

Summary of the presentations, discussion, and main outcomes of the 31st MEPAG meeting March 2-3, 2016 @ Silver Spring, MD

Posted agenda and presentation files: <http://mepag.nasa.gov/meetings.cfm?expand=m31>

Key MEPAG Announcements

(detailed in [slides from the end of Day 2](#), led by Pratt)

- **Jeffrey R. Johnson (JHU/APL) is the new MEPAG Chair.** Lisa M. Pratt will remain on the MEPAG Executive Committee within the Past Chair role. We thank her and Dave Des Marais (the previous Past Chair) for their service, and welcome Jeff.
- The **MEPAG Goals Committee has opened nominations**, in particular for open spots in Goals I/Life, II/Climate, and IV/Preparation for Human Exploration.
<https://docs.google.com/forms/d/1DooOOABf9pDsYnAZBsoxrOp8MswuLZVYiv3PEOfrJOU/viewform>
- The **Mars Program Office (MPO) is surveying the community about its communication techniques.**
<https://docs.google.com/forms/d/15DKE9kzEXfdMZbcn2IJGak8fDxrpYZf7cbfsKbVUBKI/viewform>
- The **MEPAG Executive Committee (ExCom) proposed holding a half-day virtual MEPAG meeting in the fall** (midway to another face-to-face in spring 2017).

Overviews of the US and other Mars Program Accomplishments and Plans

- Michael Meyer, NASA Mars Exploration Program (MEP) Lead Scientist, presented an [overview of MEPs accomplishments and plans](#). He described the selection of 28 Participating Scientists for the Mars Science Laboratory mission, and mentioned two studies: a *Gale Crater Special Regions Evaluation Panel* to study whether Gale Crater has modern Special Regions, and a *Mars Water ISRU Planning Study (M-WIP)* to study the hypothetical “reserves” of water on Mars. The M-WIP study is wrapping up, with a final report nearly completed. There are likely to be follow-on studies on this and related topics. The Gale Crater Special Regions Evaluation Panel is awaiting agreement on a charter.
- Jim Green, PSD Director, presented the [PSD perspective](#), with an overview of mission accomplishments and plans (through 2016) and discussion about the FY16 appropriations budget. This \$1.63B budget request is \$270M (including \$36M for Mars) above last year’s request, which supports a robust Planetary Science program. He also discussed the budget request for FY17, the new Ocean Worlds program, Discovery and New Frontiers Programs, the Europa Mission status, the launch window for the InSight mission, and SIMPLEx Cubesat Selections. He also described the \$10M in the budget intended for further formulation studies for the next Mars orbiter.
- Jim Watzin, NASA MEP Director, [presented on the state of the MEP](#), which is good but he noted our aging infrastructure (see below for Future Plans). For the next Mars orbiter, the goal is to organize an Objectives and Requirements Definition Team (ORDT) this summer, so that detailed spacecraft studies and capabilities would be provided by the Fall.
- **NASA mission reports** included:
 - [general NASA Mars mission status](#) (by Fuk Li), which included news that the Mars 2020 rover had passed its Preliminary Design Review (PDR).

