

Extreme

EXPLORER

extremeexplorer.org

Dear Educator:

This issue of EXTREME EXPLORER presents three dramatic stories of survival. Students will discover the answers to some intriguing questions. How can people survive in avalanche country? How do some creatures survive attacks by predators? How will Earth survive the damaging effects of our human footprint?

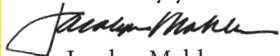
In "Avalanche!," scientist Ed Adams explains that the best way to survive an avalanche is to avoid it altogether. He's helping people do that by finding ways to better understand and predict avalanches. In the course of his research, Adams has buried himself under dozens of snow masses. Readers will learn about the different types and triggers of avalanches, and how computer models may be used to save lives in the future. Use the activity on p. T3 to check students' understanding of key science concepts.

In "Gone Today, Here Tomorrow," readers will learn about animals that can lose critical body parts—legs, internal organs, even the head—and still survive. How? They have the ability to regenerate lost or damaged body parts. Students will explore what occurs inside an animal's body to make regeneration possible, and why doctors are interested in unlocking the secrets of regeneration. You can use the activity on p. T5 to help students monitor their understanding as they read and track key information.

Finally, "Our Human Footprint" gives readers a window into the everyday choices they make and how their daily habits impact Earth, for better or for worse. Students will learn the three components that make up their footprint and discover ways to tread more lightly. To get students thinking and moving, play "The Human Footprint Game" on the poster. It's a great way to build background for the story and the journal activity on p. T7.

Now for a quick reminder: This is our last print copy of the Teacher's Guide. Starting with the January issue, the guide will be available online only for you to download. Look for it a month before you get the print magazine. Please also join our EXTREME EXPLORER teacher's panel and let us know what you think. We hope the amazing stories of survival in this issue resonate with you and your extreme explorers.

Sincerely yours,



Jacalyn Mahler
Editor in Chief

In This Issue

AVALANCHE!

PP. 2-7

Curriculum Connections

- Physical Science • Earth Science
- Language Arts

Standards Correlations

- **Physical Science:** Motions and forces; Transfer of energy
 - **Earth Science:** Characteristics of weather
 - **Language Arts:** Word study; Dictionary use
- #### Literacy Skills
- **Reading Strategy:** Ask and Answer Questions
 - **Vocabulary:** Dictionary Usage
 - **Writing:** Research

REGENERATION

PP. 8-15

Curriculum Connections

- Life Science • Biology • Language Arts

Standards Correlations

- **Life Science:** Adaptations of living organisms
- **Biology:** Cells
- **Language Arts:** Self-monitoring comprehension strategies

Literacy Skills

- **Reading Strategy:** Plan and Monitor
- **Vocabulary:** Prefixes
- **Writing:** Comic Strip

OUR HUMAN FOOTPRINT

PP. 16-23

Curriculum Connections

- Ecology • Social Studies • Language Arts

Standards Correlations

- **Ecology:** Human impact on Earth
- **Social Studies:** Interdependence
- **Language Arts:** Identifying main ideas

Literacy Skills

- **Reading Strategy:** Determine Importance
- **Vocabulary:** Word Maps
- **Writing:** Journal

Answer Key

Avalanche! • Teacher's Guide, p. T3

1. Check students' responses to make sure that the information matches the facts presented in the text;
2. by burying himself in an avalanche; by looking at snow layers; by experimenting in a lab.
3. The program will help predict avalanche danger.
4. Answers will vary.

Regeneration • Teacher's Guide, p. T5

Check students' responses to make sure the information matches the facts presented in the text. (Sample responses: **Which animal?** Salamander. **What part?** Leg. **Why?** Injury from attack. **How does an animal regenerate its body parts?** Cells change, letting the animal grow new muscle, skin, nerves, and more.)

Our Human Footprint • Teacher's Guide, p. T7

Answers will vary based on students' individual experiences and decisions.

Review • Teacher's Guide, p. T8

1. b
2. d
3. c
4. a
5. c
6. d
7. c
8. d
9. a
10. c
11. d
12. a

Next Issue

Trickster Plants: Discover some plants' wild adaptations.

Active Earth: Travel deep below Earth's surface to explore where the action starts.

