

NASA



Exploring the Planets: Venus, Saturn, Mars and More...

with
Ann Tavormina, PhD

Sally Ride Science ClubTM

"Reach for the Stars"

Los Angeles Science Festival

March 23, 2002

in association with Caltech and NASA's
Jet Propulsion Laboratory

Why become a scientist?

- To increase humanity's knowledge and deepen its understanding of:
 - How nature works, in the large and the small, the close and the far
 - The origins and destiny of our solar system
 - How Earth and its inhabitants fit in the grand scheme
- With the ultimate goal of:
 - Understanding how we may shape our place in the universe
 - Benefiting the quality of life on Earth
- But, maybe, mostly, *because that is what you're drawn to most of all...*

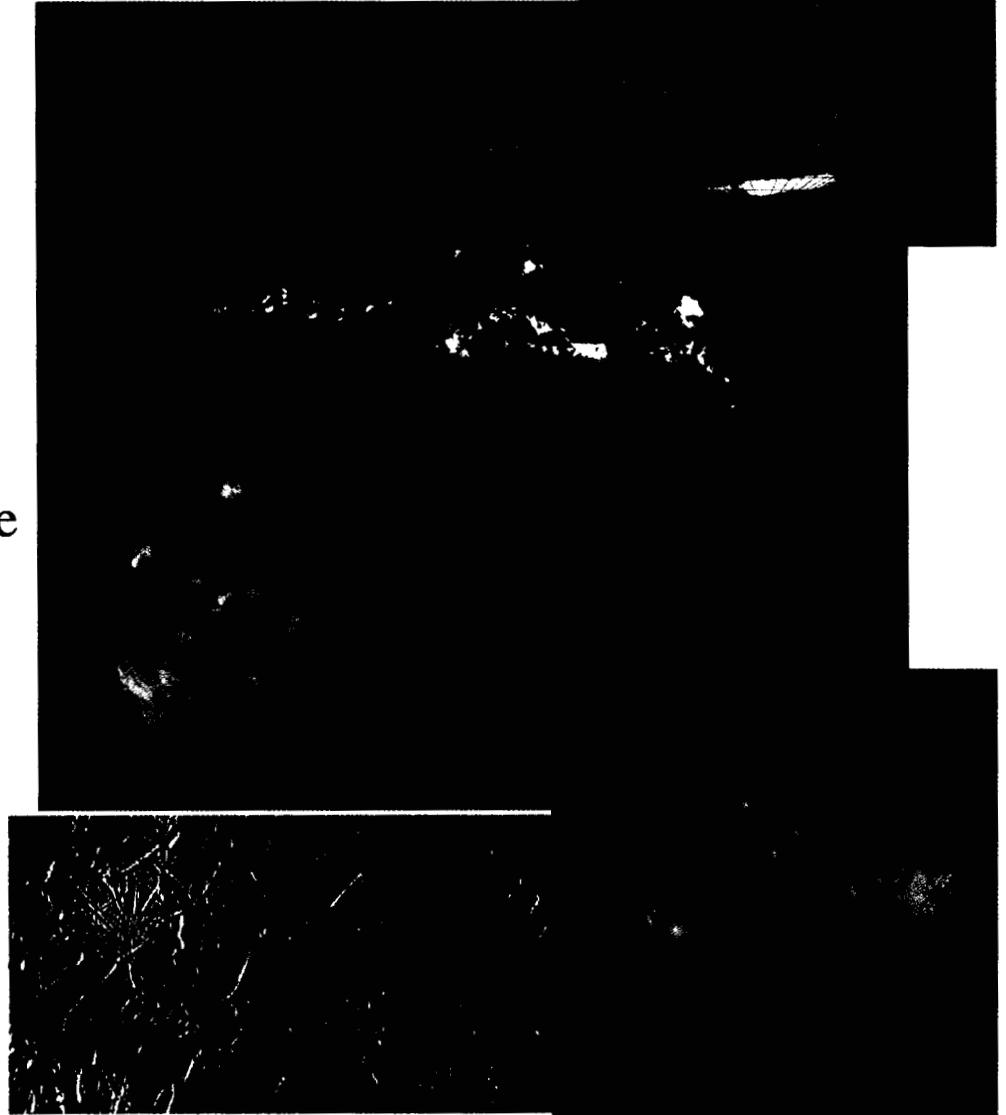
On receiving the Nobel Prize: "It might seem unfair to reward a person for having so much pleasure over the years, asking the maize plant to solve specific problems and then watching its responses. I can't imagine a better life." Barbara McClintock (1902 -), Geneticist

