

Summary of the Presentations and Discussion of MEPAG Virtual Meeting #3 (VM3)
September 13th, 2018; virtual attendance only, 11:00AM-12:15 PM PDT

Key goals of this virtual meeting were to bring the community up to date on MEPAG activities and also to hear out-briefs regarding two major National Academies reports by committees of the NASEM Space Studies Board: 1) Review and Assessment of Planetary Protection Development Processes and 2) the Mid-term report on the Decadal Survey. Posted agenda and presentation files can be found at <https://mepag.jpl.nasa.gov/meetings.cfm?expand=mVM3>, along with notes providing an overview of the discussions following the reports.

- Requests for general or meeting-specific MEPAG feedback should be made via the email mepagmeetingqs@jpl.nasa.gov.
- Meeting attendance included 78 distinct logins

MEETING NOTES

Past and on-going MEPAG and MEP activities

MEPAG Chair Jeff Johnson presented the agenda for the current virtual meeting (VM3) and an overview of MEPAG activities since the June 25, 2018 MEPAG Virtual Meeting #2. In particular, Jeff highlighted the October 1, 2019 release date for the revisions to the Goals Document, based on inputs that originated from the polar science community and were iterated with the MEPAG Goals Committee. The updated document can now be found at https://mepag.jpl.nasa.gov/reports/MEPAG%20Goals_Document_2018.pdf. Jeff also listed the MEPAG presentations from the July COSPAR meeting in Pasadena, and mentioned ongoing discussions to replenish Executive Committee and Goals Committee memberships, which will be announced via the MEPAG newsletter.

As part of the preparations for the next Planetary Decadal Survey, Jeff announced the impending formation of the Ice and Climate Evolution Science Analysis Group (ICE-SAG), whose goal will be to explore mission-based approaches to address the fundamental science questions related to the recent and ongoing evolution of Mars volatiles and climate. The ICE-SAG will be chartered and members selected by October 1 so that a final report could be prepared in February, 2019.

Other relevant activities were noted:

- Late Mars Workshop will be held Oct 1-2 in Houston, TX
 - <https://www.hou.usra.edu/meetings/latemars2018/>
- Mars Extant Life: What's Next will be held Jan 29-Feb 1 in Carlsbad, NM
 - <https://www.hou.usra.edu/meetings/lifeonmars2019/>
 - Abstract Deadline is November 15, 2018
 - Registration Deadline is January 18, 2019
- 9th International Conference on Mars is July 22-26, 2019 in Pasadena, CA
 - <https://www.hou.usra.edu/meetings/ninthmars2019/>
 - Indication of Interest is due Tuesday, March 6, 2019

Plans for the next MEPAG Virtual Meeting (VM #4) were then discussed, with the goal of holding this meeting in mid-February, 2019. Potential agenda items for the meeting include NASA HQ updates on budget activities, preparations for the 9th International Mars Conference, updates and preparations for the next Decadal Survey (including a potential architecture team to identify top priorities for non-Mars Sample Return missions), as well as reports from missions and workshops.

The next MEPAG face-to-face meeting (#37) is expected to occur in Spring 2019 on the US West Coast.

Scott Hubbard: National Academies Planetary Protection Report

<https://www.nap.edu/read/25172/chapter/1>

Scott Hubbard was a member of the NASEM panel and noted that his presentation was judged to reflect the consensus of the committee. He emphasized that the committee was not chartered to write new policy. It was chartered to make recommendations and suggest changes to the current policy development process. The charter stated:

1. Consider the historical context and the current policy development process.
2. Consider and make recommendations regarding key factors in the current policy development process.
3. Make recommendations about the future policy development process.

The notes that follow highlight some key points that were made; refer to Hubbard's presentation and the report itself for specifics:

[https://mepag.jpl.nasa.gov/meeting/2018-09/PPPD MEPAG briefing 9 13 18 updated.pdf](https://mepag.jpl.nasa.gov/meeting/2018-09/PPPD_MEPAG_briefing_9_13_18_updated.pdf)

• **Background**

- The committee focused on bodies that may be favorable to life that are being explored near-term: Mars, Europa and Enceladus. Hubbard suggested the addition of Titan to the list.
- In addition to experts in planetary science, the 15-member committee, chaired by Joe Alexander, had two space lawyers, a policy expert and a biologist.
- Mars 2020 and Curiosity were thoroughly reviewed by the committee given their astrobiological aspirations. Mars Sample Return (MSR) is in beginning stages of development, with Mars 2020 taking the first step by caching samples for possible return to Earth.
- Europa Clipper mission (an orbiter) is in development.
- A Europa Lander is being studied, and contamination questions are being posited.

