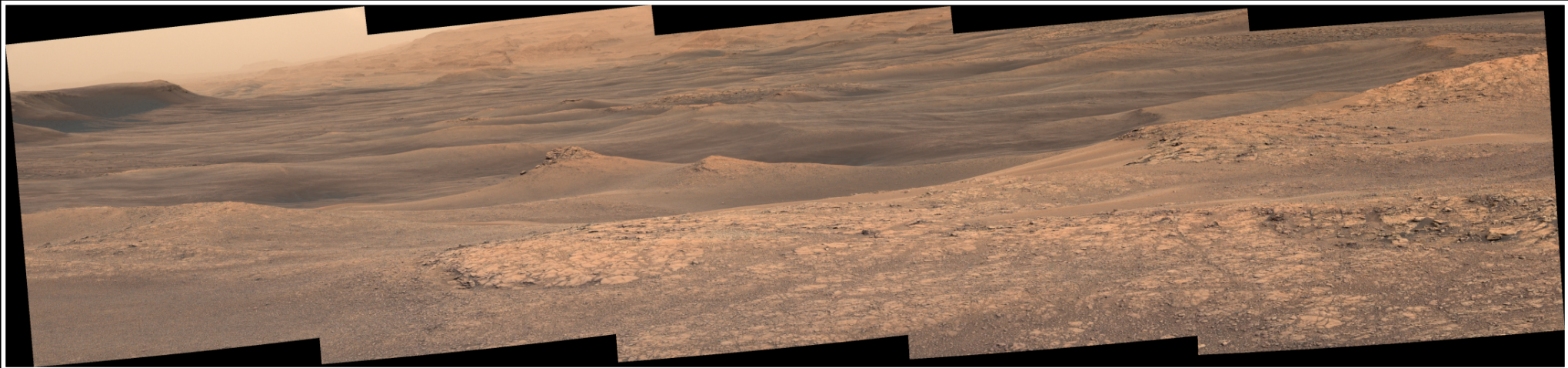


Mars Exploration Program Analysis Group (MEPAG)

R. Aileen Yingst, *MEPAG Chair*

Report to Planetary Science Advisory Committee

10 March 2020

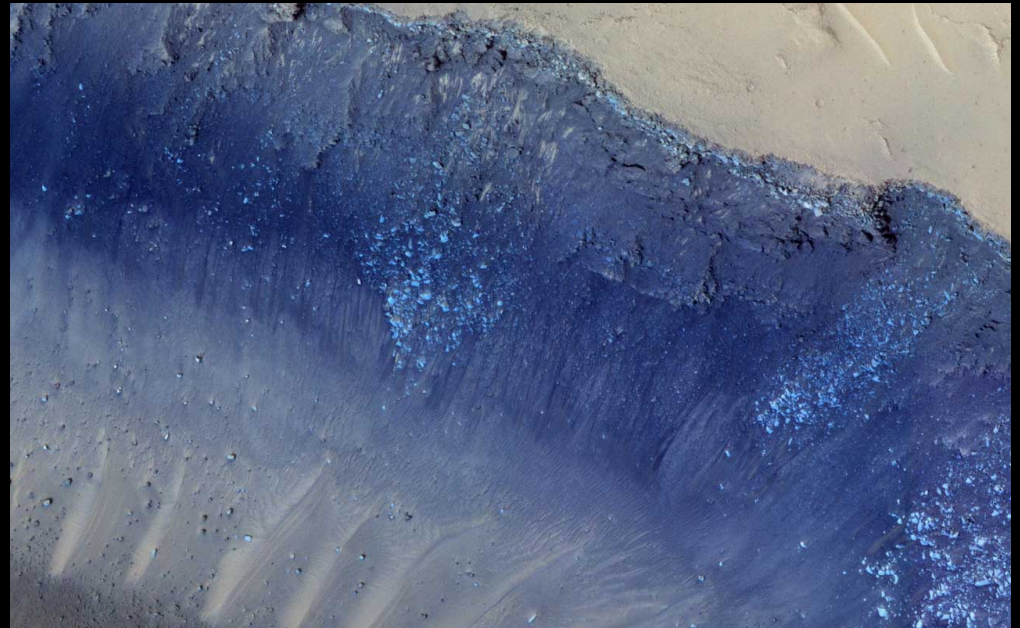


Mars Science Laboratory

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

Outline

- MEPAG committees current memberships
- Recent and upcoming activities
- Current issues* and findings for MEPAG



Landslides in Mars' Cerberus Fossae: The two largest quakes detected by NASA's InSight appear to have originated in a region of Mars called Cerberus Fossae. Credits: NASA/JPL-Caltech/Univ. of Arizona.

