

STATEMENT OF TASK
(Revised)

Planetary Science Decadal Survey: 2013-2022

The Space Studies Board shall establish a Survey Committee (the “Committee”) to develop a comprehensive science and mission strategy for planetary science that updates and extends the Board’s current solar system exploration decadal survey, *New Frontiers in the Solar System: An Integrated Exploration Strategy* (2003).

The new decadal survey shall broadly canvas the field of space- and ground-based planetary science to determine the current state of knowledge and then identify the most important scientific questions expected to face the community during the interval 2013-2022. In addition, the survey and report shall address relevant programmatic and implementation issues of interest to NASA and the National Science Foundation (NSF). Since the content and structure of the program portfolios of the two agencies are distinct from one another, implementation and investment recommendations specific to each agency should be elaborated in separate sections of the final report. This will ensure that the report’s investment guidance will be clearly addressed to the appropriate agency, especially important in the current environment of elevated budget pressures.

It is critically important that the recommendations of the Committee be achievable within the boundaries of anticipated funding. NASA and NSF will provide an up-to-date understanding of these limitations to the Committee at the time of survey initiation. Recommendations of top-line funding increases for planetary science are not appropriate for this survey.

A. Science Survey and Recommendations

The scientific scope of the survey and report shall encompass the inner planets (Mercury, Venus, and Mars), the Earth’s Moon, major planets (Jupiter, Saturn, Uranus, and Neptune), the moons of the major planets, dwarf planets and small bodies, primitive bodies including comets and Kuiper Belt objects, and astrobiology. The report should provide a clear exposition of the following:

1. An overview of planetary science—what it is, why it is a compelling undertaking, and the relationship between space- and ground-based planetary science research;
2. A broad survey of the current state of knowledge of the solar system; and
3. An inventory of the top-level scientific questions that should guide NASA flight mission investigations and supporting research programs and NSF’s programs that support planetary science research. The scientific questions for Mars and the Moon should be integrated with those pertaining to other solar system objects.

In order to ensure consistency with other advice developed by the NRC, specific guidelines for the scientific scope of the survey are as follows:

- With the exception of interactions with the atmospheres, magnetospheres, and surfaces of solar system bodies, which are within scope, solar and heliospheric phenomena are out of scope (these latter topics are treated in the NRC report *The Sun to the Earth and Beyond—A Decadal Research Strategy in Solar and Space Physics* (2003) and its follow-on decadal survey; they will also be reviewed in the astronomy and astrophysics survey in concurrent development);

- Focused study of the Earth system, including its atmosphere, magnetosphere, surface, and interior, is out of scope (these topics are treated in the NRC report *Earth Science and Applications from Space—National Imperatives for the Next Decade and Beyond* (2007));
- Basic or supporting ground-based laboratory and theoretical research in astrobiology and areas like comparative planetology are within scope; but flight and ground investigations to detect and characterize exoplanets are out of scope (these topics are being addressed in the astronomy and astrophysics decadal survey in concurrent development).

B. National Science Foundation Recommendations

For NSF, the survey and report shall encompass all ground-based observational techniques, as well as analysis of data collected and relevant laboratory and theoretical investigations (including modeling and simulation). Thus, the study will assess the NSF-supported infrastructure of the field, including research and analysis support, the educational system, instrumentation and technology development, data distribution, analysis, and archiving, theory programs, and so on. The Committee shall also recommend any changes to this infrastructure that it deems necessary to advance the science and to capture the value of facilities in place.

The Committee shall review relevant programs of other nations and will comment on NSF opportunities for joint ventures and other forms of international cooperation.

