

# Deep Space Programs Overview

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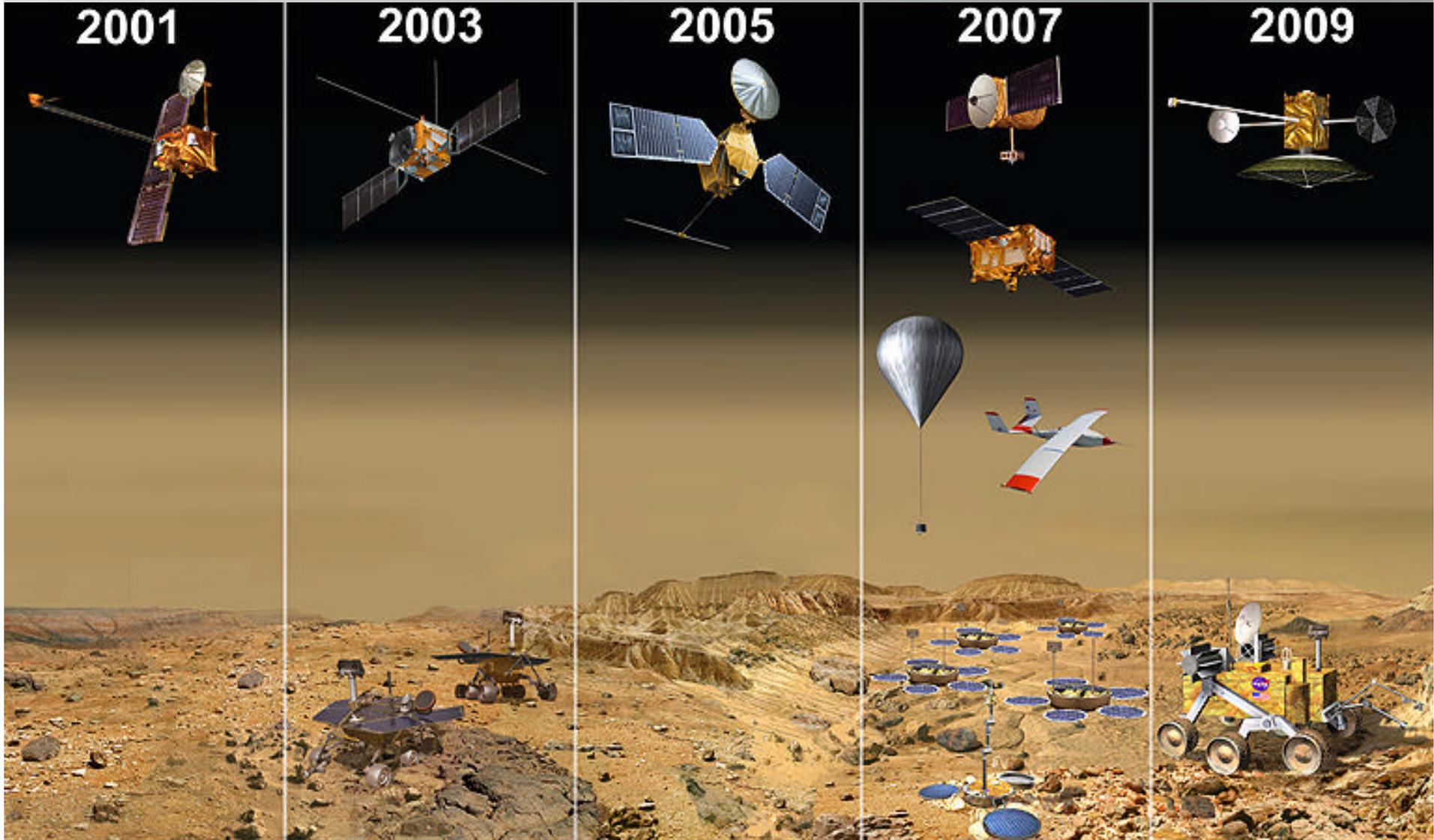
# Deep Space Programs Overview



**JPL is NASA's lead center for robotic exploration of the solar system. This presentation covers current programs and future plans for exploration of Mars, Jupiter, Saturn and other solar system objects. The role of advanced technology will get particular emphasis.**

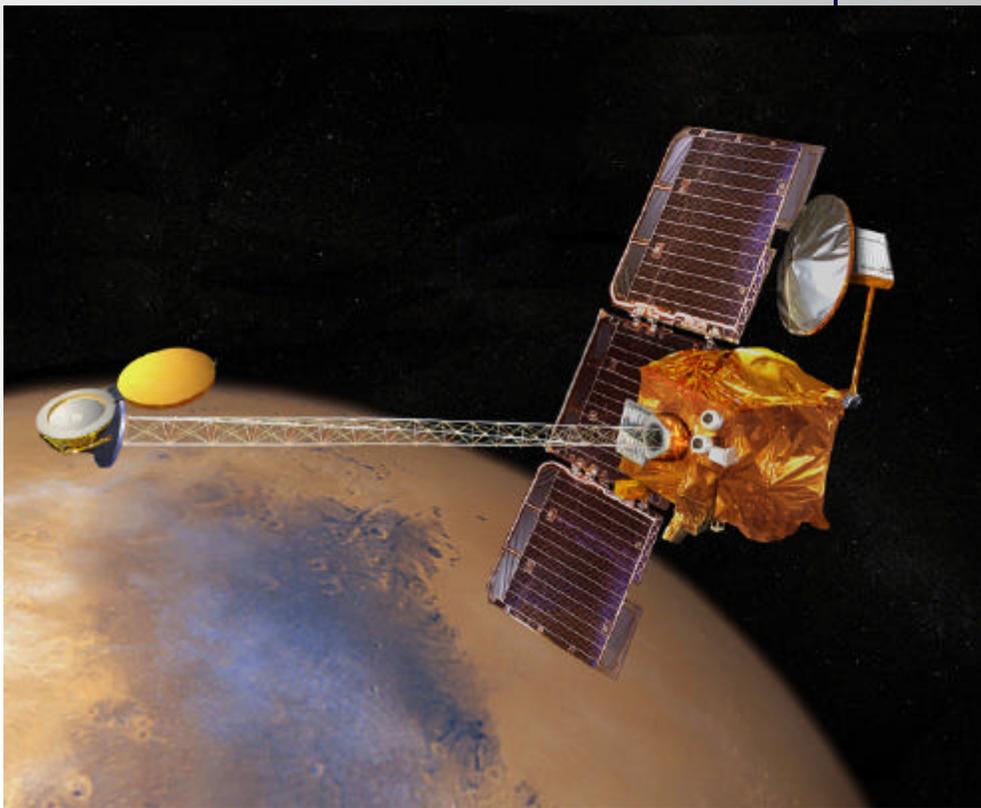
# Current and Planned Solar System Exploration Missions