Matthew Henson: Join an incredible journey to the North Pole.

Winning Edge: Meet an Olympic athlete who uses skill, strength, and science to win.

AVALANCHE!

About the Story

Snow can be fun, beautiful—and deadly. In this story, students will learn how one scientist studies avalanches from the inside out. Readers will explore triggers and types of avalanches, and discover what Dr. Ed Adams is doing to help predict avalanches.

Fast Facts

Here are some avalanche safety tips to share. Emphasize that the safest, wisest thing to do is avoid avalanches altogether:

- Constantly check avalanche conditions and know the warning signs of an avalanche.
- Always ski or snowboard with a partner.
- Stay inbounds and obey warning signs.

Vocabulary

Build Word Knowledge/Use a Dictionary:

Remind students that one way to learn about a word is by using a dictionary. Display the word *avalanche*. Have students find the entry for *avalanche* in a dictionary. Point out the parts of the entry: the word, the pronunciation key, parts of speech, word origin, and definitions. Ask: *What did you learn about the word avalanche that you didn't know before?* Ask students to repeat this process with the Wordwise words on p. 7.

Before Reading

Anticipation Guide: Explain that all good scientists need to question what they "believe" about their area of study. Display the following statements about avalanches and ask students whether they believe each one is true or false. Have them record their answers. Tell them they will have a chance to review their responses after they read the story.

1. Avalanches can move as fast as 100-130 kilometers (60-80 miles) per hour. (*True*)
2. Scientists can only study avalanches outdoors. (*False*)
3. A small clump of falling snow can trigger an avalanche. (*True*)
4. A loose snow slide is the most dangerous kind of avalanche. (*False*)

Reading Strategy

Ask and Answer 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 ask and answer questions as they read. Model the strategy by reading aloud the first three paragraphs on p. 4 and pausing to ask and answer these questions: *What are the most important ideas?* and *What information do I need to remember?* If students can't answer both questions after reading each section, suggest they reread it to clarify their understanding.

After Reading

- **Ask and Answer Questions:** To be sure students understand the main ideas, have them complete the blackline master on p. T3. Then revisit the statements you displayed before reading and their true/false ratings. If students need to revise their responses, ask them to point out the text or image that provided the accurate information.
- **Language Arts:** Challenge students to invent three new scientific terms and write a dictionary entry for each one. Each entry should include: pronunciation, syllables, part of speech, word origin, and a definition. Example: *Megalanche*: (**meg**-uh-lanch) **noun** <Greek *mega* + French *avalanche*> *an enormous slide that occurs when two or more avalanches combine.*
- **Research:** Ask students to pick another natural hazard to research, such as a volcanic eruption, hurricane, flood, drought, or mudslide. Ask them to create a fact sheet centered on the five *Ws*: *who, what, where, when, and how.* Explain that a natural hazard does not become a disaster until it negatively impacts an area or people, such as Hurricane Katrina did in 2005.

NATIONAL GEOGRAPHIC EXTREME EXPLORER (ISSN 1541-3357) is published seven times during the school year—September, October, November–December, January–February, March, April, and May—by the National Geographic Society, 1145 17th Street NW, Washington, D.C. 20036.

Postmaster: Please send address changes to NATIONAL GEOGRAPHIC EXTREME EXPLORER, PO Box 4002865, Des Moines, IA 50340-0597. Periodical postage paid at Washington, D.C., and additional mailing offices.

To subscribe in the U.S., call 1-888-915-3276.

To subscribe in Asia, call +65 81330520.

Copyright © 2009 National Geographic Society. All rights reserved. Reproduction of the whole or any part of the contents of NATIONAL GEOGRAPHIC EXTREME EXPLORER without written permission is prohibited. National Geographic, NATIONAL GEOGRAPHIC EXTREME EXPLORER, and the Yellow Border are trademarks of the National Geographic Society.

AVALANCHE!

