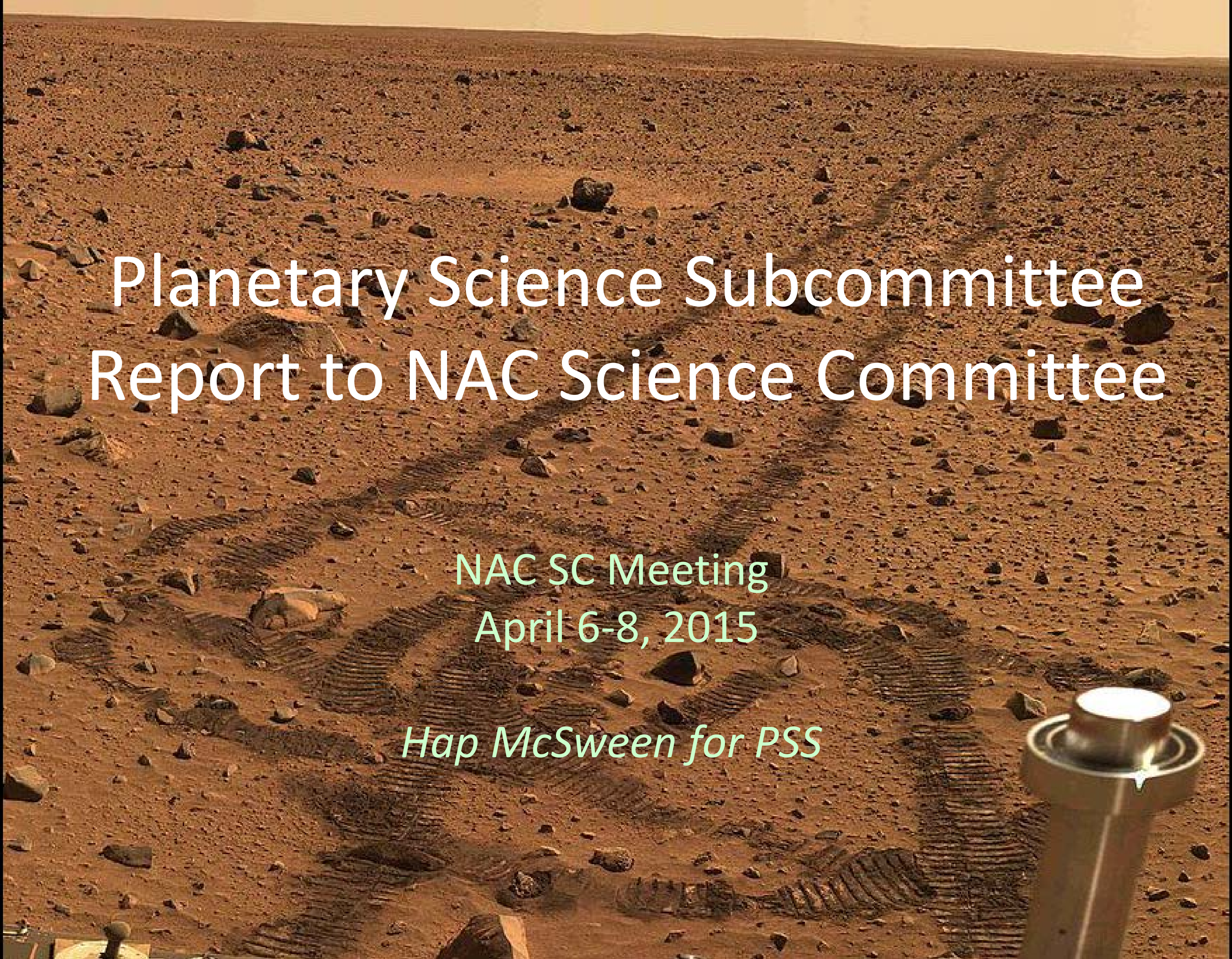


Planetary Science Subcommittee Report to NAC Science Committee

NAC SC Meeting
April 6-8, 2015

Hap McSween for PSS

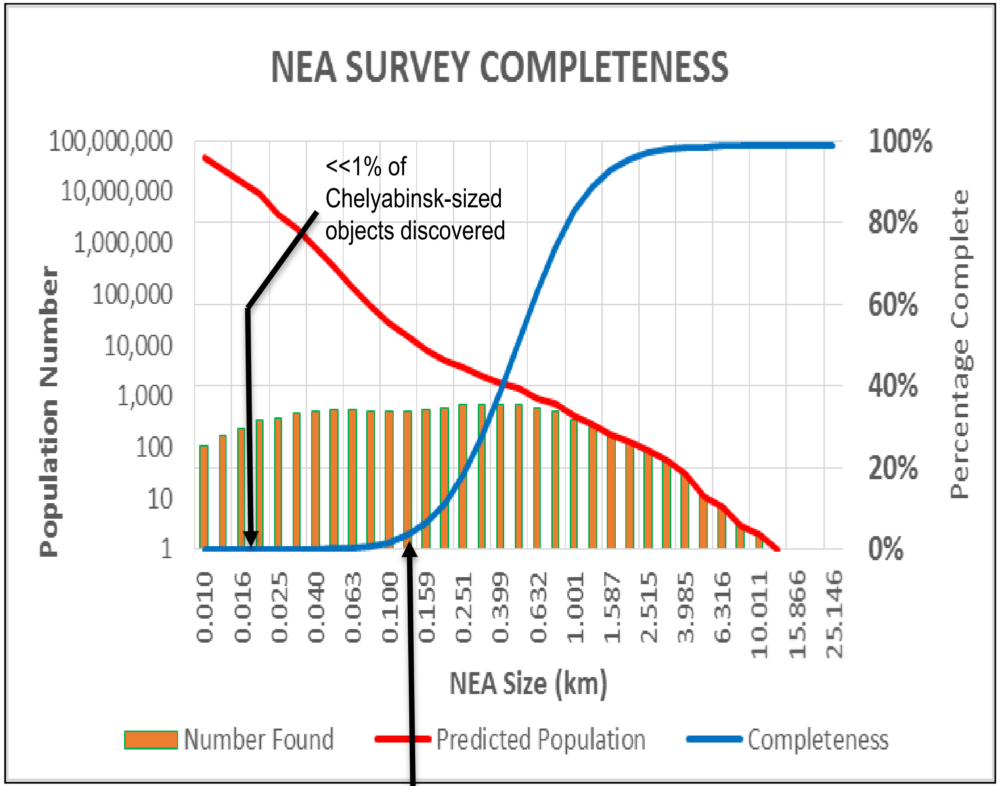
PSS Findings brought forward to the NAC Science Committee

Finding: Need for an Agency-Level NEO Survey Mission

Based on input from the community with NEO expertise, PSS reiterates its finding that the elevation of an NEO Space-Based Survey Mission to the level of an Agency priority, and the pursuit of its new start, are needed to advance NEO knowledge and essential for NASA's Asteroid Initiative. An advanced space-based survey optimized for finding and characterizing near-Earth objects (NEOs) would serve multiple Agency goals, consistent with NASA's Asteroid Initiative and Asteroid Grand Challenge. Specifically, a NEO survey telescope addresses 5 of the 10 priority questions listed in Table 3.1 of the Decadal Survey, such as "What solar system bodies endanger and what mechanisms shield Earth's biosphere?", and is identified on page 3-13 as the most expedient method for detecting NEOs for purposes of quantifying the impact hazard to Earth; numerous other examples can be identified in the Decadal Survey as well. Along with achieving the Planetary Decadal Survey science, such an asset would advance exploration, planetary defense, and resource utilization goals.

Need for a Near-Earth Object Space-Based Survey

Planetary Science Subcommittee Finding, Sept. 2014



George E. Brown Act[1]: 90% of ≥140 m by 2020
Current status: <1% of 140-m objects; 25-30% of >140-m objects
Ground-based surveys not on schedule to meet congressional direction[2]

An advanced space-based survey optimized for finding and characterizing near-Earth objects (NEOs) serves **multiple Agency goals**, consistent with **NASA's Asteroid Initiative and specifically the Asteroid Grand Challenge: "**to find all asteroid threats to human populations and know what to do about them." It is a foundational asset to:

- **Planetary Defense** – a space-based asset provides the fastest way to achieve the congressional direction of discovering potentially hazardous asteroids[2]
- **Human Exploration** – a space-based survey telescope is needed to greatly expand the catalog of accessible targets for human exploration[3]
- **Science** – PSD science goal: Explore and observe the objects in the solar system to understand how they formed and evolved[4]

The PSS finds that the elevation of an NEO Space-Based Survey Mission to the level of an Agency priority, and the pursuit of its new start, are essential for the broadly needed advancement of NEO knowledge.

