

NOTE ADDED BY JPL WEBMASTER: This content has not been approved or adopted by, NASA, JPL, or the California Institute of Technology. This document is being made available for information purposes only, and any views and opinions expressed herein do not necessarily state or reflect those of NASA, JPL, or the California Institute of Technology.

SolarSystem2012: The Planetary Science Decadal Survey

Steve Squyres
Cornell University
Chairman, Planetary Science Decadal Survey

MEPAG

Monrovia, CA, 30 September, 2010

What is a Decadal Survey?

- Once every ten years, at the request of NASA and the NSF, the National Research Council carries out a “decadal survey” for planetary science.
- The decadal survey is the primary scientific input that NASA will use to design its future program of planetary exploration.
- The results of the survey are intended to reflect a community consensus. Extensive community participation and input is therefore essential.
- SolarSystem2012 will apply to the decade from 2013 to 2022.

What will the Survey Address?

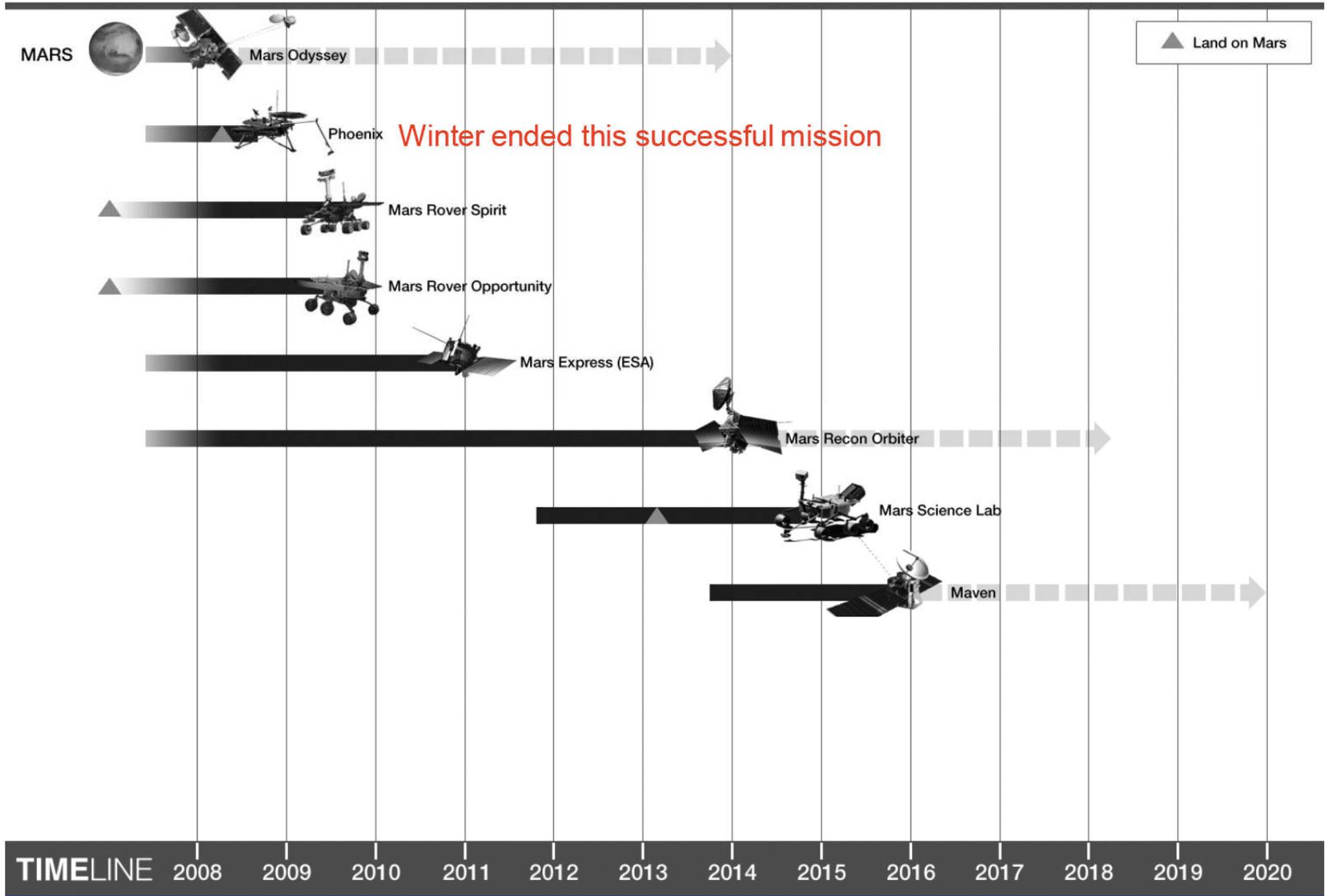
- Overview of planetary science and current state of knowledge
- List of the key scientific questions
- Assessment of NSF-funded infrastructure (e.g., ground-based telescopes)
- Recommendations on NASA program balance:
 - Mix of mission targets
 - Mix of mission sizes
 - Research activities
- Prioritized lists of New Frontiers and Flagship missions for the next decade
- Recommendations for NASA-funded research activities
- Recommendations for technology development