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 (past Chair, JHU/APL) Ex Officio
- M. Meyer (NASA HQ)
- D. Beaty, R. Zurek (JPL)
- J. Bleacher/P. Niles (HEOMD, NASA HQ) Ex Officio members



Self-portrait of InSight spacecraft.

- Goals Committee (D. Banfield, Chair)

- Goal I <Life> (S.S. Johnson, Georgetown University, J. Stern, GSFC; A. Davila, ARC)
- 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, NASA HQ HEOMD; M. Rucker, P. Niles JSC)

Mars Exploration Program Analysis Group (MEPAG)

Recent MEPAG Activities

- MEPAG meetings (<https://mepag.jpl.nasa.gov/meetings.cfm>)
 - **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>
 - Provided googledocs form for authors who wish to inform others about white paper topics of interest
 - Facilitates 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; also points to LPI site.
 - **MEPAG VM #7 (Nov., 2019): ~104 attendees**
 - Discussion of Decadal Survey white paper topics; plans for next MEPAG face-to-face meeting, overarching questions as architecture for DS
 - Findings posted at <https://mepag.jpl.nasa.gov/meetings.cfm>
 - **MEPAG VM #8 (Feb., 2020): ~65 attendees**
 - Goals revisions, discussion of Decadal Survey timeline and Administration budget proposal.
 - Findings will be posted at <https://mepag.jpl.nasa.gov/meetings.cfm>

Mars Exploration Program Analysis Group (MEPAG)

Upcoming MEPAG Activities

- LPSC “meet and greet” event in 2020
 - Interaction with Executive Committee and Goals Committee members
 - Ongoing discussions on white paper preparations for next Decadal Survey

- MEPAG #38 Face-to-face meeting
 - Scheduled for April 15-17, 2020 in the Arlington/DC area.
 - Updates on MEP, NASA, federal budget, current missions
 - Lightning presentations (oral and poster) on potential Decadal Survey white papers by community members

- Revision of MEPAG Goals Document
 - Prioritizes “flight” missions to achieve high priority Mars system science questions; updated in response to new discoveries, research directions
 - Goals include priority science for: Life; Climate; Geology; Human Exploration
 - Goals Revision was initiated July 2019 and has included several community feedback pathways over a period of 2 months, including a period of open community input followed by discussion at VM8.
 - **Final Goals Document slated to be released to community at LPSC**

MEPAG Current Issues: FY21-25 Administration Budget

- As with any Administration budget, there appears to be good news and bad news, and as with most budgets, these are likely related.
- Good news: Funding noted for MSR+Mars Ice Mapper*, increase in R&A, some restored support for MAVEN science mission in FY21 (slow decline thereafter).
 - MEPAG is encouraged to see MSR funded in the current President's budget after a significant period when it was taboo to be mentioned. Increased R&A across SMD allows gains in all areas of planetary science to be consolidated and leveraged. But...*
- Bad news: Continuing missions will have funding reduced; two more will be phased out.
 - This follows reduced funding for FY20 (next slides) and would seem to call into question the value of 3-year Planetary Mission Senior Reviews (PMSR).
 - The budget contradicts the expectations based on the generally high rankings by the PMSR of the extended mission proposals.

