

Mars Exploration Program Analysis Group (MEPAG)

R. Aileen Yingst, *MEPAG Chair*

Report to Planetary Science Advisory Committee

24 September 2019



Mars Science Laboratory
<https://mars.nasa.gov/resources/22403/curiosity-sees-waves-in-the-clay-unit/>

Mars Exploration Program Analysis Group (MEPAG)

Outline

- MEPAG committees current memberships
- Recent/Upcoming activities and meetings
- Future work
 - Mars architecture
 - Preparations for the next Planetary Decadal Survey
- Concerns
- Summary



Engineers attached NASA's Mars Helicopter to the belly of the Mars 2020 rover on Aug. 27, 2019, at the Jet Propulsion Laboratory in Pasadena, California. Image Credit: NASA/JPL-Caltech.

Mars Exploration Program Analysis Group (MEPAG)

MEPAG Programmatics

- Committees:
 - Executive Committee (Chair: R. Aileen Yingst (PSI), appointed 6/19)
 - W. Calvin (Univ. Nevada Reno)
 - J. Eigenbrode (GSFC)
 - D. Banfield (Cornell)
 - B. Cohen (GSFC)
 - J. Filiberto (LPI)
 - S. Hubbard (Stanford University)
 - J. Johnson (former Chair, JHU/APL) Ex Officio
 - M. Meyer (NASA HQ)
 - D. Beaty, R. Zurek (JPL)
 - J. Bleacher/P. Niles (HEOMD, NASA HQ) Ex Officio members
 - Goals Committee (D. Banfield, Chair)
 - Goal I <*Life*> (S.S. Johnson, Georgetown University, J. Stern, GSFC)
 - Goal II <*Climate*> (R. Wordsworth, Harvard University, D. Brain (Univ. Colorado))
 - Goal III <*Geology*> (B. Horgan, Purdue, Becky Williams, PSI)
 - Goal IV <*Human Exploration*> (J. Bleacher, GSFC, M. Rucker, JSC)

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Recent MEPAG Activities

- MEPAG meetings (<https://mepag.jpl.nasa.gov/meetings.cfm>)
 - **MEPAG VM #3 (Sept., 2018): ~100 attendees**
 - National Academies reports on: Planetary Protection, Mid-term Decadal Survey
 - **MEPAG VM #4 (Feb., 2019): ~120 attendees**
 - Planetary Mission Concept Studies overview (L. Glaze), report from Ice and Climate Evolution SAG (ICE-SAG), Decadal Survey white paper planning
 - **MEPAG VM #5 (June, 2019): ~130 attendees**
 - ICE-SAG final report, 9th Mars Conference preparations, in-situ resource utilization panel overview from Humans to Mars Summit, MSR Science Planning Group (MSPG) update
 - **MEPAG #37 Face-to-Face Meeting (July 26, 2019; Pasadena, CA; post-9th Mars): ~200 attendees, 50+ log-ons**
 - Decadal Survey preparations, Goals document update preparations, Mars mission reports, HEO/Commercial space, Mars program architecture discussion. Findings finalized Sept. 5, 2019, <https://mepag.jpl.nasa.gov/meetings.cfm>
 - **MEPAG VM #6 (August, 2019): ~104 attendees**
 - Discussion of Planetary Protection Independent Review Board (PPIRB) request for input, New Frontiers program discussion.
 - Findings posted at <https://mepag.jpl.nasa.gov/meetings.cfm>

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Recent MEPAG Activities

- LPSC “meet and greet” events in 2018, 2019 (~30-50 attendees)
 - Interaction with Executive Committee and Goals Committee members
 - Ongoing discussions on white paper preparations for next Decadal Survey
- COSPAR meeting (July 17, 2018)
 - MEPAG abstract/presentation on “Forward planning for Mars scientific exploration”
 - Participated in panel on “International Coordination of Space Exploration Activities”
- AGU poster presentation (2018)

