



## In This Guide

In this guide, you will find language arts and science lessons for the stories in the April issue of EXTREME EXPLORER.

## Explorer Magazine

EXTREME EXPLORER magazine is a classroom magazine specifically written for middle school students. The magazine contains a grade-appropriate reading experience, develops literacy skills, and teaches standards-based science content. Great storytelling and stunning photographs teach your students about our planet and the people, plants, and animals that live on it. Use EXTREME EXPLORER in your classroom to encourage students to explore our world and make it a better place.

EXTREME EXPLORER is part of NATIONAL GEOGRAPHIC EXPLORER's Education program. Visit the "For Teachers" tab on Explorer's website, [ngexplorer.cengage.com](http://ngexplorer.cengage.com), to find additional resources for extending your students' learning.

## Your Subscription Includes:

- Magazines
- Classroom Posters and Cards
- Projectable Magazine
- Interactive Whiteboard Lesson
- Teacher's Guide
- App (additional subscription required)

# A Tale of an Atoll

## LANGUAGE ARTS



### Objectives

- Students will determine an author's point of view or purpose in a text and explain how it is conveyed in the text.
- Students will understand an author's tone and meaning.

### Resources

- Vocabulary Activity Master (page 6)
- Language Arts Activity Master (page 7)

### Summary

"A Tale of an Atoll" is a first-person account featuring photographer and biologist Thomas P. Peschak as he explores and photographs Aldabra, the world's second largest coral atoll.

## BUILD VOCABULARY AND CONCEPTS

- **arthropod**
- **atoll**
- **corals**
- **herbivore**
- **lagoon**

Display the vocabulary words. Remind students that using context clues, such as the sentences before and after an unknown word and photographs on the page, can help them figure out what the unfamiliar word means.

Give each student a copy of the **Vocabulary Activity Master**. Ask students to pick one of the words (or make an assignment) from the list of vocabulary words to become an expert on. The **Vocabulary Activity Master** will place the responsibility for learning the vocabulary words on the class. Students should have their rough draft approved before moving on to the final draft. You might also have a team of students complete all of the words together. After the final drafts are completed, students exchange cards to complete the activity.

### READ

Display pages 4–5 of the **Projectable Magazine**. Remind students that the author's point of view conveys his or her purpose for writing. Have students read the first three paragraphs and ask them to think about the author's purpose for writing the article. Help students to clarify their thoughts with prompts such as:

- How long did the author have to wait for a chance to go to Aldabra?
- What does the author's willingness to have his new hiking boots slashed and destroyed tell you about his interest in Aldabra?
- How does the author's choice of descriptive words relate his feelings for Aldabra?
- How does the author insert himself into the article?
- Point out that although the author paints a fairly bleak picture of Aldabra in the three short paragraphs on page 4, he also manages to relate how wonderful it would be to go there.

Give each student a copy of the **Language Arts Activity Master**. After they read pages 6–7, ask them to summarize information from each section that conveys the author's purpose.

# A Tale of an Atoll

## LANGUAGE ARTS



### TURN AND TALK

#### Point of View

Remind students that point of view reflects the author's purpose for writing. Have students review their **Language Arts Activity Master** with a partner and discuss how the author conveys his purpose. Guide them to understand that he delights in the life that thrives on and around the atoll. He paints vivid pictures of the giant tortoises and coconut crabs. The central lagoon teems with fish and serves a nursery for both fish and shellfish. Adaptations allow mangrove trees to survive on the edge of the ocean while providing a home to colonies of birds. The author cannot say enough about the vibrant coral reefs that fringe the lagoon. His point of view about Aldabra is aptly summarized by the title of his final section: A World Treasure.

#### Explain Concepts

Students should be able to analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept. Have students read the final paragraph of the section titled The Fringing Reef. Students might discuss and identify the role each sentence plays in supporting the author's purpose. He clearly makes the case for why Aldabra's top marine predators fulfill a vital role in the ecosystem.

#### Summarize

**Say:** *One way to determine if you understand information is to try to summarize the main idea of what you have read. If you can't state a summary that states the author's point of view and the major concepts presented in the article, you might need to read the article again.* Have students turn and talk to summarize the different ways Aldabra is a world treasure. Prompt discussion with questions such as: *Why should you care what happens on a tiny remote island in the the Indian Ocean? Why are so many people willing to protect Aldabra? Why was it a privilege for the author to be able to dive in the clear water around Aldabra?*

### WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- How should the conservation lessons of Aldabra be applied to your local environment?
- What surprised you about what you read?

# A Tale of an Atoll

## SCIENCE



### Objectives

- Students will understand how ecosystems change over time and the impact on the populations in the ecosystem.
- Students will understand how Earth's biosphere, hydrosphere, and lithosphere interact over time to form atolls.