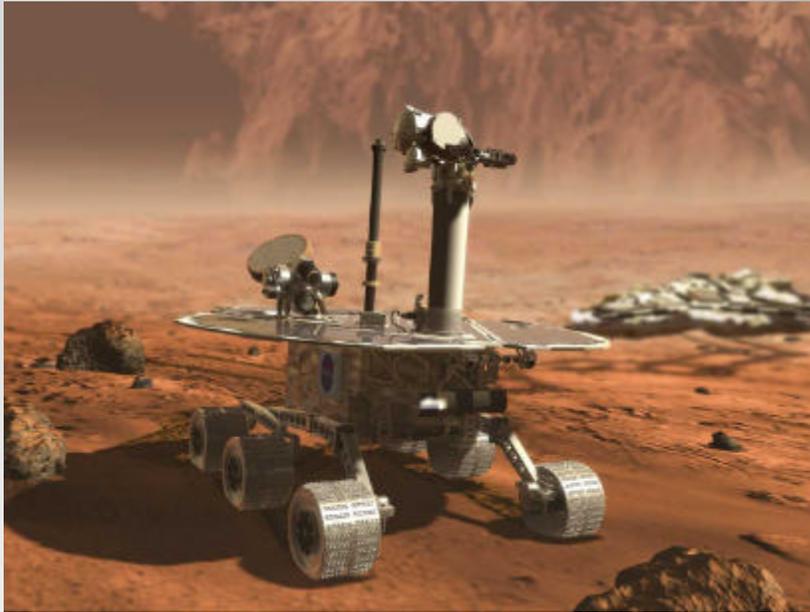
## The Mars Exploration Program



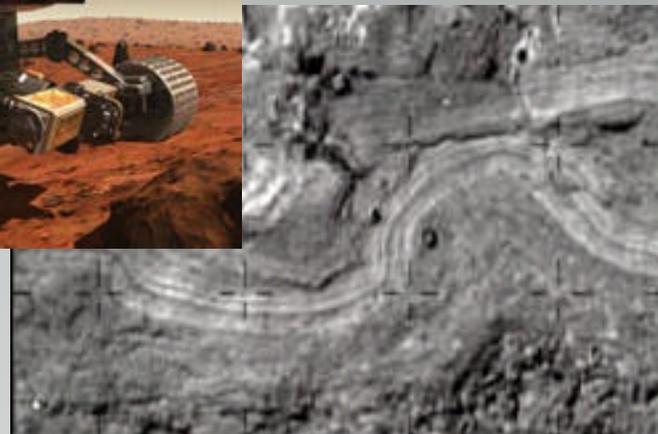


# The Mars 2001 Odyssey observed water ice at the south pole of Mars



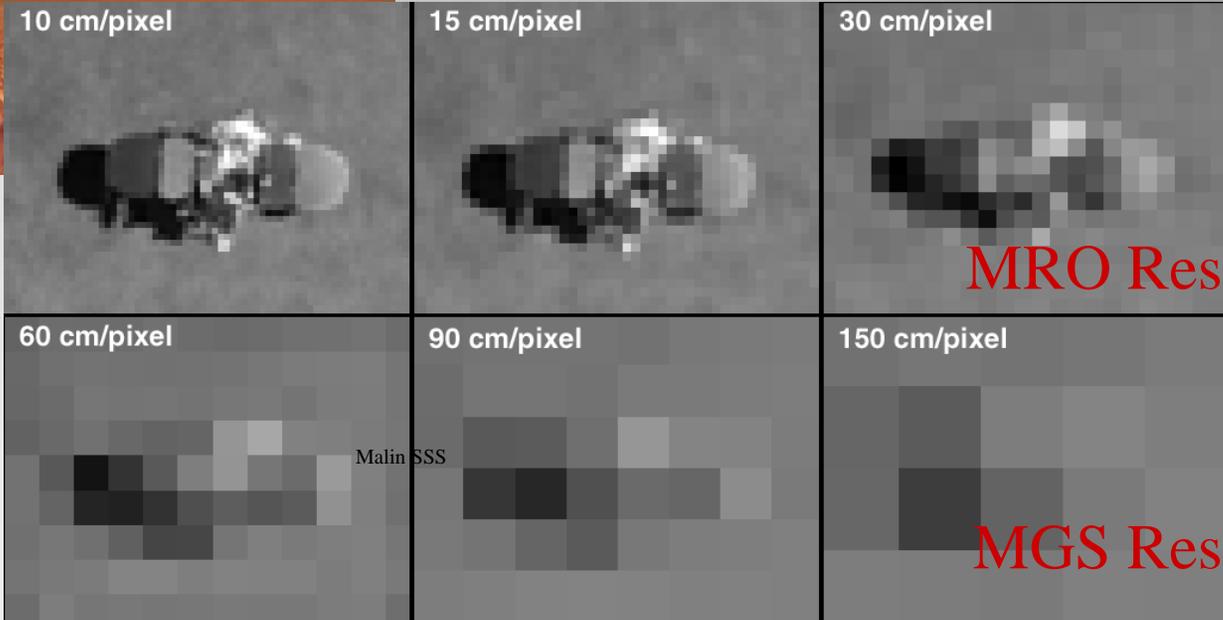
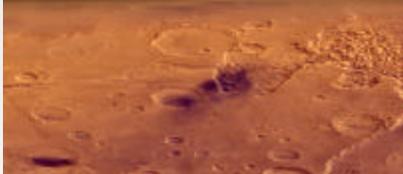


