine made from mold that helps sick people. What am I? (penicillin)



Mars Mysteries

Answer the question before
you read the story.

Answer the question after
you preview the story.

Answer the question after
you read the story.



	K What do you know about Mars?	W What do you want to learn about Mars?	L What did you learn about Mars?
1.			
2.			
3.			
4.			
5.			

Mars Mysteries

After reading the story, think about what information scientists already know about Mars. List these facts in column one. Then recall what questions scientists still have about Mars and list in column two.

What scientists know about Mars	What scientists want to find out about Mars

Challenge

1. What questions about Mars or the *Curiosity* mission would you like to have scientists answer?

2. What part of our solar system do you think scientists should explore next? Why? What do you want to know?

Comprehension Check

Write the correct letter of the word that matches each definition next to numbers 1-6.

- | | |
|--|-----------------|
| ___ 1. how food energy passes from one organism to another | a. adaptations |
| ___ 2. the sun and everything that orbits around it | b. decomposer |
| ___ 3. active at night | c. orbit |
| ___ 4. behavior or body part that helps an animal survive | d. solar system |
| ___ 5. to move around a star, planet, or other object in space | e. food chain |
| ___ 6. organism that helps dead matter decay | f. nocturnal |

Read questions 7-9. Circle the correct answer.

7. How do fungi get their food?

- A. They turn dead material into edible goo.
- B. They absorb food in rainwater.
- C. They make food by photosynthesis.
- D. They eat leftover spores

8. Which of these is **not** a gecko adaptation?

- A. super night vision
- B. ability to glide
- C. ability to swim underwater
- D. sticky toes

9. Which of these statements is **not** true about Mars?

- A. It is the fourth planet from the sun.
- B. It has big rivers.
- C. It has huge sandstorms.
- D. It has red rocks.

10. In this issue of NATIONAL GEOGRAPHIC EXPLORER you have learned how geckos and fungi adapt to survive in their habitats. Think about what you learned about Mars and describe what special features an organism would need to survive on that planet. Use the back of this paper to describe the features and explain why they would be needed.

Comprehension Check

Write the correct letter of the word that matches each definition next to numbers 1-6.

- | | |
|---|-----------------|
| <u>e</u> 1. how food energy passes from one organism to another | a. adaptations |
| <u>d</u> 2. the sun and everything that orbits around it | b. decomposer |
| <u>f</u> 3. active at night | c. orbit |
| <u>a</u> 4. behavior or body part that helps an animal survive | d. solar system |
| <u>c</u> 5. to move around a star, planet, or other object in space | e. food chain |
| <u>b</u> 6. organism that helps dead matter decay | f. nocturnal |

Read questions 7-9. Circle the correct answer.

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- ☒ A. They turn dead material into edible goo.
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8. Which of these is **not** a gecko adaptation?

- ☐ A. super night vision
- ☐ B. ability to glide
- ☒ C. ability to swim underwater
- ☐ D. sticky toes

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Answers will vary but should recognize an organism's need to adapt to the extreme

weather and geological conditions on Mars.