### Resources

- Science Activity Master (page 8)
- Science Quiz Master (page 9)
- A Tale of an Atoll Interactive Whiteboard Lesson (website; optional)

### Science Background

The geography of atolls is difficult to define. They can be a low coral reef that forms an island. Sometimes they are formed by a series of coral islands.

Over thousands of years, corals can encircle an oceanic island. As the reef continues to grow, the island it formed around slowly subsides. The central island erodes and may even sink to the seafloor. When the island sinks below the waves, the reef that had surrounded it becomes a barrier island with a lagoon at its center. Single atolls and groups of atolls forming archipelagoes or clusters are scattered across the Pacific and Indian Oceans.

Because atoll-building corals thrive in warm waters, atolls are found in the tropics and subtropics. Erosion is a constant threat to atolls, which have very few natural resources and poor soil. Sea level rise, due to global warming, will be a major problem for atolls. Limited space and resources keep atoll populations to less than a thousand people. Many atoll residents practice subsistence agriculture and fishing.

The Seychelles Islands Foundation (SIF) is responsible for all science and conservation measures on Aldabra. To find out more about Thomas Peschak or see more of his photographs and articles, visit [thomaspeschak.com](http://thomaspeschak.com).

### ENGAGE

#### Tap Prior Knowledge

Display the picture of Aldabra Atoll from pages 4–5 of the **Projectable Magazine** or Screen 1 of the **Interactive White Board Lesson**. Discover what students already know using a series of statements on the topic. Students can respond “True” by holding an index finger up in front of their torso. “False” can be indicated by two fingers.

- An atoll is the old caldera of an underwater volcano. (False)
- An atoll is a ring-shaped coral island that forms an island. (True)
- Atolls probably form slowly over thousands of years. (True)
- Atolls have plenty of natural resources and provide for a rich habitat. (False)
- Most atolls form high circular rings that are not threatened by the rising ocean levels. (False)
- Millions of people inhabit the tropical or subtropical paradises offered by atolls. (False)
- Protecting atoll habitats by limiting the number of people that can visit them is a good use of resources. (True)

### EXPLORE

#### Preview the Lesson

Invite students to read the headline and examine the photo on pages 2–3 and the blue headings, pictures, and graphics on the remaining pages. Ensure students have a general understanding of the words *arthropod*, *atoll*, *coral herbivore*, and *lagoon*.

Challenge students to predict what the article is about specifically. Discuss with students whether or not they find the fact that atolls might be a world treasure to people surprising or even true. Encourage students to elaborate on their answers with some explanation. Prompt students to think about whether their explanation is based on fact or opinion.

#### Set a Purpose and Read

Have students note how organisms, water, and land interact to form atolls as they read the article.

# A Tale of an Atoll

## SCIENCE



### EXPLAIN

Have students share the text and images on pages 4–5. Spark discussion with prompts such as these:

- What are the inhabitants of Aldabra Atoll?
- What resources are found on Aldabra Atoll?
- What aspects of its location and geology impact its inhabitants?
- How might the fact that Aldabra has been designated a protected environment impact its inhabitants?

### Ecosystem Changes Impact Populations

Students may need to do additional research to fully understand how inhabited Aldabra was during each of the six geological stages in its development into its present form. Give each student a copy of the **Science Activity Master**. Allow students to work in pairs or small groups to identify the plant and animal life found in each development stage. Their goal is to make reasonable assumptions about what life might be present during each stage. They should also focus on the overall amount of life present in each of the stages.

### Atoll Formation

Project the illustrations at the bottom of page 4. Have students speculate why there are three illustrations for six steps. Challenge students to fill in the gaps and provide illustrations for the other steps.

### ELABORATE

#### Find Out More

Have students use the **Interactive White Board Lesson** “A Tale of an Atoll” to extend their thinking about atoll environments. It allows them to interact with pertinent vocabulary, view image resources to extend their thinking, explore atoll inhabitants, and learn how Aldabra Atoll formed. The Interactive White Board Lesson also allows students to assess what they know about atolls.

#### Extend Your Thinking About Atolls

Tuvalu, one of the most densely populated atolls, is only 400 meters wide at its widest point, and about 4,500 people live there. Students might do research to learn how people are able to survive on inhospitable atolls.

### EVALUATE

Assess comprehension of science concepts mentioned in the article using the **Science Quiz** alone or in combination with the following questions. Have students record their answers in their science notebooks or on the back of the Science Quiz.