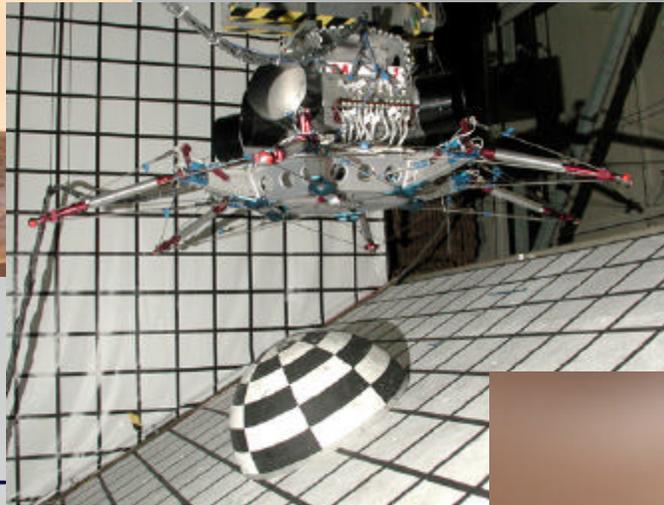
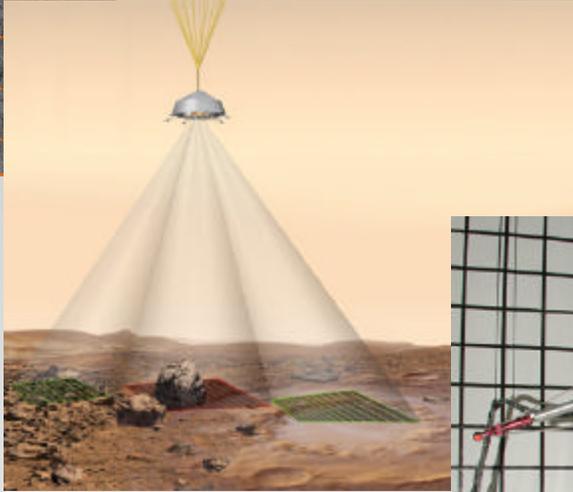
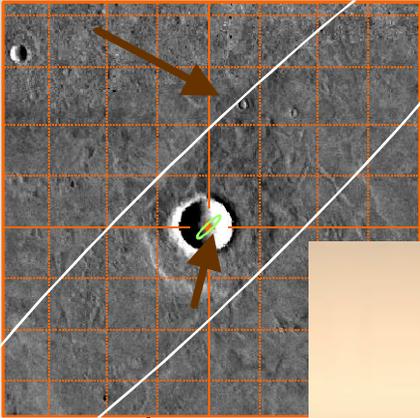
Mars 2003 twin  
robot geologists  
will provide the  
first microscopic  
view of Mars





