

# Ask®

## Into the Volcano

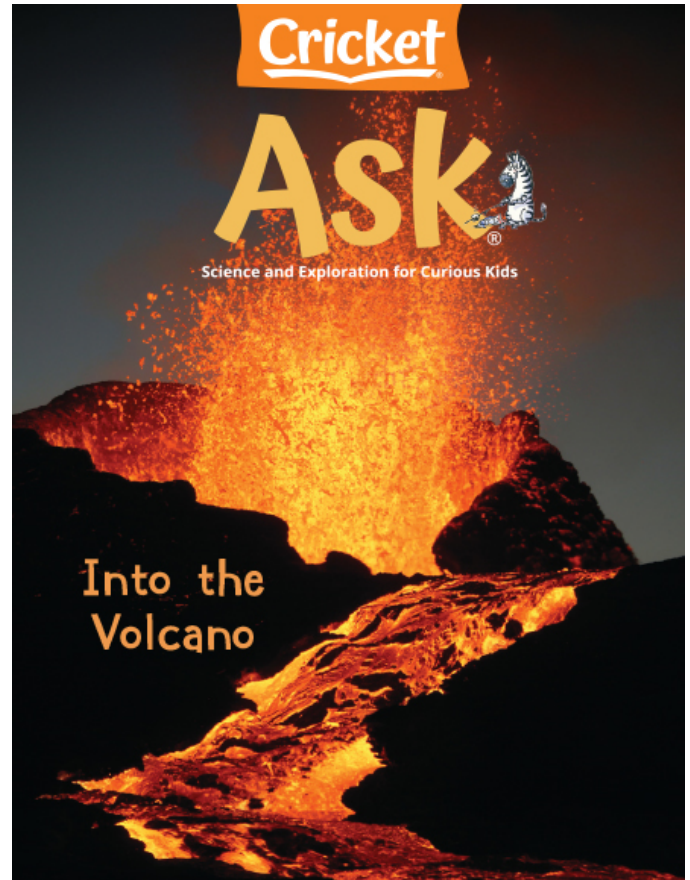
Volcanic eruptions are mesmerizing natural events that can cause widespread destruction yet also do wonderful things for the Earth. This issue of ASK magazine explores the structure and duality of these exploding mountains.

## CONVERSATION QUESTION

What is a volcano?

## TEACHING OBJECTIVES

- Students will learn how volcanoes impact the land, air, and sea around the world.
- Students will learn why earthquake and volcanic activity is so intense around the Ring of Fire.
- Students will learn how the energy from volcanoes can be harnessed.
- Students will examine cause-and-effect relationships.
- Students will obtain information from a nonfiction text.
- Students will construct explanations pertaining to scientific events.
- Students will participate in a classic science experiment.
- Students will research how modern technology is shaping exploration.
- Students will study how the location of volcanoes in Iceland creates usable geothermal energy.



In addition to supplemental materials focused on core STEM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

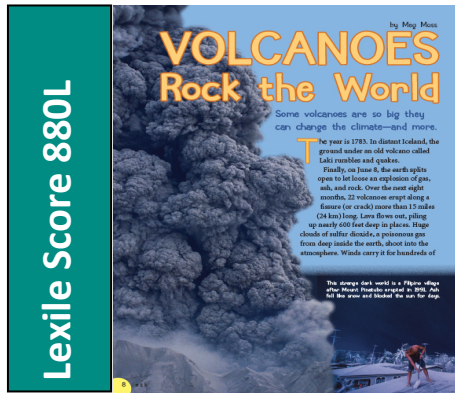
## SELECTIONS

- **Volcanoes Rock the World**  
Expository Nonfiction, ~880L
- **Ring of Fire**  
Expository Nonfiction, ~1050L
- **Magma Power!**  
Expository Nonfiction, ~990L

## Volcanoes Rock the World

pp. 8–13, Expository Nonfiction

Capable of causing great destruction but also fostering new life, volcanic eruptions are magnificent natural events. Readers will learn about the far-reaching effects of these impressive explosions of gas, ash, and rock.



## RESOURCES

- Cause and Effect: Rock On

## OBJECTIVES

- Students will learn how volcanoes impact the land, air, and sea around the world.
- Students will examine cause-and-effect relationships.
- Students will participate in a classic science experiment.

## KEY VOCABULARY

- **aerosols** (p. 10) tiny solid particles or water droplets that stay suspended in air
- **dormant** (p. 12) not active but able to become active
- **vulcanologists** (p. 13) scientists who study the formation and eruptions of volcanoes

## ENGAGE

**Conversation Question:** What is a volcano?

Entice students into a game of “20 Questions” in which they will try to guess the topic of the article (volcanoes). In this game, the players are allowed to ask yes/no questions, one at a time, in order to unravel the mystery. Instead of calling out the answer, have students write down their guesses after each question. At the end of the questions, did all students have the word *volcano* written?