- **Although Aldabra is in the tropics, why is it very unlike a typical lush tropical paradise?** (The four main islands of the atoll rise just eight meters above the surface of the ocean. For most of the year, they are bone dry, and the rain that does fall in the brief rainy season quickly drains away. Only thorny shrubs and grasses can survive in the thin, dry soil.)
- **Why is a volcano critical to the development of an atoll?** (A volcano erupts from the ocean floor. As lava builds up, the volcano eventually breaks the surface of the water, forming an island. Only after the undersea volcano rises so high can the corals begin to colonize, creating the fringing reef that eventually becomes the islands of the atoll.)
- **What are reasons why large reptiles thrive and dominate the ecosystem on Aldabra and not elsewhere?** (Answers might include: isolation of Aldabra; a pristine ecosystem; diversity of living creatures; being designated a UNESCO World Heritage Site; protection by the people of the Seychelles; and extremely low human population density)

If your classroom is so equipped, use the **Interactive Whiteboard Lesson** for a whole-class summary of the article. Even if you don’t have an interactive whiteboard, the Interactive Whiteboard Lesson can be projected and is fully functional with the mouse of the computer connected to the projector.

Name \_\_\_\_\_

Date \_\_\_\_\_

## VOCABULARY ACTIVITY: A Tale of an Atoll

Choose one vocabulary word on which to become an expert. Have your rough draft approved before attempting the final draft.

<b>ROUGH Draft</b>	<b>FINAL Draft</b>
<b>Word:</b>	<b>Word:</b>
<b>Definition:</b>	<b>Definition:</b>
<b>Part of Speech:</b>	<b>Part of Speech:</b>
<b>Picture</b>	<b>Picture</b>
<b>Identify where word is used as jargon:</b>	<b>Identify where word is used as jargon:</b>
<b>Synonym:</b>	<b>Synonym:</b>
<b>Antonym:</b>	<b>Antonym:</b>

Name \_\_\_\_\_

Date \_\_\_\_\_

## LANGUAGE ARTS ACTIVITY: A Tale of an Atoll

Closely reread pages 6–7. As you read, fill in the table below to help determine Thomas P. Peschak's point of view.

<b>Point of View Clues</b>	
<b>Clues in "A Tale of an Atoll"</b>	<b>How the Clue Conveys the Author's Point of View</b>
Facts or numbers that relate to the author's point of view	
In a debate about Aldabra, which side would the author be on? Why?	
Information the author failed to include	
Words that the author uses to convey his point of view	
How what I know about the topic compares with the author's presentation	
<b>Summary</b>	
How the author's point of view affects the text presentation	

Name \_\_\_\_\_

Date \_\_\_\_\_

## SCIENCE ACTIVITY: A Tale of an Atoll

At each stage in an atoll's development, identify how populations of organisms might have changed.

<b>Changing Environment</b>	<b>Plant Life</b>	<b>Animal Life</b>
A volcano erupts from the ocean floor. As lava builds up, the volcano eventually breaks the surface of the water, forming an island.		
Corals colonize the shallow water around the volcano.		
Over thousands of years, the hard, exterior skeletons of the corals accumulate to form a thick, ring-shaped coral reef.		
Rain, wind, and waves weather and erode the volcanic island. Over time, it disappears into the sea. The corals continue to grow.		
The ocean breaks through the coral rim and floods the area that was once the volcanic crater, forming a shallow lagoon.		
The volcanic island is completely eroded, leaving a ring of islands around the lagoon.		



## LANGUAGE ARTS

### Objectives

- Students will analyze how a key individual, event, or idea is introduced, illustrated, and elaborated on.
- Students will explain concepts based on information in the text.
- Students will summarize the article, making sure to include the details to support the summary.

### Resources

- Vocabulary Activity Master (page 14)
- Language Arts Activity Master (page 15)

### Summary

“Superstructure” highlights engineering design problems that had to be solved in building the tallest building in the world and the science behind the solutions.

## BUILD VOCABULARY AND CONCEPTS

- **concrete**
- **consistency**
- **foundation**
- **piles**
- **superstructure**

The vocabulary words are key terms important to understanding the article, but are not called out in boldface type. Display these key terms so that they can be viewed during the activity.

Give each student a copy of the **Vocabulary Activity Master** or project it for the class to use together. The sheet might be used in several ways:

- The words can be taken in turn or randomly. Students take turns calling out an item from the sheet. Another student volunteers or is called on to respond to it.
- Students take turns selecting a word and an item and then responding to it.
- The words can be taken in turn. Items are cut out and placed in a container so that they can be randomized. Students take turns drawing an item and giving a response.
- Students pick one of the vocabulary words and then respond to an item. Volunteers from the class raise their hands to identify the item.

Have students increase their depth of knowledge by joining in think-pair-shares dealing with their new vocabulary knowledge and how it can be applied to better understand the reading.

## READ

Explain that the purpose of this article is to introduce students to some of the ways that engineers solve problems about materials, forces, and energy when constructing a supertall skyscraper. Point out that scientific articles require them to analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated on in a text. Examples or anecdotes given in the text are often critical components of building comprehension.