What's In and What's Out

- Only missions that have a formal budgetary new start are assumed *a priori* to be part of the decadal plan.
- Missions that have been extensively discussed and studied but do not yet have a new start (e.g., Europa Orbiter, International Lunar Network, various future Mars missions) are “on the table”.
- NASA views SolarSystem2012 as the formal statement of priority for the coming decade by the US planetary science community, and has stated their intent to give highest priority to the missions identified in the survey.

Mars Mission timeline

Next Decadal



SolarSystem2012 Committee Organization

Steering Group

Steve Squyres, Chair
Larry Soderblom, Vice Chair
Vice Chairs of Panels
9 others

Inner Planets Panel

Ellen Stofan, Chair
Steve Mackwell, Vice Chair
10 others

Outer Planets Panel

Heidi Hammel, Chair
Amy Simon-Miller, Vice Chair
10 others

Primitive Bodies Panel

Joe Veverka, Chair
Hap McSween, Vice Chair
10 others

Mars Panel

Phil Christensen, Chair
Wendy Calvin, Vice Chair
11 others

Outer Planet Satellites Panel

John Spencer, Chair
Dave Stevenson, Vice Chair
10 others

Steering Group

- Steven W. Squyres, Cornell University
- Laurence A. Soderblom, U.S. Geological Survey
- Wendy M. Calvin, University of Nevada, Reno
- Dale Cruikshank, NASA Ames Research Center
- Pascale Ehrenfreund, George Washington University and Leiden Institute of Chemistry
- G. Scott Hubbard, Stanford University
- Margaret G. Kivelson, University of California, Los Angeles
- B. Gentry Lee, Jet Propulsion Laboratory
- Jane Luu, Massachusetts Institute of Technology, Lincoln Laboratory
- Stephen Mackwell, Lunar and Planetary Institute
- Ralph L. McNutt, Jr., Johns Hopkins University, Applied Physics Laboratory
- Harry Y. McSween, Jr., University of Tennessee, Knoxville
- George A. Paulikas, The Aerospace Corporation (Retired)
- Amy Simon-Miller, NASA Goddard Space Flight Center
- David J. Stevenson, California Institute of Technology
- A. Thomas Young, Lockheed Martin Corporation (Retired)

Mars Panel

- Philip R. Christensen - (Chair), Arizona State University
- Wendy M. Calvin - (Vice Chair), University of Nevada, Reno
- Raymond E. Arvidson, Washington University
- Robert D. Braun, Georgia Institute of Technology
- Glenn Cunningham, JPL (retired)
- David Des Marias, NASA Ames Research Center
- Linda T. Elkins-Tanton, Massachusetts Institute of Technology
- François Forget, Université de Paris
- John P. Grotzinger, California Institute of Technology
- Penelope King, The University of New Mexico
- Philippe Lognonne, Institut de Physique du Globe de Paris
- Paul R. Mahaffy, Goddard Institute for Space Studies
- Lisa M. Pratt, Indiana University

Overall Schedule 2008-2011

2008

4th Quarter Informal request received by NRC, NRC approves initiation, Formal request received, Proposal to NASA.