## INTRODUCE VOCABULARY

List the three key terms on the board and have pairs of students try to define them. Then post the definitions so that students may check their work. Have pairs choose at least seven additional words from the article and use a dictionary to find definitions. Instruct them to create a mini-crossword puzzle using all ten (or more) words. Share puzzles with another class for use as a prereading activity for the article.

## READ & DISCUSS

After students read the article, use these questions for discussion:

1. What substances spew from the mouth of a volcano?
2. How do volcanic eruptions differ?
3. What is a “volcanic winter”?
4. Describe these volcanic rocks: obsidian, pumice.
5. How are vulcanologists getting better at predicting when eruptions might occur?

## SKILL FOCUS: Cause and Effect

**INSTRUCT:** Remind students that two events are connected by cause and effect when one event brings about, or causes, another event to happen. The event that happens first is the cause. The event that comes next is the effect. Distribute and introduce the *Cause and Effect: Rock On* worksheet. Tell students they will use it to record the causes and effects of a volcanic eruption.

**ASSESS:** Review the worksheet. For additional practice with cause-and-effect relationships, challenge students to complete the same worksheet using a different natural event, such as an earthquake, a hurricane, a flood, or a tornado.

## EXTEND

**Science** Extend the theme-related excitement by having students help you create a volcanic explosion. **Materials:** Empty plastic bottle, funnel, vinegar, baking soda, clay, food coloring. **Procedure:** (1) Give each student a good amount of clay so that they can form a volcano shape around the empty bottle (optional). (2) Use the funnel to pour baking soda into the bottle—1 to 5 tbsp depending on bottle size. (3) Mix food coloring and 2 cups of vinegar. (4) Pour this mixture into the bottle. (5) Watch the eruption! Discuss the scientific reactions that caused the explosion. Multiple online sources provide further details, if needed.

## Rock On

**Cause and Effect** Volcanic eruptions have far-reaching consequences, both negative and positive. Use information from the article (and other sources, if available) to analyze the causes and effects of eruptions.

### Causes of a Volcanic Eruption

1.

2.

3.

### Effects of a Volcanic Eruption

1.

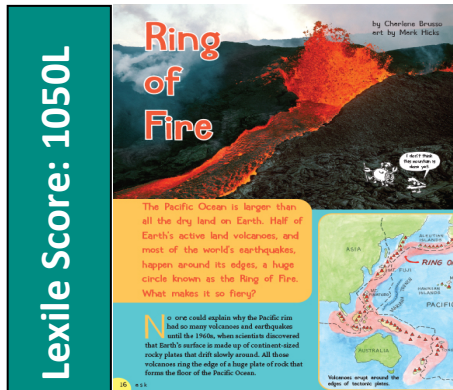
2.

3.

## Ring of Fire

pp. 16–19, Expository Nonfiction

Half of Earth's active land volcanoes and most of the world's earthquakes occur in the Ring of Fire. Readers will discover why the Pacific Rim is such a hotbed of geological activity.



## RESOURCES

- Obtain Information: Fiery Facts

## OBJECTIVES

- Students will learn why earthquake and volcanic activity is so intense around the Ring of Fire.
- Students will obtain information from a nonfiction text.
- Students will research how modern technology is shaping exploration.

## KEY VOCABULARY

- continental plates (p. 17)** large pieces of the surface of the Earth that move separately
- tsunami (p. 17)** a very high, large wave in the ocean that is usually caused by an earthquake under the sea and that can cause great destruction when it reaches land
- magma (p. 17)** extremely hot liquid or semiliquid rock located under the surface of the Earth

## ENGAGE

**Conversation Question:** What is a volcano?

Show students a map of the Ring of Fire and explain what exists there. Construct a K-W-L chart (Know-Want to Know-Learned) to record students' prior knowledge about volcanoes and what they would like to know about these "exploding mountains." Return to the chart after students complete the Skill Focus activity and have students add details to show what they have learned. If there are remaining questions about volcanoes or the Ring of Fire, allow the class to use books and the internet to find more information.

## INTRODUCE VOCABULARY

Review the key terms and definitions. Guide students to notice that each word begins with a letter from a different part of the alphabet.

**Beginning:** A–I    **Middle:** J–Q    **End:** R–Z

Have students create a three-column chart with these sections as headings. Then have them write each vocabulary word in the correct column. As a post-reading activity, have students add other theme-related words from the article to their charts.

## READ & DISCUSS

Pose the following questions to prompt meaningful discussion.

- How does the Pacific plate cause earthquakes?
- What is a mid-ocean ridge?
- Where do volcanoes form?
- What did robotic submarines discover in the 1970s?
- How does the world "reshape" itself?

## SKILL FOCUS: Obtain Information

**INSTRUCT:** Remind students that the article teaches readers why the Ring of Fire is the location of most of the volcanoes in the world. Guide students to obtain information about this from the text, captions, and photos in the article. Then distribute the *Obtain Information: Fiery Facts* worksheet. Tell students to underline the word in each set of answer choices that accurately completes the sentence.