What can we learn from planetary exploration?

- We can learn about:
 - How stars and planets form
 - How planets are different from each other and how they change over time
 - The origins of the makings of life and whether life has arisen elsewhere in the solar system
 - The interaction of the Sun and the Earth
 - The interactions of Earth's land, oceans and atmosphere
 - The future habitability of Earth and other planets

Our
Oceans

The Earth & Mars

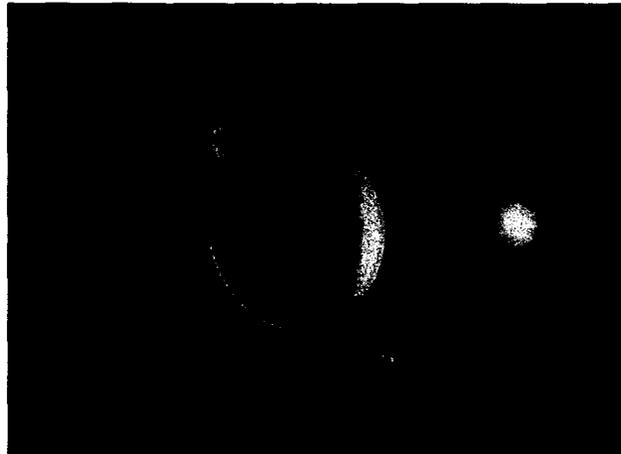


Europa's Icy Crust

Io and its Volcanoes

*"If I didn't believe the answer could be found, I wouldn't be working on it."
Florence Sabin (1871 - 1953), first female professor at a medical school*

Some past and future missions



Magellan Mission at Venus, 1990-93



Cassini Orbit Insertion, July 2004



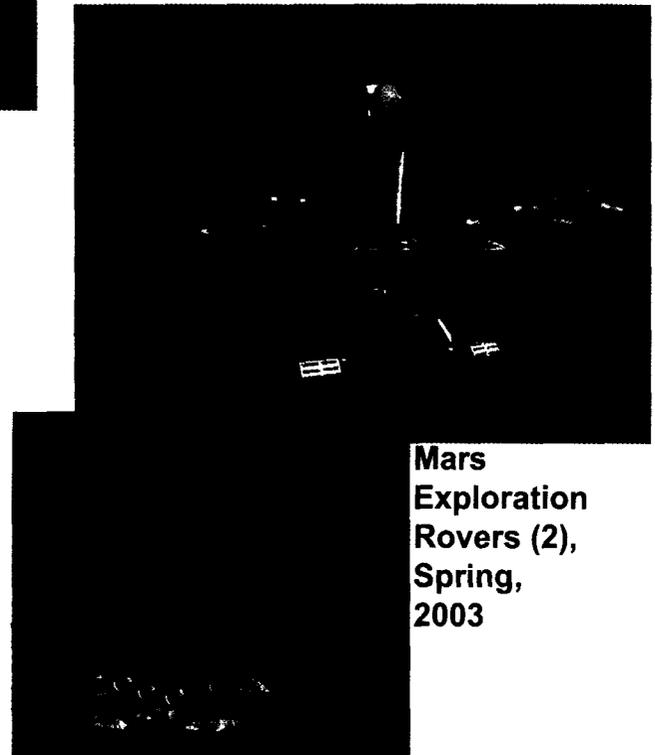
**Terrestrial Planet Finder Mission,
in conceptual development**



