



National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

An Exceptional Year at the Jet Propulsion Laboratory California Institute of Technology

Presented to
Principia Clubs of Los Angeles and San Gabriel Valley

By
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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)



Topics in the Presentation

- 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?



NASA Mission and Vision

- **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.



JPL Mission

- 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
- Principia College graduates at JPL
 - 5 physics, 1 business
 - 1 Ph.D., 2 master's, 3 bachelor's
 - At least two who attended Lower/Middle/Upper Schools at some point early in life
- Current missions: 22 missions or instruments on other people's missions operating in space



Events of the Past Year (details to follow)

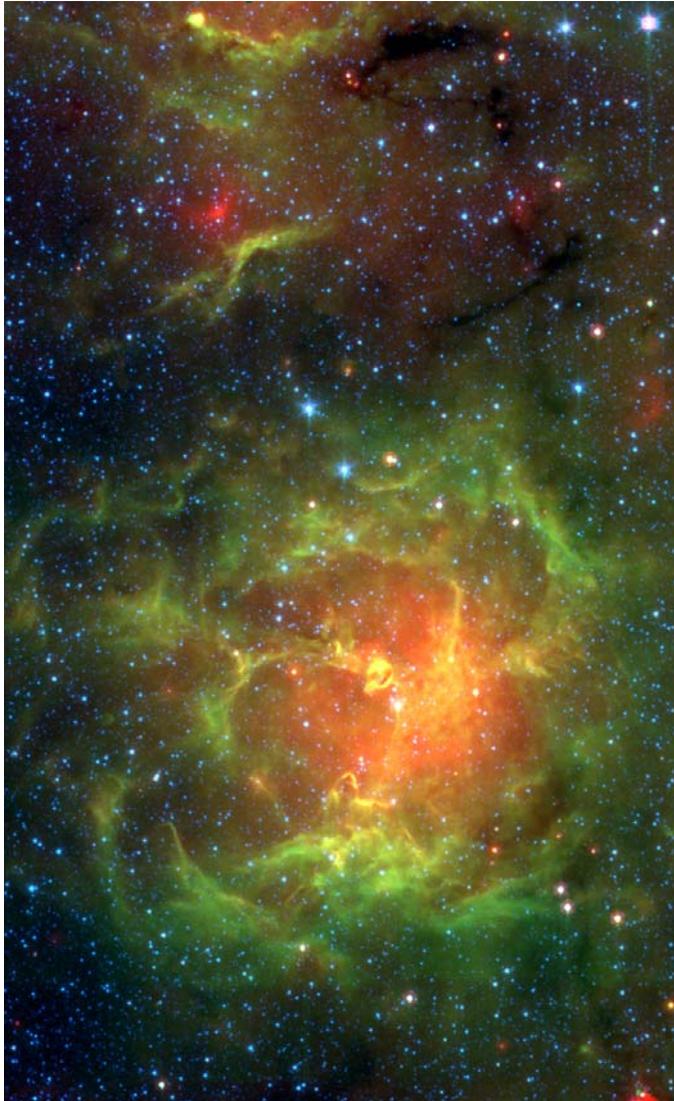
- Spitzer Space Telescope launched August, 2003
- Stardust collected dust from Comet Wild 2 January 2
- "Spirit" landed on Mars on January 4 (and bounced 28 times before coming to a stop)
- "Opportunity" landed on Mars on January 25, after bouncing 26 times
- Cassini began orbiting Saturn July 1
- Aura, an Earth observing mission to better understand the atmosphere we breath, launched July 15
- Genesis returned samples of the solar wind September 8
- The Huygens probe separated from the Cassini spacecraft on December 25 and entered Titan's atmosphere on January 14
- Deep Impact will launched January 12 and impact Comet Tempel 1 on July 4

And to come...

