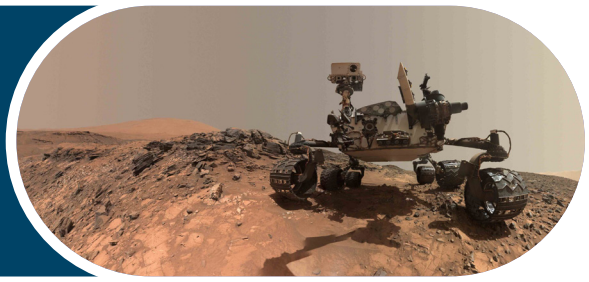
# DIGITAL DISCOVERY WORKSHOPS

Teacher Toolkit: Robots on Mars | Grades 3–8

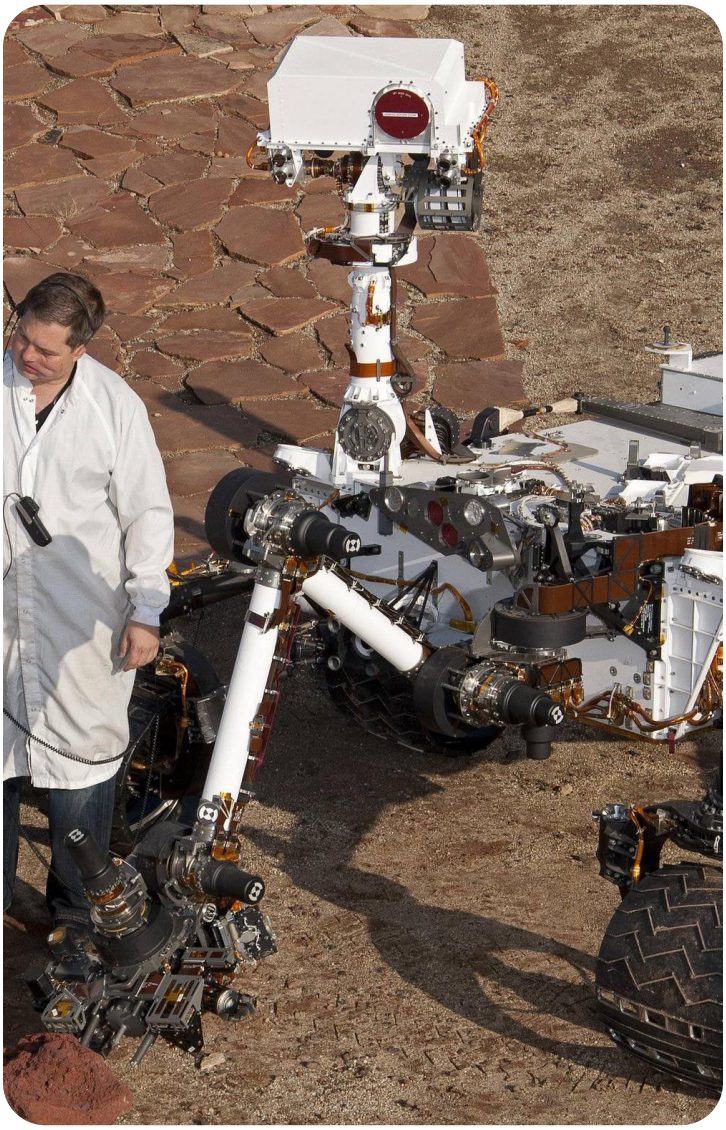


## PROGRAM OVERVIEW

*Get familiar with the program content.*

### Program Description

How do teams of scientists and engineers use robots to help them answer big science questions about places too difficult for humans to visit? Discover unique design features of remote sensing missions to the planet Mars, and practice interpreting the data these robots collect. Can you use what you've learned to solve a remote sensing mystery of our very own?



| Program Objectives |
| --- |
| Explore the interdependence of science, engineering and technology, especially when tackling large problems such as space exploration. |
| Understand remote sensing is the process of collecting information without physical interaction between the observer and what is being observed. |
| Make observations and inferences about the design features of remote sensing tools such as robots and satellites. |
| Practice using a variety of physical properties (e.g. size, shape, reflectiveness, color, texture) to describe and classify different kinds of materials. |

| Program Key Words (English/Spanish) |
| --- |
| Planetary scientist / la científica planetaria; el científico planetario |
| Remote sensing / la teledetección |
| Robotics engineer / la ingeniera en robótica; el ingeniero en robótica |
| Physical properties / las propiedades físicas |