Give each student a copy of the **Language Arts Activity Master**. Explain to students that they will build comprehension skills by analyzing how a key individual, event, or idea is introduced, illustrated, and elaborated on. Throughout the article, the writer introduces individuals, presents events, or explores ideas. This is usually done through examples or anecdotes. In this article the main character is the Burj Khalifa.

## LANGUAGE ARTS

### READ (continued)

If needed, model how to find a key individual, event, or idea presented in the text and how it can aid in understanding the passage. Display page 12 of the **Projectable Magazine**. Use the mouse to point as you read down through “second time.” **Say:** *Isn't that an interesting story or anecdote?* **Write:** . . . *watch the sun going down for the second time.* Continue reading the passage to show how an event in a text can add to comprehension.

Model filling in the first row of the **Language Arts Activity Master**.

	Example/ Anecdote	Relevance to Text	How It Aids Comprehension
1	. . . watch the sun going down for the second time.	short story of something that can happen at the Burj Khalifa every day.	clear illustration of just how tall the supertall skyscraper is

Have students read the article on their own. As they do, instruct them to look for other examples or anecdotes that aid in their understanding of the text. If they find more, encourage them to record additional information on the back of their papers.

### TURN AND TALK

Have students turn and talk to discuss how understanding events, individuals, or ideas expressed in a text can aid comprehension. Encourage them to compare their results as a class or in small groups. Then have students share their efforts on the **Language Arts Activity Master**. If another student mentions something they overlooked, instruct students to make revisions to their efforts.

### Explain Concepts

Display pages 14–15 of the **Projectable Magazine**. **Write** the questions: How did an example or anecdote increase your understanding of concepts presented in the article? How did the author introduce an idea? **Say:** *Once you understand the importance of examples and anecdotes in a text passage, you will be a better reader.* Challenge students to share and discuss examples and anecdotes found on pages 14–15 and how they aided their understanding of important concepts.

### WRITE AND ASSESS

Writing is a good way to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- Explain why two low-tech answers to problems were better solutions for the Burj Khalifa.
- What surprised most you about what you read?

### Objectives

- Students will understand how engineers solved problems about materials, forces, and energy in tall building construction.
- Students will understand that the motion of an object is determined by the sum of the forces acting on it.

### Resources

- Science Activity Master (page 16)
- Science Quiz Master (page 17)
- "How Tall?" poster (Teacher's Edition)
- "The Elements" poster (Teacher's Edition)

### Science Background

Before skyscrapers, commercial buildings were mostly built of bricks or stone. The walls of these structures were load-bearing, which meant the walls supported the floors of the building, the building's occupants, and everything the building contained. These buildings could only be of limited height. The tallest of them, the Monadnock Building located in Chicago, Illinois, is 66 meters high. The limiting factor is its walls. The bottom walls of the Monadnock building are 1.8 meters thick. At its top, the walls narrow down to 48 centimeters.

In the 1880s, a new construction technique was devised that allowed for taller buildings. This new method utilized a very strong grid of steel beams and columns. Such structures were strong enough to support the weight of the floors and building contents. They could also withstand abnormal winds and even earthquakes.

In 1931, New York's Empire State Building became the world's tallest building at 102 stories. About 41 years later, it was topped by the 110-story World Trade Center, also in New York. In 2010, the Burj Khalifa, in the United Arab Emirates, topped them all at 160 stories.

The Jeddah Tower, in Saudi Arabia, is scheduled to open in 2017. It is expected to have 167 floors and a height of one kilometer.

### ENGAGE

#### Tap Prior Knowledge

Use a prompt to engage students in thinking about superstructures:

- Tall buildings are practical because. . . .
- Tall buildings are impractical because. . . .
- Special problems that must be addressed when designing a tall building include. . . .
- Superstructures will continue to get taller and taller because. . . .

### EXPLORE

#### Preview the Lesson

Students will use their prior knowledge and prediction skills as you prompt them through the article.

Page 11 The image emphasizes the height of buildings by . . . .

Page 13 The Burj Khalifa was constructed away from other tall buildings because . . . .

Page 15 Workers completing their task might experience difficulties such as . . . .

Pages 16–17 Looking at the Burj Khalifa, I would like to know . . . .

#### Set a Purpose and Read

As students read the article, have them examine how engineers solved problems about materials, forces, and energy in tall building construction.

### EXPLAIN

Engineers solve problems in a systematic fashion.

#### Problems in Tall Building Construction

Learning how to approach and solve problems is a major skill of engineers. Give each student a copy of the **Science Activity Master**. Allow students to work in pairs or small groups to review "Superstructure" together. Have them identify the problems that had to be overcome in order to successfully construct the world's tallest building and suggest why the solution worked.