# Keen Eyes of the MRO (2005)



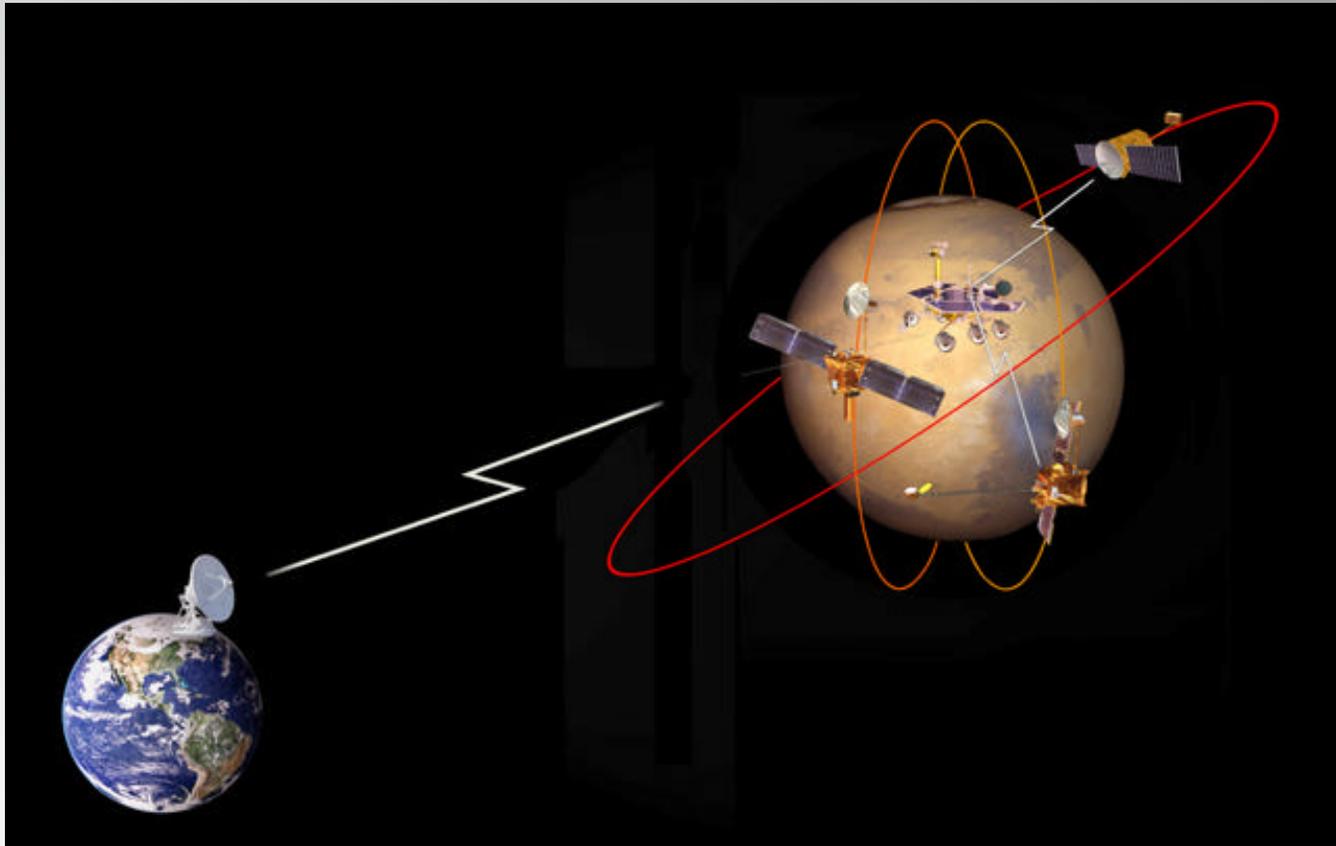


Pinpoint landing with  
the Smart Lander in 2009



# Mars Scout Concepts

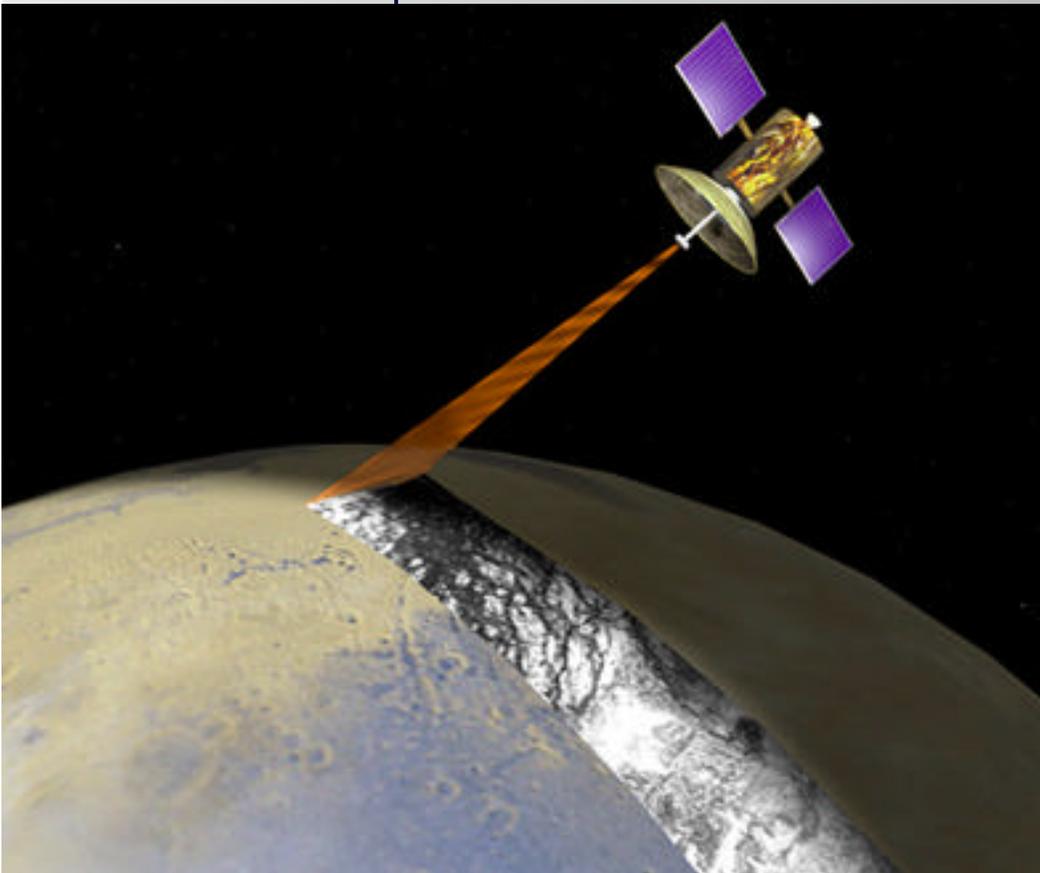




# Building up a Mars Telecom Network

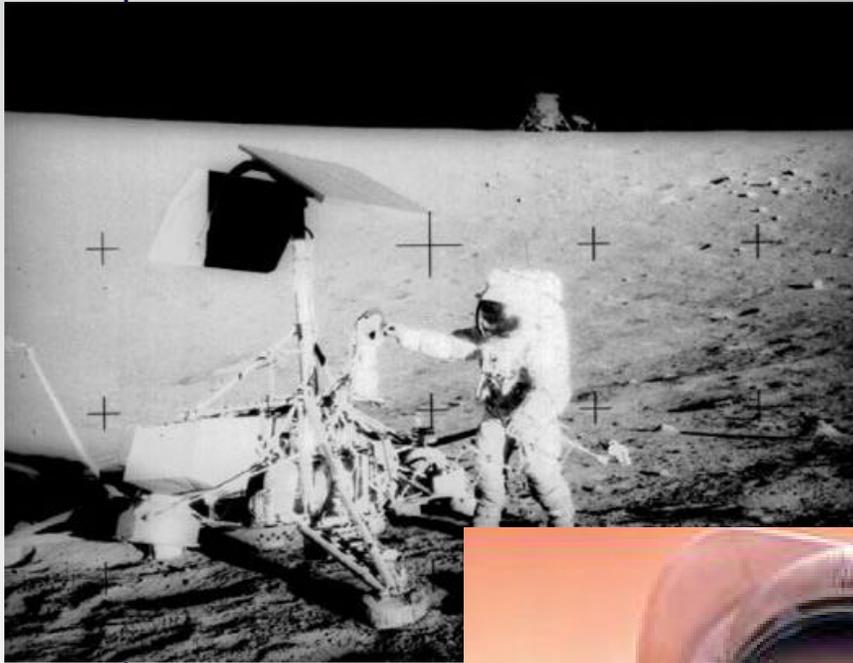


## A surface penetrating radar in 2009





Next decade:  
Bringing back a  
piece of Mars



Just as at the moon  
where we first sent  
robotic explorers, then  
humans...

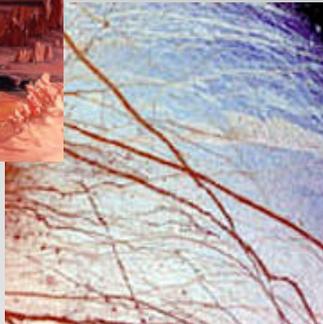


One day  
people will  
stand on the  
face of Mars.

# Outer Planets Exploration: *Exploring Organic-Rich Environments*



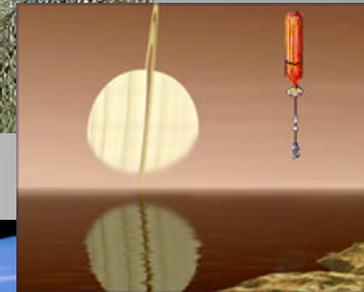
**Cassini/Huygens**



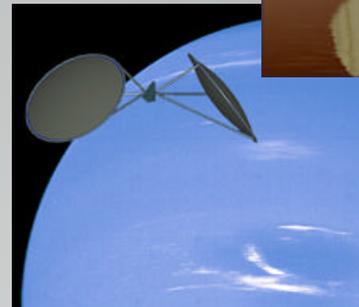