1 NASA Authorization Act of 2005, Section 321, cited as the "George E. Brown, Jr. Near-Earth Object Survey Act"; 2 Defending Planet Earth, NRC Report, National Academies Press, 2010; 3 Target NEO Workshop Report (2011) http://targetneo.jhuapl.edu/archives/2011files/TargetNEOWorkshopReport.pdf; 4 NASA Science Plan, 2014

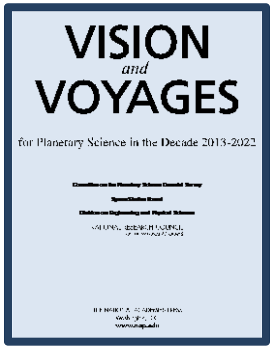


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TABLE 3.1 The Key Questions and Planetary Destinations to Address Them

Crosscutting Themes	Priority Questions	Key Bodies to Study
Building new worlds	1. What were the initial stages, conditions and processes of solar system formation and the nature of the interstellar matter that was incorporated?	Comets, Asteroids, Trojans, Kuiper belt objects (see Chapter 4)
	2. How did the giant planets and their satellite systems accrete, and is there evidence that they migrated to new orbital positions?	Enceladus, Europa, Io, Ganymede, Jupiter, Saturn, Uranus, Neptune, Kuiper belt objects, Titan, rings (see Chapters 4, 7, and 8)
	3. What governed the accretion, supply of water, chemistry, and internal differentiation of the inner planets and the evolution of their atmospheres, and what roles did bombardment by large projectiles play?	Mars, the Moon, Trojans, Venus, asteroids, comets (see Chapters 4, 5, and 6)
Planetary habitats	4. What were the primordial sources of organic matter, and where does organic synthesis continue today?	Comets, asteroids, Trojans, Kuiper belt objects, uraniaun satellites, Enceladus, Europa, Mars, Titan (see Chapters 4, 5, 6, and 8)
	5. Did Mars or Venus host ancient aqueous environments conducive to early life, and is there evidence that life emerged?	Mars and Venus (see Chapters 5 and 6)
	6. Beyond Earth, are there modern habitats elsewhere in the solar system with necessary conditions, organic matter, water, energy, and nutrients to sustain life, and do organisms live there now?	Enceladus, Europa, Mars, Titan (see Chapters 6 and 8)
Workings of solar systems	7. How do the giant planets serve as laboratories to understand Earth, the solar system, and extrasolar planetary systems?	Jupiter, Neptune, Saturn, Uranus (see Chapter 7)
	8. What solar system bodies endanger Earth's biosphere, and what mechanisms shield it?	Near-Earth objects, the Moon, comets, Jupiter (see Chapters 4, 5, and 7)
	9. Can understanding the roles of physics, chemistry, geology, and dynamics in driving planetary atmospheres and climates lead to a better understanding of climate change on Earth?	Mars, Jupiter, Neptune, Saturn, Titan, Uranus, Venus (see Chapters 5, 6, and 8)
	10. How have the myriad chemical and physical processes that shaped the solar system operated, interacted, and evolved over time?	All solar system destinations. (see Chapters 4, 5, 6, 7, and 8

PSS Findings brought forward to the NAC Science Committee

***Finding*: Sample Use Policy for Sample-Return Missions**

The Discovery and New Frontiers missions AO language stating that the mission plan “shall demonstrate that at least 75% of the returned sample shall be preserved for future studies” should apply to all sample return missions, robotic and human. Deviations from this policy must be justified (e.g. renewable sampling, planetary protection requirements). OSTP-mandated collection management policies for NASA collections should, at the subcollection level (e.g., Apollo samples, Stardust, future samples returned by a human mission), explicitly discuss balancing long-term sample preservation and usage.

PSS Findings brought forward to the NAC Science Committee

***Finding*: International Collaborations**

The PSS encourages NASA to consider innovative agency-level policies that enable collaborative international development for unique projects that are of high priority to both NASA and other agencies that would otherwise be out of reach for individual agencies. Projects like Cassini-Huygens have demonstrated that close international collaboration greatly increases mission capabilities, resources, and scientific achievements. Such cooperation could enable high-priority missions identified by the Planetary Decadal Survey that will not be able to go forward with NASA alone, for example flagship missions that were studied for Uranus, Venus, and Enceladus.