Mars Sojourner, Pathfinder Mission, 1997



**Tropospheric Emission
Spectrometer (TES on
AURA spacecraft);
June 2003**

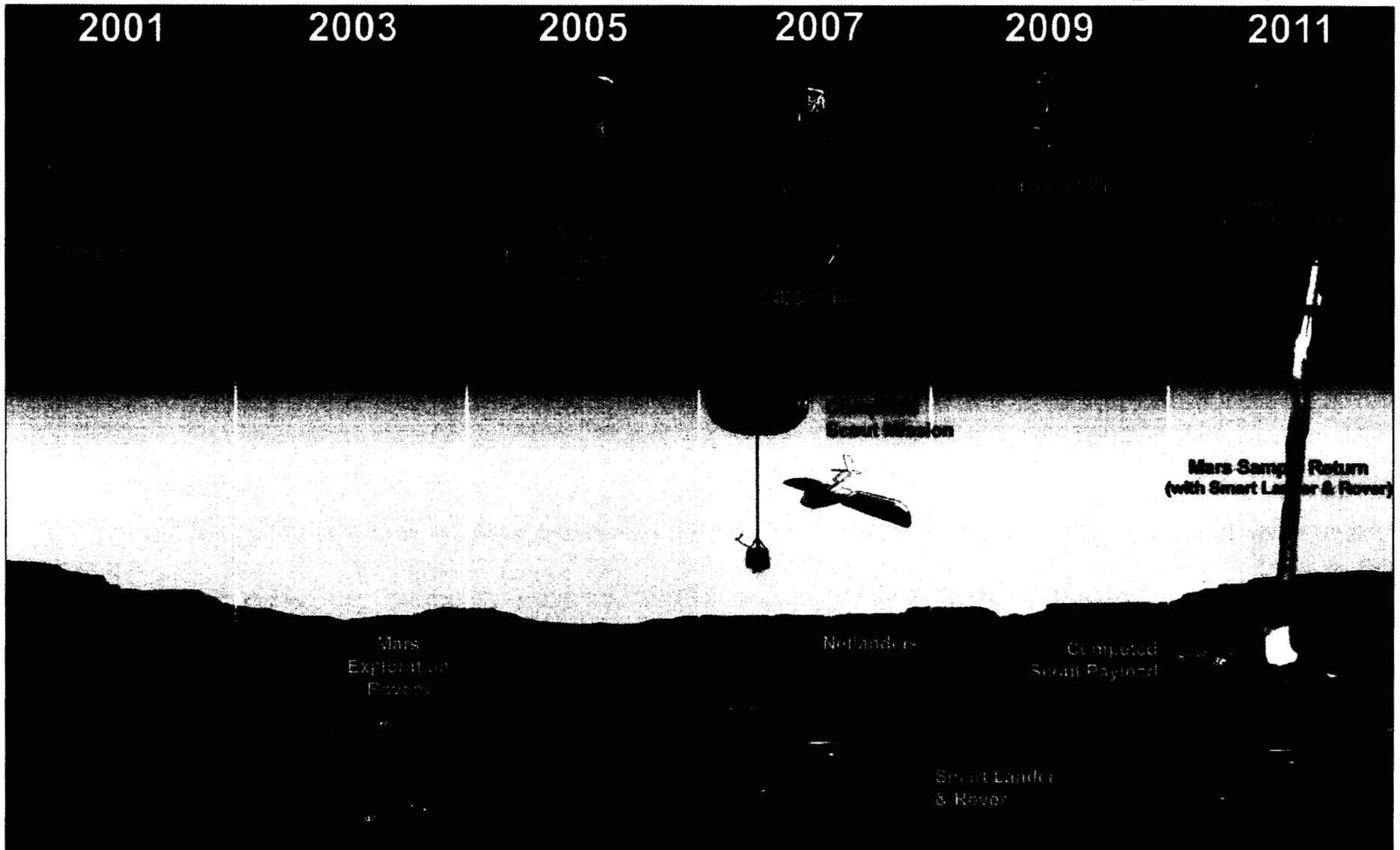


**Mars
Exploration
Rovers (2),
Spring,
2003**

"It is not easy to be a pioneer - but, oh, it is fascinating! I would not trade one moment, even the worst moment, for all the riches in the world." Elizabeth Blackwell (1821 - 1910) first woman physician in the U.S.

The plan for Mars...

Will you be a part of it?

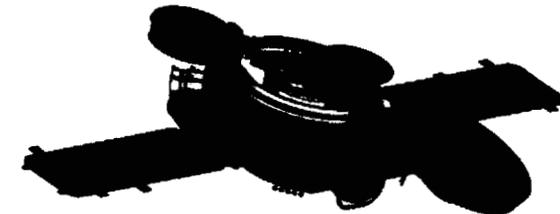


"You may have to fight a battle more than once to win it." Margaret Thatcher (1925 -)

