

**An Exceptional Year  
at the  
Jet Propulsion Laboratory**

Presented to  
Chapter VI, P.E.O. Sisterhood

By  
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Space Technology Mission Eight

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## News Flash



- "Scientific American Magazine" names JPL as "Research Leader in the Aerospace Category 'for demonstrating the power of robots to explore the planets'" (11/08/04)



- What is JPL?
  - Mission
  - Who we are
- Why was 2004 an "exceptional year"?
- What should we look forward to in 2005 and beyond?
- Where do I learn more?

- **Mission**

- To understand and protect our planet
- To explore the universe and search for life
- To inspire the next generation of explorers

. . . as only NASA can

- **Vision**

- To improve life here
- To extend life to there
- To find life beyond.



- As part of the NASA team, JPL enables the nation to explore space for the benefit of humankind by developing robotic space missions to:
  - Explore our own and neighboring planetary systems.
  - Search for life beyond the Earth's confines.
  - Further our understanding of the origins and evolution of the universe and the laws that govern it.
  - Make critical measurements to understand our home planet and help protect its environment.
  - Enable a virtual presence throughout the solar system using the Deep Space Network and evolving it to the Interplanetary Network of the future.
  - Apply JPL's unique skills to address problems of national significance.
  - Inspire the next generation of explorers.

# What is JPL?

- Institutionally
  - NASA Center (contractor operated)
  - Division of the California Institute of Technology
  - Federally-funded Research and Development Center
- People
  - More than 5,000 engineers, scientists, and support professionals
  - Approximately 1/3 each Ph.D.s, master's, and bachelor's degrees in the research and development staff



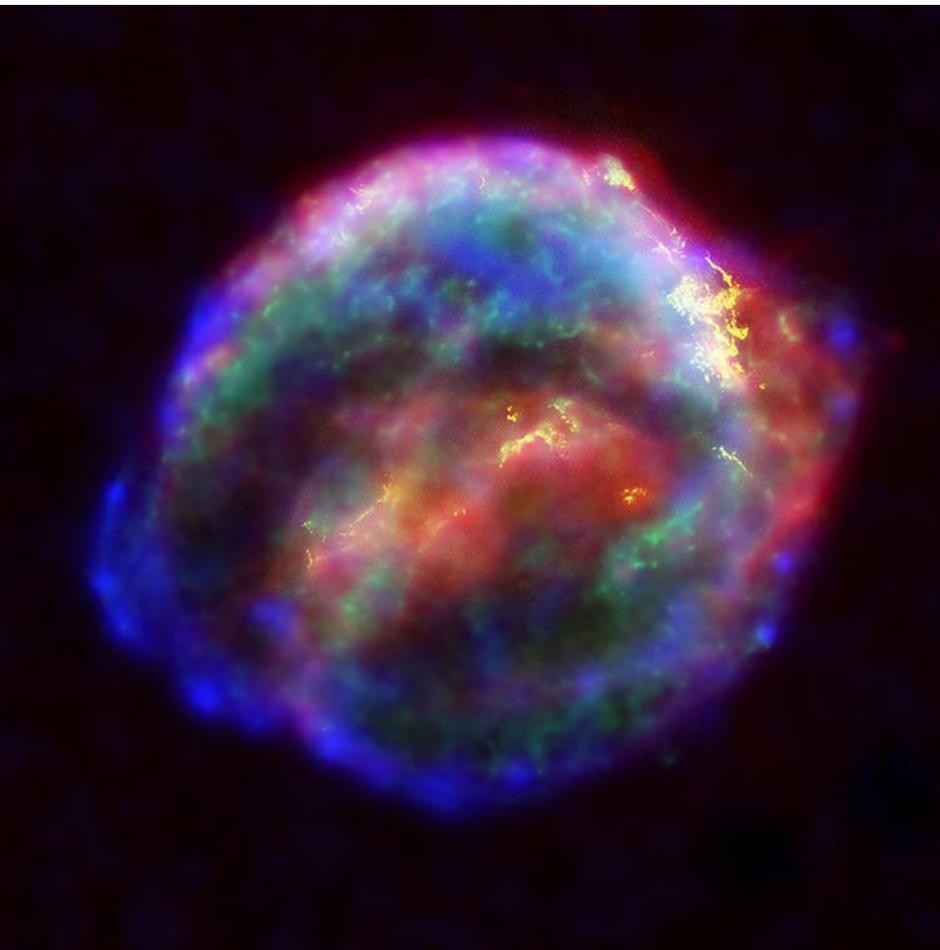
## Events of the Past Year (details to follow)