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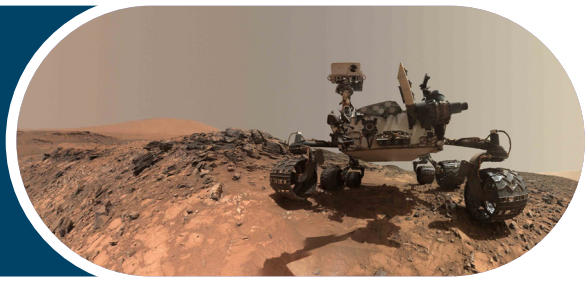

## Program Outline

*Subject to change.*

- Introduction to Mars exploration and NASA science goals:
  - Role of Planetary Scientist.
- Introduction to remote sensing tools:
  - Role of Robotics Engineers.
- Mystery Bag introduction- how will you figure out what's inside from afar?
- Mars exploration KWL Chart (Know/Want to know/ Learned).
- Curiosity Rover:
  - Observe design features.
  - Explore Curiosity findings.
  - Physical properties introduction.
- Mystery Bag Challenge Part One:
  - What objects can we rule out based on the evidence so far?
- Mars Express:
  - Observe design features.
  - Explore Mars Express findings.
- Mystery Bag Challenge Part Two:
  - What objects can we rule out based on the evidence so far?
  - Reveal the mystery item!
- Future Mars missions.
- Program wrap up .

**View Supported NGSS**

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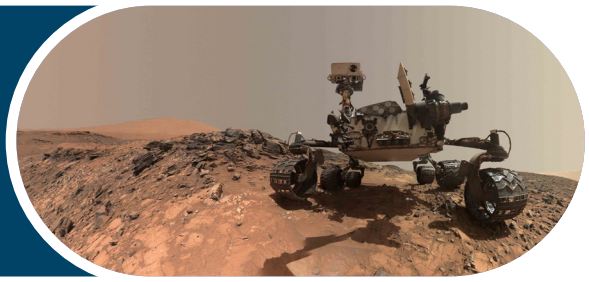

## BEFORE THE PROGRAM

### DISCUSSION PROMPTS

Use these prompts to lead an optional pre-program discussion and reflection in your class.

- How do you think scientists determine what they are going to research? What is the first thing a scientist might do when designing an experiment?
- Imagine yourself designing a robotic space mission. What tools would you give your robot to help it collect information scientists could use to learn more about a new planet?
- Should humans go to Mars? What are some of the potential benefits and risks of human exploration on other planets in our solar system?

## DURING THE PROGRAM

*Print the optional worksheet for your students to follow along with during the live presentation. The back of the worksheet includes additional prompts for after the program.*

### PRINTABLE WORKSHEET

- Robots on Mars Printout: **Click to download**, then print double sided.

## AFTER THE PROGRAM

*These optional extension resources can be used within the learning space, or shared with students to do at home with their families.*

### ACTIVITY GUIDES

- We learned how planetary scientists use physical properties to help them identify materials on Mars. Continue exploring physical properties here on Earth with **Material World** | **Mundo Material**. Activity time: 60-90 minutes.
- Learn more about how people communicate with computers by helping a robotic friend through a challenging maze of your very own design in **Robot Mazes**. Activity time: 40-60 minutes.

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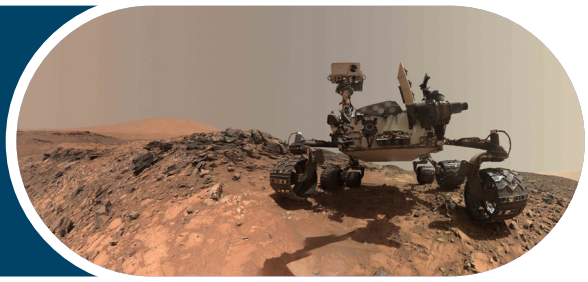


## AFTER THE PROGRAM CONTINUED

### ADDITIONAL RESOURCES

- Help the Perseverance Rover navigate Mars with **Explore Mars: A Mars Rover Game**. This game is best played on individual devices. Activity time: 30-40 minutes.
- Think like a NASA robotics engineer as you answer the question – **What Tools Would You Take to Mars?** Activity Time 30-60 minutes.

