

NASA Planetary Science Vision 2050

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Abstract

In response to a request from NASA's Planetary Science Division, a community group is currently preparing a report that lays out a vision for planetary science research and exploration in the decades until 2050. This report builds on a highly successful workshop held in March 2017 at NASA Headquarters.

1. Introduction

In October 2016, NASA's Planetary Science Director chartered a group of planetary scientists and technologists to hold a community workshop and write a report on a very long-range vision for planetary science in the coming decades until 2050, with discussion on the technical requirements to achieve that vision. Specifically, the charter for the Planetary Science Vision (PSV) 2050 Workshop was to:

- present a compelling, 35-year science vision within the frame work of the future decades (2020s, 2030s, and 2040s);
- take the Planetary Science decadal survey[1] as the starting point and build upon it;
- be science based, with notional technologies and missions;
- take into account community input through the workshop (papers, posters, presentations); and
- prepare a Vision 2050 Report summarizing the workshop results.

The charter for the PSV 2050 report, which is currently under development, is to:

- have a compelling, over-arching planetary science theme for each decade as the next phase in Solar System Exploration;
- contain one or multiple paths forward (science areas and technologies needed) towards a long-range vision;
- consider cross-cutting opportunities with other disciplines as well as the larger context of international planetary science and human exploration;

- be built on science investigations goals, leading to notional missions that achieve the science as appropriate;
- consider the technology needed to achieve specific goals; and
- identify challenges (e.g., measurement challenges, technology challenges,...) that will need early investment to become viable.

This report will not be a mini-decadal survey with recommendations and priorities; nor is it an implementation plan; it is a long-range vision document with options, possibilities and a visionary future.

2. Current Status

NASA's Planetary Science Division (PSD) hosted the community workshop at NASA headquarters in Washington, DC on February 27–28 and March 1, 2017. Presentations and abstracts from the workshop, as well as video of the oral and poster presentations, and planning materials developed during and since the meeting, can be found at <http://www.lpi.usra.edu/V2050/>. This workshop provided PSD with community input on a very long-range vision for planetary science in the future.

The workshop gathered leading experts in Solar System planetary science and related disciplines, together with experts in space technologies, to identify potential science goals and enabling technologies that can be implemented by the end of the 2040s and would support the next phase of Solar System exploration.

Despite the relatively short timelines for submission of abstracts to the workshop, we received an overwhelming response, with over 240 abstracts submitted focused on the following themes:

- Life - explore and find locations where life could have existed or could exist today; improve our understanding of the origin and evolution of life;

- Origins of Planetary Systems – explore and observe the objects in the solar system to understand how they formed and evolve;
- Workings of Planetary Systems – advance the understanding of how the chemical and physical processes in our solar system operate, interact and evolve;
- Planetary Defense and Resources – identify and characterize objects in the solar system that pose threats to Earth or offer resources for future exploration;
- Technology – technological and instrumental capabilities needed for future exploration, which stretch beyond the current decadal priorities; and
- Policy, Pathways, Techniques, and Capabilities – innovative concepts that did not fit easily into any of the other themes.

The workshop was structured to have a modest number of oral presentations that mostly addressed broader visions for the future in each of the themes, followed by moderated panel discussions that were designed to maximize participation by the audience, both in the meeting room and remotely. Evening poster sessions allowed presentations of concepts better suited to that medium. While the meeting space ultimately limited onsite participation, livestreaming of the presentations allowed interaction with a far larger group, both within the planetary science community and with interested members of the public.

Since the workshop, we have been working to draw together the scientific threads of the meeting into a coherent science plan. Overarching questions that came out of the meeting asked the following:

- Where do we come from?
- Are we alone? / Are we unusual?
- Where are we going?

Crosscutting themes specifically include Life and Planetary Systems (including Exoplanets).

Once we have worked up the science plan for the coming decades, we intend to focus on the capabilities required to achieve the vision, including technology requirements, workforce issues, public engagement, and linkages to other divisions and directorates within NASA, to other US federal agencies, and to international organizations.

References

[1] National Research Council, *Vision and Voyages for Planetary Science in the Decade 2013-2022*, The National Academies Press, Washington, D.C., 2012.