- CloudSat will launch May 26, 2005, a mission using radar to measure the vertical structure of Earth's clouds and their properties
- Mars Reconnaissance Orbiter (MRO) launches August 10, 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°F)
 - 2.5 year life, 5 year goal
 - 3 infrared instruments, operating at 3-180 μm
- Latest headline
 - Spitzer Finds Stellar 'Incubators' with Massive Star Embryos (1/12/05)
- More info:
<http://www.spitzer.caltech.edu>



Stardust



- 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



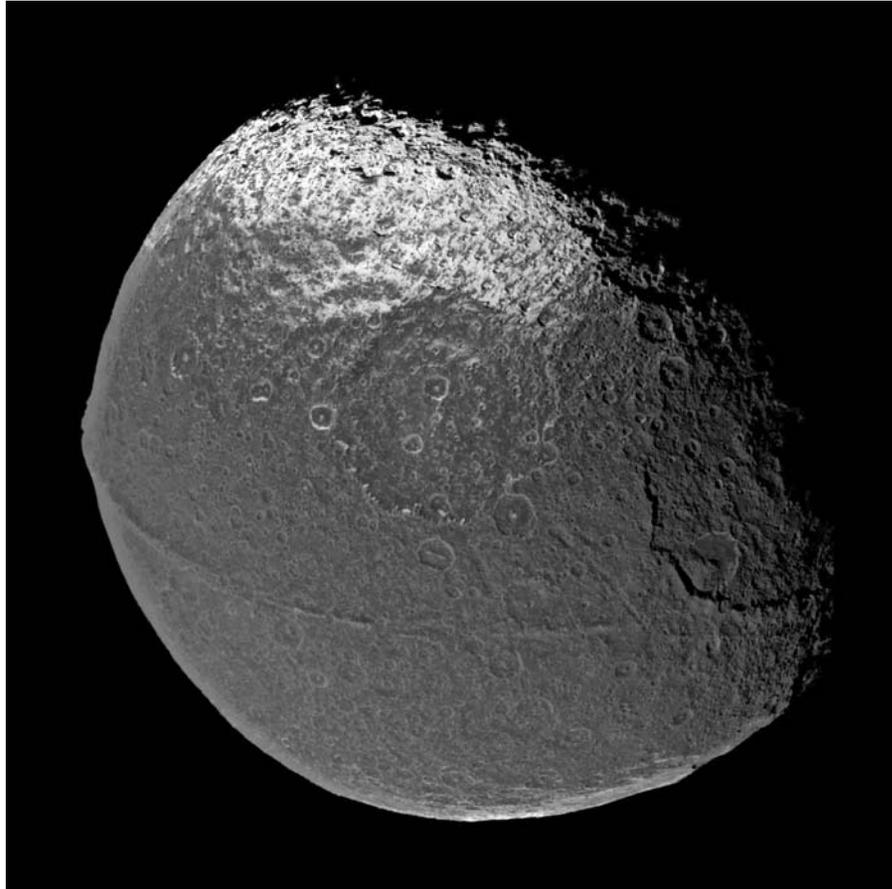
Mars Rovers: Spirit and Opportunity



- Mission
 - 2 rovers landed on Mars
 - 3 month primary mission
 - 1 year of operation so far
- Latest headline
 - NASA Rovers' Adventures on Mars Continue (01/03/05)
- 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
 - Saturn's Moon Iapetus Shows a Bulging Waistline (01/07/05)
- More info:
<http://saturn.jpl.nasa.gov>



ESA's Huygens Probe Lands On Titan

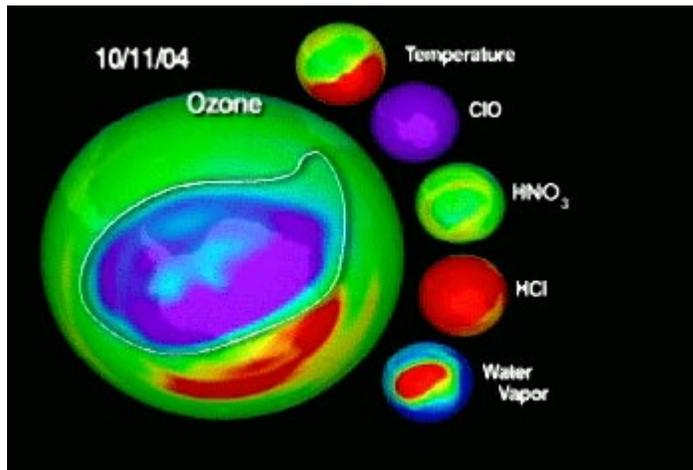


To be updated with latest press release on 1/21/05

- Science
 - Measure chemical reactions occurring in Titan's atmosphere
 - Determine the source of the hydrocarbon compounds and detect biological activity in Titan, which is so abundant in Titan's atmosphere
 - Determine if there are oceans on Titan
 - Identify complex organic compounds and 'pre-biotic' molecules on Titan
- Mission
 - Descent through Titan's atmosphere and land on the surface
- Latest headline
 - More of Titan's secrets to be unveiled on 21 January (01/18/05)
- More info:
<http://www.esa.int/SPECIALS/Cassini-Huygens/>



