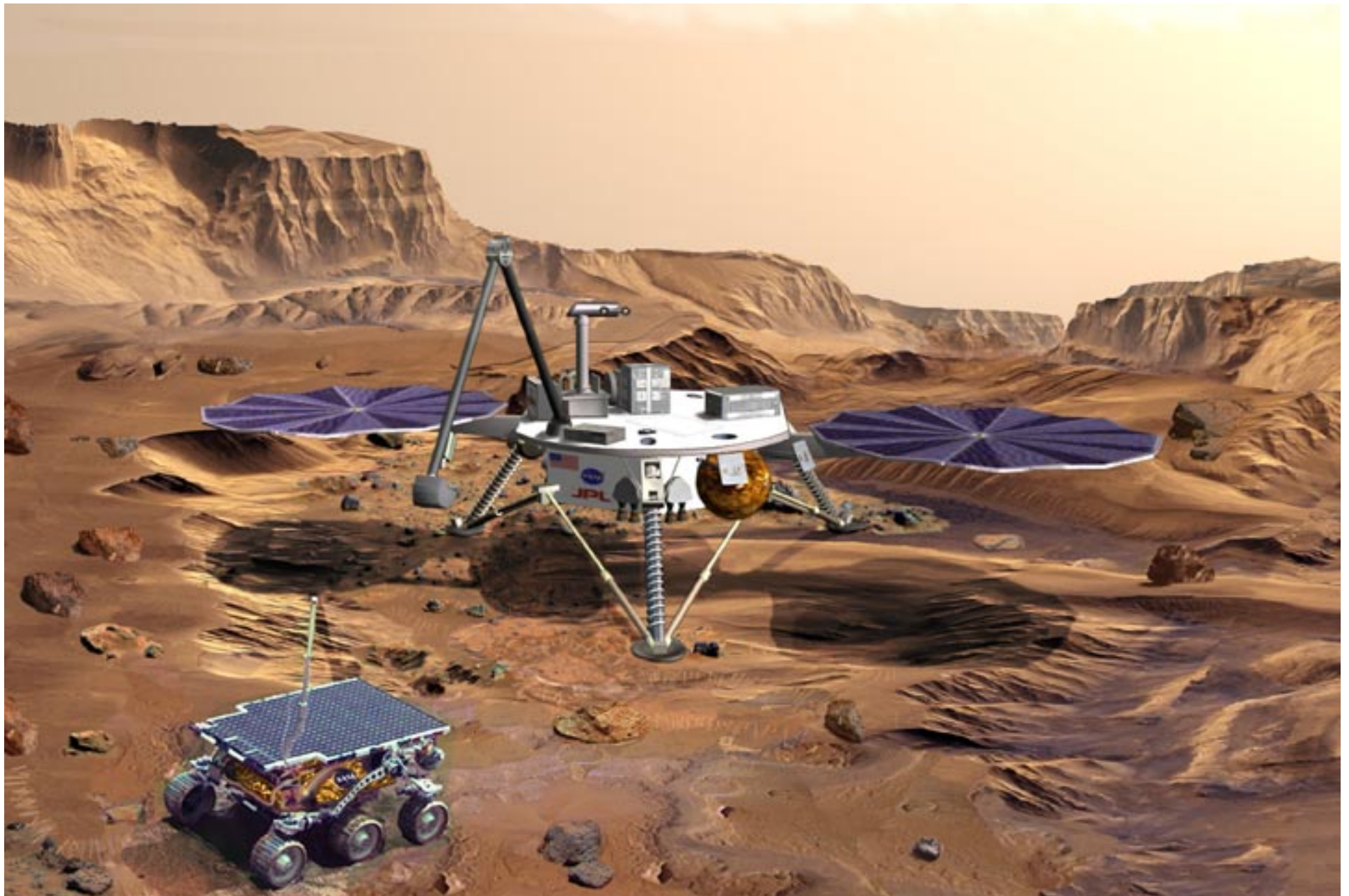




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Exploring Ancient Mars: Mars Surveyor 2001 Lander and Rover





Over the next decade, an international fleet of scientifically equipped robotic spacecraft will arrive at Mars. These robots will assess the planet's current and past climates and conduct surveys in preparation for longer-term visits on the Red Planet. Each mission will be sent to a different site to sample various environments.

