

Muse®

Eruption!

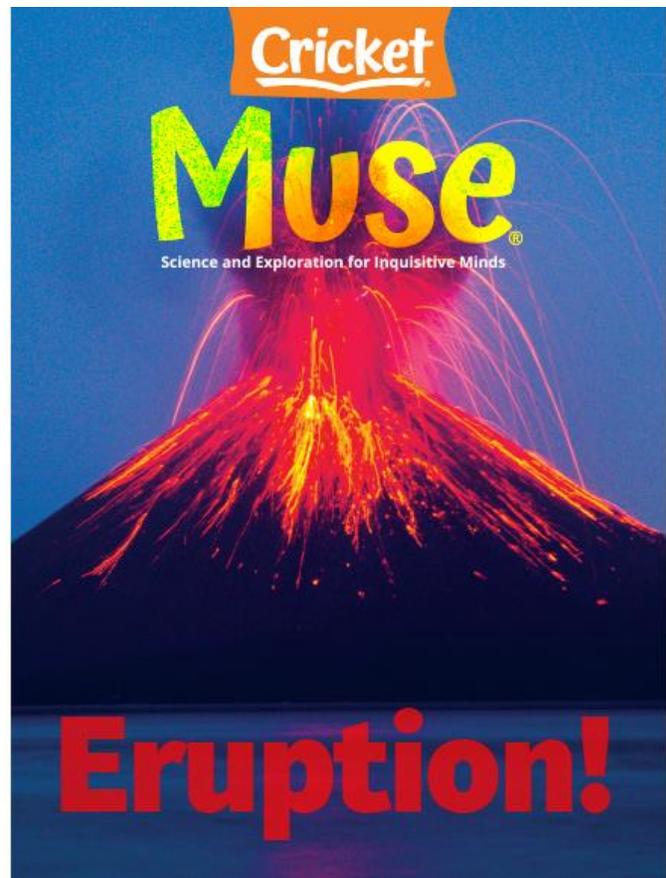
Volcanic eruptions are mesmerizing natural events that can cause widespread destruction and produce enormous change. This month's issue of MUSE is erupting with information about the structure and duality of these exploding mountains.

CONVERSATION QUESTION

How do volcanoes erupt?

TEACHING OBJECTIVES

- Students will learn about advancements in technology that are helping scientists gather more information about volcanoes.
- Students will learn about volcanoes in our solar system and beyond.
- Students will learn about five of the most powerful volcanoes in recorded history.
- Students will examine a cause-and-effect relationship.
- Students will compare and contrast volcanic eruptions.
- Students will classify information.
- Students will practice using the literary device of personification.
- Students will research how modern technology is reshaping exploration.
- Students will participate in a classic science experiment.



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.

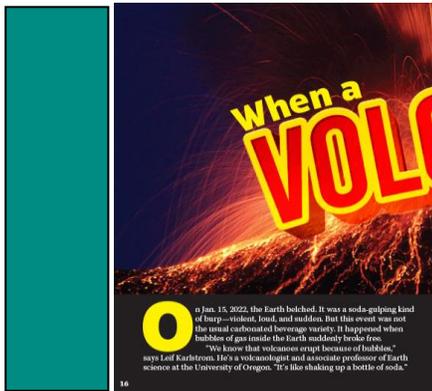
SELECTIONS

- **When a Volcano Screams**
Expository Nonfiction
- **Io's on Fire**
Expository Nonfiction
- **Big Blast from the Past**
Expository Nonfiction

When a Volcano Screams

pp. 16–19, Expository Nonfiction

Getting close to an active volcano is exciting but extremely dangerous. This article educates readers about new technology that’s making volcanology a safer and more accurate science and pays homage to the brave scientists who risked their lives in the past.



RESOURCES

- Cause and Effect: Bubble Trouble

OBJECTIVES

- Students will learn about advancements in technology that are helping scientists gather more information about volcanoes.
- Students will examine a cause-and-effect relationship.
- Students will practice using the literary device of personification.