• **Major Conclusions**

- Hubbard included a direct quote that the point of planetary protection policy is to enable, not inhibit, the search for life.
- Certain fundamentals of planetary protection (PP) policy remain relevant and vital:
 - COSPAR's role as the international group for discussion and collection of ideas about planetary protection.
 - The Outer Space Treaty (OST) is the binding legal document.
 - Article II essentially means that there is no more “flag planting” to stake a claim;
 - Article VI binds private industry as well as governmental programs;
 - Article IX pertains to contamination.
 - Science-based decision making and the involvement of a wide-range of scientific disciplines.
 - The US as a leader in planetary protection policy.

- However, the committee found five areas that NASA needs to address.
 - Managing planetary protection policy implementation;
 - Securing relevant outside expert advice;
 - Anticipating future solar system flight mission needs in PP;
 - Setting PP research and technology investment priorities
 - Identifying agency's strategy for PP in the era of sample return, human missions to Mars, and private sector missions to deep space.
- **Recommendation areas from the report**
 1. Managing policy implementations.
 2. Securing relevant outside expert advice.
 3. Planning for future missions, especially Mars sample return missions, Mars human missions, and icy moons (ocean worlds);
 - a. E.g., the Committee did not agree with the thought that PP policy is pointless once humans are on Mars;
 - b. Planetary Protection should be consulted early for Mars Sample Return.
 4. Establishing periods of restrictive biological exploration
 - a. E.g., there is presently for orbiters a rule that they should impact the surface in less than 50 years from arrival--this should be reviewed;
 - i. Can a microbe from a crashed spacecraft get through an ice mantle?
 5. Establishing the PP policies with regard to private sector missions, where there is currently a regulatory gap.
 - a. The launch of Musk's Tesla was discussed with Planetary Protection, but it was done on an ad hoc basis;
 - b. Neither the Department of Commerce or the Federal Aviation Administration (FAA) have oversight power;
 - i. Congress must write policy with the assistance of NASA.

The reestablishment of an independent planetary protection advisory board was strongly recommended. Planetary protection should not be a niche as in the past. It should be a leading-edge collaboration that engages interested parties from multiple disciplines.

- **Important Points from the Question and Answer Session**
 - Do commercial companies have to comply if they are registered in a country that is not part of the treaty (e.g., Luxembourg) and launch from international waters?
 - All current space faring nations are signatories of the Outer Space Treaty (OST).
 - Post-VM3 Clarification from Hubbard: Iran and North Korea have not signed.
 - Are there processes that examine compliance by other nations, especially in Mars missions?
 - Evasion of the OST was discussed with the lawyers on the Committee as a hypothetical. In addition to the binding legalities of the OST, the Committee believes it's in everyone's best interest to comply.
 - Planetary Protection has historically dealt with issues on a one-mission-at-a-time basis. The committee recommends that future policy should be more comprehensive.
 - Did this group revisit the issue of Special Regions on Mars?
 - The Committee did not consider special regions at a policy level.
 - Did the group address Mars Human Exploration Site science as part of the committee effort? Did the committee assume that there is no extant life on Mars?
 - There was no recommendation to assess that prior to sending humans, which can't be as quarantined as we assume for sample return.
 - The Committee is aware of the search for extant life and recommended tracking spores and other microscopic organisms that could possibly be present on spacecraft and potentially corrupt scientific analysis.
 - Planetary Protection policy is moving forward and, as mentioned above, should be enabling, not prohibitive.

Louise Prockter: National Academies Mid-Term Decadal Survey Report
<https://www.nap.edu/read/25186/chapter/1> (preliminary report)

https://mepag.jpl.nasa.gov/meeting/2018-09/V&V_presentation_MEPAG_final_Sep_13.pdf

The overview was given by Louise Prockter, co-chair with Joe Rothenberg, of the NASEM Space Studies Board Committee on the Review of Progress toward Implementing the Decadal Survey *Vision and Voyages* (V&V) for Planetary Sciences. NASA is required by law to conduct a mid-term assessment of each of its Decadal surveys. The charter directed the Committee to (paraphrased):

- Describe significant scientific, technical and programmatic changes since V&V.
- Assess how well the agency is doing in meeting the V&V recommendations and other NASEM reports
- Assess NASA's progress and the effectiveness in maintaining program balance.
- Recommend actions that optimize science value & how to account for new discoveries.
- Provide guidance for V&V's recommended mission portfolio and decision rules for the remaining years.
- Recommend actions that will prepare for the next decadal survey.

Note that the mid-term review was NOT intended to change any priorities from V&V or to set new ones.