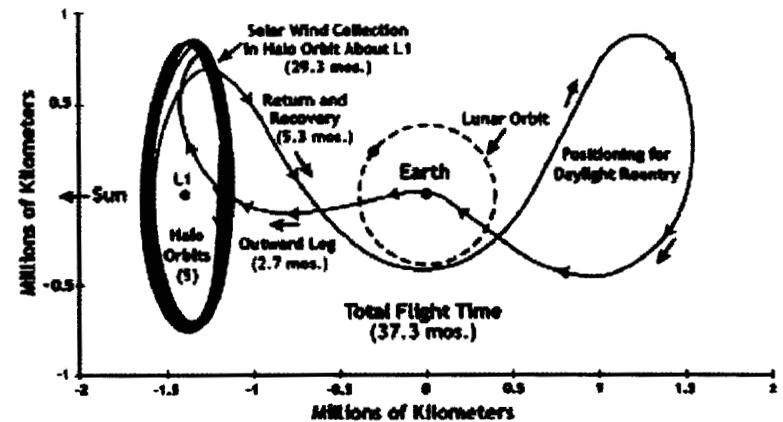
Science and engineering fields useful in planetary exploration:

- Science
 - Physics
 - Astronomy
 - Mathematics
 - Computer Science
 - Chemistry
 - Biology
 - Atmospheric Science
 - Earth Science
 - Geology
 - Planetary Science
 - Oceanography
 - Materials Science
 - Robotics
 - and more...
 - Engineering
 - Electrical
 - Mechanical
 - Nuclear
 - Telecommunications
 - Aeronautical
 - Astronautical
 - Systems
 - and more...
- For Human Spaceflight, add:
- Medicine
 - Radiation Biology
 - Environmental Engineering
 - Psychology
 - and even more...