KEY VOCABULARY

- **subterranean** (p. 18) existing or occurring under the earth’s surface
- **seismometer** (p. 18) an instrument that responds to ground noises and shaking caused by quakes, volcanic eruptions, and explosions

ENGAGE

Conversation Question: How do volcanoes erupt?

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

INTRODUCE VOCABULARY

Post and read aloud the vocabulary words. Tell students that many scientific terms have Greek and Latin roots. Break apart the terms and show the root meanings. Then compare to actual definitions.

sub = under / **terranean** = of the earth

seismo = shaking / **meter** = a measure

Ask: “How does knowing the meaning of Greek and Latin roots help to give meaning to unfamiliar words?”

READ & DISCUSS

Read the article aloud with the class. Have students reread the article in small groups to answer the questions below. Share responses.

1. What factors led scientists to believe that Hunga Tonga-Hunga Ha’apai would soon erupt?
2. How do volcanologists gather clues to understand a volcano’s story?
3. What new technologies have made volcanoes safer to study?
4. Why have satellites been a game changer for volcanologists?
5. How is Karlstrom using music and science to collect data on volcanoes?

SKILL FOCUS: Cause and Effect

INSTRUCT: Lead students in a discussion that guides them to recognize the primary cause-and-effect relationship (a relationship in which one event makes another event happen) that is presented in this article.

Introduce the *Cause and Effect: Bubble Trouble* graphic organizer. Tell students they will 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 (earthquake, tornado, etc.).

EXTEND

Language Arts: Tell students that the title of the article—“When a Volcano Screams”—is an example of a literary device called personification. Remind them that personification is the use of human qualities to describe something nonhuman, such as an object or an idea. Have students identify the personification in the following sentence: *Lightning danced across the summer sky.* Discuss the image students visualized when they read the sentence. Then challenge students to write three nature-themed sentences that use personification.

Bubble Trouble

Cause and Effect Volcanic eruptions have a combination of causes and far-reaching consequences. Use information from the article (and other sources if available) to analyze the causes and effects of such an event.

Event: Volcanic Eruption

Causes:

1.

2.

3.

Effects:

1.

2.

3.

Io's on Fire

pp. 26–29, Expository Nonfiction

Beyond Earth, scientists have been able to identify inactive volcanoes that long ago carved out the landscape of planets. In addition, they have located active volcanoes beyond our solar system. Captivating photographs accompany this high-interest article that explores volcanoes in space.



RESOURCES

- Compare and Contrast: Beyond Earth

OBJECTIVES

- Students will learn about volcanoes in our solar system and beyond.
- Students will compare and contrast volcanic eruptions.
- Students will research how modern technology is reshaping exploration.

KEY VOCABULARY

- **calderas** (p. 27) volcanic craters
- **pancake domes** (p. 27) flat, low surfaces formed by flows of sticky lava

ENGAGE

Conversation Question: How do volcanoes erupt?

Activate prior knowledge by asking students what they know about volcanoes. List responses and then ask how and where volcanoes form. Students may know about the Ring of Fire—a string of volcanoes located around the edges of the Pacific Ocean. Point out the area on a map. Finally, ask students if there are volcanoes in space. Tally yes/no answers and distribute the article. Students may be surprised!

INTRODUCE VOCABULARY

Post and discuss the key vocabulary terms. Be sure students understand what each volcanic landform looks like by showing them the photographs on pages 27–29. Next, have students fold a piece of paper into quarters. Then have them label two of the boxes with the key words and definitions and add visual representations. After reading the article, students will use the other two boxes to illustrate additional theme-related vocabulary words from the text.

READ & DISCUSS

Pose the following questions to prompt meaningful discussion. Students should use complete sentences and details to answer each question.

1. Why are volcanoes on Mars big in size?
2. How do the different crusts of Mars and Earth affect the eruption of a volcano?
3. What did the spacecraft *Magellan* discover about Venus when it was mapped with radar?
4. What is the most volcanically active place in the solar system? Why?
5. Why do volcanoes suggest an environment that can support life?