#### Forces Acting on Tall Buildings

In 2011, a 35-year-old man was crushed when a downdraft caused by the tallest building in Leeds, England, tipped a truck over on him. The building, called Bridgewater Place, is 112 meters tall. The Burj Khalifa is almost eight times taller. Have students investigate the motion and forces of winds deflected by skyscrapers. Areas they might investigate include:

- building height
- shape of the building
- acceleration of winds deflected by the building
- effect of having several skyscrapers near each other
- the Venturi effect
- width of local streets
- change in air temperature from base to top of the skyscraper
- change in wind speed as height increases
- angle of building to prevailing winds

### ELABORATE

#### Find Out More

Display the "Skyscraper" poster. As you review it, have students compare and contrast the five skyscrapers shown. Challenge them to answer questions such as:

- What do you notice about the placement of the red arrow on each structure?
- What observations can you make about the volume of the various designs?
- The buildings go from old, on the left, to new, on the right. What design changes were made over the years?
- What aesthetic features do you think are pleasing?

The Council on Tall Buildings and Urban Habitat (CTBUH) is an organization that facilitates the exchange of data on tall buildings around the world. CTBUH also formalizes the criteria against which tall buildings are judged. Have students reexamine the "How Tall?" poster in light of CTBUH's Height Criteria found at [ctbuh.org/TallBuildings/HeightStatistics/Criteria/tabid/446/language/en-US/Default.aspx](http://ctbuh.org/TallBuildings/HeightStatistics/Criteria/tabid/446/language/en-US/Default.aspx). Students might debate the logic and fairness of the height criteria.

#### Extend Your Thinking About Materials

Display the "The Elements" poster. Instruct teams of students to find elements or compounds discussed in the article. Then have them find the location of these elements, including the elements in the compounds, on the periodic table. Using data from the poster, have students compare and contrast the elements they find.

### EVALUATE

Assess comprehension of science concepts mentioned in the article using the **Science Quiz** alone or in combination with the following questions. Have students record their answers in their science notebooks or on the back of the Science Quiz.

- **What does the number of architectural drawings generated during the Burj Khalifa project tell you about it?** (Ten times more drawings were generated during the project than had been created before construction started. That implies that a great deal of problems had to be solved.)
- **What observations can you make about the "Bracing for the Wind" feature?** (The shape of the building produces less turbulence with increasing height.)
- **What challenges did the base on which the Burj Khalifa was built have to overcome?** (The base of the building had to overcome several challenges: support the mass of the building—500,000 metric tons; the shifting desert soil could allow the building to sink; the sandstone layers below the sand were weak and crumbly; the sandy soil on which the building was built was also corrosive.)

Name \_\_\_\_\_

Date \_\_\_\_\_

## VOCABULARY ACTIVITY: Superstructure

Select vocabulary words and complete the table. More than one vocabulary word can be used.

What is the part of speech?	Use this and another vocabulary word in a sentence.
Give another word with the same meaning.	Explain how adding a prefix changes the word.
Explain how adding a suffix changes the meaning.	Use the word in a sentence.
What is the root word and what does it mean?	Give a word with the opposite meaning.
What does this word and another vocabulary word have in common?	How would you define it?

Name \_\_\_\_\_

Date \_\_\_\_\_

## LANGUAGE ARTS ACTIVITY: Superstructure

Show how examples or anecdotes of individuals, events, or ideas build comprehension.

	Example/Anecdote	Relevance to Text	How It Aids Comprehension
1			
2			
3			
4			
5			

Name \_\_\_\_\_

Date \_\_\_\_\_

## SCIENCE ACTIVITY: Superstructure

Identify problems that were solved and explain why the solutions worked.

Problem	Solution and Why It Worked

## SCIENCE QUIZ: Superstructure

Circle the correct answer for questions 1–5. Then construct your response to Use Math.

- Which is a feature of the world's tallest building?
  - elevator with longest travel distance
  - second highest outdoor observation deck
  - largest building by volume
  - best all-around view
- Which is NOT true about the construction of the Burj Khalifa?
  - More than 110,000 tons of concrete were required.
  - Around 55,000 tons of steel rebar were used.
  - About 22 million man-hours were put in to complete the building.
  - At the peak of construction, 14,000 workers were on site each day.
- Which does not support the analogy that the Burj Khalifa is like a city?
  - 10,000 people use the skyscraper each day
  - supplies almost 1,000,000 liters of water daily
  - houses a hotel and homes
  - contains offices and stores
- Which feature was not solved with data from wind tunnel testing?
  - protection of people standing on the Burj's open balconies
  - how the tower cranes would be set on top
  - how to keep the building from swaying back and forth a lot
  - the final shape and position of the building
- What design problem did the 125 piles that were each 1.5 meters in diameter solve?
  - differences in the air temperature between the top and bottom
  - how to create the framework in which to put the windows
  - support of the weight of all of the materials in the building
  - flow of water to the taps on the upper floors

**Use Math:** Create a scale that would allow you to make a scale drawing of the Burj Khalifa on a sheet of paper.

# Out for Blood

## LANGUAGE ARTS



### Objectives

- Students will determine the main idea of the text.
- Students will summarize the article, making sure to include the details to support the summary.