Cassini & Huygens at Saturn and Titan



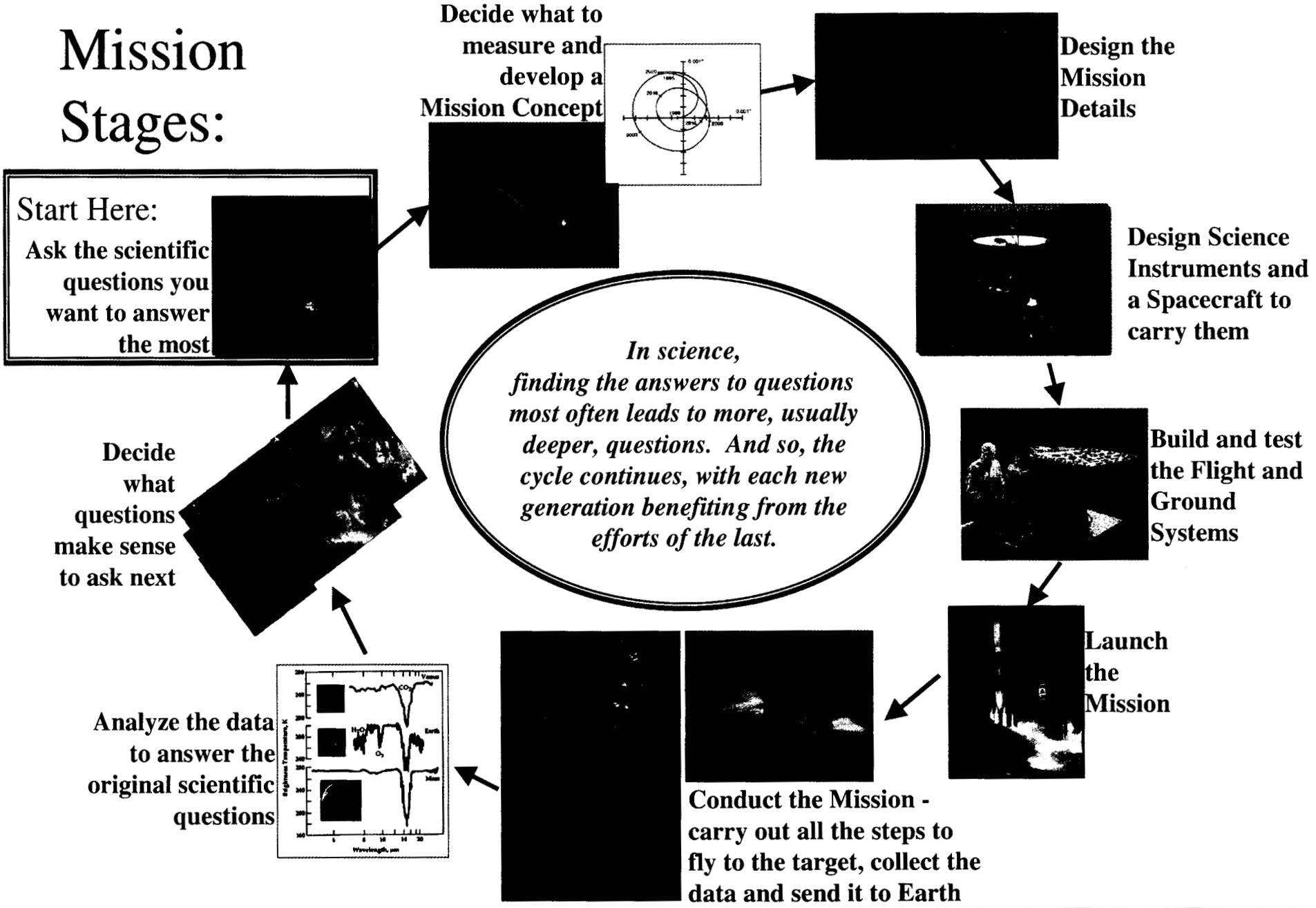
Genesis solar wind collector



Genesis Mission Trajectory

“When you get into a tight place and it seems you can’t go on, hold on, for that’s just the place and the time that the tide will turn.” Harriet Beecher Stowe (1811-1896)

Mission Stages:



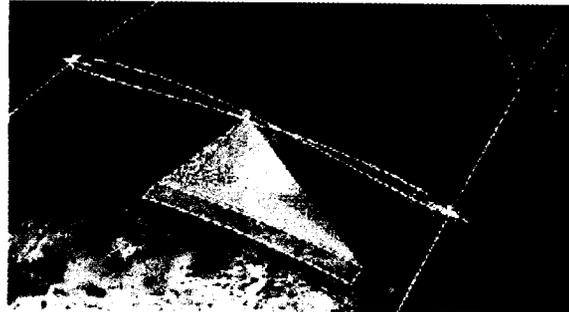
*"The world is round and the place which may seem like the end, may also be only the beginning."
Ivy Baker Priest (1905 - 1975) US Secretary of the Treasury*

What is needed to make a space mission successful?