SKILL FOCUS: Compare and Contrast

INSTRUCT: Students will compare and contrast volcanoes on Earth and volcanoes in space. Have students work in pairs to revisit the text and underline information that will be helpful for this purpose. Introduce the *Compare and Contrast: Beyond Earth* Venn diagram, and have partners use information from the article and their own prior knowledge to complete the organizer.

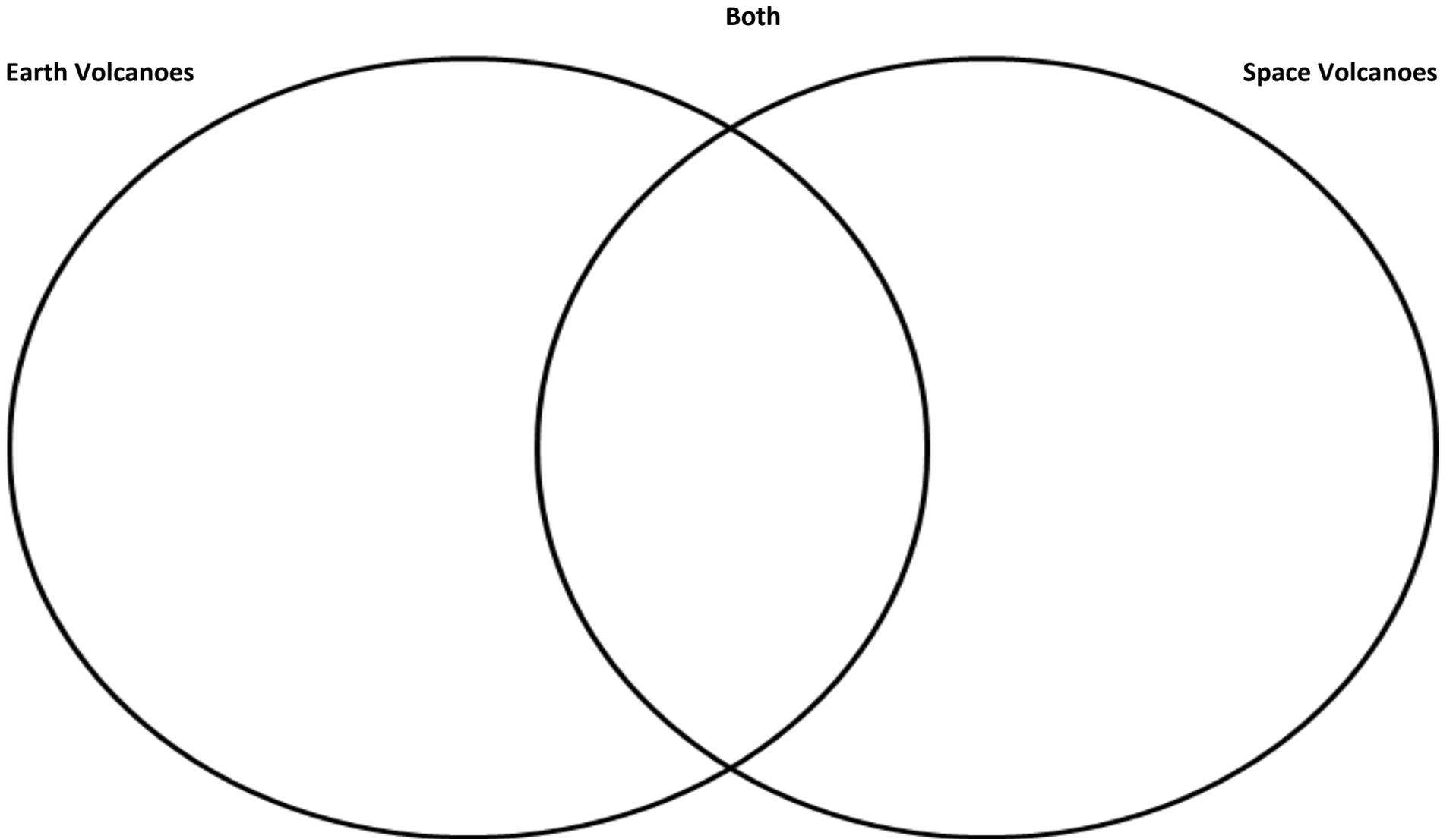
ASSESS: Review the worksheet. Then have students write paragraphs that summarize the information they collected in their Venn diagrams.

