

# Be an Engineer!

Imagine that you are part of a team designing a new Mars rover. An area of the planet has been found that has ice and possibly liquid water. It seems like a great spot to locate life on Mars! Your job is to outfit the rover with the tools it will need to reach and analyze this area of the planet.

On paper, describe the tools you will include on your rover. Explain how it will search for living things and study them without harming them. After writing your description, draw detailed plans for the rover. Label all the important parts.



## Beyond the Book

Ask family members or friends what should happen if we ever find life on Mars. Would it matter to you what kind of life it was—simple or advanced?

FOCUS Book

# MISSIONS TO MARS



• Science A-Z 





# MISSIONS TO MARS



## FOCUS Question

How can technology help us learn  
about Mars?

Structure and Function

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## THE RED PLANET

Mars is Earth's neighboring planet in space. This rocky planet circles, or *orbits*, the Sun between Earth and Jupiter. Mars is a cold world about half the size of Earth. It has two small moons. Mars looks red because the soil and rock contain the rusty mineral iron.

Ever since people first noticed it in the night sky, we have been studying Mars. Doing so may help us understand how Earth and the rest of the solar system formed and whether there is life on Mars.



COMPARING EARTH AND MARS

	Earth	Mars
distance from sun	93 million miles	142 million miles
size (diameter)	7,926 miles	4,220 miles
length of year	365.25 days	687 Earth days
length of day	23 hours, 56 minutes	24 hours, 37 minutes
gravity	2.66 that of Mars	0.375 that of Earth
temperature	average 57°F	average -81°F
number of moons	1	2



## Read-Think-Write

Write your answers on separate paper. Use details from the text as evidence.

- 1 Why do people want to learn more about Mars? Give at least one reason from the book.
- 2 Look at the chart on page 2. What are some ways Mars and Earth are alike and different?
- 3 Why would an orbiting probe be able to gather more information about a planet than one that only flies by?
- 4 What challenges have scientists faced in landing rovers on Mars?
- 5 What made people stop thinking that Mars had an advanced culture of warlike creatures?



### FOCUS Question

How can technology help us learn about Mars? Construct a time line that shows four different missions to Mars and list them in order by date. For each one, explain what the mission was designed to accomplish and describe how technology aided mission discoveries.



## LIFE ON MARS?

Mars doesn't seem to have life today, but it may have had life in the past. The chance of finding signs of life is a big reason we study Mars. Water is very important to living things. Scientists look for it on other planets.

Mars had liquid water billions of years ago. The planet's surface and climate have changed over time, however. Now, Mars is too cold to have liquid water. It only has ice.

We have learned much about Mars from building and flying spacecraft and probes. With each mission, we get a step closer to understanding the Red Planet.



This image shows the rocky walls of Victoria Crater on Mars.





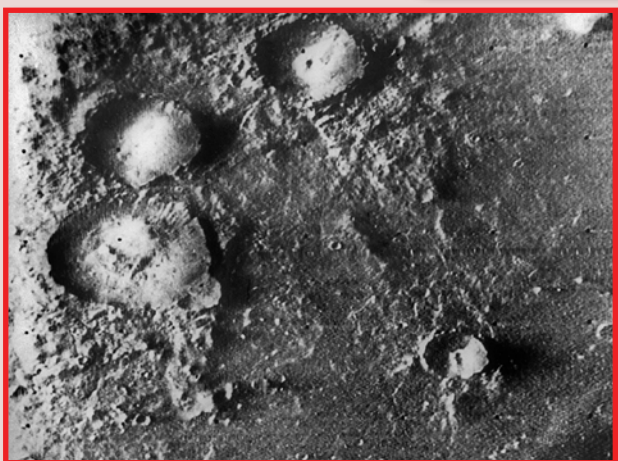
## FLY . . . BYE!

More than forty probes from different countries have flown by or landed on Mars. The first ones reached space atop rockets. The rockets put them into orbit around the Sun. Scientists used careful timing so each probe would fly by Mars.

In 1965, *Mariner 4* took the first photos of Mars from space. They showed many craters on the surface. In 1969, *Mariners 6* and *7* sent back hundreds of photos. The two probes took close-up pictures of dark grooves. They looked like human-made “canals.”

**wowser!**

Martian “canals” are really dried-up riverbeds. They were not built by Martians!



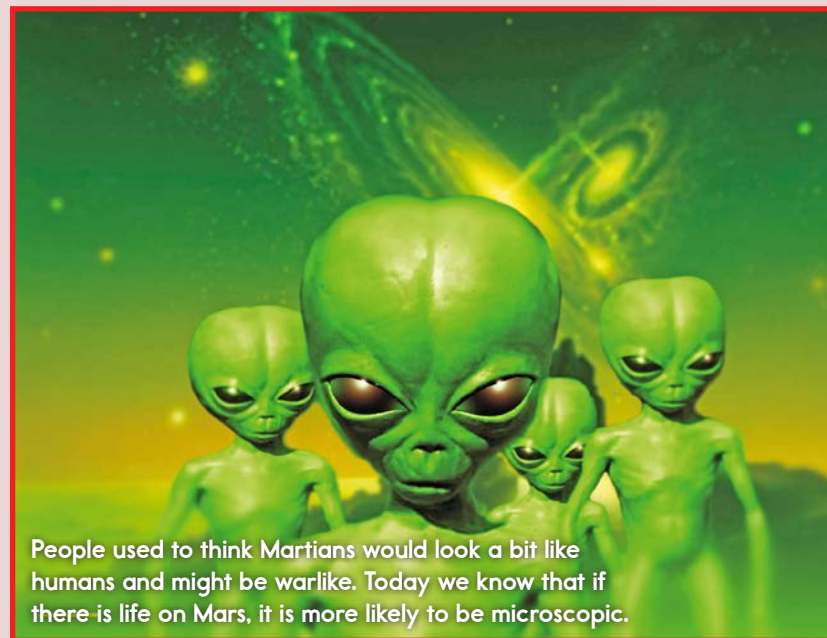
The *Mariner* spacecraft did not orbit the Red Planet. But they took photos like this one as they flew past it.