Enough people with
The right skills,
Enough time and
Enough money,

Working together as a TEAM,
Sharing the common goal of
Solving whatever problems arise

To accomplish the mission's objectives



Techsat-21 Constellation, August 2004

Sand dunes & layered Martian Terrain



Solar Sail Concept



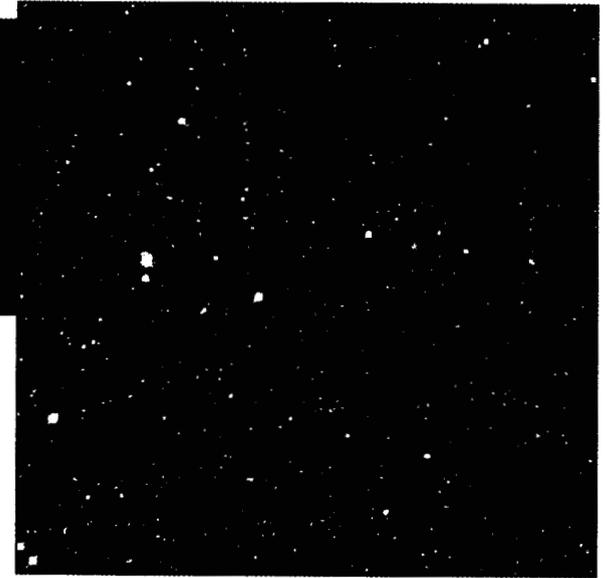
Gravity Recovery and Climate Experiment (GRACE) Mission

"It is better to light a candle than to curse the darkness." Eleanor Roosevelt (1884-1962)

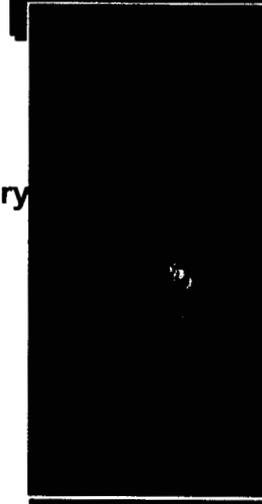
What does the future hold?

- For robotic exploration -
 - Missions to the sun, planets and small bodies in the solar system
 - Astronomical missions from Earth- and space-based observatories
 - The search for extra-terrestrial life, within and beyond the solar system
 - A fuller understanding of the Earth, the interactions of its air, water and land systems and the Sun's effect upon our world
 - Paving the way for human exploration
 - And, some day, the first interstellar mission...