**Galileo-Europa**



**Europa  
Lander**



**Titan  
Explorer**



**Neptune Orbiter**

**Operational**

**Future**



Galileo has made the first orbital survey of Jupiter and its satellites



Cassini will  
explore Saturn  
and its moon  
Titan in 2005

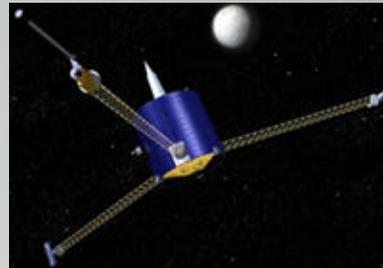
# Discovery Missions



**Mars evolution:  
Mars Pathfinder**



**Lunar formation:  
Lunar Prospector**



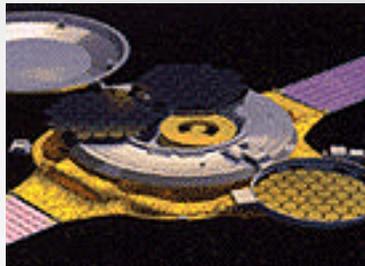
**NEO characteristics:  
NEAR**



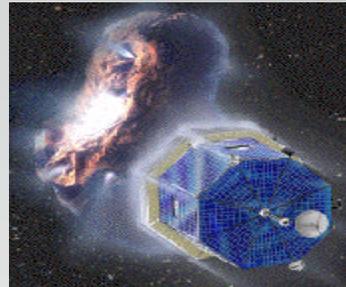
**Nature of dust/coma:  
Stardust**



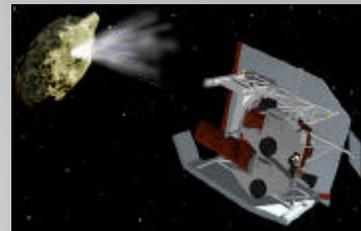
***Missions now in development will set new standards for increased capability within cost and schedule constraints***