- Spitzer Space Telescope launched August, 2003
- Stardust collected dust from Comet Wild 2 January 2
- "Spirit" landed on Mars on January 4 (and bounced 28 times before coming to a stop)
- "Opportunity" landed on Mars on January 25, after bouncing 26 times
- Cassini began orbiting Saturn July 1
- Aura, an Earth observing mission to better understand the atmosphere we breath, launched July 15
- Genesis returned samples of the solar wind September 8

And to come...

- The Huygens probe will separate from the Cassini spacecraft on December 25 and enter Titan's atmosphere on January 14, 2005
- Deep Impact will launch December 30 and impact Comet Tempel II on July 4, 2005

# Spitzer Space Telescope



- Science
  - Search for brown dwarfs and super-planets
  - Discover and study debris disks around nearby stars
  - Study ultraluminous infrared galaxies and active galactic nuclei
  - Study the early universe
- Mission
  - 85 cm telescope cooled to  $<5\text{K}$  ( $-450^{\circ}\text{F}$ )
  - 2.5 year life, 5 year goal
  - 3 infrared instruments, operating at 3-180  $\mu\text{m}$
- Latest headline
  - Spitzer Sees Ice and Warm Glows in Dark and Dusty Places (11/09/04)
- More info:  
<http://www.spitzer.caltech.edu>



- Science
  - Return cometary material to earth for the first time
  - Return interstellar material, too
- Mission
  - Collect comet material from Wild 2 in January, 2004
  - Land on earth in January, 2006
- Latest headline
  - The Calm after the Cometary Storm (01/06/04)
- More info:  
<http://stardust.jpl.nasa.gov>

# Mars Rovers: Spirit and Opportunity

- Science

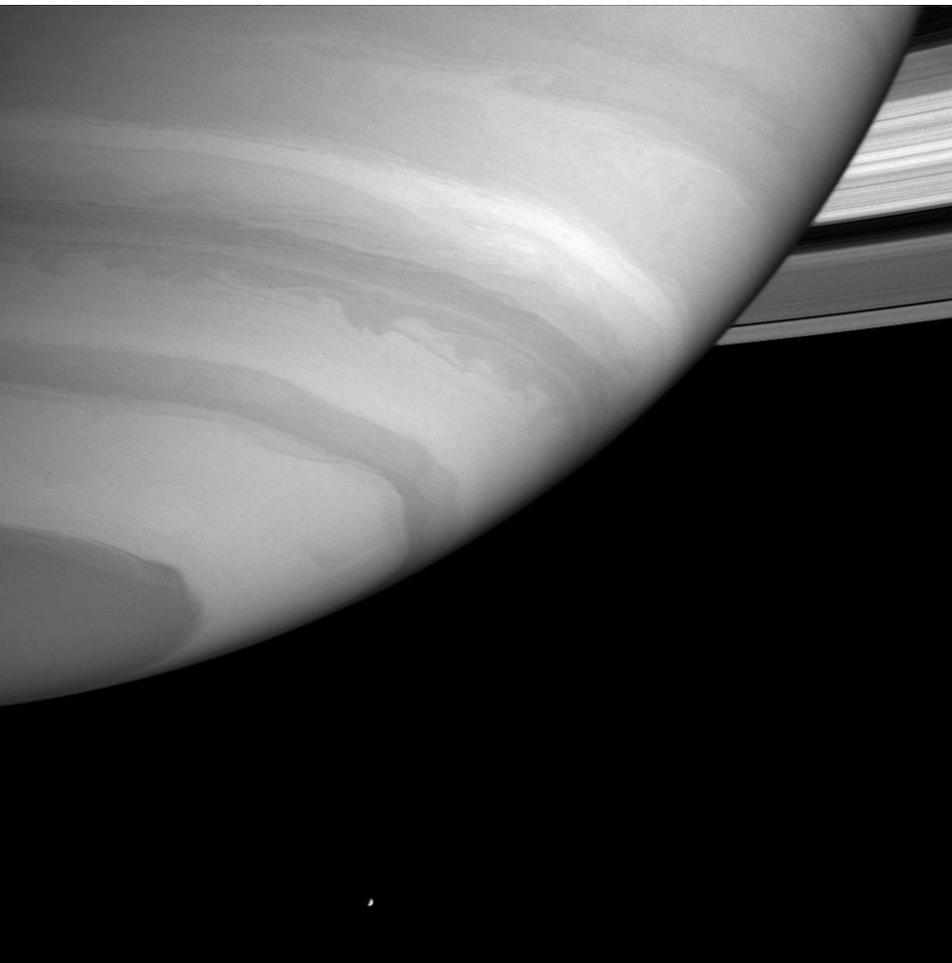
- Search for and characterize a diversity of rocks and soils that hold clues to past water activity
- Investigate landing sites, selected on the basis of orbital remote sensing, that have a high probability of containing physical and/or chemical evidence of the action of liquid water
- Determine the spatial distribution and composition of minerals, rocks and soils surrounding the landing sites
- Determine the nature of local surface geologic processes from surface morphology and chemistry
- Calibrate and validate orbital remote-sensing data and assess the amount and scale of heterogeneity at each landing site
- For iron-containing minerals, identify and quantify relative amounts of specific mineral types that contain water or hydroxyls, or are indicators of formation by an aqueous process, such as iron-bearing carbonates
- Characterize the mineral assemblages and textures of different types of rocks and soils and put them in geologic context
- Extract clues from the geologic investigation, related to the environmental conditions when liquid water was present and assess whether those environments were conducive for life