C. National Aeronautics and Space Administration Recommendations

The NASA section of the report will reflect NASA’s statutory responsibility for flight mission investigations. The principal components of the NASA implementation portion of the report shall include:

1. Recommendations on the optimum balance across the solar system and among small, medium, and large missions and supporting activities, the latter informed by the Space Studies Board’s study on this topic (“mission-enabling activities”) currently in progress;
2. Recommendations for individual flight investigations for initiation between 2013 and 2022 as follows:
 - i. Flight investigations believed executable for less than approximately \$450 million (candidates for the Discovery and Scout programs) should not be identified or prioritized. They will be proposed by community investigators to address the broad science goals in (A) above;
 - ii. Flight investigations with life cycle costs in the range \$450-900 million (New Frontiers class); the report should provide a candidate list of mission objectives, based on the 2008 Board report, *Opening New Frontiers in Space: Choices for the Next New Frontiers Announcement of Opportunity* (2008), as adjusted by the deliberations of the Committee;
 - iii. Specific destinations and science goals for “large” missions with life cycle costs projected to exceed \$900 million;
 - iv. The prioritization of flight investigations of Mars and the Moon should be integrated with flight investigation priorities for other solar system objects;
 - v. The findings and recommendations contained in *New Frontiers in the Solar System* and other recent and ongoing NRC reports on topics relevant to planetary science activities should be assessed and incorporated as appropriate. Missions identified in these reports that have not yet been confirmed for implementation must be reprioritized; and
 - vi. The flight investigations priority list should be supported by a summary of the assumptions underlying the relative rankings. This summary should, to the extent possible, be accompanied by decision rules that could guide NASA in adjusting the queue in the event of major unanticipated technical, cost, or other programmatic changes.

It is understood that initiation of missions on these lists will depend on actual resource availability.

3. Recommendations for NASA-funded supporting research required to maximize the science return from the flight mission investigations;
4. A discussion of strategic technology development needs and opportunities relevant to NASA planetary science programs; and
5. A discussion of (a) potential opportunities for conducting planetary science investigations involving humans in situ and (b) the relative value of human-tended investigations to those performed solely robotically. (NASA will provide before or at the time of survey initiation an update on NASA's human space flight plans.)

To provide NASA with actionable advice conforming to its portfolio boundaries, guidelines for the programmatic scope of recommendations to NASA are as follows:

- The scientific role of ground-based observations that support flight missions are within scope, but, except for operation of existing Goldstone facilities and the Infrared Telescope Facility (IRTF), recommendations regarding construction, operation, or funding of ground-based observatories are out of scope; and
- Scientific investigations of near-Earth objects (NEOs) are within scope, but approaches and mission concepts for space-based hazard mitigation are out of scope (they are the subject of a concurrent NRC study).

The Board should ensure that the study and report reflect an awareness of the science and space mission plans and priorities of potential foreign and U.S. agency partners and should identify opportunities for cooperation, as appropriate.

Study Approach

The flight and facilities programs recommended in the survey report must be executable within anticipated resources. In designing and pricing the study, the NRC should include resources for independent and expert cost analysis support to ensure that all flight mission cost estimates can be meaningfully intercompared and are as accurate as possible given the varying maturity of project concepts and other recognized uncertainties.

The final report must represent a comprehensive and authoritative analysis of the subject domain and a broad consensus among research community stakeholders. Therefore, NASA and NSF anticipate that the Committee will utilize specialized panels, with allocation of the domain of study among them to be determined by the Committee and the Board. It is important that the study activity include town hall meetings, sessions at geographically dispersed professional meetings, solicitation of white papers, and aggressive use of electronic communications for soliciting and aggregating inputs from across the community and country.

Products and Schedule

It is recommended that the Committee report consist of four products: a complete, integrative report of the findings and recommendations of the study; supporting reports of the focused panels, either included in the main report volume or in a separate volume; an abbreviated high level presentation of the main findings and recommendations suitable for distribution to the general public; and a CD-ROM or DVD collection of all three components that can be easily and inexpensively disseminated.

In order to impact preparation of FY13 budget submissions, the major findings and prioritized recommendations of the survey should be submitted to NSF and NASA by March 31, 2011.