Overview of Recent CAPS Meetings

A personal assessment by
Philip Christensen
CAPS Co-chair

PSS Meeting Oct. 3, 2012
Committee on Astrobiology and Planetary Science

- Philip Christensen*, ASU, Co-Chair
- James G. Ferry, Penn State University, Co-Chair
- Sushil Atreya, U. Michigan
- Amy Barr, Brown University
- Richard Binzel, MIT
- John Clarke*, Boston University
- Geoffrey Collins, Wheaton College
- Pascale Ehrenfreund*, George Washington University
- Lindy Elkins-Tanton*, Carnegie Institution
- Scott Hubbard*, Stanford University
- Laurie Leshin, RPI
- Steven Mackwell*, LPI
- Michael Russel, JPL
- Gary Ruvkun, Harvard Medical School
- Gerald Schubert*, UCLA
- Barbara Sherwood-Lollar, U. Toronto
- Norman Sleep, Stanford University
- Cristina Vesbach, U. New Mexico
- Roger Yelle, U. Arizona

* Decadal Survey Committee member
Concerns:

1. Planetary Science budget reduction of 20%
   • The pipeline of new missions is nearly empty

2. Mars Program budget reduced by ~35%
   • The Mars Program is not healthy

3. Non-implementation of Decadal Survey Report recommendations for a balanced program
   • Mission classes and destinations are both important
The MPPG was initiated by NASA in March 2012 to develop foundations for a Program-level architecture. MPPG includes members from the Science (SMD), Human Exploration and Operations (HEOMD), and Technology (STP) Directorates. The MPPG took a fresh look at possible Mars architectures and considered a very wide range of missions and directions. Cost estimates included the Aerospace “CATE” process used for the Decadal Survey.
MPPG presented two near-term orbiter options:
- Relay only: $0.3-0.4 B (including launch vehicle)
- Relay and science: $0.7-0.9 B (incl. LV)

MPPG developed four rover options for the next Mars mission:
- Two have high likelihood of meeting Decadal Survey science objectives and are very responsive to budget realities.
  - MER/airbag-based option ("Rover B"; $1.3 B incl. LV)
    - Caching and *in situ* context science
  - MSL-based option ("Rover C"; $1.5 B incl. LV)
    - Significantly less expensive than MSL
    - Capitalizes on existing MSL hardware and personnel expertise; has ample caching capability and *in situ* science opportunities.
MPPG Report (con’t)

- A rover has significant advantages over an orbiter for the 2018 mission:
  - There are currently three orbiters at Mars, with two more in development
    - No compelling need to refresh the existing communication assets prior to sending a caching rover.
  - Current planetary science budget implies that a 2018 orbiter will itself be aging before it was needed to support a follow-on rover in the mid-2020’s.
  - MSL hardware and personnel expertise exists now. Delay beyond 2018 risks the loss of the U.S. Mars EDL capability.
  - 2018 is a favorable launch opportunity - can get a rover to the surface with smaller launch vehicle and large design margins.
  - Orbital communication will need to be replaced by 2022.
MPPG Report (con’t)

• The MPPG did an excellent job of developing a balanced set of science-driven, affordable elements and options for the continuation of the Mars Program.

• The MPPG concluded that Mars sample return was the logical next step in Mars exploration.

• In reaching this conclusion the MPPG broadened the base of support for Mars sample return beyond the planetary science community (e.g. 2012 Decadal Survey) to include both the Human Exploration and Technology Directorates.

• Support for the MPPG Report from SMD AA John Grunsfeld is encouraging and I look forward to future discussions and interactions.
Europa Study

• The Europa study team has developed excellent orbiter and flyby (“Clipper”) concepts that are robust and feasible, and are responsive to the Decadal Survey in scope and cost.

• The multiple flyby “Clipper” element is favored because it addresses the preponderance of the science objectives laid out in the Decadal Survey.

• Independent review by a CATE process (the same used in the Decadal Survey) affirms that the costs for the orbiter and Clipper are credible and that the risk is low.

