

Robots and Space Exploration



OBJECTIVES

Students will be able to:

- ★ Use details from an informational article to support their ideas.
- ★ Design their own method for solving an engineering problem.

TIME REQUIRED

One to two 45-minute periods

MATERIALS

Copies of Student Article and Student Analysis Sheet, *Next Mars Rover in Action—Animation video* (youtu.be/MlpFgump7so), and computer/projector for video

Your students can find out more about building robots for space exploration with Luciana. She can't wait to be the first person on Mars!



Visit [scholastic.com/american-girl](https://www.scholastic.com/american-girl) to find out more.

LESSON STEPS

1. Ask students to imagine what it would be like to travel into space. What would they be most excited to learn? What problems would they face? Discuss as a class, or ask students to complete a freewrite in their journals.
2. As an introduction, use NASA's *Next Mars Rover in Action—Animation* video at youtu.be/MlpFgump7so.

Note: Though this 2011 video refers to Curiosity as an upcoming Mars rover, Curiosity has since landed (in 2012) and is still exploring Mars as of this publication date of February 2018.

- a. Show the first two minutes of the video (until 2:12).
 - b. Discuss as a class: What are some of the challenges faced in getting a spacecraft to land on Mars? How was the spacecraft designed to help deal with those challenges?
 - c. Show the remaining two minutes of the video (until 4:20).
 - d. Discuss as a class: What are some of the goals of the Mars rover? What parts of the robot help reach those goals?
3. Distribute the Student Article and the Student Analysis Sheet. Depending on the needs of your students, read the article together as a class and stop to discuss challenging vocabulary, or ask students to read the article independently. Encourage students to use what they learned from the video to support their comprehension.
4. Have students respond to the questions in Part A of the Student Analysis Sheet. Challenge students to support their answers with quotations from the text.
5. Divide students into small groups. Explain that in Part B of the Student Analysis Sheet, students will work together as a team to design their own robots for space exploration.
 - a. Encourage students to think about some of the challenges faced during space exploration.
 - b. Have students create a drawing of the robot on a separate sheet of paper and label each part.
 - c. Have students describe the job of each part of the robot orally or in writing.

Extension Activity Ask students to write a narrative from the perspective of their space exploration robot. What is the mission? What challenges does the robot face? Do parts of the robot help make the mission a success?

Possible Answers for Student Analysis Sheet, Part A

1. Robot part—large wheels, job—roll over rocks without getting stuck; Robot part—drill, job—extract powder so scientists can study it; Cameras—document the journey and help spot danger.
2. The Gale Crater is important to study because it includes many layers of rock that can help scientists understand the history of Mars. Curiosity can drill into different layers to find out whether Mars had water or other elements that support life.
3. The Mars rover may be called Curiosity because it is helping to satisfy our curiosity about the planet Mars. According to the article, Curiosity can drill into layers of rock on Mars to help scientists learn about the history of water there. Also, Curiosity is collecting information about radiation on Mars so that scientists can learn how to keep human explorers safe in the future.