## Mars Rovers: Spirit and Opportunity



- Mission
  - 2 rovers landed on Mars
  - 3 month primary mission
  - 10 months of operation so far
- Latest headline
  - Spirit Adds Clues About History of Rocks in Martian Hills (11/04/04)
- More info:  
<http://marsrovers.jpl.nasa.gov/home/index.html>

# Cassini Orbits Saturn



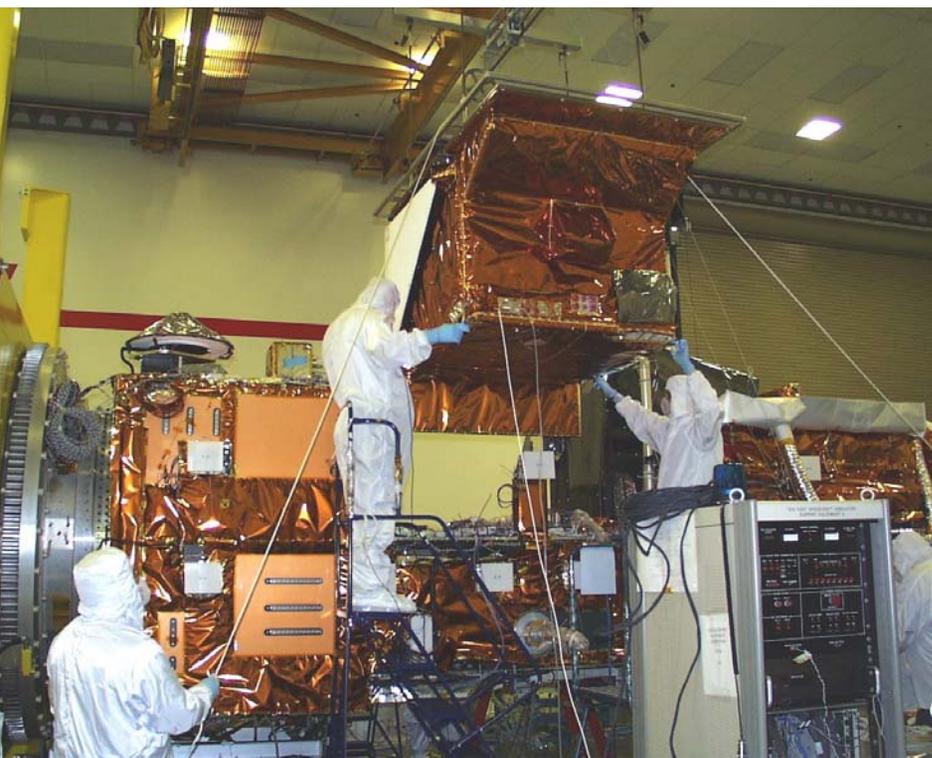
- Science
  - Characterize and develop a better understanding of Saturn's atmosphere, rings, magnetosphere, icy satellites, and Titan, the only satellite in the solar system with an atmosphere
- Mission
  - Orbit Saturn and its moons for four years
  - Deliver the European Huygens probe into the atmosphere of Titan and land on its surface
- Latest headline
  - Catching Saturn's Ring Waves (11/09/04)
- More info:  
<http://saturn.jpl.nasa.gov>

