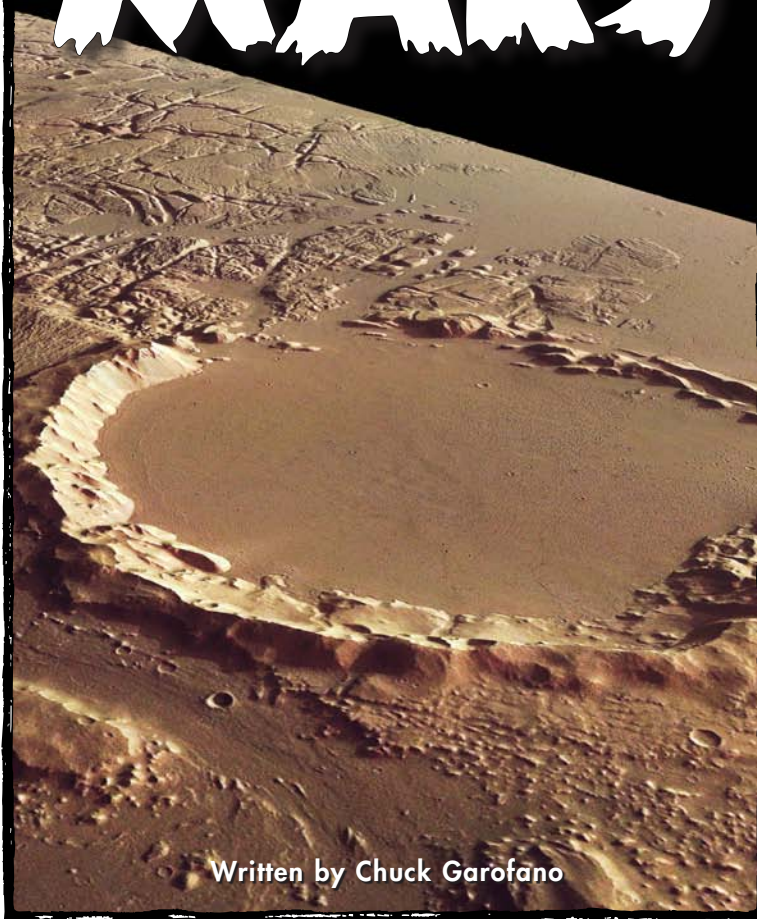


BENCHMARK • 0

# MYSTERIOUS MARS



Written by Chuck Garofano

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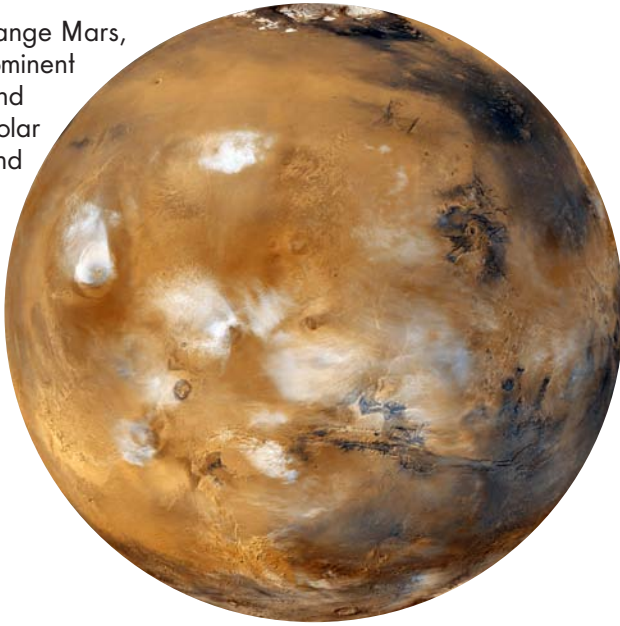
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### Road Trip to Mars!

The Mars rovers, *Spirit* and *Opportunity*, landed on Mars in 2004 for a three-month mission. But they didn't stop. In 2010, these "robot geologists" were still digging up important clues—and *Opportunity* was still roving the red planet.

Reddish-orange Mars,  
with its prominent  
northern and  
southern polar  
ice caps and  
swirling  
water-ice  
clouds.



## Introduction

What is it about Mars that makes us so curious about it? The ancient Romans liked the planet's rusty red color. They named it Mars, after their god of war. Mars has starred in books and movies. Scientists wonder what type of living things might exist there. New satellite images show us the dramatic surface. Soil tests by Mars rovers tell us what's underneath. But Mars still has many mysteries.

## The Basics

Mars is the fourth planet from the Sun and is about half the size of Earth.

A **Martian** day is about as long as an Earth day, but its year is 687 days long. Mars has a thin atmosphere of carbon dioxide, the gas you breathe out. Like Earth, Mars has a hot center and a rocky surface. It has two polar ice caps. Mars's caps are mostly frozen carbon dioxide, with some water ice. In 2008, rover *Spirit's* onboard lab "tasted" water in soil for the first time.