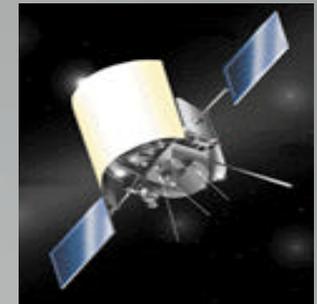
**Solar wind sampling:  
Genesis**



**Comet diversity:  
CONTOUR**

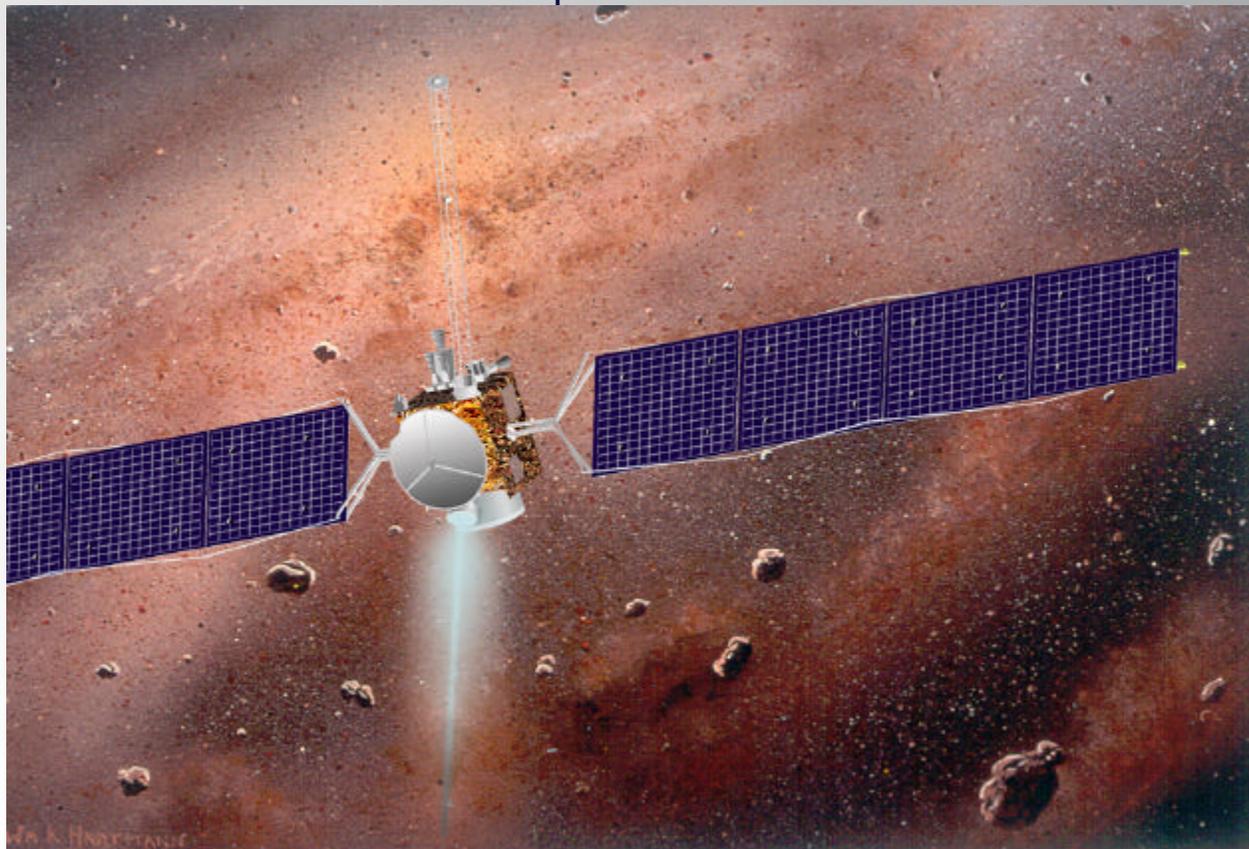


**Comet internal structure:  
Deep Impact**



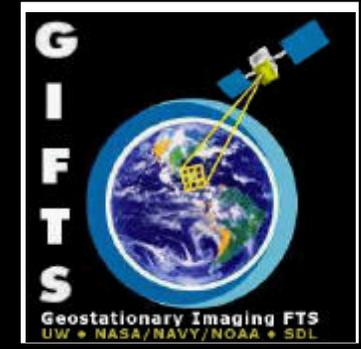
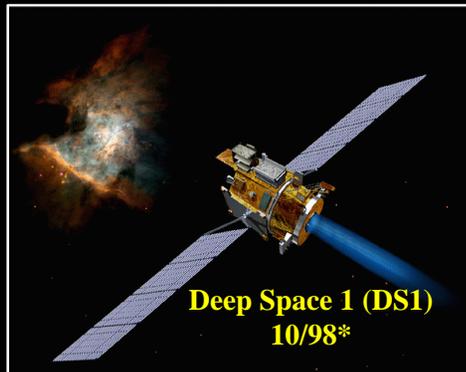
**Mercury environment:  
MESSENGER**

***Discovery: A Spring-board for Future Exploration***  
***<http://discovery.nasa.gov/>***



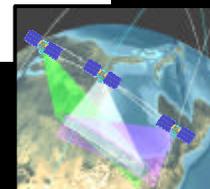
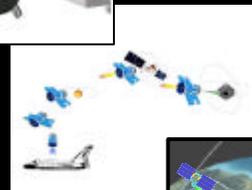
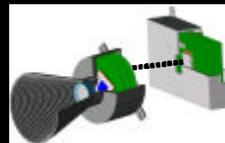
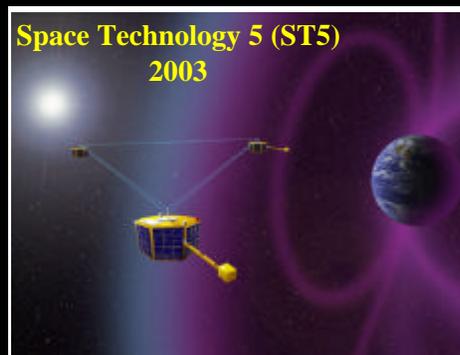
Dawn will orbit  
Vesta and  
Ceres – two of  
the largest  
asteroids in the  
solar system

# New Millennium Program Overview

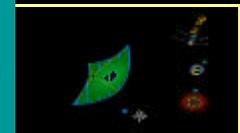
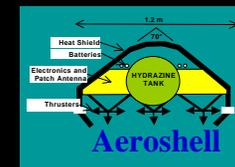


**Earth Observing 3 (EO3)**  
2006

**A cross-Enterprise program to identify and flight validate breakthrough technologies that will significantly benefit future Space Science and Earth Science missions.**