An added task for the Committee, for which its membership was expanded, was to assess the Mars program with respect to:

- The Planetary Science Division's (PSD) Mars exploration architecture (MEA) and its responsiveness to V&V and other relevant NASEM reports
- Long-term goals of the Mars Exploration Program (MEP) and its ability to optimize the science return, given the current fiscal posture
- MEA's relationship to Mars-related activities to be undertaken by foreign agencies and organizations
- Extent to which the MEA represents a reasonably balanced mission portfolio.

The notes that follow highlight some key points that were made; refer to Prockter's presentation and the report itself for specifics.

- **General**
 - It is not mandated, nor would it be possible, for NASA to do everything in the Decadal Survey. NASA should, however, attempt to stay close to the recommendations.
 - The Committee was not tasked with new priority generation.
- **Flagships:**
 - Europa Clipper: NASA should closely monitor cost and schedule to keep the mission within its approved life cycle cost (LCC).
 - Europa Lander: As a prospective Flagship, it should be evaluated and prioritized within the overall PSD program balance in the next decadal survey.

- Ice Giants: NASA should do a new study based on the V&V objectives to see if a more broad-based set of goals can be met within a \$2B cost cap.
- **Small and Medium-Class Missions**
 - Discovery:
 - NASA should proceed with the recommended cadence. It is not.
 - Balance across the solar system is lacking (e.g., Venus, Ice Giants).
 - New Frontiers (NF)
 - The likely selection of just one NF mission lags the recommended 2 per decade.
 - When new discoveries or other factors compel NASA to reassess decadal survey priorities (e.g., NF), NASA should vet the changes via NASEM (i.e., CAPS), allowing for input from the community via assessment and analysis groups as time permits.
- **Mars Exploration Program (MEP)**
 - Mars 2020 fulfills the V&V mandate on "a critical next step [to Mars Sample Return]".
 - The "focused and rapid" conceptual follow-on missions are also "fully responsive". Although the detailed architecture is still under study, NASA "is making substantial progress" technically.
 - There is concern about the aging missions and MEP's dependence upon them.
 - MAVEN is the only operating NASA orbiter less than 12 years old.
 - Science from Orbiters should not be unduly sacrificed to enable their usage for relay of communications.
 - *Note: The Committee was unaware that ESA's Trace Gas Orbiter will provide relay for NASA landed assets, just as NASA orbiters will support ESA's ExoMars Rover and Surface Platform (RSP) when they arrive.*
 - NASA should "reinvigorate" international cooperation to aid Mars exploration more effectively and affordably (including for sample return)
 - Program versus Missions:
 - MEP should be managed as a program, not a series of missions.
 - There is a need to understand the management, strategic plan and future direction of MEP.
 - E.g., there is no plan to provide future reconnaissance beyond MRO.
 - A complete strategic plan/architecture is needed to address long-term goals of Mars exploration and to optimize science return across all missions, past, current, and future.
 - This architecture should include management structure, foreign and commercial partnerships and budget while addressing V&V goals.

- **Technology/R&A:**
 - The Decadal Mid-Term Panel found that NASA is in general exceeding expectations for technology and R&A funding via V&V criteria. Some issues needing attention include:
 - NASA should assess before the next decadal survey the role and value of both ground and space-based astronomy for planetary science.
 - The panel recommends that the next decadal survey committee work with NASA to be as clear as possible when describing levels of funding for various programs.
 - NASA should continue to work closely with the DoE on development of the MMRTG and other advanced energy conversion techniques.

- **CAPTEM:** The Committee recommended that NASA ensure that all constituencies relating to sample return mission be coordinated through the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM).

- **STEM:** The Committee recommended that the STEM Activation program should work directly with planetary missions and scientists to define science content and program implementation.

- **Preparing for the next Decadal Survey**
 - The Committee on Astrobiology and Planetary Sciences (CAPS) believes NASA should sponsor 8 to 10 concept studies. Among the two listed for Mars were Mars sample-return next-step missions, and Mars medium-class missions.
 - NASA should consider priorities and pathways for advancing the state-of-the-art CubeSats and Small Spacecraft technology to the point that they could be considered by the next Decadal survey as advancing key science goals.
 - *Note: MEP has been looking at smaller missions (sub-Discovery, but larger than CubeSats)*
 - The ability to respond to new needs for data archiving and interoperability should be assessed.

- **Important Points from the Question and Answer Session**
 - Human Exploration was not addressed by the panel.
 - The DSN and laser communication options were also not discussed in terms of Mars
 - NASA HQ has not yet responded formally to the Committee findings. They have been briefed.

Jeff closed the meeting, thanking both Scott and Louise for taking the time to present overviews of these important studies representing their respective committees of the NASEM Space Studies Board.