Mars has two small, potato-shaped moons. They may have been **asteroids** trapped by Martian gravity.

|                             | Mars                                    | Earth                                  |
|-----------------------------|---|--|
| Diameter                    | 6,780 kilometers (4,213 mi)             | 12,756 kilometers (7,926 mi)           |
| Distance from Sun           | 228 million kilometers (142 million mi) | 150 million kilometers (93 million mi) |
| Moons                       | 2                                       | 1                                      |
| Length of Day               | 24 hours, 40 minutes                    | 24 hours                               |
| Length of Year              | 687 Earth days                          | 365 Earth days                         |
| Average Surface Temperature | -63° Celsius (-81° F)                   | 15° Celsius 59° F                      |
| Water                       | Ice, liquid, and vapor                  | Ice, liquid, and vapor                 |
| Life                        | UNKNOWN                                 | Yes                                    |



## The Surface of Mars

Mars is cold. Its average temperature is  $-63^{\circ}$  Celsius ( $-81^{\circ}$  F). In winter, Mars's polar caps can be  $-125$  degrees Celsius ( $-195$  degrees F). Its thin atmosphere can't block the Sun's rays from baking

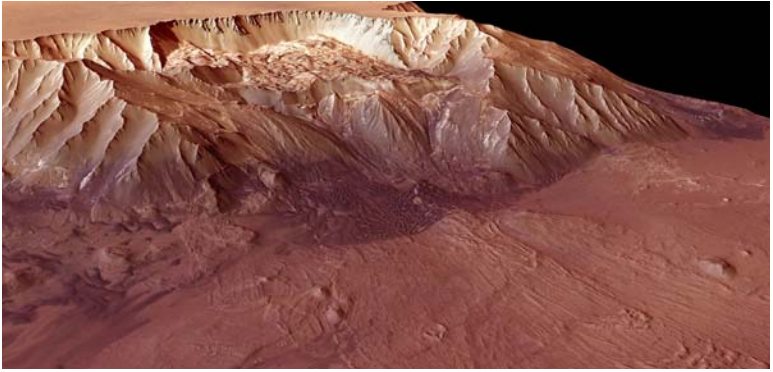


Mars Global Surveyor satellite over the largest volcano in the solar system, Olympus Mons

its dry surface. Heavy dust storms can blanket large areas of the planet.

The southern half of Mars has craters like our moon. The northern half is smoother. It has

broad plains and deep valleys. Mars also has dozens of huge volcanoes. One, called Olympus Mons, is the largest in the Solar System.



Melas Chasma, in the vast Valles Marineris canyon, is 9 kilometers deep (approx. 5.5 miles). The flow patterns on its surface show it may once have been covered by liquid water or water ice.

## Exploring Mars

Early scientists looked at Mars through weak telescopes. They noticed a network of long lines on its surface. An Italian **astronomer** named them “channels,” but someone read the word as “**canals**.” So for many years, many people thought intelligent beings had built canals all over Mars. In 1965, *Mariner 4* orbited Mars and took clear pictures. The pictures proved the “canals” were just the natural landscape of ridges, gullies, and canyons.

Later Mars missions tested its atmosphere. These tests showed the atmosphere was so cold that any liquid water would freeze or evaporate. As far as we know, all life needs liquid water to exist. Without proof there was water, it seemed nothing could be living there.

*Mariner 9* orbited Mars in 1971. It took new pictures that showed plains, volcanoes, and valleys. It also showed landforms that looked like dry riverbeds and oceans. Could that be true?



Ius Chasma, in the western area of the Valles Marineris canyon, has sloping bluffs from basalt lava flows and a rippled valley floor.





Scientists test the newest and largest Mars rover, *Curiosity*. *Curiosity* is expected to launch late in 2011 and drive onto the surface of Mars in summer of 2012.

Mars *Viking* landed on the planet in 1976. It scooped up dust and tested it for organic materials, the remains from living things. It didn't find any. *Mars Pathfinder* landed in 1997. Its tests failed to find proof of life either. But it did find pebbles that may have been worn down by liquid water.

These space probes landed on Mars. Many others orbited Mars and returned images and data. Other missions failed at launch, missed Mars, or crashed on landing.

| Probe                            | Date Landed        |
|----------------------------------|--------------------|
| Viking 1                         | July 20, 1976      |
| Viking 2                         | September 3, 1976  |
| Mars Global Surveyor             | September 11, 1997 |
| Mars Pathfinder /Rover Sojourner | July 4, 1997       |
| Mars Odyssey                     | October 23, 2001   |
| Mars Rover Spirit                | June 10, 2003      |
| Mars Rover Opportunity           | July 7, 2003       |
| Mars Phoenix                     | August 4, 2007     |



Deep gullies carved into a crater rim are typical of channels caused by water flowing over rock.