**Space Technology 6 (ST6)**  
2004

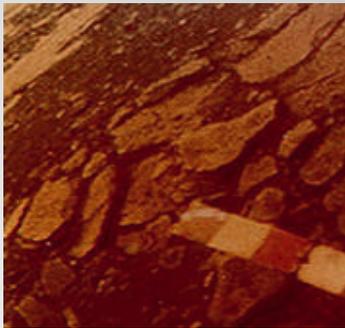


**Space Technology 7 (ST7)**  
2004-2005

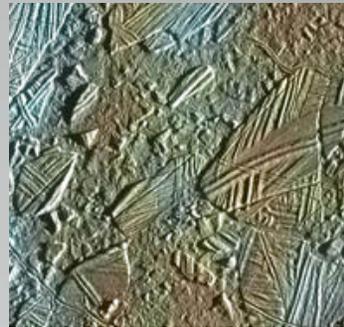
[http://nmp.jpl.nasa.gov/index\\_flash.html](http://nmp.jpl.nasa.gov/index_flash.html)

\* Actual Launch Date

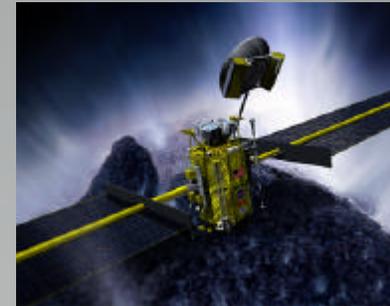
# Office of Space Science Strategic Plan Candidate Solar System Exploration Missions



