# The Planetary Decadal Survey Today

Steve Squyres
Cornell University
Chairman, Planetary Science Decadal Survey

NATIONAL RESEARCH COUNCIL
*OF THE NATIONAL ACADEMIES*

# The Situation

- The President's FY'13 budget sharply cuts funding for planetary exploration.
- Efforts are underway in Congress to restore much of that funding.
- The Decadal Survey was based on extensive community inputs. It provides:
  - Priorities for planetary exploration.
  - Decision rules for adjusting the program if budget cuts occur.
- So: What do the Decadal Survey recommendations mean now?

# From the Statement of Task

- Recommendations on the optimum balance across the solar system and among small, medium,and large missions.
- Discovery: Flight investigations… should not be identified or prioritized.
- New Frontiers: A candidate list of mission objectives.
- Flagships: Specific destinations and science goals.
- The prioritization of flight investigations of Mars and the Moon should be integrated with flight investigation priorities for other solar system objects.

# Programmatic Balance

- Programmatic balance takes two forms:
  - Balance across the solar system, assuring that the most important scientific objectives are met.
  - Balance in mission sizes (small, medium large).
- A program of only infrequent large missions would result in long stretches of relatively little new data being generated, leading to a stagnant community.
- A program of only small and medium missions would be incapable of addressing the most important scientific challenges.
- *NASA's suite of planetary missions for the decade 2013-2022 should consist of a balanced mix of Discovery, New Frontiers, and Flagship missions, enabling both a steady stream of new discoveries and the capability to address larger challenges like sample return missions and outer planet exploration.*

# MEPAG's Decadal Input

- "The following mission building blocks are proposed for the coming decade:
  - "*TGM* to determine the abundances and spatial/temporal variations of trace gases and isotopes in the present atmosphere and their implications for life
  - "*NET* to explore the nature and history of the interior and the implications for the surface and atmospheric environments
  - "*MSR [MAX-C + Return Lander & Orbiter]* to return diverse suites of carefully chosen samples from a well-characterized site to Earth for detailed geological and astrobiological study.

- "*these steps would make the greatest progress to answering fundamental questions of Solar System science*, including the age-old question of whether Mars is today—or ever was—an abode of life." -- *MEPAG White Paper*

# Mars Mission Studies Conducted

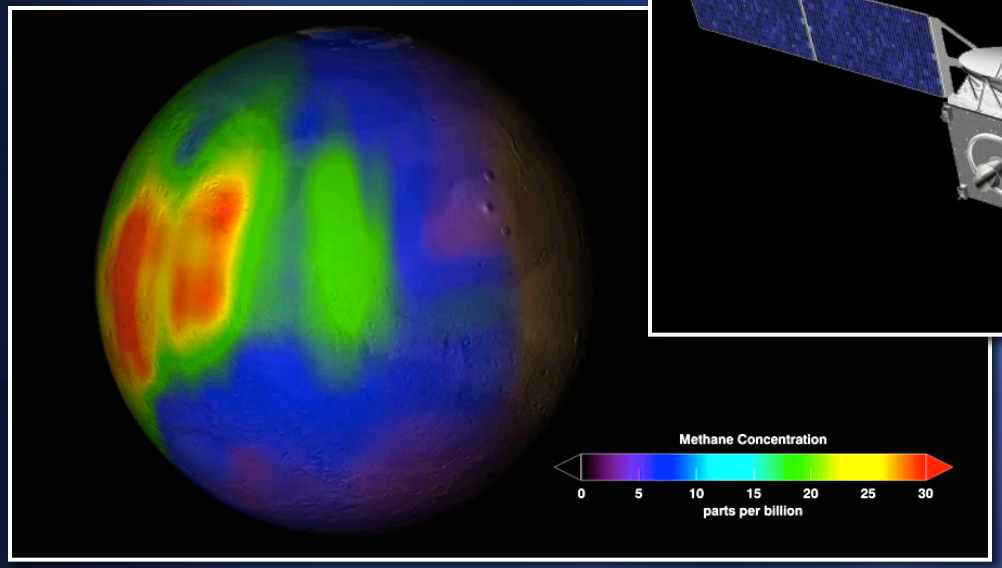
- Mars Trace Gas Orbiter
- Mars Network Mission
- Mars Polar Mission
- Skycrane Capabilities Study
- Mars Sample Return:
  - Mars Astrobiology Explorer with Caching
  - Mars Sample Return Lander
  - Mars Sample Return Orbiter

# Discovery Program

- The recommended Discovery mission cost cap is $500 million.

- Discovery missions are selected via open competition and peer review, so no specific mission recommendations were made.

# Mars Trace Gas Orbiter




- Joint mission with ESA: NASA provides most of the science payload, and the launch.

- *Carry out this mission as long as this division of responsibilities with ESA is preserved.*

# New Frontiers 4 and 5

- Select NF-4 from among:
  - Comet Surface Sample Return
  - Lunar South Pole-Aitken Basin Sample Return
  - Saturn Probe
  - Trojan Tour and Rendezvous
  - Venus In Situ Explorer

- Select NF-5 from among:
  - The remaining candidates from NF-4
  - Io Observer
  - Lunar Geophysical Network

# Flagship Missions
(in priority order)

1. Begin NASA/ESA Mars Sample Return campaign: *Descoped Mars Astrobiology Explorer-Cacher (MAX-C)*

2. Detailed investigation of a probable ocean in the outer solar system: *Descoped Jupiter Europa Orbiter (JEO)*

3. First in-depth exploration of an Ice Giant planet: *Uranus Orbiter and Probe*

4. Either *Enceladus Orbiter* or *Venus Climate Mission* (no relative priorities assigned)

# If Less Funding Is Available…

- Descope or delay Flagship missions.
- Slip New Frontiers and/or Discovery missions only if adjustments to Flagship missions cannot solve the problem.
- Place high priority on preserving R&A and technology development funding.

# Implications

- Protect R&A, Technology, Discovery and New Frontiers.
- *Fly a sample caching Mars mission only if:*
  - *The cost to NASA is no more than $2.5 billion.*
  - *It leads realistically to sample return.*
- If this mission does not meet these criteria, second priority is JEO.
- If JEO is not affordable, third priority is Uranus Orbiter and Probe ($2.7 billion).
- If UOP is not affordable, fourth priority is Venus Climate Mission ($2.4 billion) or Enceladus Orbiter ($1.9 billion).

# Summary

- Protecting R&A, technology, and the Discovery and New Frontiers programs remain high priority.
- The decadal priorities and decision rules for Flagship missions were designed specifically for a situation like the current one, and can be applied accordingly.
- Regarding Mars specifically:
  - New Mars missions that lead directly to sample return have high priority.
  - New Mars missions that do not lead directly to sample return should be openly competed via the Discovery program.