Mars Exploration Program Analysis Group (MEPAG)

FY20-22 Budgets (PMSR-period)

FY20 – NASA budget direction, Dec. 2019

- NASA direction given in December significantly cut budgets for *MSL* and *MAVEN*, less so for *MRO*.
 - These missions were all highly rated by the Senior Review (*MRO* and *MSL* rated excellent; *MAVEN* very good/excellent)
- *ODY* received the same baseline funding as proposed, but neither *ODY* nor *MSL* received the increased funding requested by them and endorsed by the Planetary Mission Senior Review
- NASA support of the *Mars Express (U. S.)* science activities will effectively end in FY20.
 - These actions, though regrettable from both a science & international support perspective, were consistent with the Senior Review

FY21-FY22 and beyond—Covered by the recently released President’s budget

- In FY21: *MRO* cut by \$2M; *MSL* cut to \$40M; *ODY* cut to \$1M (closeout)
 - *MSL* operations would be cut to ~2 planning days/week, jeopardizing investigation of the Mt. Sharp sulfates & “hydration bdry”.
 - *ODY*, the primary relay provider for InSight and still supporting *MSL*, would have to start closeout this year (in FY20).
- FY22+: *MSL* is not supported beyond FY21; *MRO* and *MAVEN* budgets continue to decline; all mission budgets at some point in the President’s budget plan fall below previously defined science floors (i.e., mission may no longer be scientifically viable).

Mars Exploration Program Analysis Group (MEPAG)

FY21 Budget — Administration

New Obligational Authority (\$M)	Ops Plan	Ops Plan	President's	Outyear Targets			
	FY2019	FY2020	Request FY2021	FY2022	FY2023	FY2024	FY2025
Mars Organic Molecule Analyzer (MOMA)	6.9		6.9	4.0	4.0	3.0	0.0
ExoMars (TGO Co-I)	2.1		2.2	2.0	2.0	2.0	2.0
Mars Program Management	13.2		12.3	12.3	12.3	12.3	12.3
Mars Future Missions (MSR & Ice Mapper)	30.3		232.6	405.6	550.8	713.4	775.0
Mars Mission Operations	1.9		5.4	5.4	5.4	5.4	5.4
Mars R&A	10.0		11.7	11.7	14.7	14.7	14.7
Mars Technology	20.5		6.7	4.4	4.4	4.4	4.4
MSL	51.1	49.0	40.0	0.0	0.0	0.0	0.0
MRO	26.0	27.4	25.5	25.0	24.5	23.5	23.5
ODY	11.5	11.7	1.0	0.0	0.0	0.0	0.0
MEX-US	2.8	1.4	0.0	0.0	0.0	0.0	0.0
MAVEN	17.9	21.3	22.0	21.0	20.0	20.0	18.0
Contuing Mission Subtotal (\$M)	109.3	110.8	88.5	46.0	44.5	43.5	41.5
Totals (\$M)	194.2		366.3	491.4	638.1	798.7	855.3

MEPAG Current Issues: FY21 Budget

- *It is not clear to the community what Ice Mapper is and why it is provided funding over other mission concepts listed as higher priority in the Decadal Survey.
 - Some information was shared at MEPAG VM8 (Feb. 28) but much remains unknown about this concept and how it would be developed. MEPAG has asked for, and MEP has responded positively to give, a presentation on this mission study at MEPAG's April Face-2-Face meeting
- This mission concept may have connections to MEPAG's NEX-SAG study (and Goal I, Sub-objective A2.1; Goal II, Sub-objective A3.2 of the MEPAG Goals doc). However, the sudden appearance of this mission concept in the budget undermines trust in the Decadal Survey process, right as the next DS process is gearing up, particularly as there are radar mappers on two pre-decadal studies now in progress.
 - The split between MSR and the Mars ice mapper study is not detailed in the budget.

MEPAG Findings summary — 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 FY20 President's Budget included studies of the next mission step, a Sample Retrieval Lander. The FY21 budget includes funds for MSR (split with Ice Mapper).
 - 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. A major milestone would be a successful Mission Concept Review in June.
 - MEPAG has several presentations on the joint MSR architecture scheduled for its April Face-to-Face meeting.