## **Signs of Water and Life**

More satellite pictures were looked at, and more tests were done. Many scientists felt certain that Mars used to be warmer, with rivers and oceans. They saw long canyons and deep gullies that could have been carved by flowing rivers and waterfalls. If these ideas are true, then why did all the water, and its life forms, disappear?

In 2003, tests showed that methane gas was escaping through the rocky crust of Mars. But what was producing the gas? Was it a byproduct of simple, **microbial** forms of life that existed deep underground? It's one of the many questions scientists hope to answer with the new Mars Science Laboratory rover, *Curiosity*. It should land on Mars in 2012.

*Curiosity* will have a chance to earn its name by solving some of the greatest mysteries on Mars.



Echus Chasma may have been one of the largest water source regions on Mars. Scientists debate whether waterfalls once carved these canyons and flowed over cliffs that are 4 kilometers high (approx. 2.5 miles).

## Glossary

- asteroids** (*n.*) Irregularly shaped rocks that orbit the Sun (p. 5)
- astronomers** (*n.*) scientists who study planets, stars, galaxies, and other objects in space (p. 7)
- canals** (*n.*) waterways dug across land (p. 7)
- Martian** (*adj.*) of Mars, on Mars, or from Mars (p. 5)
- microbial** (*adj.*) a microscopic organism, such as a bacteria (p. 11)



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Front cover: The collapsed rim of a large impact crater, approximately 35 km in diameter (about 22 miles), shows erosion evidence of earlier flowing water. The source of the once-flowing water was located in Echus Chasma, about 850 km (528 miles) to the southwest of the crater.

Title page: A small crater filled with ice straddles a high mountain ridge that divides two areas of distinctly different surface textures. Scientists think the smoother texture on the left of the ridge was caused by wind erosion. The more pitted texture on the right side may have been caused by the movement of glaciers.

Back cover: The southern polar ice cap of Mars

Table of Contents: Three generations of robotic Mars rovers show a dramatic increase in size. The tiny *Sojourner* rover (center) landed on Mars in 1997.

*Sojourner* was only 24 inches long. Twin rovers *Spirit* and *Opportunity* (left) landed in 2004. In 2010, *Opportunity* was still returning data. In comparison, the Mars Science Laboratory (MSL) rover, due to begin its Mars mission in 2012, is 9 feet wide, 10 feet long, and 7 feet high.

Mysterious Mars  
Level O Leveled Benchmark Book  
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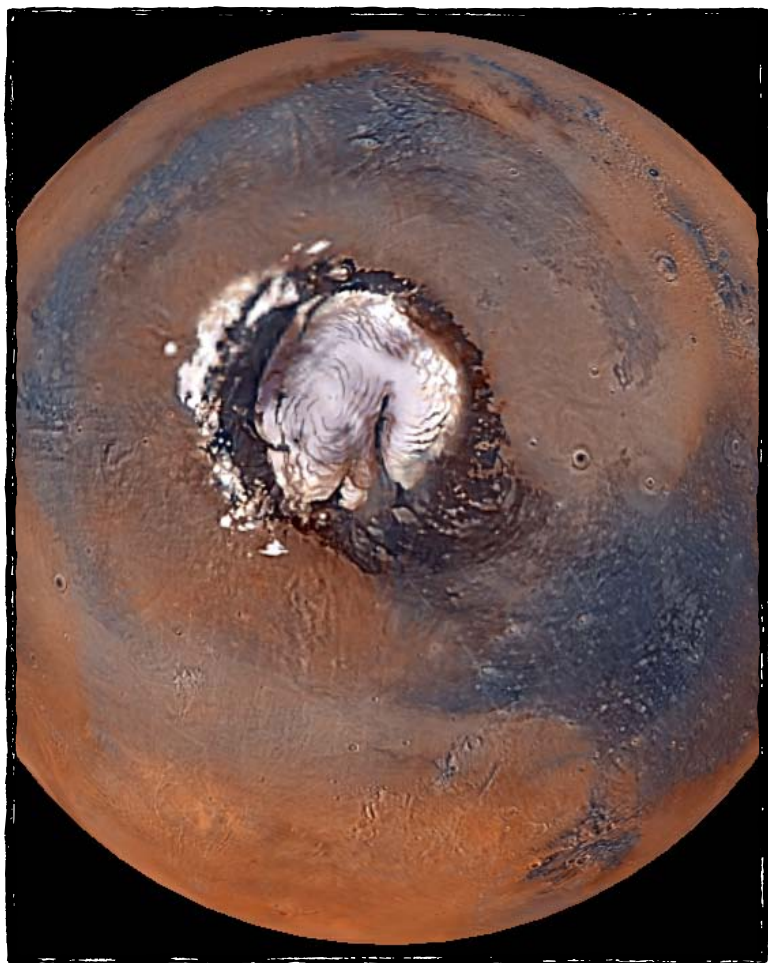
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| Reading Recovery  | 20 |
| DRA               | 28 |



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