

MEPAG Meeting #39

Findings

MEPAG Community
Convened 4 May 2022

*2018 Planet-Encircling Dust Event
MRO MARCI / MSSS / JPL / NASA*

Preamble

At the May 2-4, 2022 Mars Exploration Program Analysis Group (MEPAG) Meeting #39, the Mars community conducted an initial assessment of the recently released Planetary Science and Astrobiology Decadal Survey committee report, and received a preliminary report from the I-MIM MDT, a review of Mars Sample Return status, and several current mission updates, including the outcome of the 2022 Planetary Mission Senior Review and the initial planning for deploying the first cache by Perseverance. Before presenting findings from the meeting, MEPAG as a community wishes to express the following:

- MEPAG congratulates the Decadal Survey committee for their efforts on behalf of the entire science community, and specifically their clear recommendations for the Mars Exploration Program (MEP) and Mars Sample Return (MSR).
- MEPAG expresses deep sympathy to our colleagues regarding the suspension of the ExoMars rover launch due to the present international situation. MEPAG supports and will continue to follow ESA and the international community in their efforts to recover this very important science.

MEPAG Findings Overview

- The Mars Exploration Program Analysis Group (MEPAG) strongly concurs with the Origins, Worlds and Life (OWL) report on the importance of returning samples from Mars to Earth by the end of the decade (2033), on increased funding for R&A to cope with the massive return of data by planetary missions, including those at Mars, and to invest wisely in the technologies that can enable future exploration at Mars and across the Solar System.
- The Planetary Science and Astrobiology Decadal Survey also presented an overarching challenge to NASA and its Mars Exploration Program and thus to MEPAG that MEP should *“...develop and execute a comprehensive architecture of missions, partnerships, and technology development to enable continued scientific discovery at Mars.”*
- *Consistent with OWL’s text and reports from study groups such as MASWG and a KISS workshop, MEPAG believes that such a “comprehensive architecture” should begin with a new program of low-cost missions (<\$300M) this decade, augmented by medium-class missions after the peak-spending phase of MSR.*

These and other findings are discussed in more detail in the following slides.

1. Finding: Decadal Survey initial thoughts 1, MEP

- The Planetary Decadal Survey report *Origins, Worlds and Life* (OWL) has unambiguously recognized the profound strategic and scientific benefits of the comprehensive program structure under which Mars exploration operates (the Mars Exploration Program, MEP). The report recommends the continuation of the MEP “success story,” which strategically plans Mars exploration using the full umbrella of tools within the MEP architecture, from small to medium-class missions, and from infrastructure to development of enabling technology.
- *MEPAG enthusiastically endorses the recommendation that MEP “...develop and execute a comprehensive architecture of missions, partnerships, and technology development to enable continued scientific discovery at Mars.” MEPAG believes that such a “comprehensive architecture” should begin with a new program of low-cost missions (<\$300M) during the execution of the MSR flight program, augmented by medium-class missions after the peak-spending phase of MSR, as noted in OWL.*
- *The funding for this architecture of low-cost and New-Frontiers (medium) class MEP missions would come from restoration of MEP funding as recommended by OWL.*

2. Finding: Decadal Survey initial thoughts 2, MSR

- Mars Sample Return (MSR), with its goal of providing a scientifically return-worthy cache of samples for return to Earth, was noted by the last Decadal Survey as the highest priority for flagship missions in the decade 2012-2022. MSR remains the highest priority robotic exploration goal in OWL, for 2023-2032.
- *MEPAG welcomes the recommendation to finish MSR “as the highest scientific priority of NASA’s robotic exploration efforts this decade” and to do so without undermining “the long-term programmatic balance of the planetary portfolio.”*



3. Finding: Decadal Survey initial thoughts 3, R&A

- The OWL recommendation that PSD “increase its investment in R&A activities to achieve a minimum annual funding level of 10 percent of the PSD total annual budget” is timely and, given the magnitude of returned data from all the planetary missions, sorely needed.
- *MEPAG strongly encourages that NASA adopt the OWL recommendation to bring R&A funding to the 10% level, in line with pre-2018 levels.*

4. Finding: Decadal Survey initial thoughts 4, technology

- The many technology recommendations in OWL are welcomed, particularly as they pertain to the ability to reach the Mars surface in an affordable way and provide access to the subsurface as well. Recent studies have highlighted the benefits of technology that would enable a number of MEPAG goals (e.g., affordable access to the surface; high-volume communication; subsurface access; mobility).
- *MEPAG welcomes opportunity for MEP to use all the strategic tools available to it, to explore Mars, including innovations like low-cost missions and associated support of technology maturation. MEPAG will study the many recommendations in this area with the intent of identifying ways in which its studies could further refine OWL recommendations.*

5. Finding: Decadal Survey initial thoughts 5, MLE

- While MEPAG previously advocated that Mars be included in the New Frontiers competition, it affirms the language used in OWL whereby medium-class missions for Mars exploration are best defined and executed strategically within the MEP, and that MEP funding be restored to levels that would make a new start for the first of such missions possible late in the decade. MEPAG agrees with OWL that astrobiology and ice science objectives would have high value for such medium-class missions (e.g., Mars Life Explorer, MLE).
- *MEPAG stands ready to build on current studies with science analysis groups as needed to define and refine objectives of an astrobiology/ice science Mars mission, which by its placement in MEP further enhances the ability of the program to define compelling precursors and successors in a long-term exploration strategy. Given MEPAG's long-standing emphasis on competing mission scope & implementation, we look forward to community participation in a future SAG, SDT & AO informed by the community.*