  • The projected cost of each element is less than half the cost of JEO.
    • Clipper: $1.98 B + launch vehicle cost
    • Orbiter: $1.7 B + LV
    • Enhanced Clipper: $2.2 B + LV
Europa Study

• The Clipper mission has excellent scientific value:
  • Key Europa questions very well addressed
  • No significant overlap with JUICE mission
• Clipper mission concept is well thought out and realistic:
  • Mission length reasonable (32 Europa flybys) and potential for extension
• Radiation issues have been well addressed.
• Solar power option is feasible based on Juno experience.
• High resolution imaging, if possible without significant growth in cost or complexity, would be an excellent “feed forward” element for a future lander mission.
Astrobiology Status

- Restoration of funding from deeply reduced FY07 levels has allowed the continuation of programs towards understanding of the origin, evolution and limits of life on Earth, which is fundamental to extraterrestrial life detection. Astrobiology is central to the exploration of Mars, the outer planet satellites, and exoplanets, expanding our terrestrial view of “life” and “habitability.”
- Success of future flight missions is ensured by greater integration of astrobiology with planetary sciences through technology development and field testing programs.
- The successes of astrobiology has generated unprecedented interest among students ensuring an infrastructure necessary for continued progress.
Back-up Slides
Concerns:

1. Planetary Science budget reduction

- Planetary Science Division faces an extraordinary crisis
  - Planetary Science has suffered a massive budget cut in the FY13 request - over 20% in one year - larger than any other science program across the government and with devastating consequences for the future of planetary exploration.
  - The cut to the Mars Program was ~35%. The Mars Program is not healthy.
- The pipeline of new missions is nearly empty. The robust suite of planetary missions today is the result of planning and groundwork done a decade ago. The lack of new missions today will have devastating consequences a decade or more ahead.
- Efforts by Congress to partially restore planetary funding are an excellent step, but are on a year-by-year basis.
  - Stability in funding is essential to the ability to plan and implement planetary missions.
Concerns:

2. Implementation of the NRC Decadal Survey Report recommendations

• The NRC Planetary Science Decadal Survey clearly outlined the importance of a balanced program of mission classes - flagship, New Frontiers, and Discovery - as well as destinations that encompass both the inner and outer solar system.

• However, the Decadal Survey, released last year, is not being followed:
  • Strategic flagship missions have been removed from the President’s budget plan, rather than being descoped or delayed. This action is not consistent with the Decadal Survey recommendations and jeopardizes program balance and scientific advancement.
  • The Mars Program is undergoing major reevaluation and needs significant review and interaction with the NRC and the science community.
  • The next mission in Discovery Program is being delayed by almost three years.
Concerns:

3. Mars Program

• Initiation of the first element of the Mars sample return campaign (MSR) was the highest priority Decadal Survey flagship mission recommendation and continues to have strong support in the Mars community.

  • However, the President’s FY13-17 budget effectively eliminates the sample-caching rover that is the first step in this campaign.

  • These cuts also ended the carefully developed cooperative NASA-ESA Mars exploration activities.

• The rationale presented for not starting MSR is the unwillingness to commit to a three-element campaign of large missions.

  • However, MSR is the logical next step following the investment of $10B in Mars exploration over the past 20 years. The damage from the drastic Mars Program budget cuts severely jeopardizes this investment.

• A modest descope of the caching rover, rather than its elimination, would allow initiation of MSR and retain fidelity to the Decadal Survey.

• The Mars Program Planning Group (MPPG) presented excellent suite of descoped mission options that include objectives from NASA’s human exploration and technology sectors.
Concerns:
4. Outer Planets missions

- Investigation of the Outer Solar System is a high scientific priority in the Decadal Survey.

- However, the outer solar system exploration is facing the longest hiatus (over a decade) since it began in the early 1970’s unless a new mission starts soon.
  - The next five years will see the end of the Cassini, New Horizons, and Juno missions, with no new NASA missions in the pipeline to explore the outer solar system beyond 2017.

- Europa remains the highest scientific priority outer planets mission.

- The Europa Study Team has done an impressive job of crafting descope options. The Europa Clipper, in particular,. This option appears responsive to the Decadal Survey, the current budget constraints, and the need for balance in the Planetary Program.
Concerns:

5. International Partnerships

- The termination of U.S. participation in ExoMars due to the major reduction in the Mars Program funding has had a devastating effect on NASA-ESA collaboration in Mars exploration.
  - Collaboration could be improved by a NASA contribution to ESA missions, including continued NASA commitment to MOMA (Mars Organic Mass Analyzer) on ExoMars.
  - ESA should be included in the planning of future NASA Mars missions.
- NASA’s involvement in the ESA JUICE mission is a positive development, but JUICE is not a replacement for a mission that conducts an in-depth study of Europa.
  - The JUICE investigations of Ganymede, Callisto and Jupiter would complement a US-lead mission to Europa.
President’s FY13 Budget

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- Grey region is a “notional” budget - top line remains the same but details within may change.
Planetary Science Operating Missions by Year 2012-2022

Border Legend
- Spacecraft Operational Phase
- Operational IF awarded an extended mission
- International Partner with U.S. Participation

* LRD= Launch Readiness Date