“Preparation for the Planetary Decadal Survey: The 2018 MEPAG Goals Document and plans for 2019 updates”
- Ice and Climate Evolution Science Analysis Group (ICE-SAG) report
 - Goal: *Explore mission-based approaches to address the fundamental science questions related to the recent and ongoing evolution of Mars volatiles and climate*
 - Preprint version released May, 2019, to support Planetary Mission Concept Studies call; final report published July 8, 2019 (https://mepag.jpl.nasa.gov/reports/Preprint_ICESAG_May28.pdf)

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Recent and Upcoming MEPAG Prep for Decadal Survey

- Goals Document
 - Last update released October, 2018, incorporating polar and non-polar ice discoveries.
 - Newest updates will be based on ICE-SAG (Ice and Climate Evolution Science Analysis Group) report and on 9th Mars Conference reports and community input (estimated delivery March 2020)
- Assist with Mid-Term Decadal Survey review panel request to:
 - *“...develop a comprehensive Mars Exploration Program (MEP) architecture, strategic plan, management structure, partnerships (including commercial partnerships), and budget that address the science goals for Mars exploration outlined in Vision and Voyages.”*
 - NASA has commissioned a Mars strategic architecture panel, intends to utilize MEPAG for vetting of drafts among other things.
- Assist with next Decadal Survey community response
 - Supplied Big Questions at request from NASA
 - Participation in CAPS discussion (September, 2019, Caltech) on preparation for the next Planetary Decadal Survey
 - Will provide googledocs form for those authors who wish to inform others about white paper topics of interest.
 - Would facilitate co-authors, co-signatories, and/or combining of similar efforts among multiple authors under a single entry; similar to effort in support of Planetary Mission Concept Studies

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MEPAG Issues — 1: MSR and beyond

- A prime concern of the MEPAG community has been the absence of high-level commitment to missions needed to carry out the return of the samples to be collected by the Mars 2020 caching rover preparing for launch next year ([Finding 1, MEPAG #37](#)).
 - For a time, NASA avoided even discussion of such return. That changed with Dr. Zurbuchen's presentation to the Mid-Term Decadal Committee (August, 2017).
 - The FY19 President's Budget included "studies for a potential Mars Sample Return" and the President's FY20 budget included studies of the next mission step, a Sample Retrieval Lander.
 - The definition of a joint ESA-NASA partnership is very exciting and we hope will result in a robust plan and reasonable cost for the next steps needed to achieve MSR.

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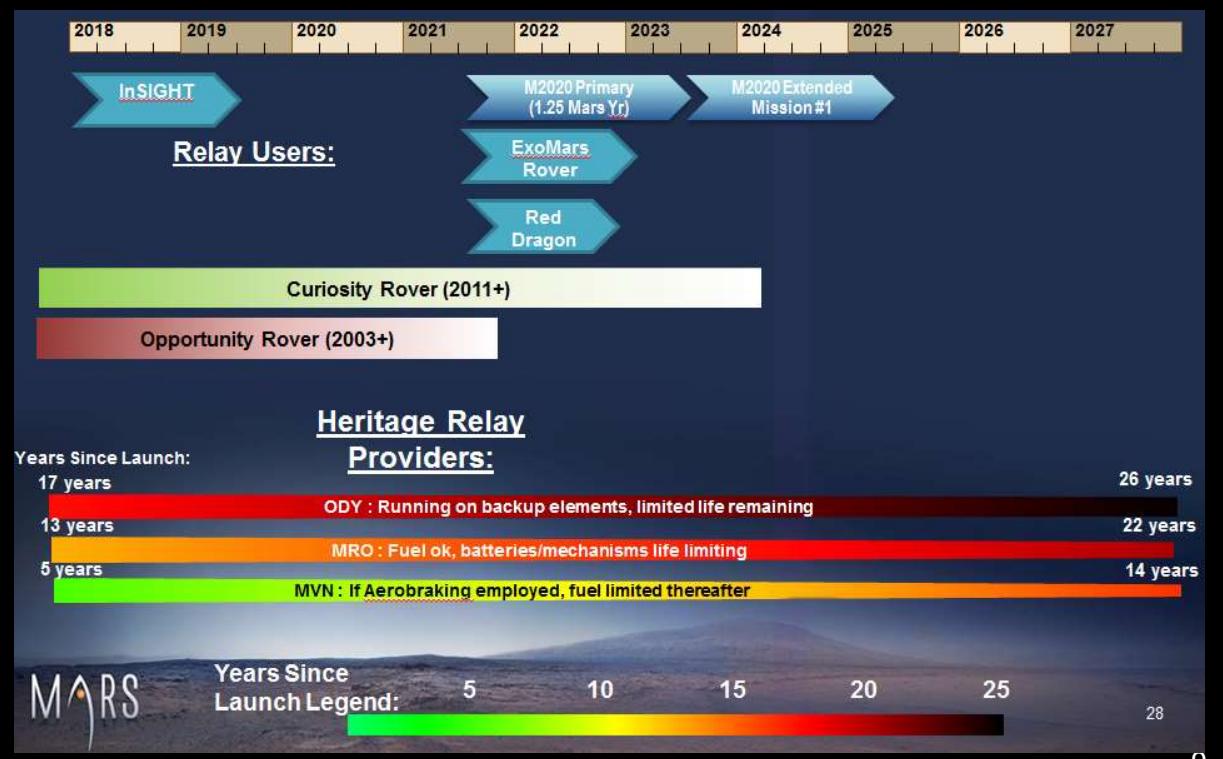
MEPAG Issues — 2: MSR and beyond

