Planetary Science Vision 2050

Steve Mackwell

CAPS – March 29, 2017

Charge to the Committee

This Planetary Science Vision (PSV) 2050 Workshop will:

- 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 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);
- prepare a Vision 2050 Report summarizing the workshop results;
- deliver report to the Planetary Science Division Director.

The PSV 2050 report should:

- 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;
- identify challenges (e.g. measurement challenges, technology challenges….) that will need early investment to become viable.

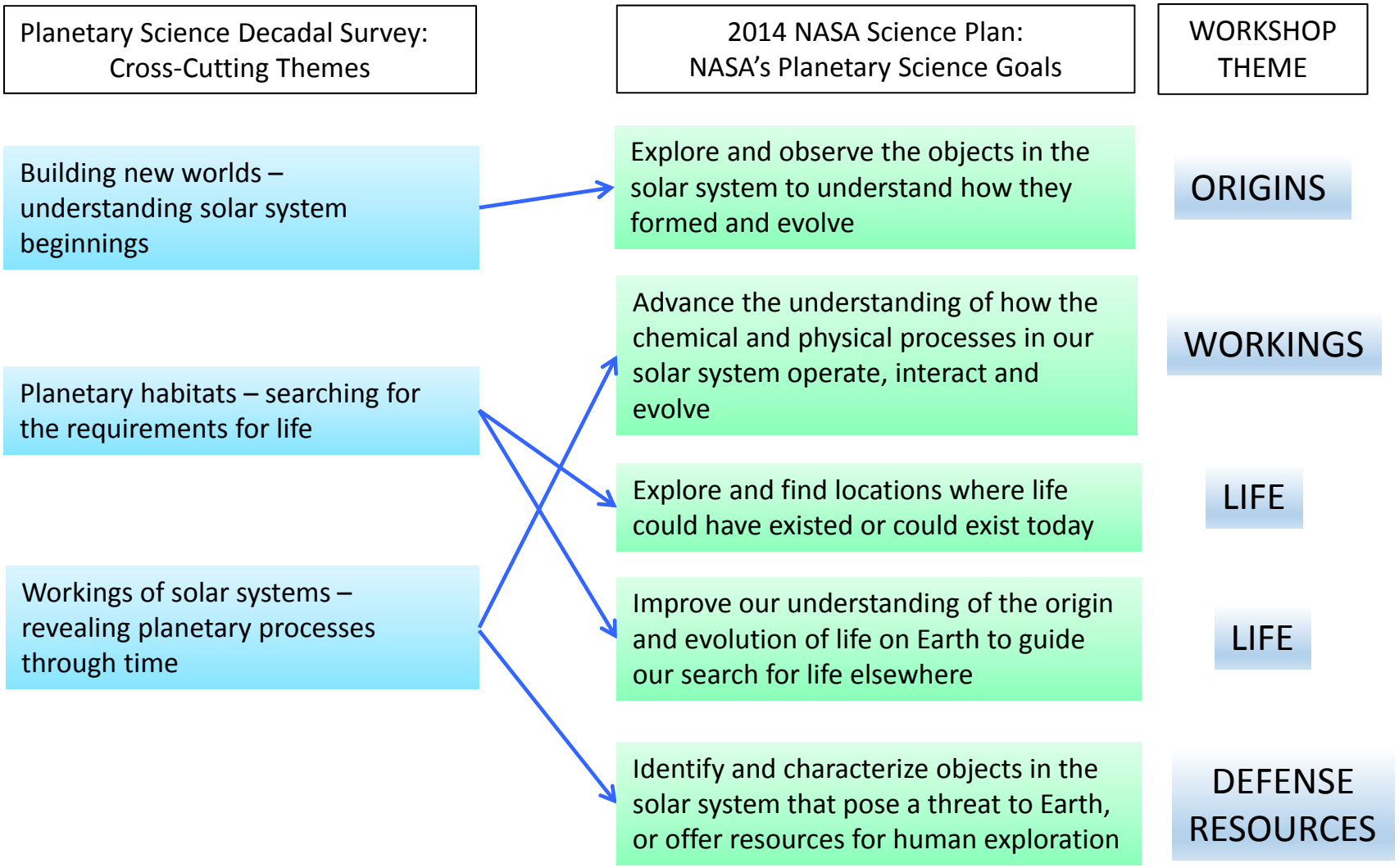
-IMPORTANT-

This workshop (and report) is not 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.