6. Finding: Mars exploration concurrent with MSR

- OWL recommended that the Mars Exploration Program (MEP) strategically plan and execute Mars exploration concurrent with MSR. Several highly relevant community-based studies are now available regarding concurrent exploration avenues, including the recommendations of the Decadal Survey report, the updated MEPAG Goals Document, the MASWG report, the KISS Workshop ('Revolutionizing Access to the Mars Surface'), ICE-SAG and Nex-SAG, the Low-Cost Science Mission Concepts for Mars Exploration Workshop, and the I-MIM MDT preliminary report.
- *MEPAG strongly endorses the need for a strategic plan for exploration concurrent with MSR that is science driven. To that end, MEPAG will stand up a Mars Concurrent Exploration (MCE) SAG, tasked with identifying and prioritizing scientific objectives and/or investigations that could be executed within the next ten years, in parallel with the MSR effort and in conjunction with DS guidance for the MEP. This effort is planned to be completed by mid-September, 2022.*

7. Finding: Inclusion, Diversity, Equity, Accessibility

- The “State of the Profession” section in OWL offers many important recommendations for improving Inclusion, Diversity, Equity and Accessibility (IDEA) in the planetary community. MEPAG welcomes the workshop “Advancing IDEA in Planetary Science”, hopefully the first of many, and looks forward to the work of the AG-based IDEA committee.
- *MEPAG applauds the inclusion of a detailed IDEA section in OWL, enthusiastically supports the work of the IDEA representatives on our Steering Committee and the AG-wide committee they serve on, and looks forward to implementing recommendations to support a more inclusive, diverse, equitable and accessible Mars science community. MEPAG recommends continued NASA support of this initiative, and encourages continued engagement and concrete movement.*

8. Finding: Infrastructure

- The assets conducting ongoing orbital science and rover data return are aging but continue to provide crucial science data and communication relays. The need for continued reconnaissance science and systematic monitoring has been identified by a number of studies, and the relay burden will only increase given the arrival of missions to be launched in the next decade. Approaching both orbital science and relay needs by design will maximize resources for the entire program.
- *MEPAG encourages a systematic approach to supporting and refreshing Mars orbital science, monitoring, and relay requirements both in the near-term for upcoming missions, and in the longer term (a move that could dramatically enable highly productive Mars small spacecraft concepts). New architecture and aggressive approaches could leverage new technology to substantially increase bandwidth for Mars which could be enabling for small missions.*

9. Finding: Current missions

- The latest Senior Review provided high ratings for the ongoing Mars missions, and the Decadal Survey report (OWL) noted the exceptional value that such mission extensions are providing. This is particularly true for Mars where mission extension has greatly enhanced the scientific return of landed (e.g., Perseverance, InSight, Curiosity) and orbital (synergies among MAVEN, MRO, TGO, ODY & HOPE) missions. This is an excellent example of the program-level approach recommended by OWL for sustaining Mars exploration (as well as other areas of planetary exploration).
- *MEPAG agrees with the above conclusions and encourages continued support of these missions at levels necessary to maintain high scientific return.*

10. Finding: I-MIM Measurement Definition Team

- While noting the controversial history of its beginnings, OWL states that “[w]ith engagement of the scientific community in measurement definition, I-MIM has the potential to be a pathfinding example of how Mars human exploration objectives can simultaneously advance high-priority science questions related to Mars climate and how scientific expertise can help successfully realize human exploration objectives for ISRU.” MEPAG is grateful for NASA and partners’ efforts toward organizing the I-MIM MDT, commends this committee’s ongoing work, and is intrigued by its preliminary findings regarding the reconnaissance and science goals of the mission concept. MEPAG was surprised by the lack of funding for I-MIM in the FY23 Administration budget (prior to the release of the MDT report), and in light of the OWL endorsement of the importance of a Mars ice mapping-type mission.
- *MEPAG eagerly awaits completion of the final MDT study. This will enable the community to fully evaluate the degree to which the I-MIM mission concept addresses key goals of the Mars community regarding ice investigations, and will place in clearer context OWL discussions regarding I-MIM or a similar type of joint mission as an Agency-level priority.*

11. Finding: MSR in relation to Mars 2020

- MEPAG applauds the ongoing MSR Program mission element studies and engineering tests such as those involving the Mars Ascent Vehicle Integrated System (MAVIS) and Earth Entry System (EES). MEPAG also appreciates the rationale for establishing the MSR Campaign Science Group and the MSR/MEP Joint Steering Group to ensure frequent, high-level discussions among key leadership. However, MEPAG is concerned regarding how MSR Program requirements (such as assessing locations for sample cache depots) are communicated within the context of otherwise highly constrained Mars 2020 mission operational scenarios, and their impacts on maintaining efficient progress toward accomplishing mission science goals.
- *MEPAG underscores the importance of discussion and clear communication at all levels as the Mars 2020 and MSR teams work to achieve a balanced mission operations approach that will sustain the goals of both MSR and MEP in an efficient manner during the entire course of the Mars 2020 mission.*