### Resources

- Vocabulary Activity Master (page 22)
- Language Arts Activity Master (page 23)

### Summary

"Out for Blood" explores how some species adapted through natural selection to feed on blood. The article also examines how leeches have been used in medicine historically and are still being used today.

## BUILD VOCABULARY AND CONCEPTS

- **anesthetic**
- **anticoagulant**
- **dengue**
- **encephalitis**
- **proboscis**

Display these key terms, some of which are not boldface in the article. Remind students that using context clues, such as the sentences before and after an unknown word and photographs on the page, can help them figure out what the unfamiliar word means. Students should read the article to build an understanding of each of the words.

Explain to students that hieroglyphs are a type of pictogram that includes both image and letter elements. Group students and distribute copies of the **Vocabulary Activity Master**.

Have groups of students identify a list of attributes for each of the vocabulary words. They can then translate the attributes into a symbolic representation. Their goal is to create a pictogram that is meaningful to their classmates. Students might justify their design for each pictogram on the reverse side of the **Vocabulary Activity Master**.

To extend the vocabulary experience, display the five vocabulary words on an interactive whiteboard. Have the class do a matching activity with each group's efforts. As a summary, have the class identify the best representative pictogram for each of the vocabulary words.

### READ

"Out for Blood" exposes students to the world of hematophagy. Throughout the article, the author, Shirleyann Costigan, explores and explains the adaptations that enable some animals to use blood for nutrition. Point out that learning the central idea of the article and the details through which it is conveyed will help students better understand the text.

Display pages 20–21 of the **Projectable Magazine** or have students turn in the print edition. If needed, model how to find the main idea using the "Vexing Vampires" passage found at the top of page 20. Have it read aloud. **Say:** *When I read the first sentence "People in the tropics of Central America and South America know about vampires—not the Dracula type of vampire, the bat type." I begin to think about a bat biting me to take my blood. I am struck by the author's use of the word "Dracula" and all of the negative connotations connected with it. As I continue reading, the bats don't seem so bad. The bat clips away fur. Although the host's skin is punctured, it can't be very painful because the animal continues to sleep on. Only about thirty milliliters of blood are lapped up. That doesn't seem like a lot. That the victim doesn't feel a thing is pretty cool. The next paragraph wraps it all up. A few adaptations make it possible for an animal to survive by bloodsucking.*

Remind students that the central idea of a text is also its overall message. Let students know that once they have identified the main idea and supporting details within an article, they can use those to help them synthesize and summarize the entire article.

Give each student a copy of the **Language Arts Activity Master**. Have students read the article on their own. As they do, instruct them to note key details that they think support the overall main idea of the article. Challenge them to select only the strongest supporting details. Students should record the main idea and details that support it on the **Language Arts Activity Master**. The most important section of the Activity Master is the students' explanation given in the final section.

# Out for Blood

## LANGUAGE ARTS



### TURN AND TALK

Have students turn and talk to compare their **Language Arts Activity Master** with a partner. Did students find the same examples of useful adaptations for sucking blood? Did they interpret each adaptation in the same way? Have students explain their reasoning to their partners. If partners used the same information to come to different understandings, encourage them to reread the text and review the information together.

### Main Ideas

Remind students that individual reading passages should support an overall focus for the article as a whole. Have students review their **Language Arts Activity Master** and work with a partner to suggest the main idea of the article and identify details that support it. Most students will develop a variation of the main idea that there are many successful blood feeders in the animal kingdom. Then have students turn and talk to discuss how the fact that leeches feed on blood can help people survive. Students should be able to use details to support a main idea statement about adaptation and survival as well, or another main idea they might suggest.

### Summarize

**Say:** *One way to determine if you understand information is to try to summarize the main idea of what you have read. If you can't state a summary based on the main idea and details, you might need to read the article again.* Have students turn and talk to summarize the different ways adaptations have allowed many animals to successfully feed on the blood of other animals. Prompt discussion with questions such as: What things do animals that feed on blood have in common? What is required to be a successful practitioner of hematophagy? Why is it natural that we should be afraid of organisms that may feed on our blood?

### WRITE AND ASSESS

You may want students to write about what they learned to assess understanding. Encourage students to reflect upon what they read and how it affected their ideas about the topic.

- How can you explain why so many varied types of organisms successfully practice hematophagy?
- What surprised you about what you read?

# Out for Blood

## SCIENCE



### Objectives

- Students will compare and contrast species that are adapted to using blood for nutrition.
- Students will make generalizations about the relative danger of blood-feeding species to humans.
- Students will summarize ways that scientists use leeches today.