# Aura – Microwave Limb Sounder



- Science
  - Track recovery of the ozone especially track chlorine and bromine chemistry, and resolve current issues in hydrogen chemistry
  - Understand aspects of how composition affects climate especially through water vapor in the upper troposphere
  - Quantify aspects of pollution in the upper troposphere - ozone, carbon monoxide (CO), methyl cyanide (CH<sub>3</sub>CN), hydrogen cyanide (HCN); biomass burning injections especially track chlorine and bromine chemistry, and resolve current issues in hydrogen chemistry
  - Understand aspects of how composition affects climate especially through water vapor in the upper troposphere
  - Quantify aspects of pollution in the upper troposphere - ozone, carbon monoxide (CO), methyl cyanide (CH<sub>3</sub>CN), hydrogen cyanide (HCN); biomass burning injections
- Mission
  - Orbiting the earth on the Aura spacecraft
- Latest headline
  - Aura Post-launch Status Report (08/04/04)
  - First release of science data imminent
- More info: <http://mls.jpl.nasa.gov>

# Aura – Tropospheric Emission Spectrometer



- Science will contribute to:
  - The distribution of tropospheric ozone as modified by natural and anthropogenic sources of its precursors and the consequent changes in the oxidizing power of the troposphere;
  - Global climate modification caused by the increase in radiatively-active gases;
  - The exchange of gases between the troposphere and the stratosphere;
  - Sources and sinks of species important to the generation of tropospheric and stratospheric aerosols;
  - Natural sources of trace gases such as methane from organic decay, nitrogen oxides from lightning and sulfur compounds from volcanos; and
  - Biogeochemical cycles of the interaction of the lower atmosphere and the biosphere.
- Mission
  - Orbiting the earth on the Aura spacecraft
- Latest headline
  - Aura Post-launch Status Report (08/04/04)
  - First release of science data imminent
- More info: <http://tes.jpl.nasa.gov>



From despair...

...to hope



- Science
  - Obtain precise solar isotopic abundances.
  - Obtain greatly improved solar elemental abundances by factor of 3-10 in accuracy.
  - Provide a reservoir of solar matter for 21st century science.
- Mission
  - Returned samples of solar wind are being cataloged and curated at Johnson Space Center
  - Mishap board investigating the cause of the return vehicle crash into the Utah desert
- Latest headline
  - NASA's Genesis Mishap Board & Researchers Both Report Progress
- More info:
  - <http://www.genesismission.org/>

## A Sampling of Upcoming Missions

- Mars
  - Mars Reconnaissance Orbiter - 2005 launch
  - Phoenix lander - 2007 launch
  - Mars Science Lander - 2009 launch
  - Continuing series of Mars missions
- Solar system missions (not Mars and not Earth)
  - Deep Impact launches (12/04) and impacts comet (07/04/05)
  - DAWN launches in 2006 to investigate two asteroids, Ceres and Vesta
  - Future missions to moon, Jupiter, Venus, and comet being defined
  - Continuing opportunities for other solar system objects
- Earth
  - CloudSat launches in April, 2005
  - Orbiting Carbon Observatory - 2007 launch
  - Ocean Surface Topographic Mission - 2008 launch
- Astrophysics
  - Kepler - 2007 launch
  - Wide Field Infrared Survey Explorer - 2008 launch
  - Space Interferometry Mission - 2009 launch



## For More Information...

- Come to our Open House: May 14-15, 2005
- Check our our web site: <http://www.jpl.nasa.gov>
- Keep tabs on the NASA web site:  
<http://www.nasa.gov>
- Sign up for our e-mail updates
- Tell children about NASA's Space Place:  
<http://spaceplace.nasa.gov> (también en español)