

**Mars 2003: Closest Approach**

# Mars 2003: Closest Approach

## The Two Faces of Mars

These two images, taken 11 hours apart with NASA's Hubble Space Telescope, reveal two nearly opposite sides of Mars. Hubble snapped these photos as the red planet was making its closest approach to Earth in nearly 60,000 years.

The image at left (A) was taken August 26, 2003, several hours before Mars had its closest encounter with Earth. The prominent Martian features in this photo are Syrtis Major, the "shark-fin" shape on the right, and the Hellas impact basin, the circular feature near the center of the image.

The image at right (B) was snapped within minutes of the red planet's close rendezvous with Earth on August 27, 2003. When this photo was taken, the two planets were 34,647,420 miles (55,757,930 kilometers) apart. Mars is a mere 1,400 miles closer to Earth in this picture than in the one taken 11 hours earlier.

The striking features in this image are Olympus Mons [oval-shaped object just above center], the largest volcano in the solar system, and Solis Lacus, an immense dark marking also known as the "Eye of Mars" [below, right]. Mars's surface area roughly equals the combined area of Earth's seven continents.

The smallest features in these images measure 17 miles across. Both images show most of the southern polar ice cap. The pictures were taken during the middle of summer in the Southern Hemisphere. During this season the Sun shines continuously on the southern polar ice cap, causing the cap to shrink in size (*bottom of both images*). The orange streaks are indications of dust activity over the polar cap.

*Credits: NASA, J. Bell (Cornell University), and M. Wolff (Space Science Institute).*

## VOCABULARY

**Hemisphere:** Half of a spherical or roughly spherical body; for example, the northern and southern halves of the Earth, above and below the equator.

**Red planet:** A nickname for Mars, which has a reddish color to the naked eye.

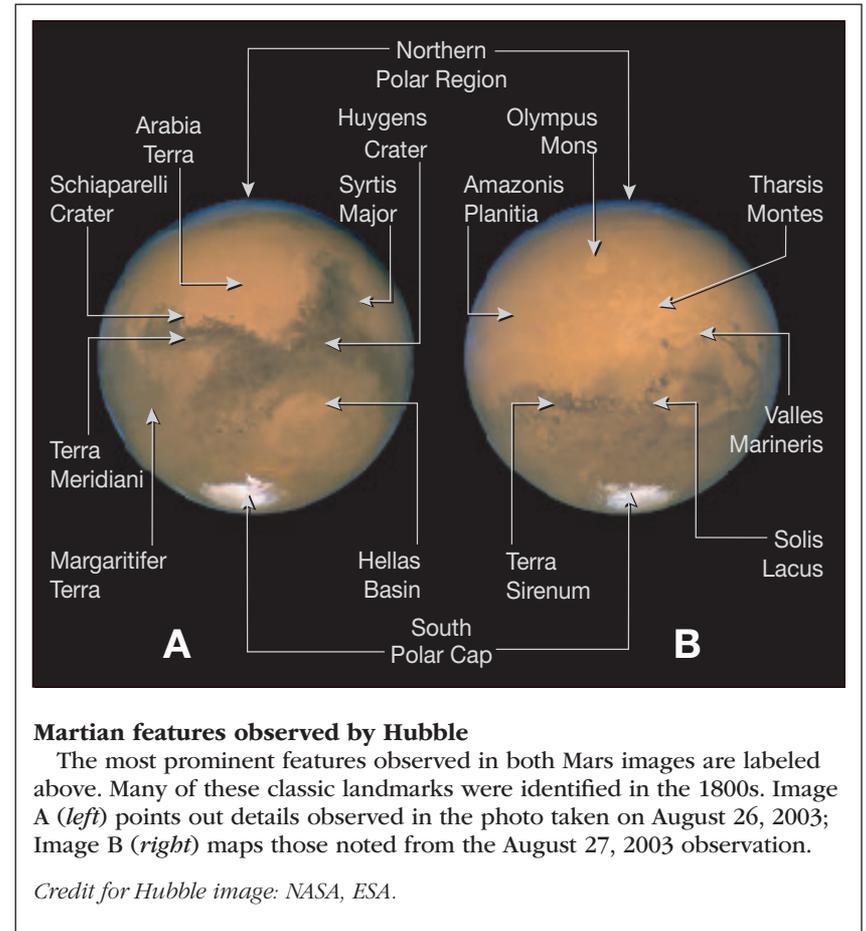
National Aeronautics and Space Administration

**Goddard Space Flight Center**

8800 Greenbelt Road

Greenbelt, Maryland 20771

[www.nasa.gov](http://www.nasa.gov)



## Martian features observed by Hubble

The most prominent features observed in both Mars images are labeled above. Many of these classic landmarks were identified in the 1800s. Image A (*left*) points out details observed in the photo taken on August 26, 2003; Image B (*right*) maps those noted from the August 27, 2003 observation.

*Credit for Hubble image: NASA, ESA.*

You can get images and other information about the Hubble Space Telescope on the World Wide Web. Visit our website, <http://hubblesite.org/>, and follow the links.

The corresponding classroom activity for this lithograph can be found at: <http://amazing-space.stsci.edu/eds/tools/type/pictures.php> or may be obtained by contacting the Office of Public Outreach at the Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218.





## In Search of ... Planet Mars

### Description

Using the “Mars 2003: Closest Approach” lithograph as a starting point, students will compare the surface features of Mars with those of Earth. Students will use the images and text to formulate questions about the Martian features visible on the lithograph. They will then conduct further research to answer their questions, organize their material, and present a report comparing the features of Mars with those of Earth.

### Grade Level

Middle school, grades 6–8.