In the spring of 2001, three spacecraft — an Orbiter, a Lander, and a Rover — will begin their journeys. The Mars Surveyor 2001 Lander and Rover are scheduled for launch together about April 10, 2001, to land on Mars about January 22, 2002. The Lander and Rover will visit ancient terrain to explore the history of geology and climate, and to provide key information about the Martian environment.

The Lander's Mission. Three of the Lander's instruments, in a package called APEX (Athena Precursor Experiment), will also be carried on future missions — a panoramic camera (Pancam), a mini-Thermal Emission Spectrometer (Mini-TES), and a Mössbauer spectrometer.

Geologic Exploration. Using two high-resolution digital cameras, the Pancam will provide panoramic 3-D views of Martian rocks, dunes, distant mountains, and perhaps ancient waterways with detail almost four times that of earlier missions. The Mini-TES will observe heat given off by rocks and soils. Most minerals have a distinctive "fingerprint" — detecting and imaging thermal radiation will help scientists "see" under thin dust layers on Martian rocks to identify mineral composition.

The surface of Mars contains a lot of iron. The Mössbauer spectrometer, mounted on the Lander's robotic arm, will determine the composition and abundance of iron-bearing minerals in surface soil and airborne dust. Identifying each of the minerals may provide information about early environmental conditions on Mars.

The Versatile Arm. The robotic arm's first duty will be to lift the Rover off the Lander deck and place it gently on the Martian surface. The arm will also collect soil samples to be studied by the Lander's instruments, and it is equipped with its own camera to take close-up pictures of the soil samples on the ground and in its scoop.

Assessing the Effects of Radiation. Along with a similar instrument on the 2001 Orbiter, the Mars Radiation Environment Experiment (MARIE) on the Lander will study the effects of the atmosphere on the radiation environment on the surface.

Assessing the Environment. The Lander's Mars Environmental Compatibility Assessment (MECA) package contains four instruments to study Martian dust and soil. MECA will identify hazardous substances that may come from Martian soil when it is exposed to water. It also will study the sizes and shapes of particles that stick to different kinds of surfaces, and will determine if they may pose a threat to operating equipment. MECA will perform experiments to learn about adhesion, abrasion, and the electrostatic behavior of particles on Mars.

A Small Oxygen Factory. The Mars In-situ Propellant Production Precursor (MIP) package is designed to extract oxygen from the thin carbon dioxide atmosphere found near the Martian surface. Using a small-scale oxygen factory on the Lander deck, MIP will demonstrate the capability to produce rocket propellant. MIP will also test advanced solar cell technology and techniques for repelling dust.

The Lander will also carry an imager to take pictures of the terrain during descent to the surface.

The Rover's Mission. The 2001 Rover, named Marie Curie, is a duplicate of the Mars Pathfinder Sojourner Rover that landed on Mars in 1997. Mission engineers tested commands on Marie Curie before they were sent to Sojourner on Mars. The 2001 Rover carries a camera

plus an instrument — the Alpha Proton X-ray Spectrometer — that can identify chemical elements in rocks and soils. APXS data will be valuable in understanding Martian weathering processes, water activity, and formation of the Martian crust.

Where Will They Land? Scientists are still deciding exactly where the 2001 Lander and Rover will land. Two sites look particularly exciting. One is on the rim of the Isidis Basin, in some of Mars' oldest terrain, in an area with small valleys and gullies indicating that water once flowed there. The other site is a smooth, flat plain; orbiting spacecraft have determined that this area has a lot of the mineral hematite. Hematite normally forms in the presence of liquid water, so this is another place that may have once been warm and wet — very different from current conditions.

The Mars Exploration Program is managed for NASA's Office of Space Science by the Jet Propulsion Laboratory, California Institute of Technology. JPL's industrial partner is Lockheed Martin Astronautics. Scientific instruments are operated by principal investigators from Cornell University, West Virginia University, NASA Johnson Space Center, University of Arizona, and Malin Space Science Systems.

Join us as we explore Mars! Log on to <http://mars.jpl.nasa.gov> to learn the latest news in these historic journeys of adventure.

Education. The 2001 mission includes several exciting educational programs, whose participants will be chosen in 2000. Some students will help propose rocks for the Rover to study. Other students will actually send tiny experiments on the Lander. Many others will be able to observe the Martian Sundial on the Lander.

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