

ask

Catching Comets

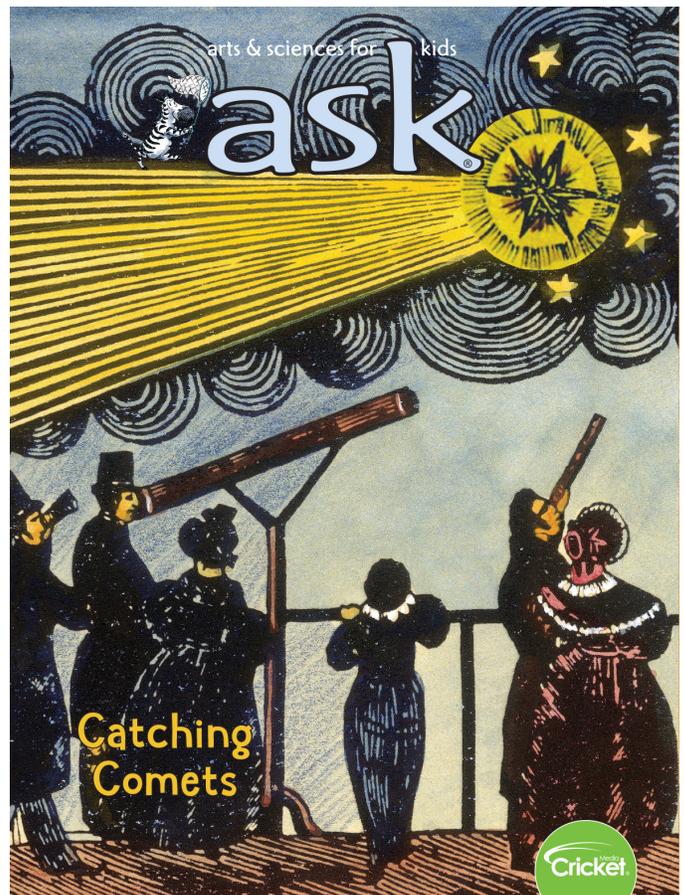
This issue of ASK will endear itself to aspiring astronauts and casual stargazers alike. Readers will discover the enormity of space and the variety of rock material that is swirling about in space. Interesting articles will address the information that scientists have gathered about asteroids, comets, and meteors.

CONVERSATION QUESTION

What do we know about the composition and behavior of rocks in space?

TEACHING OBJECTIVES

- Students will learn about a variety of rocks that are swirling around in space.
- Students will learn how scientists are attempting to gain more information about asteroids.
- Students will examine the scientific possibilities for contending with an asteroid that is headed for Earth.
- Students will obtain and classify scientific information.
- Students will compare and contrast the asteroid-hunting missions of JAXA and NASA.
- Students will identify a primary problem with multiple solutions.
- Students will research rocks in space and contribute to a class book for their Science Center.
- Students will create a theme-based acrostic poem.
- Students will use logic to solve a problem.



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.

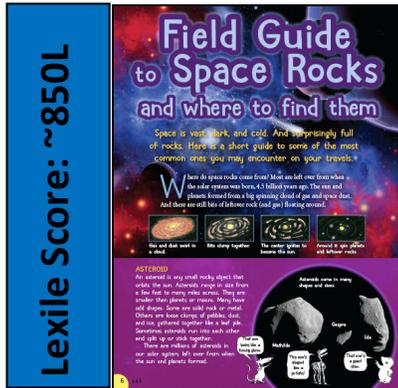
SELECTIONS

- **Field Guide to Space Rocks**
Expository Nonfiction, ~850L
- **To an Asteroid and Back**
Expository Nonfiction, ~850L
- **How to Avoid an Asteroid**
Expository Nonfiction, ~850L

Field Guide to Space Rocks

pp. 6–9, Expository Nonfiction

Board your spaceship and get ready to expand your rock collection! Students will study various rock formations floating in space and discover their scientific origin and composition.



ENGAGE

Conversation Question: What do we know about the composition and behavior of rocks in space?

Distribute the article and direct students to notice the subheadings. Remind students that subheadings in nonfiction texts are used to organize information for improved comprehension. Do you think this is an efficient way to organize Science articles? Why or why not? Would this be a good format for other disciplines?

INTRODUCE VOCABULARY

Review the key vocabulary with the class. Guide students to notice that all of the words contain a different number of syllables. Have students divide a piece of paper into three columns with the following headings: Two-syllable words/Three-syllable words/Four-syllable words. Instruct the class to properly partition each key term into syllables and place it in the correct column. As a post-reading activity, have the students search the article for other theme-related words to add to each column.

