



# Mars Update

Presented by NASA/JPL Solar System Educator Don W. Brown



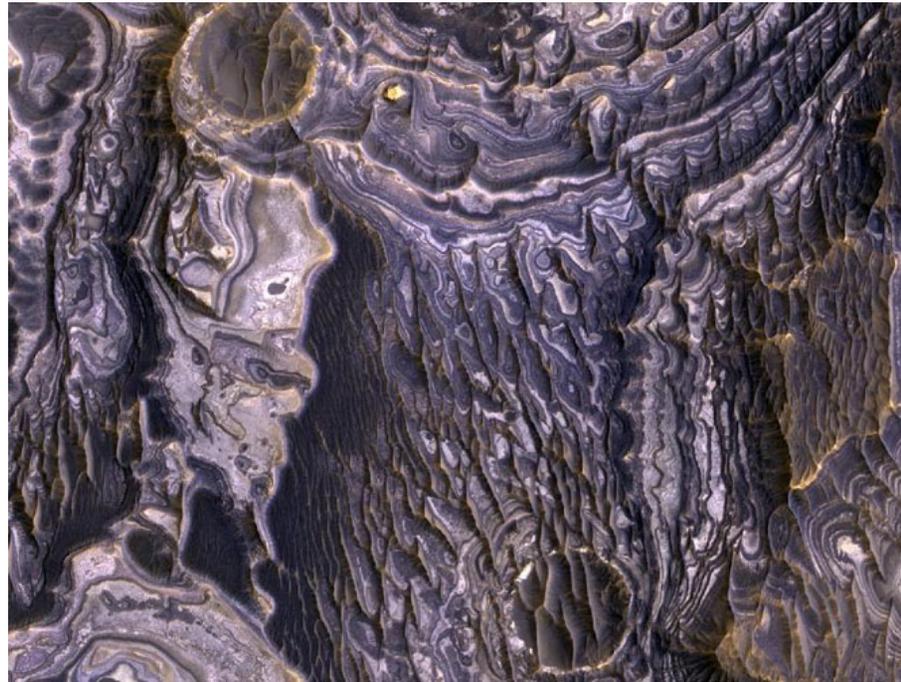
# What do you know about Mars?



# Another image from MRO



# Alien and Beautiful



<http://www.wired.com/wiredscience/2010/01/gallery-mars/6/>

# Knock, Knock.... Who's There?

- Mariner
- Mars Climate Orbiter
- Mars Exploration Rovers
- Mars Global Surveyor
- Mars Odyssey
- Mars Polar Lander
- Mars Reconnaissance Orbiter
- Mars Science Laboratory

# Mariner

- 6 different probes launched from 1964-1971
- Included fly-by and orbital missions
- Mariner 9 was the first artificial satellite of Mars, orbiting the planet for nearly a year. It revealed a very different planet than expected -- one that boasted gigantic volcanoes and an immense canyon stretching 4,800 kilometers (3,000 miles) across its surface.
- <http://www.jpl.nasa.gov/missions/missiondetails.cfm?mission=Mariner8and9>

# Mars Climate Orbiter and Mars Observer

- Both lost as they approached Mars
- MCO Launched in 1998
- Mars Observer was launched in 1992



# Mars Exploration Rovers



- Launch of Spirit: June 10, 2003
- Launch of Opportunity: July 7, 2003
- In April 2004, two mobile robots named Spirit and Opportunity successfully completed their primary three-month missions on opposite sides of Mars and went into bonus overtime work.
- By the end of four years on Mars, Spirit had traveled more than 4 miles and Opportunity had driven more than 7 miles.
- 3 years later Spirit now stuck in sand, but collecting data; Opportunity still operating.

# Mars Global Surveyor



- This orbiter studied the entire Martian surface, atmosphere and interior, and returned more data about the red planet than all previous Mars missions combined. Among key science findings, Global Surveyor took pictures of gullies and debris flow features that suggest there may be current sources of liquid water, similar to an aquifer, at or near the surface of the planet.

# Mars Odyssey



- An orbiting spacecraft designed to determine the composition of the Martian surface, to detect water and shallow buried ice, and to study the radiation environment.
- Odyssey has been collecting images that are used to identify the minerals present in the soils and rocks on the surface and to study small-scale geologic processes and landing site characteristics.
- By measuring the amount of hydrogen in the upper meter of soil across the whole planet, the spacecraft helps us understand how much water may be available for future exploration, as well as give us clues about the planet's climate history.
- The orbiter also collects data on the radiation environment.

# Mars Reconnaissance Orbiter



- My personal favorite, and the source of the photos we saw!
- Outstanding webpage: <http://marsprogram.jpl.nasa.gov/mro/>
- HiRise instrument discovered new craters this month on Mars: run by Arizona State University  
[http://hirise.lpl.arizona.edu/PSP\\_010200\\_1805](http://hirise.lpl.arizona.edu/PSP_010200_1805)
- The spacecraft went into a minimum-activity safe mode on Aug. 26 when it spontaneously reset its onboard computer for the fourth time this year. The orbiter had resumed normal operations within a few days after each of the earlier resets: Feb. 23, June 4 and Aug. 6. After the Aug. 26 event, the team chose to keep the spacecraft in safe mode while investigating possible causes and ramifications of the series of resets.

# Phoenix

- **Launch: August 4, 2007** In the continuing pursuit of water on Mars, the poles are a good place to probe, as water ice is found there. This mission sent a high-latitude lander to Mars where it is using its robotic arm to dig trenches up to half a meter (1.6 feet) into layers of soil and water ice.
- The mission's biggest surprise was finding a multi-talented chemical named perchlorate in the Martian soil. This Phoenix finding caps a growing emphasis on the planet's chemistry, said Michael Hecht of NASA's Jet Propulsion Laboratory, Pasadena, Calif., who has 10 coauthors on a paper about Phoenix's soluble-chemistry findings.



# Mars Science Laboratory

- Launch: 2011 NASA proposes to develop and to launch a roving long-range, long-duration science laboratory that will be a major leap in surface measurements and pave the way for a future sample return mission.



# Why Mars?

- Earth-like in many ways including weather system, volcanism, shifting poles, composition of crust and polar ice.
- Water: Life
- The thin air on Mars makes it a dangerous place for humans. It is mostly poisonous carbon dioxide. Recently, scientists found lots of frozen water (scientists say water ice) just under the surface of Mars. This means astronauts who may visit Mars in the future will have plenty of water - enough to fill Lake Michigan twice.

# For More information...

- [www.jpl.nasa.gov](http://www.jpl.nasa.gov)
- Kid-friendly pages  
<https://sse.jpl.nasa.gov/planets/profile.cfm?Object=Mars&Display=Kids>
- <https://sse.jpl.nasa.gov/missions/index.cfm>
- Images, Wallpaper, etc  
<http://www.jpl.nasa.gov/multimedia/index.cfm>
- Solar System Exploration  
<https://sse.jpl.nasa.gov/index.cfm>