UNIT 02B: Spirit and Opportunity on Mars

# *Spirit* and *Opportunity* on Mars

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**Blast Off! Missions to Mars**

Humans have never set foot on Mars. However, robots have been exploring the "Red Planet" for years. Just how can a robot explore Mars? Let's find out more.

For decades, scientists have conducted **experiments** with space travel. The first humans landed on the moon in 1969. Many people thought that Mars would be next.

Mars is about 50 million miles away from Earth. The journey would be difficult for any **astronaut** and it would take many months.



Scientists on Earth: Think about why the author gives us details in this paragraph. What does that tell you about the author's intent?

Journey would take many months: What would you do to pass the time on such a long journey?

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NASA is the U.S. **government** agency in charge of space exploration. They wanted to get a closer look at Mars. In 1976, they sent a spacecraft to Mars. It sent back incredible pictures and information. Then NASA developed a robot on wheels, or "rover." In 1997, a spacecraft carried the rover to Mars.





Unfortunately, the rover broke down in 1998. NASA quickly went to work on the next generation of Mars robots.

**Landing—Not Crashing—a Rover**

Spacecraft are sent to Mars using rockets. The rockets travel through space at 12,000 miles per hour. If the rover hit Mars at that speed, it would be smashed to pieces! Scientists had to figure out how to slow the spacecraft down. If the spacecraft landed at more than 12 miles per hour, it would crash.

They solved the problem with large parachutes and airbags.



Did you know that rockets travel as fast as 12,000 miles per hour? This is information that you might want to add to a KWL chart.

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First, the parachutes would slow the spacecraft down. Then, the airbags would help the rover bounce off Mars's surface. Finally, **gravity** would pull the rover gently to the ground.





**Spirit and Opportunity**

NASA made many **improvements** to the rover. In January 2004 two rovers landed safely on Mars. The rovers, named Spirit and Opportunity, are about the size of riding lawnmowers.

They are both loaded with special tools, like cameras. There are also magnets to collect magnetic dust samples and hammers to break down large rocks. Each rover has a moveable arm to hold its tools.

Scientists on Earth radio their commands to the rovers. The rovers can also make some decisions on their own.



Next generation of rovers: If you had to design the rovers, what kinds of things would you think about adding?

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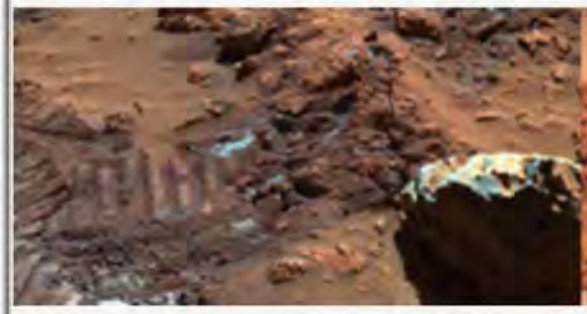
For example, with help from its camera, the rover can turn to avoid a rock in its path.

Accidents do happen now and then. Once, a rover got stuck in a sand dune. Scientists studied the situation using their model of the rover. They radioed their new instructions and the rover was able to free itself.







**Water: The Stuff of Life**

The two rovers were sent to Mars to study its ground and air. They sent the **data** back to the scientists on Earth. The information the rovers sent showed that Mars's soil is rich in minerals. One of these minerals is sulfur.



One of these minerals is sulfur: If you wanted to know what minerals were found on Mars, what information here would you add to your KWL chart.

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Finding sulfur on Mars was an exciting discovery. It suggests that water once soaked the soil and then evaporated.

The rovers also took pictures of tiny grains in layers of rock. The grains look like bits of sand. Perhaps they were formed by moving water. This is more evidence suggesting that water existed on Mars. It might still exist there.

So what's all the fuss about water? If water exists on Mars, then scientists believe there could be life there, too!







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