- [InSight](#) (by Bruce Banerdt), in which the problems with the SEIS instrument were described. Their March 1 presentation to NASA for a new mission plan (launch on May 5, 2018 with landing November 28) was received well, but final decisions were expected in the next few weeks.
 - [MAVEN](#) (by Bruce Jakosky) provided a science overview of the main mission results to date, which centered on the discovery that the major mechanism for changes in the atmosphere and climate through time has been loss to space.
 - [2020 Mars Rover](#) (by Ken Farley and John NcNamee) concentrated on the status of mission development and the development of constraints on the sample integrity requirements in regards to both forward and backward contamination. Terrain Relative Navigation (TRN) is now baselined for the mission, allowing “land on” science to be accommodated, along with other landing sites that were previously uncertain.
- We heard from [HEO representatives about their Mars-focused studies](#): Ben Bussey, HEOMD Chief Exploration Scientist, and Rick Davis presented an overview of progress and plans in selecting a landing site for humans on Mars. This included discussion of potential exploration zones (100 km radius regions with multiple areas for investigating resources and science studies), the landing site workshop last October (to which 400 people contributed to 45 proposed sites) and ISRU options/knowledge needs. Regarding the last, the *M-WIP study* was again mentioned, along with the *HEO ISRU-Civil Engineering Working Group (ICE-WG)*.
 - Steve Hoffman, (Johnson Space Center) then presented on the [ICE-WG final report](#), in which 400 km total range of traverse was assumed, with multiple crews each spending about 300-500 sols on the surface. (The [ICE-WG report](#) can be found on the MEPAG Reports page, under SMD.)
 - Reports were also given about **Mars work and studies by other space agencies or by international groups**, including
 - [ExoMars/ESA](#) (by Ralph de Groot, Hakan Svedhem, Bernardo Patti, and Sanjay Vijendran), included description of the planned March 14 launch date for ExoMars, with the Schiaparelli EDL Demonstration Module (with a battery-powered, several-sol payload) landing on October 19 in Meridiani Planum. The planned 2018 rover mission will be nominally 218 sols with a 1.5-2.5 km traverse to allow for drilling. Three landing sites were still in consideration with Oxia Planum the target for a 2018 launch, and Mawrth Vallis, and Aram Dorsum as back-ups. A Phobos sample return mission Phase A study started in mid-2015 will complete this summer, with launch opportunities in 2024-2028 to return 100 g of sample.
 - the Canadian Space Agency (by Victoria Hipkin), who described an ongoing Mars analog campaign with simulated rover operations. (presentation not posted)
 - the potential [JAXA Phobos sample return mission](#) – *Mars Moon eXploration/MMX* (by Hiridy Miyamoto), with a launch date of August 2022, arrival at Mars in 2023, departure in 2026, and return to earth in April 2027 including at least 10 g of samples from two sites deeper than 2 cm from the surface.
 - potential NASA-ISRO interactions (by Michael Meyer), particularly for their next deep space mission. (no slides)

- the [international Mars Architecture for the Return of Samples/iMars](#) (by Caroline Smith and Tim Haltigin). They explained that a minimum of 500 g of returned samples were assumed in their studies, for which laboratories would need to be up and running at least two years prior to receiving the first sample. They recommended that planetary protection and sterilization protocols need to be in place soon, given that a Sample Receiving Facility (SRF) requires a 12 year lead time.
- United Arab Emirates (UAE) representatives from the *Emirates Mars Mission* were in attendance, but did not present. (no slides)

Additional Reports

- David Smith, of the National Academy of Sciences/NAS, presented a [Review of the Special Regions Science Analysis Group/SR-SAG2 report](#). Their charter was to organize a joint committee of the Space Studies Board and ESA to review the Special Regions SAG. Their main findings included: confirmation that “The SR-SAG2 report is a comprehensive review of Special Regions and the factors used to define them” and support for 29 of SR-SAG2’s 45 findings, slight revisions for 15, and disagreement with 1. (The [SR-SAG2 report](#) can be found on the MEPAG Report page, under Topical Reports.)
- Paul Niles and Dave Beaty presented on the [Human Exploration of Mars Science Analysis Group/HSO-SAG](#) findings. The purpose of the Human Science Objectives (HSO) SAG was to refresh understanding of the science objectives for humans missions and their implications for human exploration zones. (The [HSO-SAG report](#) can be found on the MEPAG Report page, under Topical Reports.)
- Rich Zurek and Bruce Campbell presented on the [Next Orbiter Science Analysis Group/NEX-SAG](#) findings. This group was co-chartered by HEO Mission Directorate (MD) and the Science Mission Directorate (SMD) to look at science objectives. For comparison, the “NeMO” activity was a study by engineering teams for the next Mars orbiter, the results of which fed into this study. The main goal of the orbiter is to replenish the communications infrastructure at Mars, but the SAG also investigated resource prospecting and Strategic Knowledge Gaps (SKGs) along with potential synergistic science that could be done, both in response to the Decadal Survey and to discoveries since the Decadal Survey. Proof of concept instruments were listed to address both science and resource objectives, with considerable synergy. Cost was found to be the major limiting factor for the orbiter, not mass or power. Using the Solar Electric Propulsion (SEP) opens up opportunities for different capabilities than the Mars Reconnaissance Orbiter, including studies of the moons, sample cache return capability, and spacecraft orbital inclination changes. (The [NEX-SAG report](#) can be found on the MEPAG Report page, under Topical Reports.)

