

# NASA PLANETARY SURFACE EXPLORATION

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## **Abstract**

Managed for NASA by the California Institute of Technology, the Jet Propulsion Laboratory is the lead U.S. center for robotic exploration of the solar system. JPL spacecraft have visited all known planets except Pluto (a Pluto mission is currently under study). In addition to its work for NASA, JPL conducts tasks for a variety of other federal agencies. In addition, JPL manages the worldwide Deep Space Network, which communicates with spacecraft and conducts scientific investigations from its complexes in California's Mojave Desert near Goldstone; near Madrid, Spain; and near Canberra, Australia. JPL employs about 6000 people.

### *Past Missions*

JPL developed spacecraft have investigated Venus (Mariners 2, 5, 10, and Magellan), Mars (Mariner 4, 6, 7, 9, Viking 1 and 2 - Orbiters/Landers and Mars Observer), the Moon (Surveyor Moon Lander), and Mercury (Mariner 10). These missions have completed their investigations and have provided a vast amount of new data for planetary scientists to better understand the formation of the solar system and its composition.

### *Present Missions*

At the present time several spacecraft are exploring the solar system. Cassini, perhaps the last large JPL spacecraft, is on its way to Saturn and its moon Titan. Galileo spacecraft is finishing its exploration of Jupiter and its moons. Mars Global Surveyor is orbiting Mars and sending very high resolution images of the red planet. Mars Pathfinder and its Sojourner Rover have basically finished their mission after the most spectacular landing and roving on Mars. Voyagers 1 and 2 have been flying for over 20 years. Voyager 1 is the farthest human made object from the Earth. Ulysses Mission to the Polar Regions of the Sun is in progress.

### *Future Missions*

JPL has planned to develop numerous spacecraft to explore the solar system in the coming decade. There is a paradigm shift from developing expensive large spacecraft with many science instruments to many inexpensive spacecraft with fewer science instruments. These new generations of spacecraft will also use cutting edge technology, which normally was not used in the past for flagship missions.

At the present time three New Millennium Program missions namely Deep Space 1, Deep Space 2, and Deep Space 4 are planned to explore an asteroid, send a probe that will penetrate the Martian surface, and rendezvous with a comet and scoop up a sample of the nucleus, and return to Earth.

The Stardust mission will bring back to Earth a sample from another comet.

### *Mars Missions*

The Surveyor Program consists of a series of missions that will explore Mars and bring samples back to Earth. Current plans call for launching two spacecraft, one orbiter and one lander, every 26 months. The first of these is the '98 mission which will have a lander with a robotic arm. The robotic arm will be used to scoop soil and perform in-situ analysis. The 2001 mission will be a similar mission to the Pathfinder

mission using a Sojourner type rover. The 2003/2005 sample return mission consists of sending two rovers to Mars and returning several samples to Earth collected by these rovers in 2007.

A full description of the Mars Sample Return Mission (MSR) scenario, and its components will be discussed. Videotapes of current research rovers in support of these missions will be shown.