Express mission to Mars

Mars Express is the European Space Agency's first mission to Mars. Its role is to survey the planet from the topmost layer of the atmosphere down to beneath the surface. Since its arrival at Mars, the mission has proved a great success and has given us many new insights into the Martian environment.

Moon watch

Mars has two small, irregularly-shaped moons called Phobos and Deimos. Mars Express has provided the most complete detailed picture of Phobos to date. The OMEGA instrument has mapped the chemical composition of the moons' surfaces and minerals that have been exposed at the bottom of impact craters.

Phobos
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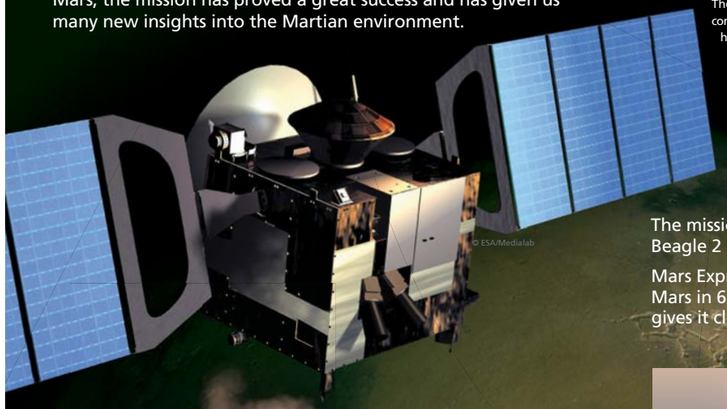

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Highlights include the detection of methane in the Martian atmosphere, the discovery of water ice reserves buried under the planet's surface and the discovery that aurora occur in the upper Martian atmosphere.

The mission consisted of the Mars Express orbiter and the Beagle 2 lander.

Mars Express, which will operate until at least May 2009, orbits Mars in 6 hours and 43 minutes and follows an elliptical path that gives it close up and global views of the planet.

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Mars Express was launched in June 2003, taking advantage of a close alignment of Mars and the Earth to reach the Red Planet in just six months.

Beagle 2, which was named after Charles Darwin's ship The Beagle, was built to search for chemical markers that would show if life once existed on Mars. Unfortunately, it was lost on landing but the miniaturised technology developed for its instruments will be used on future missions.

HRSC colour image of the caldera of Olympus Mons
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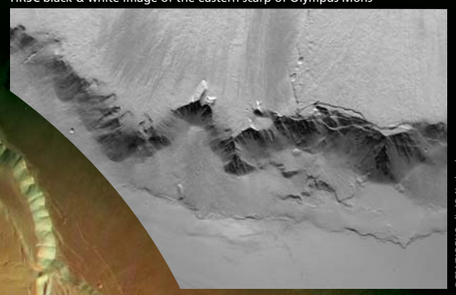
HRSC black & white image of the eastern scarp of Olympus Mons



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HRSC 3-D image of the caldera of Olympus Mons

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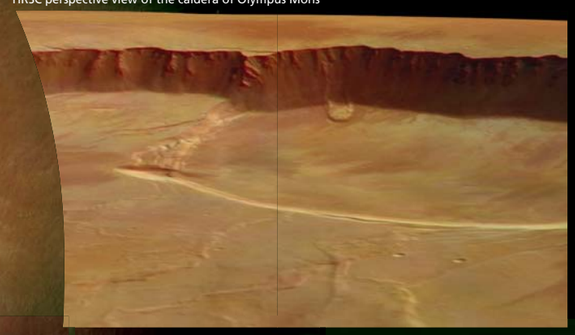
HRSC perspective view of the caldera of Olympus Mons



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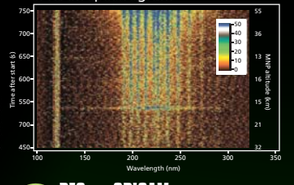
Versatile vision
the many eyes of Mars Express

HRSC The High Resolution Stereo Camera is a sophisticated system that produces black and white, colour, infrared and 3-D images of the surface of Mars. The images can be processed to produce perspective views of features. When Mars Express is closest to the surface (258 km altitude), HRSC images have a resolution of 10 metres, which means objects about the size of a house can be distinguished. In addition, the camera has a Super Resolution Channel, which can zoom in on an area and take images with a resolution of 2.3 metres (about the size of a small car).

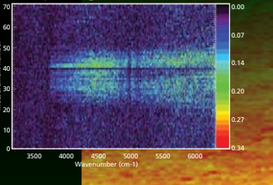
The Mars Express orbiter carries seven instruments that are tailor-made to monitor different aspects of the Martian environment. HRSC, OMEGA and MARSIS study the planet's surface or subsurface, and PFS, SPICAM and ASPERA monitor the Martian atmosphere and its interaction with the solar wind. The Mars Radio Signal experiment uses radio transmissions between the spacecraft and the Earth to deduce information about the planet's surface and interior. UK scientists are involved in the ASPERA, MARSIS and HRSC instruments.

SPICAM spectrogram



© ESA/SPICAM

PFS spectrogram



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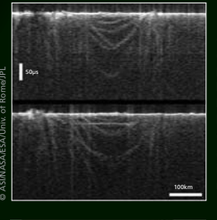
PFS and **SPICAM** instruments analyse infrared and ultraviolet radiation to determine the composition of the Martian atmosphere. Peaks in the spectrum indicate the concentrations of gases present.



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MARSIS (the Mars Advanced Radar for Subsurface and Ionosphere Sounding) probes up to 5 kilometres below the Martian surface by bouncing radio signals off layers in the rock and analysing the echo. The "radargrams" above appear to show a buried impact crater filled with a material rich in water-ice.

ASPERA-3 consists of 4 sensors that monitor the interaction of the Martian atmosphere with the solar wind.

OMEGA analyses the light reflected from the surface of Mars to create a map of rock-types on the surface and areas covered by frost or ice. Different chemicals absorb light strongly at characteristic wavelengths. These three images of the Martian south pole show (from left to right) areas covered by carbon dioxide ice, water ice and south pole in visible wavelengths.

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Mars Express

Further Information

If you would like to know more about the Mars Express mission, try the following resources:

World Wide Web sites

http://sci.esa.int/marsexpress
www.esa.int/SPECIALS/Mars_Express/
www.dlr.de/pf/en/desktopdefault.aspx/
www.esa.int
www.nineplanets.org/mars.html
www.uk2planets.org.uk

Books

Patrick Moore
Patrick Moore on Mars
Cassel, 2006

Steve Squyres
Roving Mars: Spirit, Opportunity and the Exploration of the Red Planet
Hyperion, 2005

Michael Hanlon
The Real Mars
Constable and Robinson 2004

Joseph M Boyce
The Smithsonian Book of Mars
Smithsonian Institution, 2003

Heather Couper & Nigel Henbest
Mars *Headline, 2001*

Fredric W. Taylor
The Cambridge Photographic Guide to the Planets
Cambridge University Press, 2001

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