Topics of interest or concern reflected in other PSS Findings

- With increasing connectivity with HEOMD, PSD should advocate for its core science priorities identified in the Decadal Survey to be achieved in the anticipated mission architecture for Mars.

- PSS applauds initiation of an NRC study of the reorganized R&A program structure's effectiveness in achieving programmatic goals, and requests ongoing communication with community stakeholders.

- PSS supports extended mission funding for the highly ranked Lunar Reconnaissance Orbiter and Opportunity Rover if possible.

- PSS encourages continued PSD investment to build on MMRTG technology and pursue technology development for RTGs and Stirling generators.

Topics of interest or concern reflected in other PSS Findings

- Analysis/assessment groups (AGs) have recently been excluded from the NAC structure. Retaining the functionality of these groups in some form that allows interaction with the scientific community is critical.

- Increasing the launch cadence of Discovery missions to 24 months is desirable, recognizing that is a second priority to R&A support.

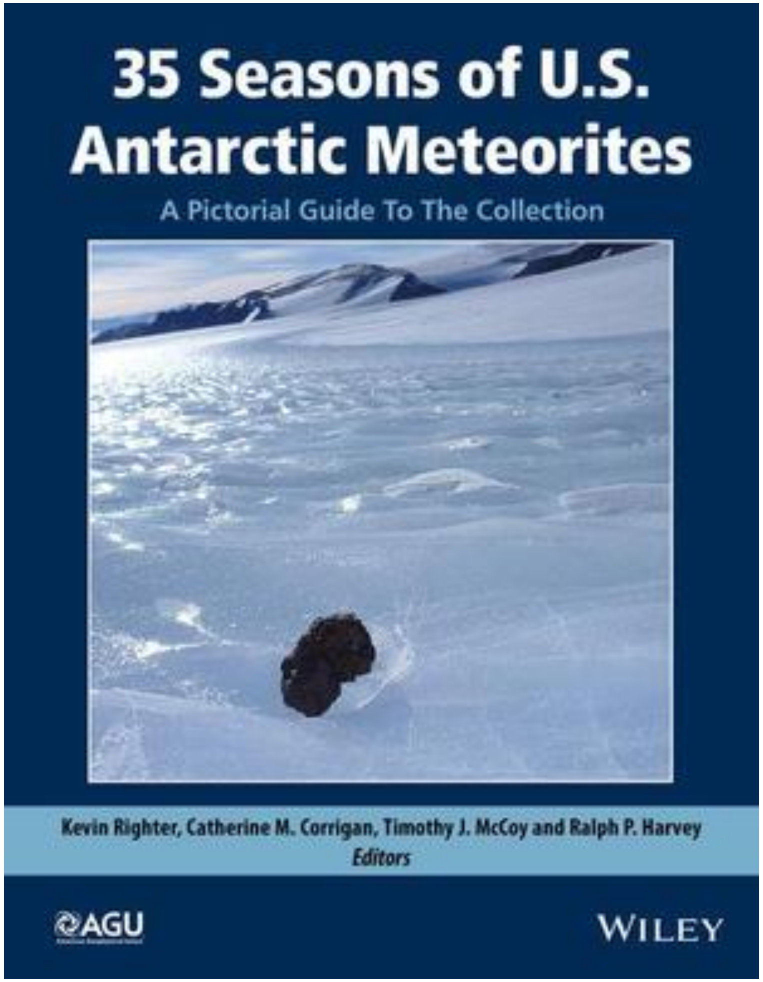
- PSS encourages coordinated investments with STMD for technology developments needed to enable future planetary missions to allow deep space exploration, long-term survival in the Venus surface environment, and submersible exploration of oceans on icy satellites.

PSS Meeting full text Findings are posted at:
www.lpi.usra.edu/pss/

AGs (Assessment Groups): PSD Community Contributions

Selected Science Highlights

A Special Anniversary for Antarctic Search For Meteorites (ANSMET)



- In the US ANSMET expeditions since 1977, ***20,700*** meteorites have been collected.
- Currently, around **700-800 specimens** (subsamples of meteorites) are prepared and loaned to investigators annually.
- ANSMET meteorites come from the **Moon and Mars**, plus **~80 parent asteroids**. This is arguably NASA's cheapest mission!