Read "Avalanche!" in NATIONAL GEOGRAPHIC EXTREME EXPLORER. Then answer these questions:

1. What are four facts about avalanches you learned from the story?

Fact 1: _____

Fact 2: _____

Fact 3: _____

Fact 4: _____

2. How does Dr. Adams study avalanches?

3. How will his computer program help skiers and snowboarders?

4. What is the most important thing you learned from this story?

Gone Today, Here Tomorrow

About the Story

Some animals can lose a tail, a leg, or even their head and still survive. The story introduces students to regeneration champs such as sea cucumbers and salamanders. They will discover why animals use regeneration, find out what happens in an animal's cells during regeneration, and learn about possible applications for human health.

Fast Facts

- As frogs age, they lose their ability to regenerate their body parts.
- Deer appear to be the speed champions when it comes to regeneration. Some antlers can grow as much as an inch a day.
- A person can regrow his or her liver after losing as much as 75% of the organ.

Vocabulary

Prefixes: Display the word *regrow* and circle the word part *re-*. Explain that *re-* is a prefix, or word part that comes at the beginning of a word. When *re-* is added to a base word like *grow*, it changes the word's meaning. Ask students what they think *regrow* means ("to grow again"). Point out that the prefix *re-* can mean "again" or "back," as in the words *return* and *repay*.

Encourage readers to use what they know about the meanings of the prefix to help them understand other words in the story. (Examples: *regeneration*, *replace*, *reacted*). You may want to caution students that the letters *re-* appear in some words but don't function as a prefix; for example, *records* and *reveal*. Students can tell if it's a prefix by taking away the letters and looking for a helpful base word or root.

Before Reading

Preview: Guide students as they preview the story, focusing on the headline and deck on p. 8, the photographs, and the boldface headings. Ask: *Based on your preview, what will you be learning about? Do you think you will need to adjust your reading rate?* Record students responses.

Reading Strategy

Plan and Monitor: Read aloud the introduction on p. 10. Ask a volunteer to sum up the main idea in his or her own words. (Some animals can grow new body parts.) Then ask: *What questions come to mind?* (Sample questions: *What kinds of animals can regenerate? What body parts can they regenerate? Why do they do it? How do they do it?)*

Next, distribute the blackline master on p. T5. Review the directions and the questions in the chart. Suggest that students complete the chart as they read. They should check in with themselves at the end of each section to make sure they understood what they just read. If not, they can reread the section more slowly or read on for more information.

After Reading

- **Plan and Monitor:** Review students' responses to the Before Reading preview activity. Discuss how previewing the pictures and headings helped them get an idea of what they would be reading about and plan their reading rate. Then ask volunteers to summarize the story.
- **Art:** Have students work in pairs to create a comic strip titled "Gone Today, Here Tomorrow" that features an animal that is able to regenerate its body parts. Encourage them to do additional research to make the text and images accurate.

NATIONAL GEOGRAPHIC EXTREME EXPLORER is a publication of the
NATIONAL GEOGRAPHIC SOCIETY

brought to you in cooperation with the

INTERNATIONAL PAPER
FOUNDATION

NATIONAL GEOGRAPHIC SOCIETY
EDUCATION FOUNDATION

Gone Today, Here Tomorrow

As you read "Gone Today, Here Tomorrow" in **EXTREME EXPLORER**, use this chart to record what you learn.

Which Animal?	What Part?	Why?

How does an animal regenerate its body parts?

Our Human Footprint

About the Story

How much of an impact does each student have on the planet? In this story, readers will learn what makes up their human footprint—the trash they create, their use of natural resources, and emission of CO₂ through their use of energy. The story will encourage students to analyze their footprint and to discover what they can do to tread more lightly on the planet.

Fast Facts

- Students and their families can read more about ways to shrink their human footprint in "Saving Energy Starts at Home" in the March 2009 issue of NATIONAL GEOGRAPHIC.
- Students and their families can learn more human footprint facts on the National Geographic Channel's Human Footprint website: <http://channel.nationalgeographic.com/channel/human-footprint/>
- Human activities have had an impact on, or altered, 83% of the land on Earth. The most heavily affected areas include cities like New York, Mexico City, and Beijing. The least affected areas include the Arctic tundra, Africa's deserts, and central Australia.