### Resources

- Science Activity Master (page 24)
- Science Quiz Master (page 25)

### Science Background

Adaptations allow invertebrates, fish, birds, and mammals to base their diets on blood—a liquid tissue rich in proteins and lipids. Eating blood is common and is found in over 14,000 living animal species according to Tommy Leung, a parasitologist at the University of New England in Australia.

While many different kinds of animals feed on blood, many of the adaptations that allow them to do so are similar. Most of them have anticoagulant and pain killing properties in their saliva. These chemical agents increase the flow rate of the blood they are consuming while reducing the chance that the host will know they are being fed upon.

They also have special mouthparts or other adaptations that help them consume blood. Sharp teeth and piercing mouthparts are common adaptations among bloodsucking species. Some insects have a hollow proboscis with which they perforate capillaries. Hematophagous fish have circular rows of teeth and a rough tongue. Blood-feeding birds have sharp beaks.

The bloodsucking animals described in the article are prey for even tinier species that feed on blood. Read "*The Vampires that Feed on Vampires*" by Jason Bittel, National Geographic, October 29, 2015, at [news.nationalgeographic.com/2015/10/151029-vampire-bats-moths-mosquitoes-blood-suckers-hematophagy](http://news.nationalgeographic.com/2015/10/151029-vampire-bats-moths-mosquitoes-blood-suckers-hematophagy).

### ENGAGE

#### Tap Prior Knowledge

Have volunteers call out single words or phrases that describe vampire bats. They might include characteristics of bloodsucking bats specifically, or larger related groups that practice hematophagy. Record the responses and have students differentiate between biological characteristics and those based on opinion. Then, as a class, develop an operational definition of what hematophagy is.

### EXPLORE

#### Preview the Lesson

Beginning on page 18, have students examine the photographs and blue headings in the article. Ensure students have a general understanding of the words *anesthetic*, *anticoagulant*, *dengue*, *encephalitis*, and *proboscis*.

Challenge students to write a single thought-provoking question for each of the blue headings. Remind them that the photographs on each page should give clues to the content of that page.

#### Set a Purpose and Read

Have students read the article in order to learn about the adaptations of some animals that enable them to use blood for food.

### EXPLAIN

#### Adaptations for Survival

Elicit from students what adaptations are and how using blood as food is an adaptation. Give each student a copy of the **Science Activity Master**. Allow students to work in pairs or small groups to identify behavioral and physical adaptations that aid in the survival of animals that practice hematophagy. Students should identify each behavior or adaptation and how it aids survival. Then facilitate a discussion about the role of DNA in the evolution of adaptations and why adaptations might be similar among different kinds of bloodsucking animals.

#### Human Blood as Food

Have pairs of students determine which of the blood-sucking animals in the article poses the greatest threat to humans. They might conduct additional research to supplement the information in the article. Encourage students to state their conclusion in the form of a claim backed by evidence.

#### Using Leeches Today

Encourage students to work in pairs or small groups to find out more about the benefits of using leeches in medicine or other scientific research. Students might create a slide show of annotated images to summarize their findings.

### ELABORATE

#### Find Out More

Have students use the library or Internet to find out more about the diseases carried by mosquitoes and passed from organism to organisms via blood. The newest threat is the Zika virus, but the list includes yellow fever, dengue fever, Japanese encephalitis, Rift Valley fever, Chikungunya virus, and West Nile virus as well. Consider having students create visual, audio, or print "health alerts" that inform the public about the risks and steps to limit exposure to mosquitoes.

#### Extend Your Thinking About Mosquitoes

Have students debate the relative value of mosquitoes to Earth's food web and whether or not they should be eradicated from the planet to stop the spread of human diseases. Have them start their research on the pros and cons with "Zika Raises the Question: Are Mosquitoes Necessary?" by Jason Bittel, published February 7, 2016, at [news.nationalgeographic.com/2016/02/160207-mosquitoes-zika-virus-environment-science-animals](http://news.nationalgeographic.com/2016/02/160207-mosquitoes-zika-virus-environment-science-animals).

### EVALUATE

Assess comprehension of science concepts mentioned in the article using the **Science Quiz** alone or in combination with the following questions. Have students record their answers in their science notebooks or on the back of the Science Quiz.

- **Pick an organism that practices hematophagy. Explain why it is or is not a threat to people.** (*Mosquitoes are very good at tracking and piercing the skin of humans. They are also able to inject dangerous viruses and bacteria into the victims that cause malaria, dengue, encephalitis, West Nile virus, and Zika.*)
- **What is special about ticks and leeches that allow them to wait for a long time between meals?** (*Ticks are very patient. They wait for their prey to come to them. They may search the host to locate a patch of thin skin. Days may be required for them to fill up. Leeches draw out several times their own weight in blood. After feeding, they may not have to eat for six months or longer.*)
- **Identify two adaptations that hematophagic organisms have that aid in the location of their prey.** (*Students may cite adaptations such as: Deer ticks can find a host by detecting body odors or sensing body heat. Female mosquitoes are able to smell the carbon dioxide that people exhale.*)

**VOCABULARY ACTIVITY: Out for Blood**

Use the attributes of each vocabulary word to create a pictogram.