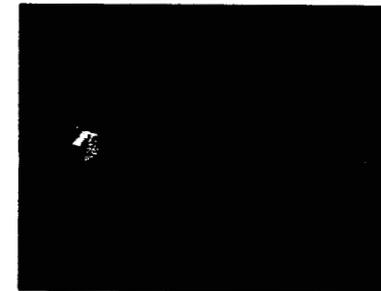
Trillions of Stars



Mercury



Deep Impact,
Jan
2004



Low
Temp.
Physics
Exp't,
Nov.
2005



Stardust comet dust collector

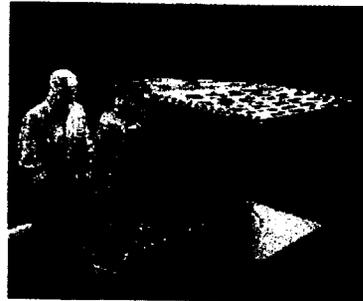
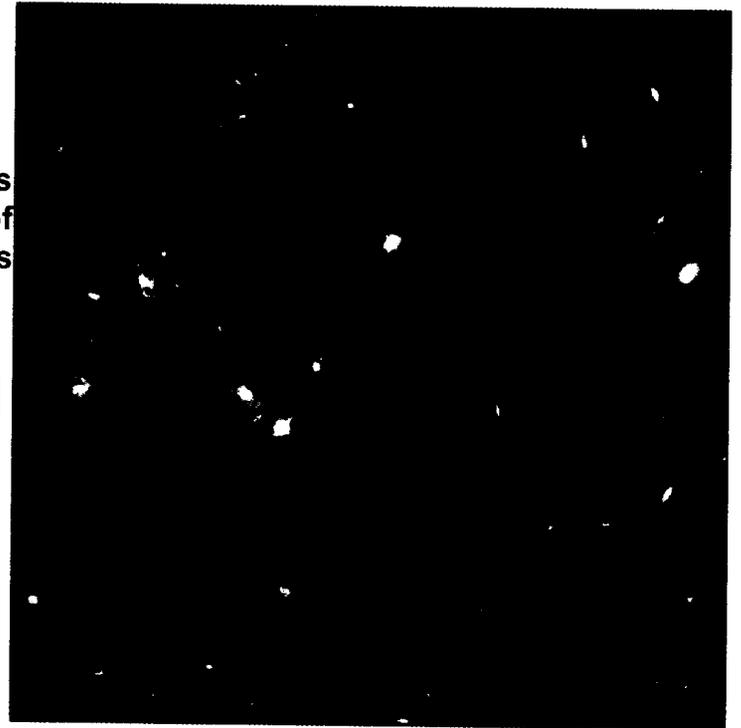
"Take each good day and relish each moment. Take each bad day and work to make it good."

Lisa Dado (1930 -) American Writer

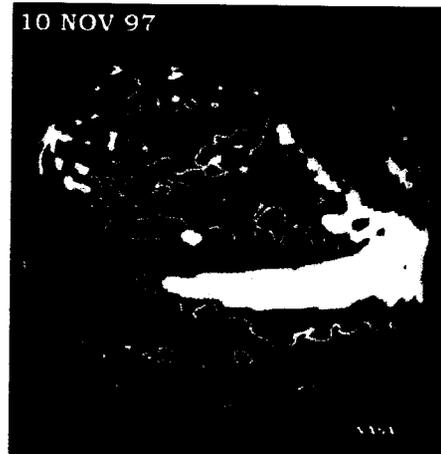
What does the future hold?

- For you -
 - Some exciting years, full of growing and learning:
 - Junior High
 - High School
 - College
 - Graduate School
 - The opportunity to choose a field you love and make the impact you want in the world
- So, aim high, set your sights and never give up - you'll have a great ride!

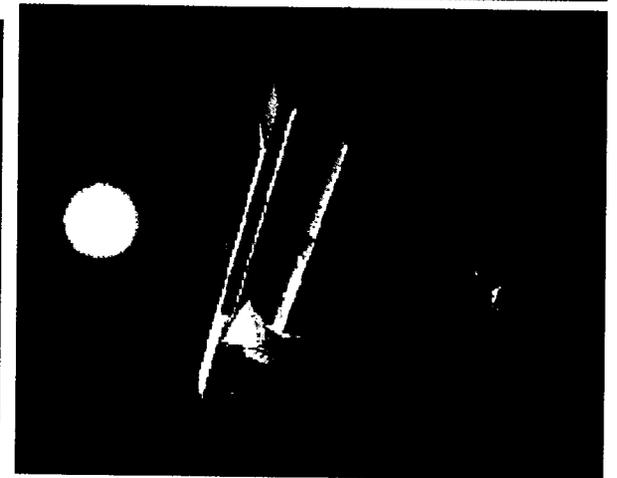
Billions
of
Galaxies



AIRS; April 2002



Topex/Poseidon Mission



SIRTF, January 2003

"You cannot hope to build a better world without improving the individuals. To that end each of us must work for his own improvement, and at the same time share a general responsibility for all humanity, our particular duty being to aid those to whom we think we can be most useful." Marie Curie (1867 - 1934)