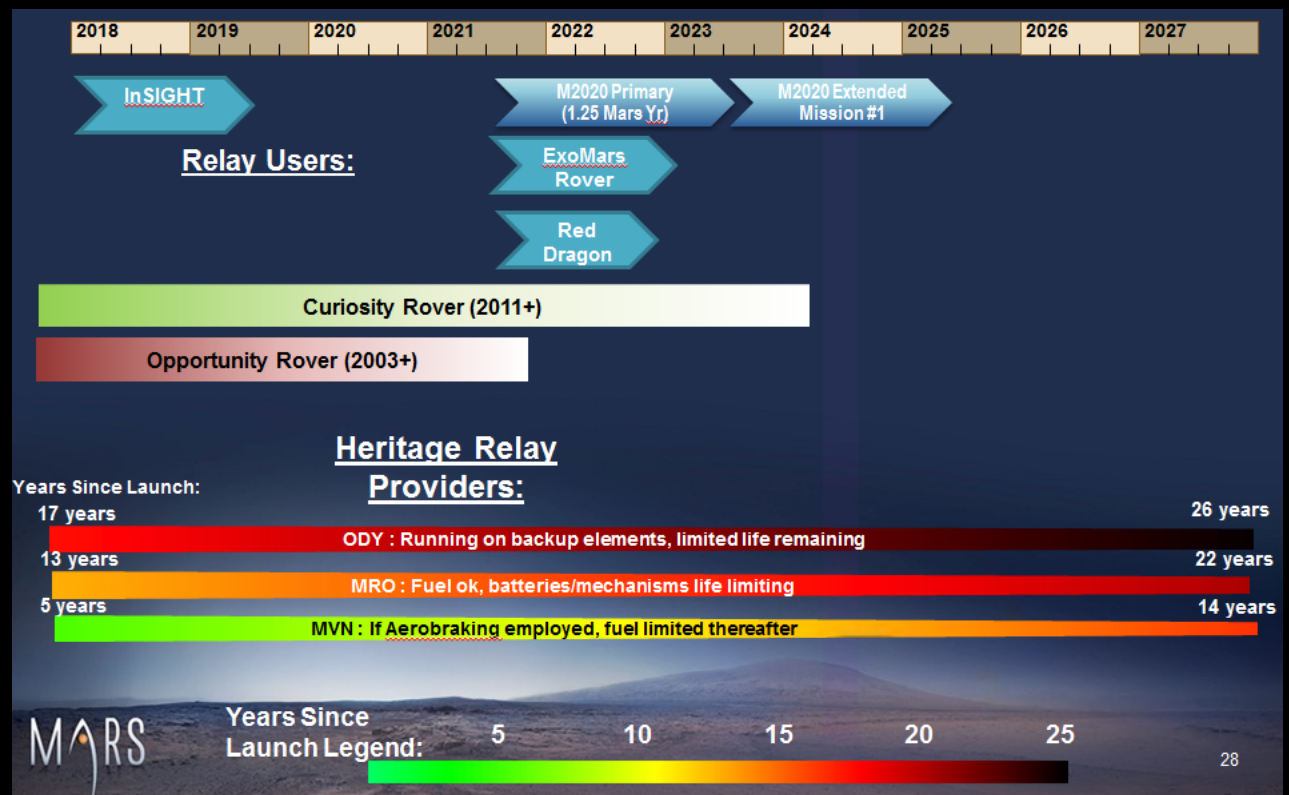
MEPAG Findings summary — 2: MSR and beyond

- 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)
 - The MASWG strategic architecture panel is developing a comprehensive MEP architecture that addresses the Decadal Survey science goals; this is very encouraging. *It is not clear how an Ice Mapper fits into this plan.
 - 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. MEPAG is encouraged to see its increase in the FY21 administration budget.

Mars Exploration Program Analysis Group (MEPAG)

MEPAG Findings summary — 3: Infrastructure

- The communications infrastructure around Mars is aging. MEPAG encourages ensuring the safety of current and future landed missions, as well as continuing important ongoing orbital science. (Finding 3, MEPAG #37).
- Closing out a working Odyssey mission goes in the wrong direction.



Summary

- The FY21 Administration budget appears to support long-awaited next steps towards returning Mars samples to Earth. The recognition that an increased R&A budget is needed to fully exploit data already returned and yet to come is greatly appreciated.
- However, the FY21-22 budgets currently do not fully reflect community prioritization (extended missions are zeroed out while a study of a mission not openly discussed with the community is funded).
- Progress is being made toward defining architecture for Mars beyond MSR
 - The Mars Architecture Study Working Group is working now on a vision for post-2020 Mars architecture
- An aging infrastructure and reduced funding for extended mission science are both ongoing concerns for the community.
- The future of Mars exploration includes identifying opportunities for competed non-MSR flight investigations (especially small spacecraft, commercial and international partnerships)
- *MEPAG is ready to respond to calls for assistance with planning and analysis.*