

SolarSystem2012: The Planetary Science Decadal Survey

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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.

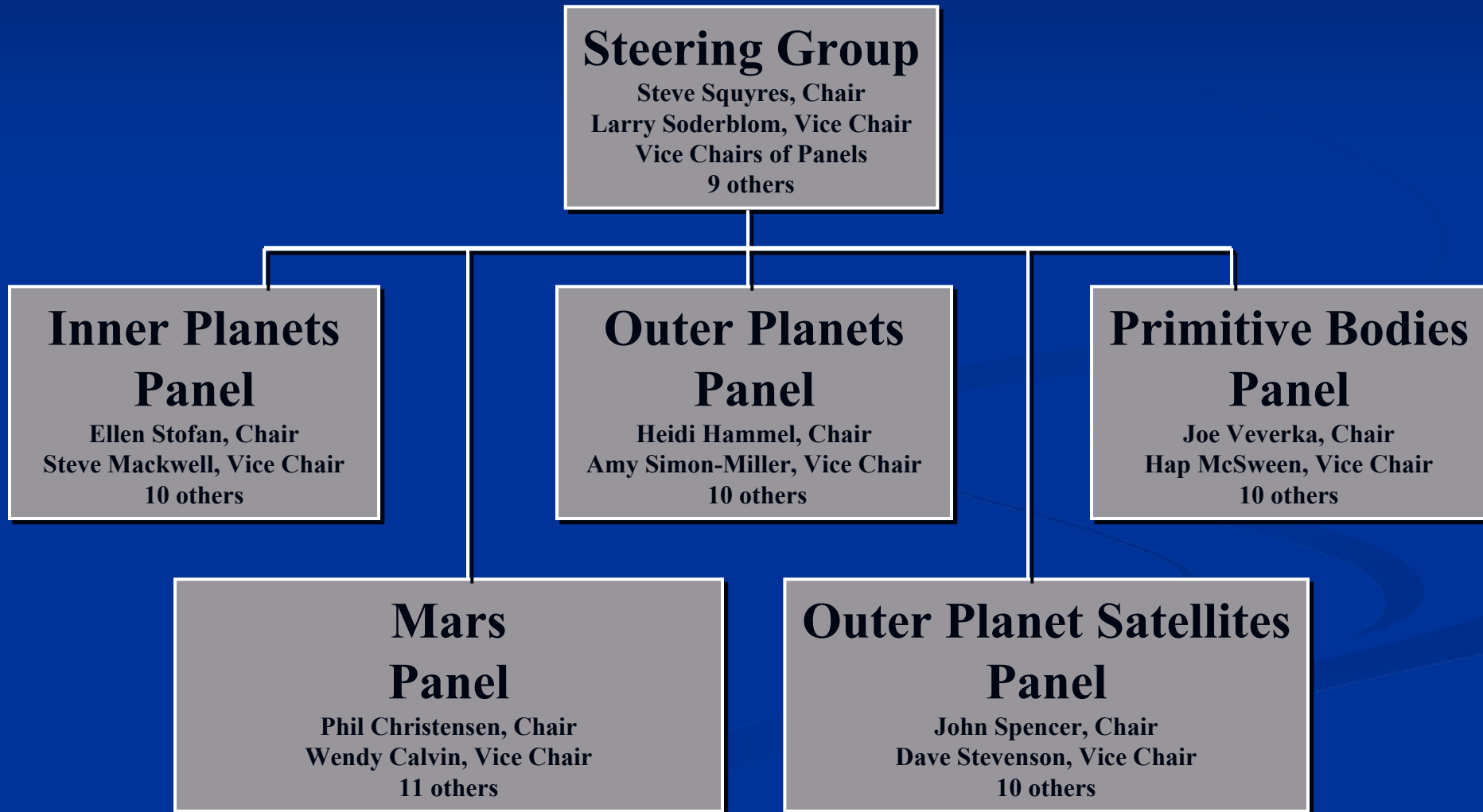
What will the Survey Address?

- 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 list of New Frontiers and Flagship missions for the next decade
- Recommendations for NASA-funded research activities
- Recommendations for technology development

Statement of Task

- Decadal survey activities are governed by a “statement of task”, available at the decadal survey web site.
- The statement of task was provided by NASA and NSF, with input from the White House Office of Management and Budget.
- The statement of task for this decadal survey places a strong emphasis on identifying a suite of missions that can be carried out in full by NASA using the funding projected to be available.