2009

1st Quarter Funding received, Chair identified,
Chair and Vice Chair appointed
2nd Quarter Steering Group appointed, Panels Appointed
3rd Quarter Meetings of the Steering Group and Panels begin
4th Quarter Panels' period of peak activity

2010

1st- 2nd Quarter Final Panel meetings, Panel reports finalized
2nd-3rd Quarter Prioritization and drafting of survey report
4th Quarter Draft survey report to reviewers, Report revised

2011

1st Quarter Report approved, NASA, NSF, OMB and Congress briefed
and report released (prepublication-format)
3rd Quarter Printed report released

Community Interactions

Broad community input is the defining feature of a decadal survey

- Town halls and open meetings were held early and often (e.g., AGU, VEXAG, MEPAG, OPAG, RAS, LPSC, NLSI, CAPTEM, EPSC, DPS, AGU (again), LPSC, AbSciCon, MEPAG again (right now!)).
- White papers from the community were submitted via the SolarSystem2012 web site.
- Steering committee and panel meetings were webcast live and are archived in full.
- Activities were coordinated with other groups that have overlapping interests (e.g., Astro2010)

White Papers

- One of the most important ways for members of the science community to participate in the decadal survey was via submission of white papers.
- A total of 199 white papers were received in September of last year, with 1669 individual authors/endorsers.
- White papers were assessed in detail by the panels, and folded into all panel activities.

Evaluation of Candidate Missions

- Compared to previous decadal surveys, this one placed much greater emphasis on evaluation of the technical maturity and probable costs of candidate missions.
- The panels and the steering group included members who are expert in engineering, project management, and cost estimation.
- Resources were available to do moderate-fidelity (and conservative!) cost estimates for the highest-priority candidate missions.
- The objective was to produce a realistic set of candidate missions for NASA to carry out in the coming decade.

Assuring Fiscal and Technical Realism

A lack of technical and fiscal realism has been a major weakness of past decadal surveys (in planetary science and other disciplines). This decadal survey adopted a twin-track approach to crafting more robust mission priorities.

Mission studies were conducted by:

- *Jet Propulsion Laboratory*
- *Applied Physics Laboratory*
- *Goddard Space Flight Center*

Independent cost and technical evaluations were provided by:

Aerospace Corporation

The Mission Candidates

- Based on white papers and other community inputs, a total of 25 mission candidates were selected for detailed study.
- The three New Frontiers 3 candidate missions are also on our list, but not being studied as part of the decadal survey:
 - SAGE (Venus lander)
 - MoonRise (South Pole-Aitken Basin lunar sample return)
 - OSIRIS REx (Near-Earth asteroid sample return)

The Mission Candidates

- Mercury Lander (APL)
- *SAGE (NASA NF-3 Candidate)*
- Venus Mobile Explorer (GSFC)
- Venus Tessera Lander (GSFC)
- Venus Climate Mission (GSFC)
- *MoonRise (NASA NF-3 Candidate)*
- Lunar Polar Volatiles Lander (APL)
- Lunar Network Mission (MSFC)

The Mission Candidates

- Mars Trace Gas Orbiter (JPL)
- Mars Polar Mission (JPL)
- Mars Network Mission (JPL)
- Mars Sample Return (JPL):
 - Mars Astrobiology Explorer with Cacheing
 - Mars Sample Return Lander
 - Mars Sample Return Orbiter

The Mission Candidates

- Europa Flagship Mission (JPL)
- Io Mission (JPL)
- Ganymede Mission (JPL)
- Saturn Probe (JPL)
- Titan Flagship Mission (JPL)
- Titan Lake Lander (JPL)
- Enceladus Mission (JPL)
- Uranus System Mission (APL)
- Neptune System Mission (JPL)

The Mission Candidates

- *OSIRIS REx (NASA NF-3 Candidate)*
- Main Belt Asteroid Lander (APL)
- Chiron Orbiter (GSFC)
- Trojan Asteroid Tour (APL)
- Comet Surface Sample Return (APL)

It's Not Just Missions

- Beyond describing a prioritized set of NASA planetary missions, the survey report addresses several other issues:
 - NSF-funded ground-based telescopes
 - Technology development for future NASA planetary missions
 - The NASA and NSF planetary R&A programs
 - Education
 - Public Outreach

There's Going To Be Sticker Shock!

- What NASA does is expensive. In particular, some of the mission candidates are very costly.
- We're working in FY'15 dollars, which makes the problem look even worse.
- The number of missions that can be conducted with the available funds is highly restricted.
- Some very tough choices had to be made.
- Prioritization was guided by the inputs received from the science community, including MEPAG.

Current Status

- The first draft of the report has been written and will be transmitted to the NRC at midnight tonight!
- The report will undergo rigorous external peer review, per NRC policies and standards
- Once revised and approved, the report will be released, and briefed widely:
 - NASA
 - NSF
 - Office of Management and Budget
 - Congress
 - Science community

Our Web Site

http://sites.nationalacademies.org/SSB/CurrentProjects/ssb_052412

QuickTime™ and a
decompressor
are needed to see this picture.