Overview of Recent CAPS Meetings

An assessment by

Philip Christensen
CAPS Co-chair

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- 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 was 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

4. International relationships

- Termination of U.S. participation in ExoMars had a devastating effect on NASA-ESA collaboration
- NASA's involvement in the ESA JUICE mission is a positive development, but does not replace an in-depth study of Europa.

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.
- One rationale presented for not starting MSR is concern about committing to a three-element campaign of large missions.
- However, MSR is the logical next step following the investment of $12 B in Mars exploration over the past 20 years. The damage from the Mars Program budget cuts severely jeopardizes this investment.
- A modest descope of the caching rover, rather than its elimination, would initiate MSR and retain fidelity to the Decadal Survey.

Mars Program Planning Group (MPPG) Report

- The MPPG was initiated by NASA in March 2012 to develop foundations for a Program-level architecture
- MPPG included 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 Report (con't)

- 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.
  - 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 to include both the Human Exploration and Technology Directorates.
- Support for the MPPG Report from SMD AA John Grunsfeld is encouraging and we 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 the ESA 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 and field testing programs.
- The successes of astrobiology has generated unprecedented interest among students ensuring an infrastructure necessary for continued progress.