Workshop Planning and Report Writing Team

Steve Mackwell (Chair)	USRA	Deborah Amato	NASA Goddard
Doris Daou (Exec Sec)	NASA HQ SMD	Bethany Ehlmann	Caltech
Carrie Anderson	NASA Goddard	Bill Bottke	SwRI Boulder
David W. Beaty	NASA JPL	Gina DiBraccio	NASA Goddard
John (Jay) Falker	NASA HQ STMD	Shannon Curry	UC Berkeley
Bill Farrell	NASA Goddard	Lindsay Hays	NASA JPL
Anthony Freeman	NASA JPL		
Shawn Domogal-Goldman	NASA Goddard		
Brook Lakew	NASA Goddard		
Kurt Lindstrom	JHU APL		
Amy Mainzer	NASA JPL		
Larry Nittler	Carnegie DTM		
Gregory Schmidt	NASA Ames		
Christophe Sotin	NASA JPL		
Julie Stopar	USRA LPI		
Dana Hurley	JHU APL		
*Jim Green **	*NASA HQ SMD*		
*Louis Barbier **	*NASA HQ Chief Scientist Office*		
*Len Dudzinski **	*NASA HQ SMD*		
*Michael Seablom **	*NASA HQ SMD-HEOMD*		

** ex officio*


Planetary Science Decadal Survey: Cross-Cutting Themes
2014 NASA Science Plan: NASA's Planetary Science Goals
WORKSHOP THEME
Building new worlds – understanding solar system beginnings
Planetary habitats – searching for the requirements for life
Workings of solar systems – revealing planetary processes through time
Explore and observe the objects in the solar system to understand how they formed and evolve
Advance the understanding of how the chemical and physical processes in our solar system operate, interact and evolve
Explore and find locations where life could have existed or could exist today
Improve our understanding of the origin and evolution of life on Earth to guide our search for life elsewhere
Identify and characterize objects in the solar system that pose a threat to Earth, or offer resources for human exploration
ORIGINS
WORKINGS
LIFE
LIFE
DEFENSE RESOURCES

Workshop Themes

There are 5 basic themes. Take the current planetary science goals articulated below and develop a vision of where they might go in the coming three decades:

- **ORIGINS** — understanding formation and evolution of solar systems (including exoplanetary systems)
- **WORKINGS** — understanding how the processes in our solar system operate, interact, and evolve
- **LIFE** — improve our understanding of the origin & evolution of life, including Earth analogs, to guide our search for life elsewhere
- **DEFENSE AND RESOURCES** — identify and characterize objects that pose threats to Earth or offer resources for human exploration
- **POLICIES, PATHWAYS, TECHNIQUES and CAPABILITIES** — other thoughts about where we might be in three decades that are not captured above (e.g., terraforming)

Workshop Format

- We received 250 abstracts, many more than we anticipated
- Participation ~170 registrants (40% Female, 60% Male)
- Abstracts, Posters & Presentations are posted on workshop website
- The half-day sessions each included a series of oral presentations and a panel discussion
- Oral sessions (~70 speakers – 15 or 3 min talks) and panel discussions were live-streamed and archived for later viewing
- We used a web tool to collect questions from remote participants that allowed them to upvote the questions; highest rated questions were posed to the panels
- Program included six half-day sessions with no parallel sessions
- Two poster sessions, one each on Monday and Tuesday evening
- Presentations are being used in the development of the workshop report

http://www.lpi.usra.edu/V2050/ #V2050

Planetary Science Vision 2050 Workshop
NASA Headquarters
February 27-28 and March 1, 2017

Monday, February 27, 2017

8:30 a.m.	Welcome
9:00 a.m.	Life Oral Session
11:15 a.m.	Life: Panel Discussion
1:30 p.m.	Origins
3:45 p.m.	Origins: Panel Discussion
5:30 p.m.	Posters – Life; Origins; Workings