Vocabulary

Word Maps: Explain that students can do more than look up a word in a dictionary to make it their own. Students can make a word map, gathering data for their own definition of a word they want to learn. Model creating a word map. First, display the word *decompose* in the center of a box. Above the word, add a connecting spoke and a box with the question: *What is it?* (to rot). Encourage students to break the word down into meaningful word parts to help them understand that it means "to break apart or rot." To the right of the word, add a connecting spoke and a box with the question: *What is it like?* (smelly, dirty, slimy) Finally, add a series of connected boxes below the word with the question: *What are some examples?* (trash, compost). Encourage students to make word maps for other words they want to learn.

Before Reading

Connect to Personal Experiences: Ask students if they think one person's choices can affect the health of a whole planet. Lead them in discussing decisions they make about recycling vs. producing trash and conserving vs. using energy. Point out that since they have different habits and ideas, each of them brings something different to the reading experience. Their experiences and the things they care about affect their reactions to a writer's ideas.

Reading Strategy

Determine Importance: Remind students that each reader connects to the writer's ideas that matter most to him or her. Suggest that as they read, they ask themselves: *What do I want to learn from the text? What do I think is worth remembering? What habits can I change?* Students can use self-stick notes to mark sections of the text and record their personal reactions.

After Reading

- **Determine Importance:** Display "The Human Footprint Game" poster. Have volunteers read the facts at the bottom of the game board and connect them to their own life. Review the directions and relate each landing spot on the board to doing something good for Earth (green) or something that leaves a damaging footprint (black). Students can make game pieces from recycled objects such as bottle caps.
- **Make Connections:** After students play the game, lead a discussion about what they learned. Then distribute copies of the journal on p. T7. Ask students to keep the journal for one week, documenting what they do to try to reduce their footprint. At the end of the week, ask them to write a before-and-after comparison that describes changes they made in their routines.
- **Critical Thinking:** Ask students to think of three recent things they bought. Then display the words *need* and *want*. Using a decision-making tree format, have them analyze the pros and cons of each purchase to determine whether it was something they really needed, or something they wanted but didn't really need.

Our Human Footprint

After reading "Our Human Footprint" in **EXTREME EXPLORER**, keep a journal for one week to track what you do to shrink your footprint.

Day	My Shrinking Footprint
Mon.	
Tues.	
Wed.	
Thur.	
Fri.	
Sat.	
Sun.	

© MACKINOTO/SHUTTERSTOCK

COMPREHENSION CHECK

Answer each question. Fill in the circle by the correct answer.

- Dr. Ed Adams studies avalanches in order to—
 - make them smaller and less dangerous
 - predict them and save lives
 - protect sources of drinking water
 - build safer buildings at ski resorts
- Which of these can trigger an avalanche?
 - a shed on a snowy mountainside
 - slopes that are less than 25° steep
 - a triangle-shaped runout zone
 - any movement, even a small one
- What is the main cause of a slab avalanche?
 - piles of powdery snow
 - a strong snowpack
 - weakened layers of snow
 - careless skiers and snowboarders
- What is the most important part of Adams' work?
 - understanding the layers in a snowpack
 - doing extreme experiments in a "cold room"
 - surviving an avalanche in a shed
 - triggering different kinds of avalanches
- Animals that regenerate—
 - can have many babies
 - are stronger than other animals
 - regrow lost or injured body parts
 - can heal other animals
- The ability to regenerate helps animals to—
 - heal serious injuries
 - escape predators
 - grow spare body parts
 - all of the above
- What is autonomy?
 - growing extra limbs
 - exploding internal organs
 - dropping body parts on purpose
 - mimicking other animals
- Why are scientists studying regeneration?
 - They want to protect bird populations.
 - They want to help deer during the winter.
 - They want to grow more food in the oceans.
 - They want to help injured people.
- How is our "human footprint" like a real footprint?
 - Both leave marks on Earth.
 - Both are made up of cells.
 - Both are smaller than they used to be.
 - Both weigh less in water.
- Which of these things is not part of our human footprint?
 - trash
 - CO₂ emissions
 - exercise
 - use of natural resources
- Which of these can shrink your human footprint?
 - Buy only what you need.
 - Walk or bike ride when you can.
 - Take shorter showers.
 - All of the above.
- What is a good way to get rid of trash?
 - Turn it into compost.
 - Bury it in deep landfills.
 - Ship it to other countries.
 - Burn it in incinerators.