Word	Pictogram
anesthetic	
anticoagulant	
dengue	
encephalitis	
proboscis	

## LANGUAGE ARTS ACTIVITY: Out for Blood

Identify the main idea of the passage and provide adequate support for it.

**Identify the main idea.**

**Key Detail**

**Key Detail**

**Key Detail**

**Explain how these details strongly support the main idea.**

Name \_\_\_\_\_

Date \_\_\_\_\_

## SCIENCE ACTIVITY: Out for Blood

Identify behavioral and physical adaptations that aid in the survival of animals that practice hematophagy.

Animal	Behavioral or Physical Adaptation	Benefit

## SCIENCE QUIZ: Out For Blood

Circle the correct answer for questions 1–5. Then write your response to Your Ideas.

- Which is NOT an organism that practices hematophagy?
  - deer ticks
  - freshwater leeches
  - bedbugs
  - male mosquitoes
- How can birds with blunt beaks practice hematophagy?
  - They suck blood from sleeping injured animals.
  - They remove ticks and feed on the blood that continues to flow from the wound.
  - Their beaks are dull but their proboscises allow them to obtain the blood they need.
  - They obtain blood from the carcasses of animals that were killed by top predators.
- How do bedbugs get their name?
  - They maintain their body temperature under bedcovers, especially during cold winters.
  - They expand like an inflatable mattress as they gorge themselves on blood.
  - They spread diseases that cause infected people to have long periods of bed rest.
  - They live in warm, cozy spaces around mattresses near their prey.
- Why do doctors still find leeches to be powerful tools in bloodletting?
  - They prevent blood from clotting.
  - They cure many ailments.
  - They remove disease-causing blood.
  - They pierce the skin and blood drips out.
- Which is NOT true of organisms that practice hematophagy?
  - Animals that practice hematophagy are usually small.
  - They usually have an anticoagulant to keep the host's blood flowing.
  - They release an anesthetic that helps them to obtain their food.
  - They are found in a few environments that are easily avoided.

**Your Ideas:** Rate the bloodsucking animals in the article on a danger scale from most dangerous to least dangerous. Tell why you rated them that way.

# Explorer - Extreme



## ANSWER KEY

### A Tale of an Atoll

#### Vocabulary Activity, page 6

Students should choose one of the terms from the WordWise feature—arthropod, atoll, corals, herbivore, lagoon—or another unfamiliar term. Responses will vary for students targeting the same term, but their responses should be logical.

#### Language Arts Activity, page 7

Students' responses will vary but should be logical in the relationship of the text to their idea about how it conveys the author's point of view. Evaluate each for accuracy and sense.

#### Science Activity, page 8

Students will be making conjectures about the time period over which an atoll forms and the kinds and sizes of populations present at any given point. Responses will vary, but should be logical.

#### Science Quiz, page 9

Science Quiz Answers

1. A    2. C    3. D    4. B    5. C

Your Ideas: Students' responses will vary but might include how the clarity of the water and lushness of the mangrove tree indicate high environmental quality.

### Superstructure

#### Vocabulary Activity, page 14

Students might choose familiar or unfamiliar terms central to comprehending the article, such as concrete, consistency, foundation, piles, and superstructure. Responses will vary for students targeting the same term, but their responses should be logical.

#### Language Arts Activity, page 15

Students' responses will vary, but should be logical in their relationship to the examples and anecdotes chosen. Evaluate each for accuracy and sense.

#### Science Activity, page 16

Students responses will vary but should show logical relationships for the problems and solutions chosen.

#### Science Quiz, page 17

Science Quiz Answers

1. B    2. D    3. B    4. B    5. C

Use Math: Students should create a mathematical relationship between the height of the tower and either the width or length of their quiz paper.

### Out for Blood

#### Vocabulary Activity, page 22

Students should use the following terms from the article—anesthetic, anticoagulant, dengue, encephalitis, proboscis. Students should be able to explain how their symbols relate to the attributes of the terms.

#### Language Arts Activity, page 23

The main ideas of the passages recorded by the students may differ; however, the details each student records should support the main idea(s) he or she suggested.

#### Science Activity, page 24

Students' responses will vary but should show an understanding of what adaptations are and how they can be beneficial for survival. Evaluate responses on their logic and sense.

#### Science Quiz, page 25

Science Quiz Answers

1. D    2. B    3. D    4. A    5. D

Your Ideas: Answers will vary. Look for logical support in the students' rationales.