RESOURCES

- Rock On!

OBJECTIVES

- Students will learn about a variety of rocks that are swirling around in space.
- Students will obtain and classify scientific information.
- Students will research rocks in space and contribute to a class book for their Science Center.

KEY VOCABULARY

- **evaporate (p. 7)** to remove moisture and turn from liquid to vapor
- **orbit (p. 6)** the curved path of a celestial object or spacecraft around a star, planet, or moon; especially a period elliptical revolution
- **vaporize (p. 8)** to convert into vapor, usually by heat or pressure

READ & DISCUSS

Reinforce comprehension of the facts presented in the article by using the following prompts to direct discussion.

- Use information from the article to describe “space.”
- Where do all the rocks in space come from?
- Why are scientists so interested in space dust?
- Explain the difference between a meteoroid, a meteor, and a meteorite.
- What is a meteor shower?

CONCEPT/SKILL FOCUS: Classifying Information

INSTRUCT: Guide students to obtain information from the text, captions, and photos in the article. Remind students that the article was written to teach readers about a variety of rocks that exist in space. Introduce the *Rock On!* graphic organizer and instruct students to record their findings. Students will need to choose the correct word to complete the sentence and then return to the text to retrieve an additional fact.

ASSESS: Review information that the students have recorded on their charts. Be sure that their facts have been properly classified.

EXTEND

Science Divide the class into small groups and assign each group a different space rock to research (asteroid, meteor, planet, etc.). Inform the students that they will need to gather factual information and include illustrations. They can use details from the article as well as other resources to create their page. Have small groups present their work before binding it into a class book, “A Field Guide to Space Rocks.”

Rock On!

Use information from the article, "Field Guide to Space Rocks," and details from the sentence to classify each rock. Then add a second fact about that space rock.

Word Bank

meteor shower comets moon micrometeoroids asteroids

Any small, rocky objects that orbit the sun are called _____.

Fact 2: _____

Orbiting the sun on wide loops, _____ are like large, dirty snowballs.

Fact 2: _____

A _____ is an object that orbits a planet instead of a sun.

Fact 2: _____

Many meteors falling at the same time are called a _____.

Fact 2: _____

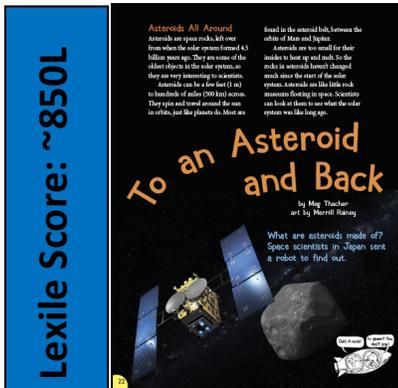
Very tiny space rocks are called _____.

Fact 2: _____

To an Asteroid and Back

pp. 22–25, Expository Nonfiction

To infinity and beyond . . . or perhaps just to an asteroid belt and back. Students will learn about the methods that Japanese and American space programs are using to explore asteroids and procure samples to study on Earth.



RESOURCES

- Asteroid Hunters

OBJECTIVES

- Students will learn how scientists are attempting to gain more information about asteroids.
- Students will compare and contrast the asteroid-hunting missions of JAXA and NASA.
- Students will create a theme-based acrostic poem.

KEY VOCABULARY

- **capsule (p. 24)** a small part of a spacecraft that is separate from the rest of the spacecraft; container
- **rover (p. 23)** a vehicle for exploring the surface of an extraterrestrial body
- **sample (p. 24)** a small part or quantity intended to show what the whole is like

ENGAGE

Conversation Question: What do we know about the composition and behavior of rocks in space?

Introduce the topic of asteroids by showing the students a video clip of the primitive space-themed arcade game, *Asteroids* (Atari, 1979). Take this opportunity to discuss how space programs around the world, much like the video game industry, are constantly evolving.

INTRODUCE VOCABULARY

Post the key vocabulary terms on the board. Have the students use resources to define them and then display the given definitions. Ask the class to predict the content of the article. Then display the title, “To an Asteroid and Back,” and reveal the questions below.

READ & DISCUSS

Post and discuss the questions prior to reading. Read the article aloud, pausing when answers to the questions are revealed.

- Why are asteroids so interesting to scientists?
- Explain this sentence from page 22, “Asteroids are like little rock museums floating in space.”
- Why are asteroids hard to see with telescopes?
- How are rock samples collected in space?
- What is the goal of the robot mission of JAXA’s Hayabusa2?