### Prerequisites

At the very least, students should be aware that Mars is a rocky planet like Earth. Knowledge of Earth’s surface features is helpful.

### Misconceptions

Teachers should be aware of the following common misconceptions and determine whether their students harbor any of them. Students may have misconceptions concerning the makeup of the solar system. Some students may think that the Earth is the center of the solar system, which consists only of the Sun and planets. Others may think that stars and galaxies outside the solar system are part of the solar system. In addition, they may not be aware that the Sun is a star and that comets are part of the solar system.

Students may have misconceptions concerning the sizes of the solar system members. Some students may think the Earth is the largest object in the solar system, while others may think all the planets are the same size as Earth. Students should be aware that the Sun is the largest object in the solar system and that the planets range in size.

Mars has been known since antiquity as one of five star-like objects. (The other star-like objects are Mercury, Venus, Jupiter, and Saturn.) Called planets (Greek for wanderers), these star-like objects change position relative to the fixed patterns of stars that make up the constellations. As scientists and amateur astronomers turned their telescopes toward the red planet, basic questions about Mars’ surface features emerged. Observers noticed that there were white spots near the poles (which we now call polar caps); dark areas (which we now call maria); various markings (which

became known as canals); and white spots (which were interpreted as clouds and proved that Mars had an atmosphere). These observations led people to believe that there is liquid water on Mars as well as intelligent life. The many NASA missions to Mars have addressed these issues, but some student misconceptions may still exist.

### Purpose

The purpose of this activity is to use the images and text on the lithograph to introduce the similarities and differences between the surface features of Mars and those of Earth. Students formulate questions about the surface features of Mars visible in the lithograph, use the Internet to search for answers, and then demonstrate an understanding of the similarities and differences between Mars’ surface features and those of Earth by presenting a report. Students are also asked to reflect on their learning by checking if they answered their original questions and/or generated any new questions.

### Materials

- “Mars 2003: Closest Approach” lithograph
- Computer with Internet connection for conducting research

## Instructions for the Teacher

### Preparation

- Obtain a lithograph for each student.
- Familiarize yourself with the similarities and differences between the surface features of Mars and those of Earth.
- Bookmark or identify as favorites the following suggested websites:
  - STScI: “Mars: Closest Encounter” <http://hubblesite.org/newscenter/archive/releases/2003/22/>
  - STScI: “Scientists Track ‘Perfect Storm’ on Mars” <http://hubblesite.org/newscenter/archive/releases/2001/31/>
  - STScI: “Martian Colors Provide Clues about Martian Water” <http://hubblesite.org/newscenter/archive/releases/1999/07/>

# In Search of ... Planet Mars

## Procedure

Before beginning this activity, evaluate your students' misconceptions about Mars by having them write down anything they know and understand about the planet. You can use these statements to evaluate your students' misconceptions. Have students volunteer their ideas about Mars in order to identify their misconceptions and address them, or collect their papers containing their ideas about Mars, compile a list of their misconceptions, and discuss them with the class.

Ask students to look at the images of Mars on the front of the lithograph and formulate three questions about the surface features visible in the image. Collect the questions and group them by common theme. Ask students to read the information on the back of the lithograph and check if any of their questions have been answered. Using the Internet, have students research their questions. The Internet sites listed above can provide a starting point for their research. If students have access to other websites, instruct them how to use them.

Ask students to prepare a report in which they compare the surface features of Mars with those of Earth. This report could be in the form of a slide show, a skit, a story, a graphic organizer, a Power Point presentation, or a written report — anything that conveys their understanding of the topic to another student, a group of students, or the entire class. Ask students to review their original questions to see if they were answered. Then ask them if they have any additional questions.

## Instructions for the Student

Your teacher will ask you to write down things you know and understand about the planet Mars. You may be asked to share this information with the rest of the class. Study the images of Mars, and write down three questions about what you see in the images. Then read the back of the lithograph, and check if any of your questions were answered.

Using your questions as a guide, research the surface features of Mars on the Internet. Your teacher will guide your search by providing some sites to use. To demonstrate your understanding of the material you

researched, your teacher will ask you to give a report comparing the surface features of Mars with those of Earth. This report could be a slide show, a skit, a story, a graphic organizer, a Power Point presentation, or whatever presentation you think will communicate the information you learned about Mars. You may be allowed to work individually or in small groups, and make your presentations to another classmate, another group of students, or the entire class.

In the end, you will be asked to review your original list of questions and reflect on whether they were answered fully, partially, or not at all through your research. Your teacher also may ask if you have generated any other questions while you were researching the answers to your original questions.

## Education Standards

### Benchmarks for Science Literacy

#### American Association for the Advancement of Science

<http://www.project2061.org/publications/bsl/online/index.php>

#### 4. The Physical Setting

##### A. The Universe

By the end of the 8th grade, students should know that:

- Nine planets of very different size, composition, and surface features move around the Sun in nearly circular orbits. Some planets have a great variety of moons and even flat rings of rock and ice particles orbiting around them. Some of these planets and moons show evidence of geologic activity. The Earth is orbited by one moon, many artificial satellites, and debris.

##### B. The Earth

By the end of the 8th grade, students should know that:

- The Earth is mostly rock. Three-fourths of its surface is covered by a relatively thin layer of water (some of it frozen), and the entire planet is surrounded by a relatively thin blanket of air. It is the only body in the solar system that appears able to support life. The other planets have compositions and conditions very different from the Earth's.

National Aeronautics and Space Administration

**Goddard Space Flight Center**

8800 Greenbelt Road

Greenbelt, Maryland 20771

[www.nasa.gov](http://www.nasa.gov)

LG-2003-11-074-GSFC rev. 2 (2/2)

Educational Product

Educators & Students

Grades 6–8