Tuesday, February 28, 2017

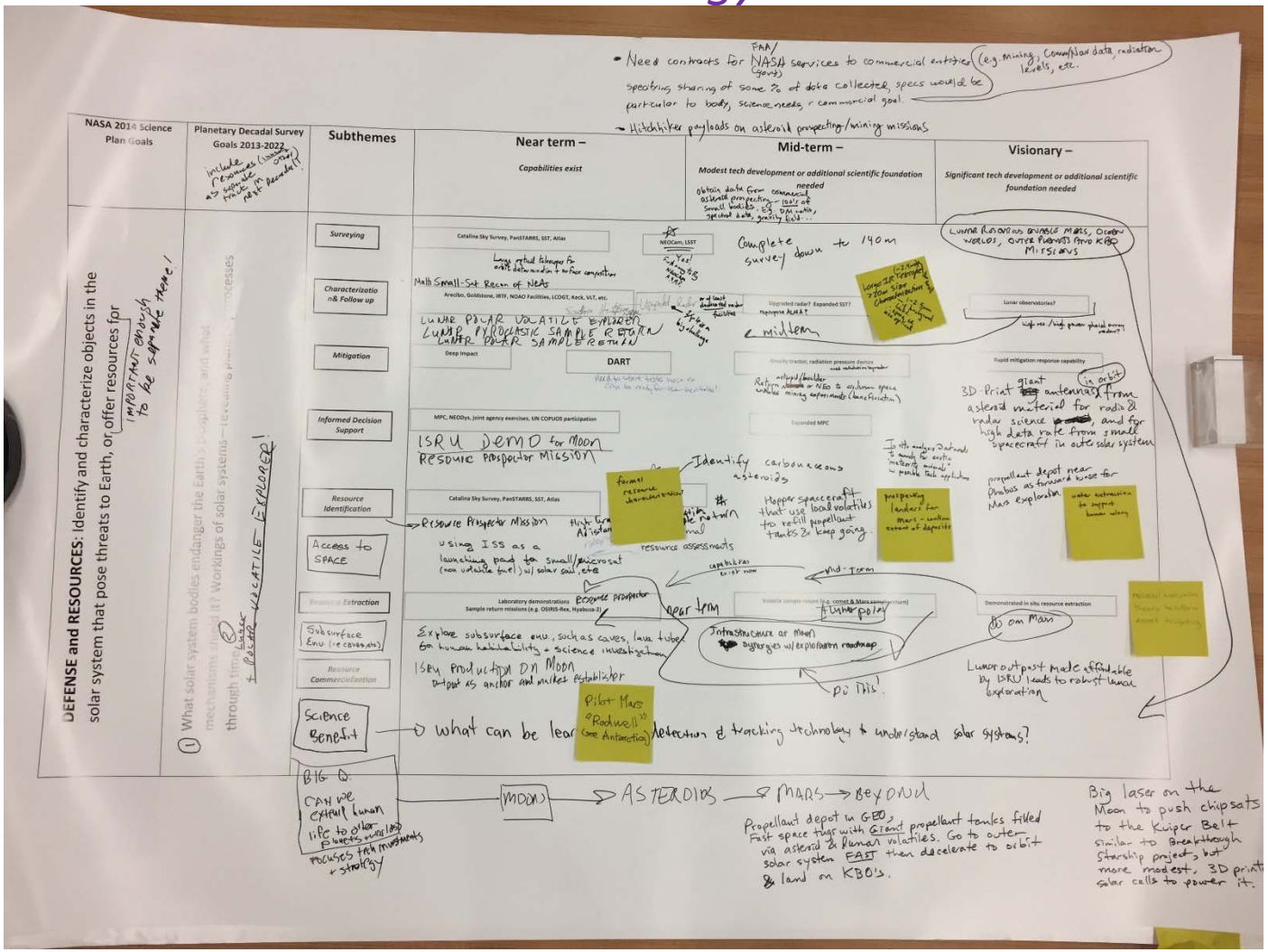
8:30 a.m.	Workings Oral Session
10:45 a.m.	Workings: Panel Discussion
1:00 p.m.	Defense and Resources
3:15 p.m.	Defense and Resources: Panel Discussion
5:00 p.m.	Posters - Defense and Resources; Policy, Pathways, Techniques, and Capabilities

Wednesday, March 1, 2017

8:30 a.m.	Policy, Pathways, Techniques, and Capabilities Oral Session
10:45 a.m.	Policy, Pathways, Techniques, and Capabilities: Panel Discussion
1:00 p.m.	Future Technologies: Panel Discussion
2:30 p.m.	Overarching Issues Oral Session

Thematic Posters

for Origins, Life, Workings, Defense and Resources, Policies, Pathways, Techniques and Capabilities, and Overarching Technology



Report- What We Heard

The writing team met on March 2, 2017, to capture the sense of the workshop. The following fundamental questions seem to have come up again and again:

- Where do we come from? (Life, Origins)
- Are we alone? (Life, Origins)
- Are we unusual? (Life, Origins, Workings)
- Where are we going? (Defense & Resources, Workings)

Also we identified the following cross-cutting themes:

- Life
- Planetary Systems (exoplanets)

And synergistic relationships (will the current divisions and directorates even make sense in 2050?):

- Astrophysics (exoplanets)
- Heliophysics
- Earth Science
- HEOMD
- STMD

Realizing the future - capability needs:

- Technology
  - Mission requirements, including long-lead development
  - Earth and Space-based observatories
  - Laboratory requirements (e.g., sample return)
- Workforce
  - Diversity (gender, ethnic, career focus, etc.)
  - Sustainability (maintenance of critical capability)
- Engagement and Outreach

Where is the report now?

Currently mapping the science threads over the coming decades to the questions:

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

Once we have a sensible science plan, we will hold a smaller technology workshop to look at overarching technology needs and onramps.

Material will be posted on the website as it is developed.

Visit our web site:
www.lpi.usra.edu/V2050/
updated frequently