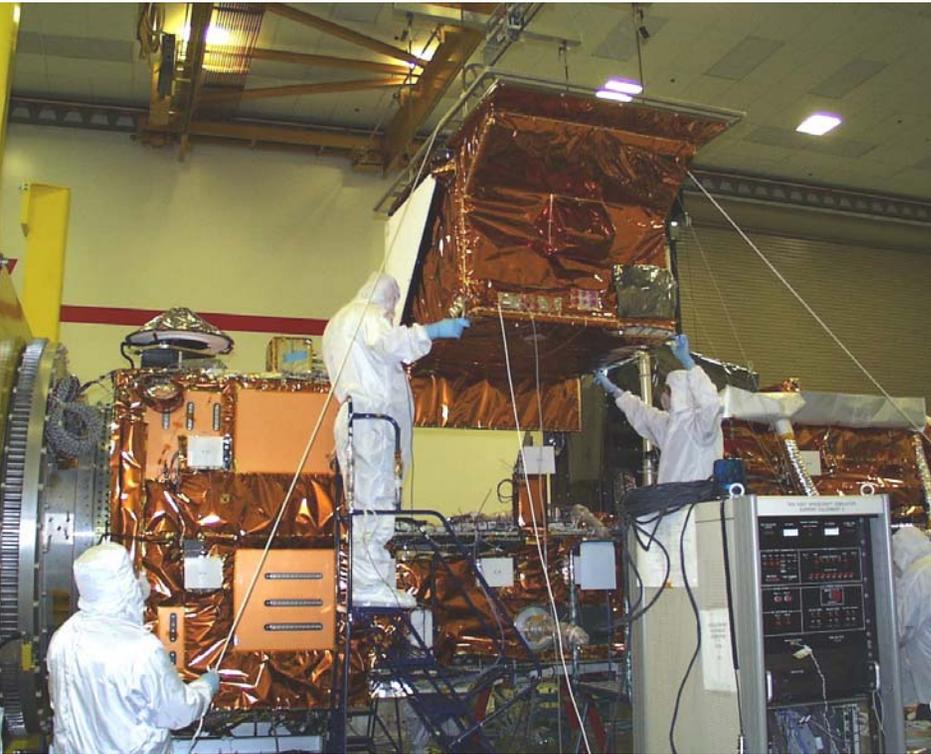
Aura – Microwave Limb Sounder



- 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 (CH₃CN), 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 (CH₃CN), hydrogen cyanide (HCN); biomass burning injections
- Mission
 - Orbiting the earth on the Aura spacecraft
- Latest headline
 - NASA'S Aura Satellite Sheds new Light On Air Quality and Ozone Hole (12/14/04)
- 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 volcanoes; and
 - Biogeochemical cycles of the interaction of the lower atmosphere and the biosphere.
- Mission
 - Orbiting the earth on the Aura spacecraft
- Latest headline
 - NASA'S Aura Satellite Sheds new Light On Air Quality and Ozone Hole (12/14/04)
- More info: <http://tes.jpl.nasa.gov>



Deep Impact



- Science
 - Observe how the crater forms
 - Measure the crater's depth and diameter
 - Measure the composition of the interior of the crater and its ejecta
 - Determine the changes in natural outgassing produced by the impact
- Mission
 - Impact Comet Tempel 1 to study its pristine interior by excavating a crater more than 25 m deep and 100 m in diameter
- Latest headline
 - Deep Impact Status Report (01/13/05)
- More info:
<http://deepimpact.jpl.nasa.gov/>



A Sampling of Upcoming JPL Missions

- **Mars**
 - Phoenix lander - 2007 launch
 - Mars Science Lander - 2009 launch
 - Continuing series of Mars missions
- **Solar system missions (not Mars and not Earth)**
 - 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**
 - Orbiting Carbon Observatory - 2007 launch
 - Aquarius - 2007 launch
 - Ocean Surface Topographic Mission - 2008 launch
- **Astrophysics**
 - Kepler - 2007 launch
 - Wide Field Infrared Survey Explorer - 2008 launch
 - Space Interferometry Mission - 2009 launch
- **Other NASA missions to watch**
 - MESSENGER orbits Mercury in March, 2011, after 3 flybys in 2008 and 2009
 - Lunar Reconnaissance Orbiter launches in 2008



For More Information...

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