



Mars—the Red Planet, the Bringer of War—has inspired wild flights of imagination over the centuries, and an intense scientific interest. Fancied to be the source of hostile invaders of Earth, the home of a dying civilization, and a rough-and-tumble mining colony of the future, Mars has proven to be fertile ground for science fiction writers, based on seeds planted by centuries of scientific observation. Mars has shown itself to be most Earth-like of all the planets; it has polar ice caps that grew and receded with the change of seasons, and markings that looked, through 19th century telescopes, to be similar to human-made water canals on Earth, which fueled speculations that Mars was inhabited.

American and Russian orbiters did not disclose any canals on Mars, but did find evidence of surface erosion and dried riverbeds, indicating the planet was once capable of sustaining liquid water. For millions of years, the Martian surface has been barren of water, and not subjected to the erosions and crustal plate movement that continually resurface Earth. Mars is too cool and its atmosphere is too thin to allow liquid water to exist. There is no evidence of civilizations, and it is unlikely that there are any extant life forms, but there may be fossils of life-forms from a time when the climate was warmer and there was liquid water.

Mars is a small rocky planet that developed relatively close to the Sun that has been subject to some of the same planetary processes associated with the formation of the other "terrestrial" planets (Mercury, Venus, and Earth), including: volcanism, impact events, and atmospheric effects. Unlike Earth, Mars retains much of the surface record of its evolution. Layered terrains near the Martian poles suggest that the planet's climate changes have been periodic, perhaps caused by a regular change in the planet's orbit. Martian tectonism—the geological development and alteration of a planet's crust—differs from Earth's. Where Earth tectonics involve sliding plates that grind against each other or spread apart in the seafloors, Martian tectonics seem to be vertical, with

hot lava pushing upwards through the crust to the surface. Periodically great dust storms occur that engulf the entire planet. The effects of these storms are dramatic, including dunes, wind streaks, and wind carved features.

Mars has some remarkable geological characteristics including: the largest volcanic mountain, Olympus

Mons (27 km high and 600 km across), in the solar system; volcanoes in the northern Tharsis region that are so huge they deformed the planet's sphericity; and a gigantic equatorial rift valley, the Vallis Marineris. This canyon system could easily fit the Grand Canyon inside it and stretches the distance equivalent from New York to Los Angeles.

## Significant Dates

- 1965 - U.S.A. *Mariner 4* made first close-up pictures of the surface during flyby.
- 1969 - U.S.A. *Mariner 6* and *Mariner 7* flybys resulted in high-resolution images of the equatorial region and southern hemisphere.
- 1971 - U.S.A. *Mariner 9* spent nearly 2 years orbiting Mars on a mapping mission. Took detailed photos of Phobos and Deimos. U.S.S.R. orbiter *Mars 2* dropped a capsule to the surface of Mars.
- 1973 - U.S.S.R. *Mars 3* and *Mars 5* and its lander took the first TV pictures from the surface of another planet, and orbited Mars.
- 1975 - U.S.A. *Viking 1* orbited Mars. Lander provided first sustained surface science. U.S.A. *Viking 2* lander discovered water frost on the surface.
- 1988 - U.S.S.R. probe *Phobos* returned detailed pictures of Phobos.

## About the Image

*This false color mosaic of Mars is composed of images taken by Viking Orbiter 1 in 1980. The right of the image shows the entire Valles Marineris, a canyon system that stretches over 5,000 km in length and up to 8 km in depth. South of Valles Marineris is ancient terrain covered by impact craters. North of the eastern end of the Valles Marineris is the Chryse Planitia where Viking 1 landed. West of the Valles Marineris lie three of Mars' huge volcanoes. The Tharsis volcanoes, as they are known, appear as dark reddish spots. Each volcano is about 27 km high, over 350 km in diameter, and has a central crater at its summit. The most famous member of the Tharsis volcanoes, Olympus Mons, is clearly visible in the mosaic. It lies approximately 1,100 km west of Tharsis volcanoes and is also 27 km high, but over 600 km in diameter. Also visible are the polar ice caps, which are the white features at the top and bottom of the image.*

## Fast Facts

<b>Namesake</b>	Roman God of War
<b>Distance from Sun</b>	
<b>Maximum</b>	249 million km
<b>Minimum</b>	206 million km
<b>Distance from Earth</b>	
<b>Maximum</b>	399 million km
<b>Minimum</b>	56 million km
<b>Rotational Period</b>	24.6 hours
<b>Equatorial Diameter</b>	6,786 km
<b>Equatorial Inclination to Ecliptic</b>	25.2°
<b>Gravity</b>	0.38 of Earth's
<b>Atmosphere</b>	
<b>Main Component</b>	Carbon Dioxide
<b>Pressure at Surface</b>	~8 millibars (vs 1,000 on Earth)
<b>Temperature Range</b>	-143°C to +17°C
<b>Maximum Day Side</b>	740 degrees Kelvin (467° C)
<b>Maximum Night Side</b>	90 degrees Kelvin (-183° C)
<b>Moons (2)</b>	Phobos (Fear), 21 km diameter Deimos (Panic), 12 km diameter
<b>Rings</b>	None
<b>Orbital Eccentricity</b>	0.093
<b>Orbital Inclination to Ecliptic</b>	1.85°
<b>Magnetic Field Density</b>	To be determined. Very weak, if any.

### References

1. *Discovering Mars*, PAM-537, NASA Headquarters, Washington, DC. 9/94.
2. *The Exploration of Mars*, EB-112, Educational Brief, NASA Headquarters, Washington, DC. 5/93.
3. *Charting the Planets*, EB-111, Educational Brief, NASA Headquarters, Washington, DC. 12/92.