EXTEND

STEM: Point out that advancements in technology are continually providing us with 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 scientific field of study. They 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.

Beyond Earth

Compare and Contrast Use information from the article and your own thinking to compare and contrast volcanoes and their eruptions on Earth and in space.

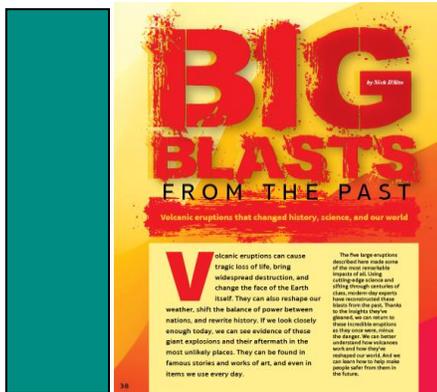


Muse® Teacher Guide: October 2023

Big Blasts from the Past

pp. 38–41, Expository Nonfiction

Capable of causing great destruction, volcanoes can also reshape our weather, shift the power balance between nations, and inspire great art. This article examines evidence of five powerful eruptions and their aftermath.



RESOURCES

- Classifying Explanations: Explosive Changes

OBJECTIVES

- Students will learn about five of the most powerful volcanoes in recorded history.
- Students will classify information.
- Students will participate in a classic science experiment.

KEY VOCABULARY

- aftermath (p. 38)** the period of time after a bad and usually destructive event
- magnitude (p. 41)** the size, extent, or importance of something

ENGAGE

Conversation Question: How do volcanoes erupt?

Post the article title: “Big Blasts from the Past.” Have students work in pairs to discuss how natural disasters can affect the people, the economy, the politics and the future of a region, acknowledging the devastating loss of life. Have students also contemplate how such events can be the inspiration for great art. Encourage volunteers to share their thoughts, and then delve into the article.

INTRODUCE VOCABULARY

Post and discuss the two vocabulary terms and definitions. Have students Think-Pair-Share with a partner. Give them the following directives, one at a time:

- How does the **aftermath** of the pandemic continue to affect the world?
- Why would the **magnitude** of an arena make it unsuitable for acoustic performances?

READ & DISCUSS

Reinforce comprehension of the concepts presented in the article by using the following questions to direct a discussion.

- How do modern-day experts reconstruct the history of past eruptions?
- How do we know what happened at Pompeii?
- What damage was caused by the eruption of Mount St. Helens in the state of Washington in 1980?
- How have volcanoes affected famous stories and works of art?
- Why was the Volcanic Explosivity Index (VEI) created?

SKILL FOCUS: Classify Information

INSTRUCT: Elicit from students that the main idea of the article is to provide readers with knowledge about five volcanic eruptions that changed history, science, and our world. Present the *Classifying Explanations: Explosive Changes* graphic organizer. Tell students they will use it to classify and record the details of each eruption.

ASSESS: After organizers are reviewed, hold a class discussion about how disasters of the past can help us prepare for disasters in the future.

EXTEND

Science: Extend the theme-related excitement by working with students to 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/play dough and have students work together to form a volcano shape around the empty bottle. 2. Use the funnel to pour baking soda into the empty bottle (1–5 tbs depending on bottle size). 3. Mix food coloring and two cups of vinegar together. 4. Pour this mixture into the bottle. 5. Stand back and watch the eruption! Discuss the scientific reactions that caused the explosion. Consult online sources for more information about this experiment.

Explosive Changes

Classifying Information Refer to the article to find information about each volcanic eruption. Complete the chart using facts and details.

Volcano	Location	Description of Eruption	Negative Effects	Positive After-Effects
Thera				
Mount Tambora				
Krakatoa				