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Panel Session I - Exploration has Already Begun: Space Science within the new "Vision" for NASA

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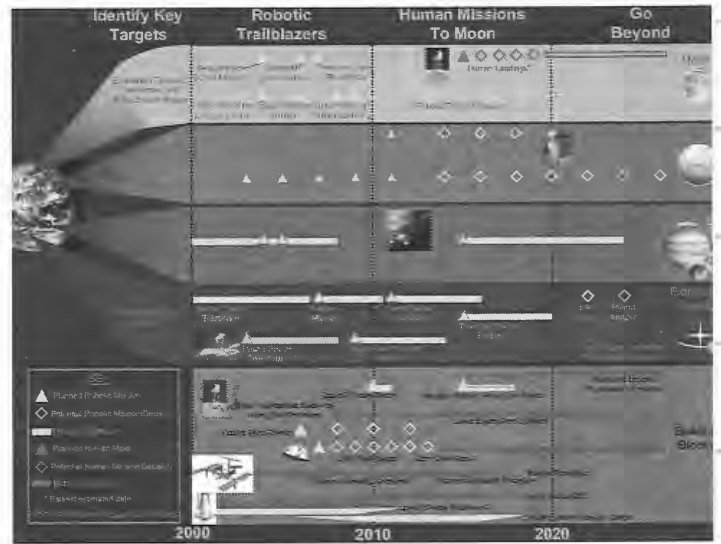
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Exploration has Already Begun: Space Science within the new "Vision" for NASA

[See also Panel III]

Dr. Harley Thronson
Director of Technology
NASA Office of Space Science



The Space Science Vision

The Space Science Enterprise seeks to discover:

- How the universe began and evolved
- How we got here
- Where we are going
- Whether we are alone

A Robust Space Science Program Consistent with the President's "Vision"

Emphasis in four broad areas:

- A new lunar robotic program and an augmented Mars robotic program to achieve science goals and support human exploration.*
- Robotic exploration in the outer Solar System specifically to search for life's other potential abodes.*
- Seek Earth-like worlds outside the Solar System via astronomical observations.*
- Understand and predict the effects of "Space Weather and Climate" on robotic and human systems.*

... and the technologies to achieve this.

The Sun Planet Connection: Space Weather and Climate

How does the planet respond to solar variation

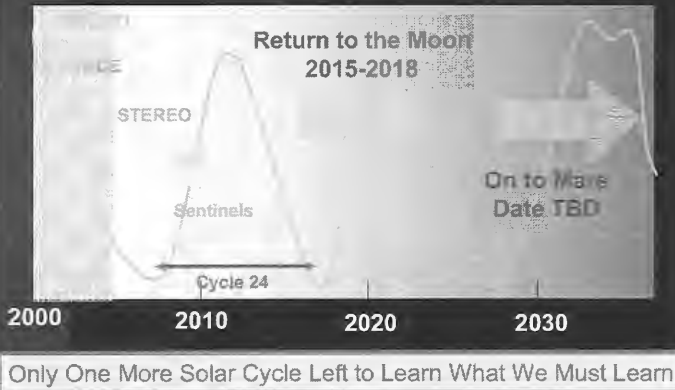
- Disruption of technology based systems
- Harm humans in space
- Climate change

Why Should We Care About Space Weather?

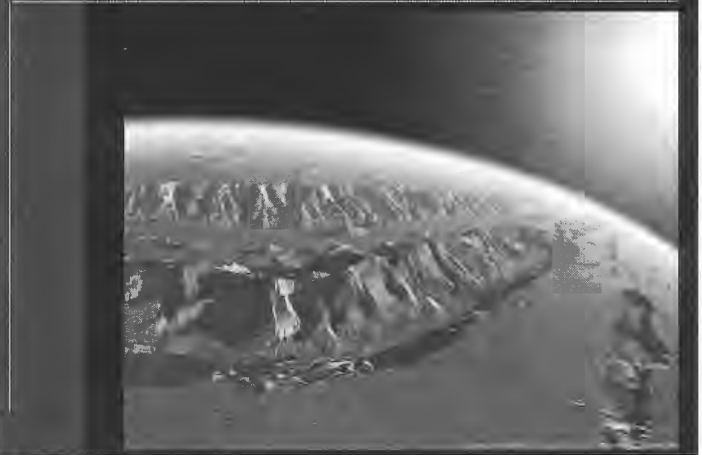
Return to the Moon On to Mars Beyond...

Radiation exposure will be a significant and serious hazard during any human expedition transiting deep space

Significant Events in the Moon, Mars, and Beyond Vision



Finding the Habitable Zones ...in space and time: Exploring the Solar System's Other Possible Abode for Life



Why Mars?

Mars is the nearest planet for which the search for evidence of life is justified:

- Earliest Mars preserves record of conditions and materials from which LIFE could have started (on Mars or on Earth)
- Even today there are places on Mars that are "habitable"

Mars is so much like Earth, yet surprisingly different

- Silicate planet with an atmosphere, hydrosphere, and climate
- Potentially allows for comparative climatology with Earth
- Natural "control experiment" for key state variables

Mars inspires, both scientifically, and as a tangible frontier

- Today's MEP will provide the knowledge needed to decide when to send human explorers to the Red Planet

The Outer Solar System: Life in *Truly* Extreme Environments?



If we do not find life elsewhere in the Solar System, there is a Universe of worlds to investigate.



The Astronomical Search for Life-bearing Planets

And Who Else is Looking for Their Origins?

A Search for Extra-Solar Planets and Life Beyond the Solar System



The First Steps to Studying in Detail the Universe of Planets Beyond the Solar System

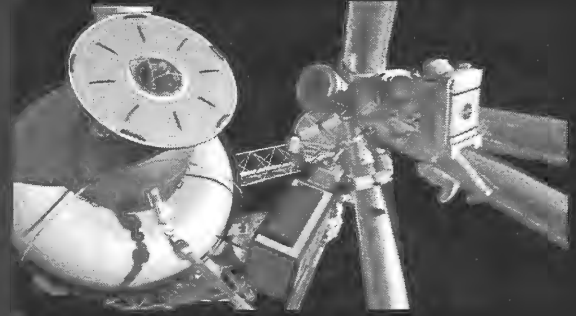
The James Webb Space Telescope: planned for launch in 2011 to study the birth of galaxies, stars, and planets.



The Terrestrial Planet Finder: one design, planned for launch in the middle of the next decade, to search for Earth-like worlds.



Human and Robotic Collaboration to Achieve the President's "Vision"



A Libration Point "gateway" facility supporting humans and robots to assemble a telescope to search for Earth-like worlds.

NASA
Humans and Robots Collaborating to Answer One of Humanity's Defining Questions

Are we alone?



Planet Imager - 2020+

Experience with the Hubble Space Telescope demonstrates the enormous public appeal of using astronauts to achieve astronomical goals.



The Moon, Mars, and Beyond
 ...the search for life:
 Humanity's most enduring quest