Future Plans

- Regarding the **potential Next Mars Orbiter**: The NEX-SAG findings and definition of a potential mission’s trade space fed into [MEP plans](#), which were presented by Jim Watzin, NASA MEP Director (also linked above, see Overview). The Next Orbiter would aim to provide capabilities addressing needs under infrastructure continuity, decadal priorities, and resource prospecting for future

landing sites and exploration planning. A tentative timeline was presented, with an Objectives and Requirements Definition Team/ORDT (which would include Science Definition Team/SDT-type work) this summer, Phase A implementation beginning in Fall 2016, and a Payload AO released in the spring of 2017. This timeline supports a 2022 launch opportunity. Work is ongoing to also explore Next Orbiter and MSR partnerships. PSD/MEP is also talking with international space agencies to see if there are possibilities for their contributions to spacecraft or payload elements. It is hoped that these possibilities would be identified by the end of May so that they could be considered by the summer's ORDT.

- Dave Beaty and Rich Zurek led a discussion on [future MEPAG activities](#). Possibilities for Science Analysis Group/SAG studies were discussed, to support robotic exploration and/or preparation for human exploration of Mars. It is expected that there is time for one SAG in the late part of 2016.
- David Smith, of the NAS, presented on [various review studies proposed by NASA](#) that would have relevance to the MEPAG community. (To find out more about NAS studies: <http://www8.nationalacademies.org/cp/search.aspx>.) This included studies on the value of Extended Missions, Research and Analysis Program restructuring (report due in November), the role of Flagship missions, Searching for Life across space and time (due Spring 2017), and Planetary Protection development process (Due December, 2017). Additionally, he commented on an expectation that a mid-term review of the [2013-2022 Planetary Science Decadal Survey](#) will be requested in the near future (this was verified by a NASA official in attendance), and outlined a very tentative schedule for the next *Planetary Science Decadal Survey* (starting with an organizational meeting in September 2019).

Findings and Community Observations, reported to the Planetary Science Subcommittee (PSS)

(Lisa Pratt's presentation, and the full PSS agenda/presentation list can be found at:

<http://www.lpi.usra.edu/pss/mar2016/>)

Next Orbiter:

- MEPAG endorsed the NEX-SAG report, and agreed that "A mission with SEP could have the capability for return of a cache of Mars samples to Earth vicinity as well as payload elements addressing high-priority resource and other science objectives."
- MEPAG is encouraged by inclusion of \$10M in the President's FY17 budget to study the next Mars mission.
- MEPAG agrees with the importance of replenishing relay and site certification infrastructure to support future missions.
- MEPAG is encouraged by MEP's efforts to work with other NASA directorates and with international partners to include payload elements to achieve synergistic science and resource objectives that a SEP orbiter mission to Mars could support, but also notes the importance of a competitive peer process that allows the US science community to be involved in achieving objectives.

International Mars Exploration:

- MEPAG commends the exciting Mars opportunities being considered by the world community.
- MEPAG recognizes that international collaboration can enable significant advances in exploration, particularly in a time of tight space agency budgets.

Exploration by Humans on Mars:

- The last year has seen considerable and productive progress in joint HEO-SMD activities to assist planning for missions with humans on Mars; in particular, the *HSO-SAG*, *NEX-SAG*, and Landing Site for Humans activities.
- MEPAG believes this joint activity has been productive and is ready to support additional joint study where HEOMD and SMD agree that it is productive.
- While supportive of these joint studies, MEPAG believes it is imperative that MEP continue to plan and implement a "robotic" Mars exploration program.

Additional findings:

- MEPAG hopes that PSD (and Congress) will support InSight for flight in 2018.
- Looking ahead to humans on Mars and given the emergence of Special Region candidates, Planetary Protection policy needs continued examination.
- Under the PSD Mission Senior Review process, MEPAG hopes the enormous value (science gained for the funds expended) of extended missions will be recognized and that high-quality science will continue to be supported.
- MEPAG clearly supports ongoing Research and Analysis (R&A) and Data Analysis programs.
- There is an urgent need for adequate funding to support U.S. investigators on foreign instrument teams, whether on U.S. or other missions.