CONCEPT/SKILL FOCUS: Compare and Contrast

INSTRUCT: Students will compare and contrast the details of Japan’s and the United States’ space missions to hunt for asteroids. Instruct pairs of students to reread the text and to underline information that will be helpful for this purpose. Introduce the graphic organizer, *Asteroid Hunters*, and have the partners record the data on their charts. They should answer the question in the “Think Tank” independently.

ASSESS: Review the *Asteroid Hunters* worksheet. Be sure that the students have collected accurate and pertinent information. Evaluate their independent response to the “Think Tank” question.

EXTEND

Poetry Review the strategies for creating an acrostic poem. (An acrostic poem is one in which the first letter of each line spells out a word or a message.) Instruct the students to use the word ASTEROID to create an acrostic poem that includes words, ideas, and facts studied in this article and/or in this month’s issue of ASK magazine. Encourage students to create a background or illustration to enhance their work.

Asteroid Hunters

Refer to the article, "To an Asteroid and Back," to compare and contrast the asteroid-hunting missions of Japan and the United States.

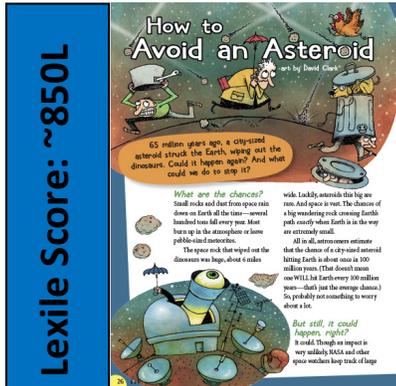
JAXA	NASA

Think Tank: How could humanity learn more about space if programs around the world worked together?

How to Avoid an Asteroid

pp. 26–28, Expository Nonfiction

This article goes beyond “duck and cover” to explore the many options that NASA has at its disposal to nudge an asteroid off course in order to avoid a catastrophic collision with Earth.



RESOURCES

- Asteroid Avoidance

OBJECTIVES

- Students will examine the scientific possibilities for contending with an asteroid that is headed for Earth.
- Students will identify a primary problem with multiple solutions.
- Students will use logic to solve a problem.

KEY VOCABULARY

- **asteroid (p. 26)** a small space rock orbiting the sun
- **comet (p. 27)** a ball of mostly ice that moves around in outer space
- **meteorite (p. 26)** a solid piece of debris (rock) that originated in outer space and survived its passage through the atmosphere to reach the surface of a planet.

ENGAGE

Conversation Question: What do we know about the composition and behavior of rocks in space?

Show the opening scene of Disney's *Dinosaurs* (or another appropriate clip), which features a spectacular scene of the earth being hit by asteroids. Engage the class in a discussion to activate prior knowledge on this subject.

INTRODUCE VOCABULARY

Post and discuss the key terms. Be sure that students understand the definitions before reading the article. As a post-reading activity, have students use the three vocabulary words to summarize the article in paragraph form.

READ & DISCUSS

Pose the following questions to the students to facilitate meaningful discussion following the reading of the article.

- What happens to most of the small rocks and dust that fall from space every year?
- What do we know about the asteroid that many people believe wiped out the dinosaurs?
- How is NASA keeping track of large asteroids?
- Explain the DART mission.
- Why can't we just “shoot down” an asteroid headed for Earth?

CONCEPT/SKILL FOCUS: Problem and Solutions

INSTRUCT: Inform students that they will be rereading the article with a partner and highlighting passages that depict the possible solutions to the question, “What can be done to stop a big asteroid that is headed for Earth?” Distribute the graphic organizer, *Asteroid Avoidance*, and tell students that they will be responsible for recording the problem/solution relationship from the article. Encourage pairs of students to discuss their findings as they complete the chart.

ASSESS: Review the information that the students listed on their charts. Evaluate the thoroughness and accuracy of their statements.

EXTEND

Logic Have students brainstorm other situations where collisions must be avoided. (travel, sports, etc.) Encourage students to use the format of the article to outline steps that could be taken to improve a potentially disastrous situation. Students can work with a group or independently. Invite students to share their work.

Asteroid Avoidance

Refer to the article, "How to Avoid an Asteroid," to explain how each solution listed could help save the earth from a disastrous collision.

Problem	Solutions
<p>What can be done to stop a big asteroid that is headed for Earth?</p>	<ol style="list-style-type: none"><li data-bbox="496 558 704 590">1. Run into it<li data-bbox="496 863 769 894">2. Gravity tractor<li data-bbox="496 1188 789 1220">3. Give it a jetpack<li data-bbox="496 1524 651 1556">4. Paint it