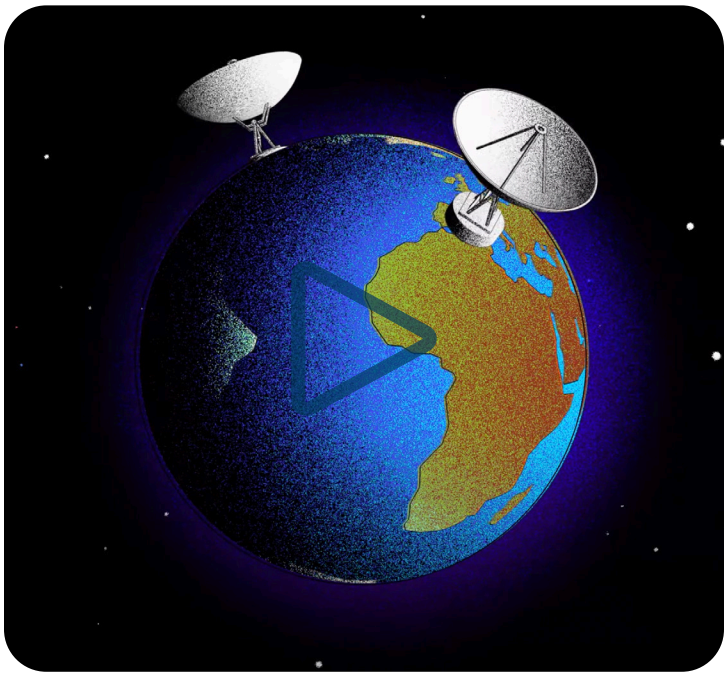
### STEAM VIDEOS

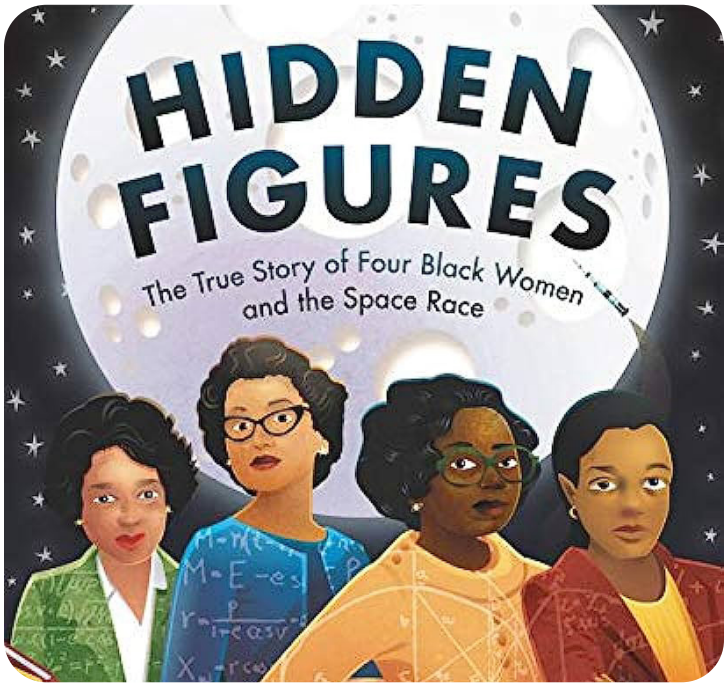
- Watch this three-minute video from NASA to learn **how we communicate with faraway spacecraft** during remote sensing missions.
- Take a virtual tour of **NASA's Jet Propulsion Laboratory** to see where many robotics engineers and planetary scientists plan remote sensing missions. Activity time: 30-60 minutes.

### READING LIST

- Check out the **Robots on Mars reading list** for STEAM books related to the program themes. .

*For more activities with simple materials, check out the* **Curiosity at Home** / **Curiosidad en Casa** *web page. Explore activity sheets by age group and topic in both English and Spanish.*



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