Venus surface exploration  
and sample return



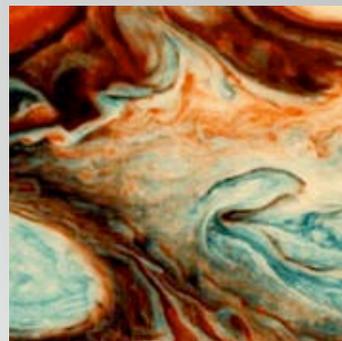
Europa surface  
and subsurface



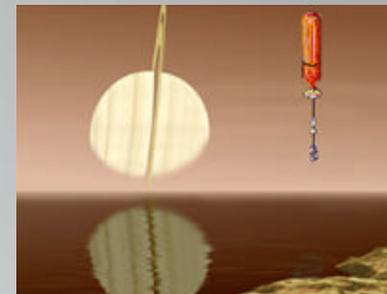
Comet nucleus  
sample return



Neptune and Triton



Giant Planet Deep Probes

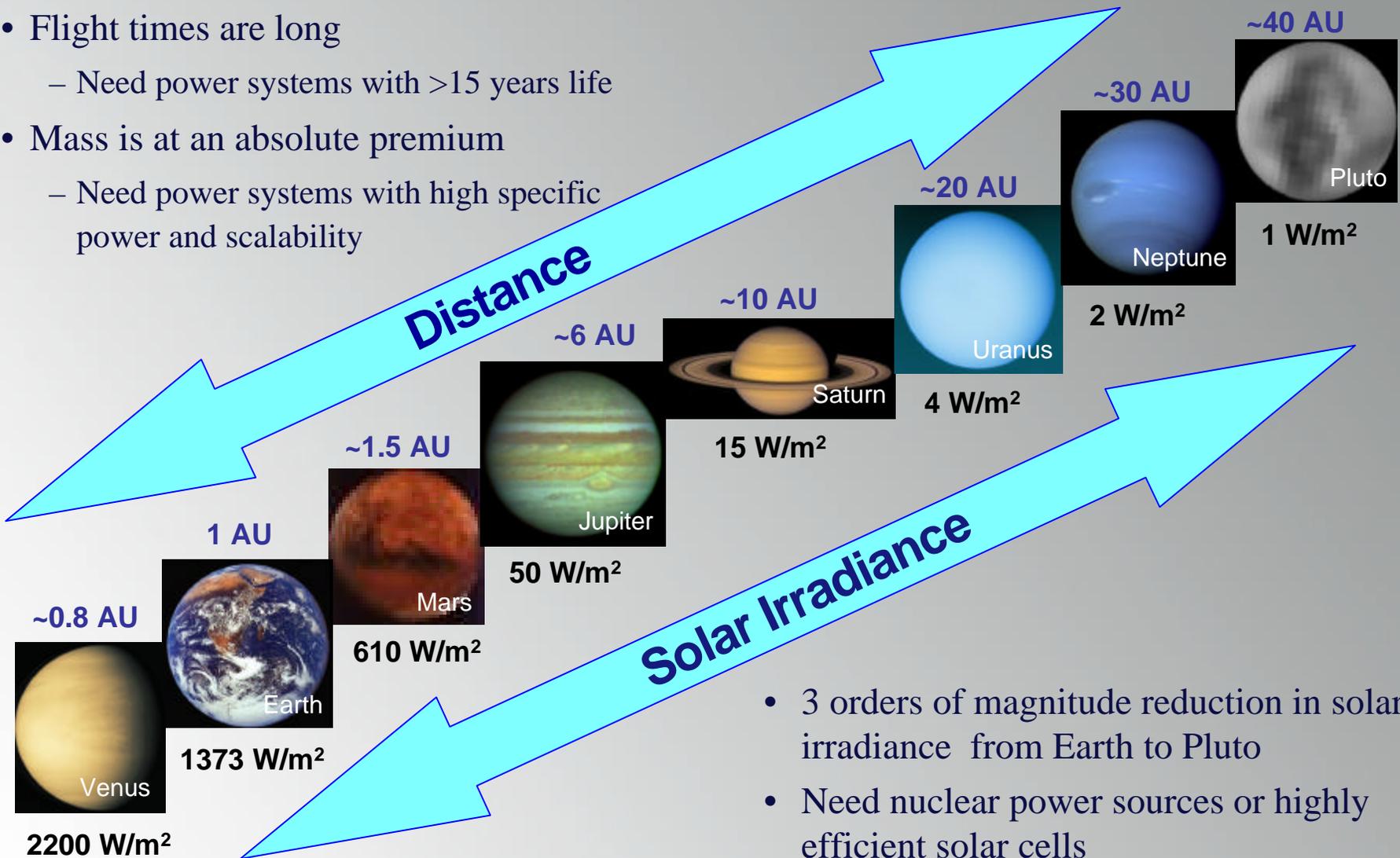


Titan *in situ*

# Coping with Environmental Extremes Power Technology



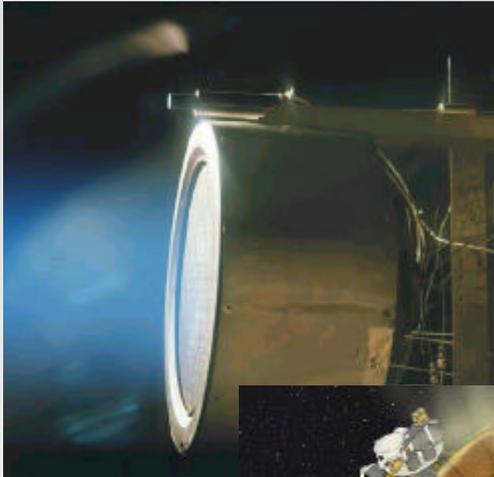
- Flight times are long
  - Need power systems with >15 years life
- Mass is at an absolute premium
  - Need power systems with high specific power and scalability



- 3 orders of magnitude reduction in solar irradiance from Earth to Pluto
- Need nuclear power sources or highly efficient solar cells

# The Challenge of Distance

## In-Space Transportation Technology



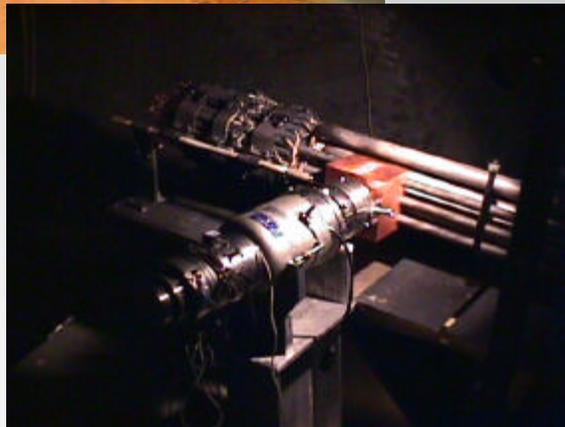
- **Solar Electric Propulsion**

- Visits to multiple objects in the inner solar system
- Fast access to the outer solar system



- **Aerocapture**

- Efficient orbital capture in the outer solar system

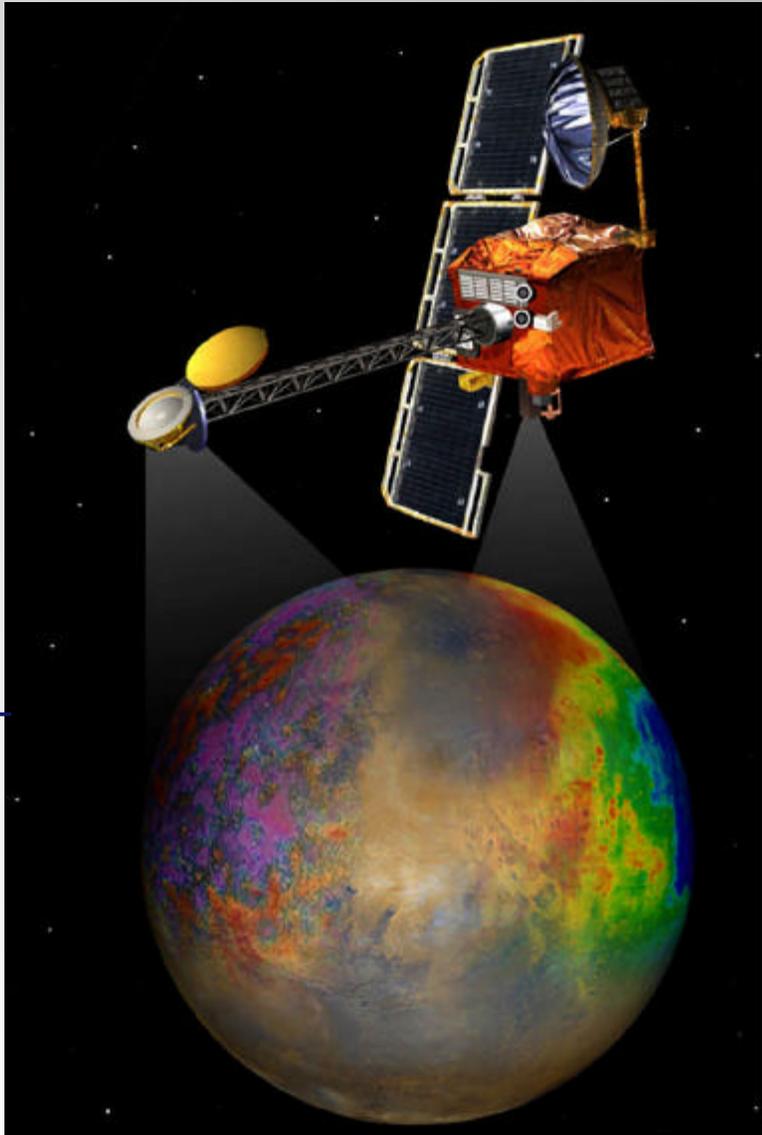


- **Nuclear Electric Propulsion**

- Access anywhere anytime
- Visits to multiple bodies in the outer solar system
- Sample return from outer solar system



And it will help get us here also.



From now until then, there are many exciting missions, many scientific discoveries and countless stories about the journey to tell.