- A second major concern of the U.S. portion of the MEPAG community is the lack of program definition for other priority questions in Mars science (e.g., polar climate science) in parallel with, or beyond, the orbiter and rover missions required for sample return. (Finding 2, MEPAG #37)
 - NASA's commissioning of a MEP strategic architecture panel to develop a comprehensive MEP architecture that addresses the Decadal Survey science goals is encouraging.
 - Innovative paths for non-MSR flight investigations (orbital or landed) should be identified, including possibilities with international partners (Finding 4, MEPAG #37), commercial partners and smaller missions.
 - R&A funding is crucial to support research and analysis of the incredible wealth of data acquired from Mars.

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MEPAG Issues — 3: Infrastructure

- The communications infrastructure around Mars is aging. What should be done to ensure the safety of current and future landed missions, as well as continue important ongoing orbital science? (Finding 3, MEPAG #37).



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MEPAG Issues — 4: Extended missions

- Extended Mars (and other) missions are threatened by development cost over-runs of the Mars 2020 rover. Additionally, the FACA-compliant Senior Review process which judged 3-year continuing mission proposals in 2019 did not finish on schedule. Its budget guidelines were superseded by year-by-year budget mandates which continue the earlier practice of decreasing budgets with time. (Finding 5, MEPAG #37)
 - While MEPAG laments the loss/deferment of science due to cost overruns, we recognize the budget realities and believe it is essential to get Mars 2020 launched without delay.
 - The 2019 Senior Review process, whose budget guidelines were more consistent with the NAS report on extended missions, was unable to provide timely input on extended mission priorities into the budget process. Are there changes that can be made to the Senior Review process that in the future would allow its results to better inform programmatic decisions?

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Findings Summary

- Progress is being made toward Mars Sample Return
 - 2020 Mars caching rover is on schedule and budget, with a capable payload for selecting samples; some technical studies in progress will help lower the cost and cost risk of future missions needed to complete sample return
- New and ongoing discoveries challenge many previous views of Mars; community momentum is strong to address these high-priority questions about planetary evolution and origin of life
- Major issues and concerns for Mars science are:
 - An aging infrastructure and reduced funding for extended mission science
 - Lack of a confirmed post-2020 architecture with specific MSR follow-on
 - Significant movement in these areas, including commission of a strategic architecture panel
 - Lack of identified opportunities for competed non-MSR flight investigations (especially small spacecraft, commercial and international partnerships)
 - The importance of continued basic R&A support for the current and next generation of scientists
- *MEPAG is ready to respond to calls for assistance with planning and analysis.*