SolarSystem2012 Committee Organization



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

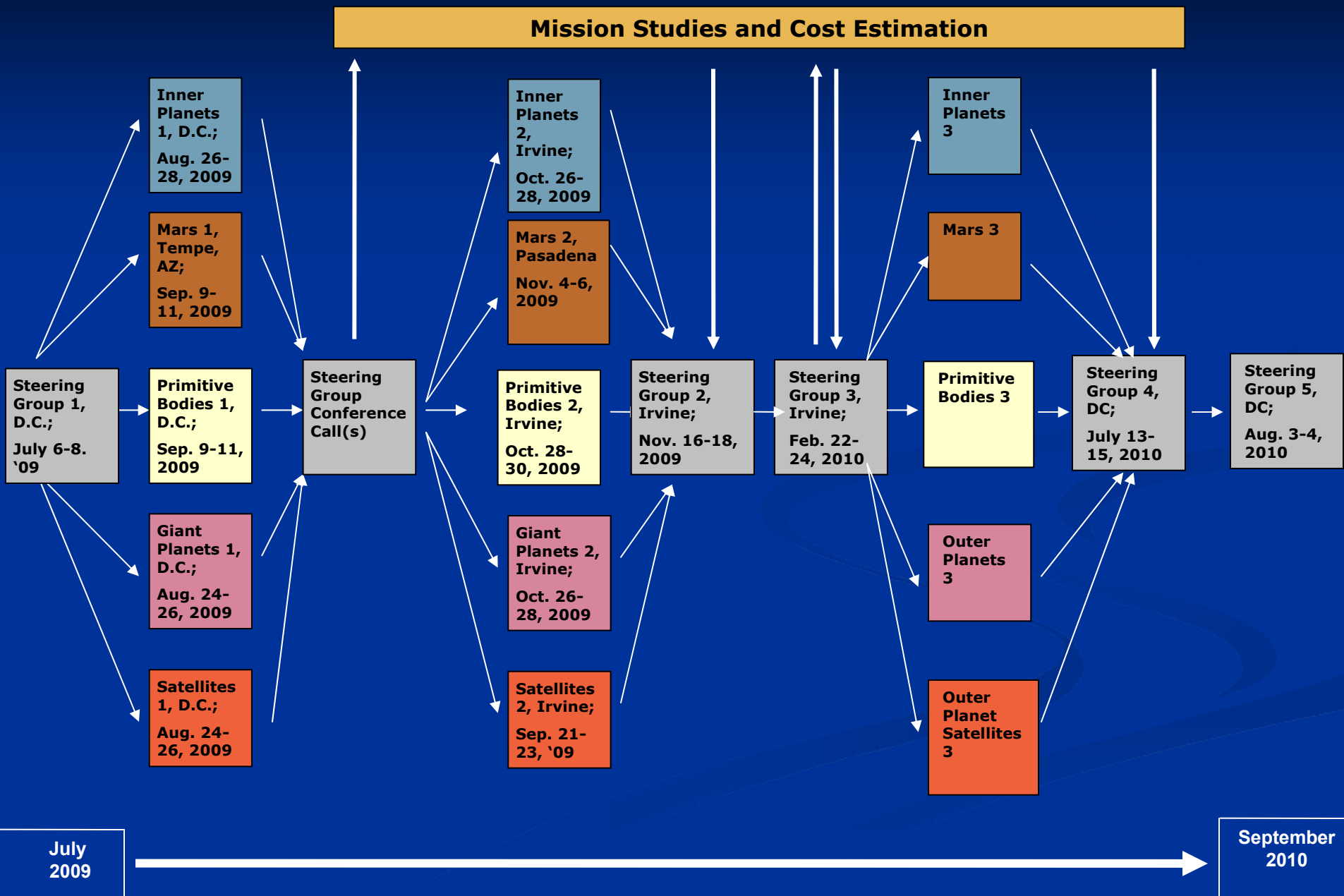
1st Quarter

Report approved, NASA, NSF, OMB and Congress briefed and report released (prepublication-format)