## MARTIANS AND OUR IMAGINATION

Science fiction and movies thrill us with Martian tales. In 1938, a radio play called *The War of the Worlds* frightened people. They thought Martians were really invading Earth! Later, the sight of “canals” brought on Martian fever.

We now know that Mars has no advanced culture. But we still hope to find traces of life. People are even making plans to visit the Red Planet. Would you want to travel to Mars? Maybe you’ll be part of a team that helps us get there!



People used to think Martians would look a bit like humans and might be warlike. Today we know that if there is life on Mars, it is more likely to be microscopic.



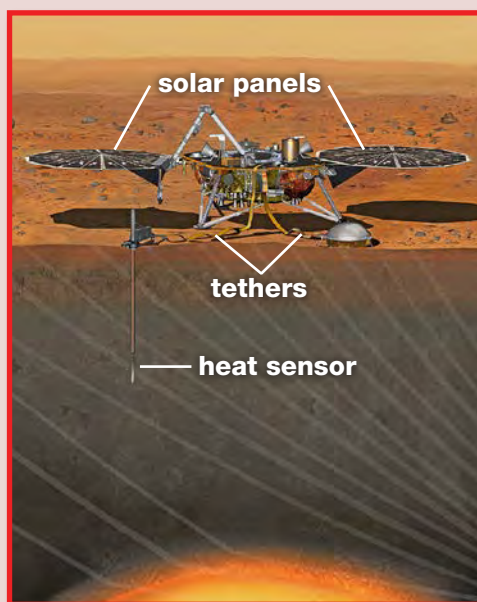
## FUTURE MISSIONS

We still have a lot to learn about Mars. Depending on the two planets' locations in their orbits, it takes between one and five months to travel from Earth to Mars. The InSight mission is scheduled to launch in 2016. It is designed to carry tools to dig deep into the surface of Mars. The mission may help us understand how all four rocky planets formed.

The mission of ExoMars is to learn if life ever existed on Mars. Its first launch, set for 2016, consists of an orbiter, lander, and rover. Its job is to test the atmosphere and soil of Mars.

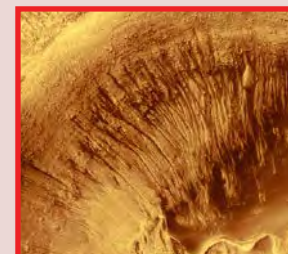
Long ago, people brought moon rocks back to Earth. Someday, we might bring samples from Mars back to Earth.

This artist's drawing shows the InSight lander on the surface of Mars. InSight will study the area below Mars's surface.



## ROUND AND ROUND THEY GO

The next probes did more than a flyby. They entered Mars's orbit for a closer, longer look. *Mariner 9* mapped the entire surface in 1971. It saw many canyons, craters, and inactive volcanoes. *Mariner 9* was the first to spot Mars's two moons.



This crater wall shows gullies thought to have been formed by water.

*Mars Global Surveyor* entered orbit in 1997. It found new signs that Mars once had water. The surface has paths left by flowing water!

### word Wise

Just as a moon orbits a planet, so do orbiting probes. In fact, they are both called *satellites*. Moons are natural satellites. Probes are artificial, or human-made, satellites.



*Surveyor* spent close to ten years in orbit while mapping Mars.





## TOUCHDOWN!

Viking 1 and 2 made history by both landing on Mars in 1976. First, they entered orbit. Then they sent landers down to different parts of the planet. Protective shells kept them safe on touchdown. They then went to work taking photos and doing soil and air tests.

Mars Pathfinder bounced onto the surface in 1997. It floated down on a *parachute*. Airbags protected the craft during its landing. Inside was the first Mars rover. It cruised the surface and sampled soil and rocks. Studying the rocks taught us that Mars was once much warmer—and wetter. In fact, Mars Pathfinder had landed in the site of an ancient flood.

### DO YOU KNOW?

Mars Pathfinder's airbags were made of special fabric that wouldn't tear when the lander hit the rocky surface.



## ROVERS ALL OVER

Mars Pathfinder's landing paved the way for Spirit and Opportunity. These two “rock stars” were sent to study Mars's rocks and soil. Both rovers were built to work for three months. Spirit kept going for six years. Opportunity lasted even longer! It traveled dozens of miles across the red surface.

Next, an even bigger rover was sent to Mars: Curiosity. This time, a parachute and airbags weren't enough. Special landing rockets slowed down the car-sized rover. Then a crane lowered it to the ground. Curiosity is a traveling science laboratory. It studies samples of Martian rocks and soil.