**ASSESS:** Review answers as a class. Have students correct their errors.

## EXTEND

**STEM** Point out that advancements in technology are continually providing new information about the world. Divide the class into three groups: Earth, sea, and space. Have the groups research the effects of modern technology in each region of study. Groups should include a list of technologies currently relevant in the field, compare past/present practices, and state how technological advancements have increased our understanding of the sea, outer space, and our Earth. Have each group present their findings.

## Fiery Facts



**Obtain Information** Complete each sentence below by circling the correct answer choice in parentheses. Revisit the article as needed to help you choose the correct answers.

1. A huge circle known as the Ring of Fire is located around the edges of the **(Atlantic / Pacific / Indian)** Ocean.
2. The Mariana Trench stretches from Guam to **(China / Mexico / Japan)**.
3. The existence of life deep under the sea was discovered by **(deep sea divers / modern telescopes / robotic submarines)**.
4. The Pacific plate is **(denser / smaller / lighter)** than those around it.
5. The snowy Aleutian Islands off the coast of **(Greenland / Alaska / Iceland)** are also on the Ring of Fire.
6. Open volcanoes form over hotspots in the Earth's **(mantle / core / crust)**.
7. The plumes streaming out of deep-sea chimneys are **(icy vapors / hot water / boiling lava)**.
8. The island of Hawaii is still growing as volcanoes pour **(lava / water / sand)** into the sea.
9. **(Mussels / Tube worms / White crabs)** have no stomachs.
10. Mineral-rich water was discovered spewing from cracks on the seafloor called **(infrared / hydraulic / hydrothermal)** vents.



## Magma Power!

pp. 20–23, Expository Nonfiction

Under perfect conditions, geothermal energy can be a powerful renewable energy source. This article explores attempts to harness this “earth-heat.”



## RESOURCES

- Construct Explanations: Power Up

## OBJECTIVES

- Students will learn how the energy from volcanoes can be harnessed.
- Students will construct explanations pertaining to scientific events.
- Students will study how the location of volcanoes in Iceland creates usable geothermal energy.

## KEY VOCABULARY

- fumaroles** (p. 20) openings in the Earth's surface from which steam and gases come out
- geothermal** (p. 20) using the natural heat produced inside the Earth
- turbines** (p. 21) engines with blades that are caused to spin by pressure from water, steam, or air

## ENGAGE

**Conversation Question:** What is a volcano?

Have students brainstorm a list of renewable energy sources, such as solar, wind, hydro, etc. If students do not list geothermal energy, define it for them (the heat produced deep in the Earth's core). Ask students what they think produces geothermal energy, how it can be harnessed, and what it can be used for. List responses and then distribute the article. Revise the list after reading to correct and add responses.

## INTRODUCE VOCABULARY

Post and discuss the key vocabulary words and definitions. Then display the following cloze sentences. Have students supply the correct word:

- \_\_\_ energy is a renewable source that is continually created below the Earth's surface.
- Wind \_\_\_ can interfere with the migration of birds if they are placed in a migratory path.
- The volcano is considered active, and steaming \_\_\_ can still be seen.

## READ & DISCUSS

Post and discuss questions prior to reading. Have students read the article independently and answer the questions using full sentences.

- What is geothermal heating?
- How does Iceland utilize the heated water that results from its many volcanoes?
- How do hot springs form?
- Why are geysers referred to as Earth's tea-kettles?
- Why doesn't everyone heat their homes with steam from the Earth?

## SKILL FOCUS: Construct Explanations

**INSTRUCT:** Have students review the article and study the renewable energy source information under the three subheadings. Distribute the *Construct Explanations: Power Up* graphic organizer, and have students work in pairs to complete it. Partners will need to provide clear explanations of how the Earth creates free heat and electricity and how particular criteria must be met for placing a geothermal plant.

**ASSESS:** Review the chart with the class. Discuss how improvements in technology will help make renewable energy sources more usable.

## EXTEND

**Geography** Read this sentence from the article: “The champion of geothermal heating is a famously cold country—Iceland.” Then have students locate Iceland on a world map. Discuss how Iceland's location provides information about its climate. Next, display a map showing Iceland's volcanoes (available online). Have students use the maps and information from the article to write a paragraph summarizing the combination of factors that make Iceland a geothermal leader. Then discuss what other nations can learn from Iceland's example.

## Power Up

**Construct Explanations** The three subheadings from “Magma Power!” are listed in the chart below. Use information from the article and your critical thinking skill to answer each question below.

Article Subheadings	Construct Explanations
“Free Heat”	1. How does the Earth create free heat?
“Hot Power”	2. How does the Earth generate electricity?
“The Right Rocks”	3. Why don’t we all heat our homes with steam from the Earth?