Meet the Mars Rover: Curiosity

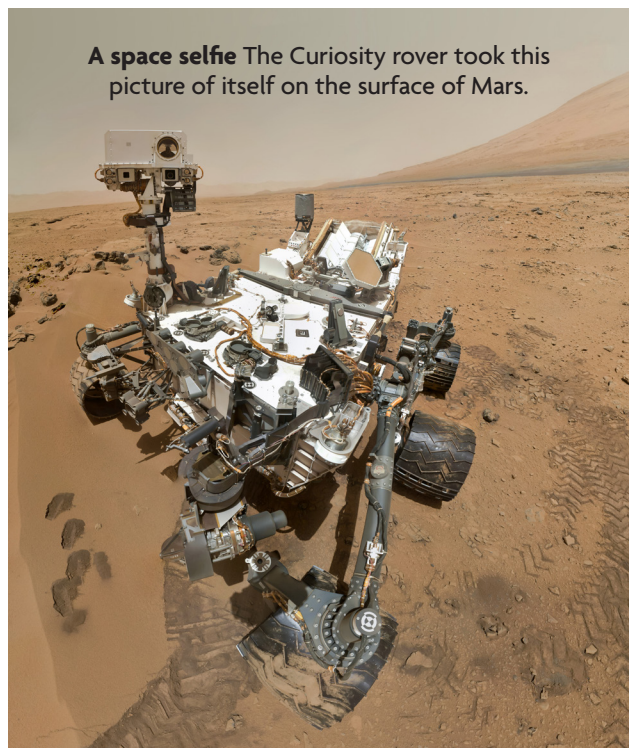
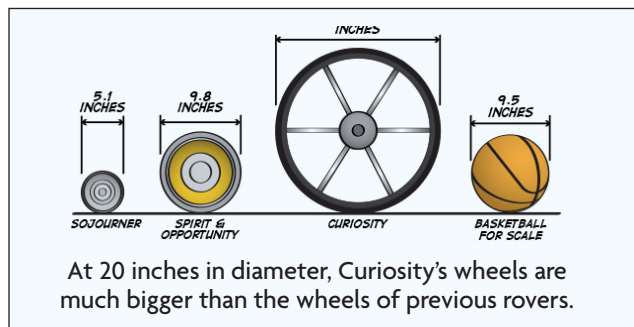
On Earth, where there is water, there are living things. We know that Mars had water a long time ago. But did it also have other conditions life needs?

To find out, NASA sent the **Curiosity** rover to Mars. Curiosity is the largest robot to ever land on another planet. It is about the size of a small SUV.

Because Curiosity is so big, it also has bigger wheels than the previous rovers had. This helps it to roll over rocks and sand without getting stuck. However, even on a long driving day, it still only travels about 660 feet.

Curiosity landed in **Gale Crater**. This crater is special because it has a tall mountain in the middle. The mountain has many layers of rock. Each layer is made of different minerals from different time periods. These minerals could tell scientists about the history of water on Mars.

The rover uses many scientific instruments to study the rocks in Gale Crater. Curiosity used its drill to make a hole in a rock that once was mud at the bottom of a lake. One of its other instruments studied the powder drilled from the rock. This information helped scientists learn that the Gale Crater had ingredients that ancient life would have needed to survive.



Scientists sent Curiosity to Mars to measure lots of other things, too—including **radiation**. Radiation is a type of energy that can come from the sun. It travels in high-energy waves that can be harmful to living things. Curiosity found that Mars has high, dangerous levels of radiation. NASA will use Curiosity's radiation data to design missions to be safer for human explorers.

Curiosity brought 17 cameras with it to the Red Planet—more than any other rover. It uses some of the cameras to take photos of its journey. Cameras also act as Curiosity's eyes, helping it to spot and stay away from danger.

One of Curiosity's cameras—at the end of its seven-foot long robotic arm—even acts like a sort of "selfie stick." Curiosity can hold the camera two meters away and take a selfie to send back to Earth (like it did in the photo!)

Name: _____

Curious About Curiosity

Part 1 Read the NASA article, “Meet the Mars Rover: Curiosity.” Then answer these questions.

1. Scientists designed each part of Curiosity to do a certain job. Explain the parts of the robot and their functions.

Robot Part	Function (Job)

2. Why is the Gale Crater an important area to study? Use evidence from the article to support your answer. _____

3. Why do you think that the Mars rover is named Curiosity? Use evidence from the article to support your answer. _____



Part 2: Now work together with a classmate to design your own robot for space exploration!

- 1. Create a drawing of the robot on a separate sheet of paper.
- 2. Label the parts of the robot.
- 3. Describe the job of each part of the robot.

In the book *Luciana* by Erin Teagan, the lead character works with a team to build a robot. **Each member contributes ideas. They work together to solve problems.** Now it's your turn!