

MEPAG VM #17

Findings

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MEPAG greatly appreciates the hard work of the second Mars Sample Return Independent Review Board (MSR IRB-2), and the IRB's comprehensive report aimed at ensuring MSR is a scientific success that will return outstanding value for the nation's investment. (1/2)

- The IRB-2 report recognizes the importance of (1) continued science and sampling with M2020, (2) the value of scientific diversity in the collection, and (3) the added value of exploring and collecting additional samples on and beyond the western rim of Jezero crater. MEPAG urges NASA to emphasize maximizing returned sample number and diversity as the MSR architecture evolves.
- MEPAG concurs with the Board's assessment that NASA must develop a viable architecture with a realistic budget and achievable budget profile (e.g., accounting for likely annual budget limits). This is a critical component of a sustainable MSR Program.

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- MEPAG strongly agrees with the IRB-2 that NASA must *develop a strategy and implement a compelling communication plan* that reflects MSR as the top planetary Decadal priority, an Agency priority, and as a priority for the nation. This plan must not only be targeted to appropriators and the public, but it must also articulate the extraordinary science return to the Mars and broader Science Mission Directorate (SMD) communities.
 - MEPAG is planning to host a workshop in early 2024 to (1) encourage greater collaboration between the Mars exploration and sample science communities, (2) discuss the scientific usefulness of returned samples from Mars (particularly in terms of the integration with remote sensing and in situ science), and (3) detail specific testable hypotheses across multiple fields. This needs to complement and be complemented by NASA's messaging.

Sample return enables transformational science and MEPAG reaffirms its strong support of the *Origins, Worlds, and Life... (OWL)* decadal report regarding the scientific value and importance of returning samples of Mars to Earth.

- Returned samples from Mars will test hypotheses derived from nearly 50 years of remote sensing, in situ science, and modeling. These samples will spur new scientific questions that will guide the next generation Mars Exploration Program
 - In the 12 OWL chapters summarizing priority science questions, the return of samples is invoked as a strategic research activity in all but one chapter, from a range of destinations including: Mars (8 chapters), the Moon (5), Mercury (1), Venus (4), asteroids (5), comets (4), Europa (2), Enceladus (2), Titan (2), and TNOs (1).

MSR will be a pathfinder for NASA's Moon to Mars initiative, demonstrating key capabilities that will inform the human exploration of Mars, such as: launch from the surface of another planet, on-orbit rendezvous, and planetary protection.

MEPAG stresses the high scientific value of continued robotic exploration at Mars as envisioned by the Decadal Survey, as well as the need to maintain infrastructure supporting all robotic missions, including MSR.

- Consistent with past findings, *MEPAG encourages a science-rich plan to refresh Mars' orbital assets, both in the short- and long-term*; an important part of this solution could be lower cost/size missions.
 - The urgent need to refresh infrastructure at Mars goes hand in hand with the desire to continue exploration at the Red Planet; both will be negatively affected without replacing or augmenting the existing infrastructure (e.g., communications relay for current and future landed assets, imaging, and weather). Many key infrastructure elements conduct compelling scientific investigations, increasing their overall impact and contribution to the program.

MEPAG continues to support the Decadal Survey report's recommendations regarding programmatic balance in the Planetary Science Division.

- MEPAG remains concerned by the potential impact of MSR annual cost growth on other scientific priorities within the Mars Exploration Program (MEP) and the wider Planetary Science Division.
- MEPAG endorses the Decadal Survey language that, should the life cycle or annual costs grow beyond stated limits, NASA augment funding without disrupting the rest of PSD, including MEP, activities.

MEPAG encourages the Planetary Science Division (PSD) to make investments in R&A (using new or existing funds) aimed at facilitating the preparation of the Mars remote sensing, in situ, and modeling communities for integration of their work with returned samples. Such efforts also should foster collaborations with the sample science community.

- Specific testable hypotheses can now be detailed, given knowledge of the growing collection of samples obtained by M2020 and the supporting in situ and remotely sensed data, providing potentially revolutionary connections
- Developing collaborations with the sample science community is needed to maximize the return for all disciplines in Solar System science.