3rd Quarter

Printed report released

Steering Group/Panel Interactions



Community Interactions

Broad community input is the defining feature of a decadal survey

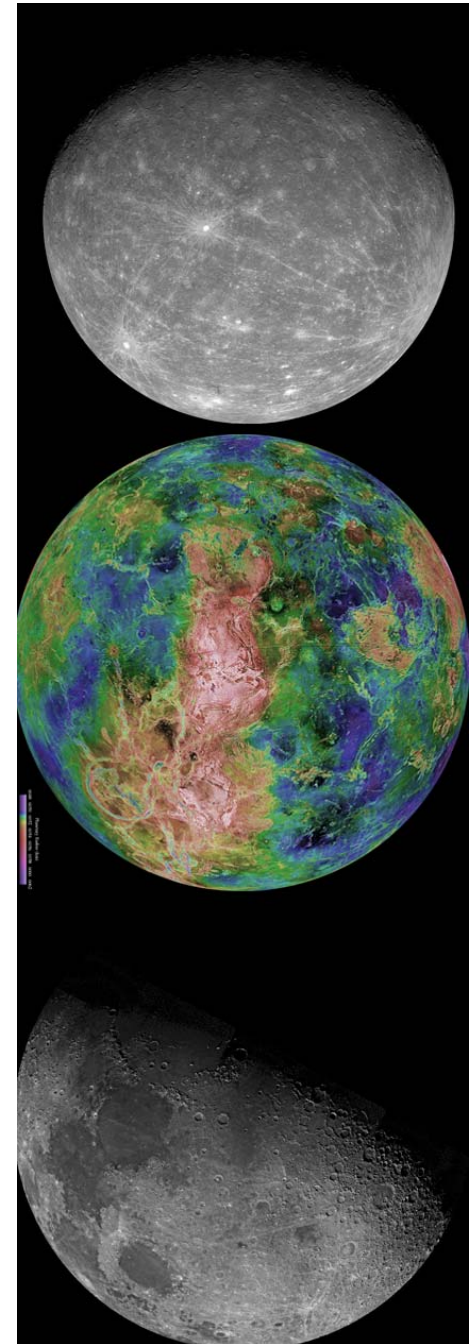
- Town halls and open meetings have been held early and often (e.g., AGU, VEXAG, MEPAG, OPAG, RAS, LPSC, NLSI, CAPTEM, EPSC, DPS, AGU (again), LPSC, AbSciCon, LEAG (right now!)).
- White papers from the community were submitted via the SolarSystem2012 web site.
- Open parts of steering committee and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

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 4935 total authors/endorsers.
- White papers were assessed in detail by the panels, and folded into all panel activities.

Inner Planets Science Goals

1. Understand the origin and diversity of terrestrial planets
 - Bulk composition
 - Interior evolution and differentiation
 - Geological history of surfaces
2. Understand how the evolution of terrestrial planets enables and limits the origin and evolution of life
 - Distribution of volatile chemical species
 - Effects of internal planetary processes
 - Effects of processes external to a planet
3. Understand the processes that control climate on the Earth-like planets
 - Current climate processes
 - Climate evolution
 - Primordial climates



NASA's Mission Portfolio

- NASA currently has three main classes of planetary missions:
 - Discovery (least expensive)
 - New Frontiers (more expensive)
 - Flagship (very expensive)
- Discovery missions will not be prioritized by the decadal survey. This job is left to the AO and peer review process. Candidate science for the Discovery program will be identified.
- Prioritized lists of New Frontiers and Flagship missions will be identified and presented.
- A recommendation will be made regarding the appropriate balance among these classes of missions.

Evaluation of Candidate Missions

- Compared to previous decadal surveys, this one must place much greater emphasis on evaluation of the technical maturity and probable costs of candidate missions.
- The panels and the steering group include members who are expert in engineering, project management, and cost estimation.
- Resources are available to do moderate-fidelity (and conservative!) cost estimates for the highest-priority candidate missions.
- The objective is 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 has adopted a twin-track approach to crafting more robust mission priorities.

Mission studies are being conducted by:

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

Independent cost and technical evaluations are being 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/APL)

The Mission Candidates

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

Additional Studies

- *NEO target study.* (Assess NEO targets that can be reached with an electric propulsion spacecraft.)
- *Reactor-Based thermoelectric generator technology study.*
- *Saturn Ring Observer technology study.*
- *Comet cryogenic sample return technology study.*

It's Not Just Missions

- Beyond describing a prioritized set of NASA planetary missions, the survey report will address 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.
- In the end, the number of missions that can be conducted with the available funds will be highly restricted.
- Some very tough choices are going to have to be made this summer.
- Prioritization will be guided by the inputs received from the science community (including discussion at this session!)

The End Game

- Draft report will be written in the summer of this year
- Report will undergo rigorous external peer review, per NRC policies and standards
- Once revised and approved, report will be released, and briefed widely:
 - NASA
 - NSF
 - Office of Management and Budget
 - Congress
 - Science community

Summary

- The decadal survey process is aimed at articulating a program for the coming decade that represents as fully as possible the true consensus view of the U.S. planetary science community.
- The distinguishing features of the decadal survey process are inclusiveness and transparency.
- In contrast to past decadal surveys, this one will place a strong emphasis on cost realism.
- Community participation in all aspects of the decadal survey is strongly encouraged!

Our Web Site

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