National Aeronautics and
Space Administration

EXPLORE SOLAR SYSTEM&BEYOND

AG Slides

PAC Meeting
June 22, 2023

MEPAG

MEPAG Update

Vicky Hamilton, Chair

Southwest Research Institute

22 June 2023

These slides are an abridged subset of findings from MEPAG's April 2023 face-to-face meeting; full text is included in backup slides

Key Points

- MEPAG supports the draft MEP Future Plan
- NASA leadership should continue to engage with the MEPAG and PSD community on the known or anticipated impacts of MSR and SRP costs on other priorities
- Keep talking about Mars science objectives for Moon to Mars
- Preserve the science budgets of extended Mars missions at levels consistent with the Academies' Extended Missions study recommendation
- Provide specific details on an infrastructure plan as soon as possible

MEP Draft Future Plan, I

- MEPAG understands the significant effort that has gone into the MEP draft future plan and the broad range of community inputs that were considered in its development.
- Even as NASA is realizing the nearly 50-year strategic goal of returning samples from Mars, it is looking ahead to continuing exploration of the Red Planet; the plan includes exciting opportunities for lower-cost, small-class missions, the Decadal Survey-recommended medium-class mission, technology development, engagement with the commercial sector and international partners, expanded interactions with the human flight program, and plans to enable the participation of all communities in Mars exploration.

- *MEPAG supports the overall goals of the draft future plan and appreciates the opportunity to review and comment on the plan.*

MEP Draft Future Plan, II

- MEPAG understands that the budget available for additional activities during peak MSR spending currently is limited; unfortunately, this results in a significant gap in new launches that extends to 2028, whereas the 2023 Decadal Survey (OWL) envisioned an ongoing MEP that could support small, low-cost missions in the period leading up to the launch of NASA's MSR flight elements.
- It is crucial to MEP flight missions, and the Moon-to-Mars initiative, that scientific expertise is not lost during this timeframe.

- *MEPAG encourages PSD/MEP, as part of the regular budget planning cycle, to seek the budget augmentation required to enable the launch of small-class missions earlier than currently envisioned in the draft future plan and as implied by the Decadal Survey.*
- *MEPAG strongly endorses the preparatory elements of the draft plan*

Mars Sample Return

- After nearly 50 years of study, and as reaffirmed by the latest Decadal Survey, Mars Sample Return remains the highest scientific priority of the PSD and the MEP as well as an Agency priority. The MEPAG community is pleased that the US contribution to this international mission appears to be on track to complete the KDP-C milestone this calendar year and supports the convening of a second Independent Review Board to assess the MSR Program's progress.
- Nonetheless, there is genuine concern in the MEPAG community about the possibility of increases in costs for MSR and SRP and the pressure that could place on the draft future plan for the Mars Exploration Program and the broader Planetary Science Division budgets and priorities.

- *MEPAG encourages NASA leadership to continue to openly engage with the MEPAG and PSD community on the known or anticipated impacts of MSR and SRP costs on other priorities and what mitigations are being pursued to minimize those impacts (e.g., following Decadal Survey recommendations). Providing information to these communities, as soon as possible, will permit them to proactively adapt to an evolving budgetary landscape and update exploration priorities for the next decade as needed.*

Moon to Mars

- As noted previously, the Moon to Mars effort will benefit from early, vigorous communication among the stakeholders with respect to the high-priority science that could be accomplished by crewed missions to Mars; MEPAG continues to have concerns as to how science community input will be integrated into planning efforts on an ongoing, iterative basis.

- *MEPAG looks forward to a near-term demonstration by NASA of the formal pathway by which science planning will be integrated into Moon to Mars strategic planning and strongly supports the immediate inclusion of science discussion and input into the ongoing development of detailed, Moon to Mars objectives that will reduce risk and maximize science return.*

Extended missions

- The 2023 Decadal Survey and the Academies' study "Extending Science: NASA's Space Science Mission Extensions and the Senior Review Process (2016)" asserted the exceptional value of extended missions (EM). EM continue to return valuable science data heading into a period with no new missions on the near-term horizon. The cost of continuing to collect science data and perform data analysis via EM is incremental relative to the cost of new missions.
- Extended missions will provide ongoing support for developing and maintaining multi-generational community expertise through this gap period, ranging from students and early career researchers to mid-career and senior members whose expertise and mentoring efforts will ensure a strong, stable community.
- *Although MEPAG understands the MEP budget is constrained at present, preserving the science budgets of extended Mars missions at levels consistent with the Academies' study recommendation (i.e., to account for inflation), in addition to current programmatic needs, is a very high priority. MEPAG considers this support crucial for workforce stability through the gap between launch opportunities.*

Infrastructure

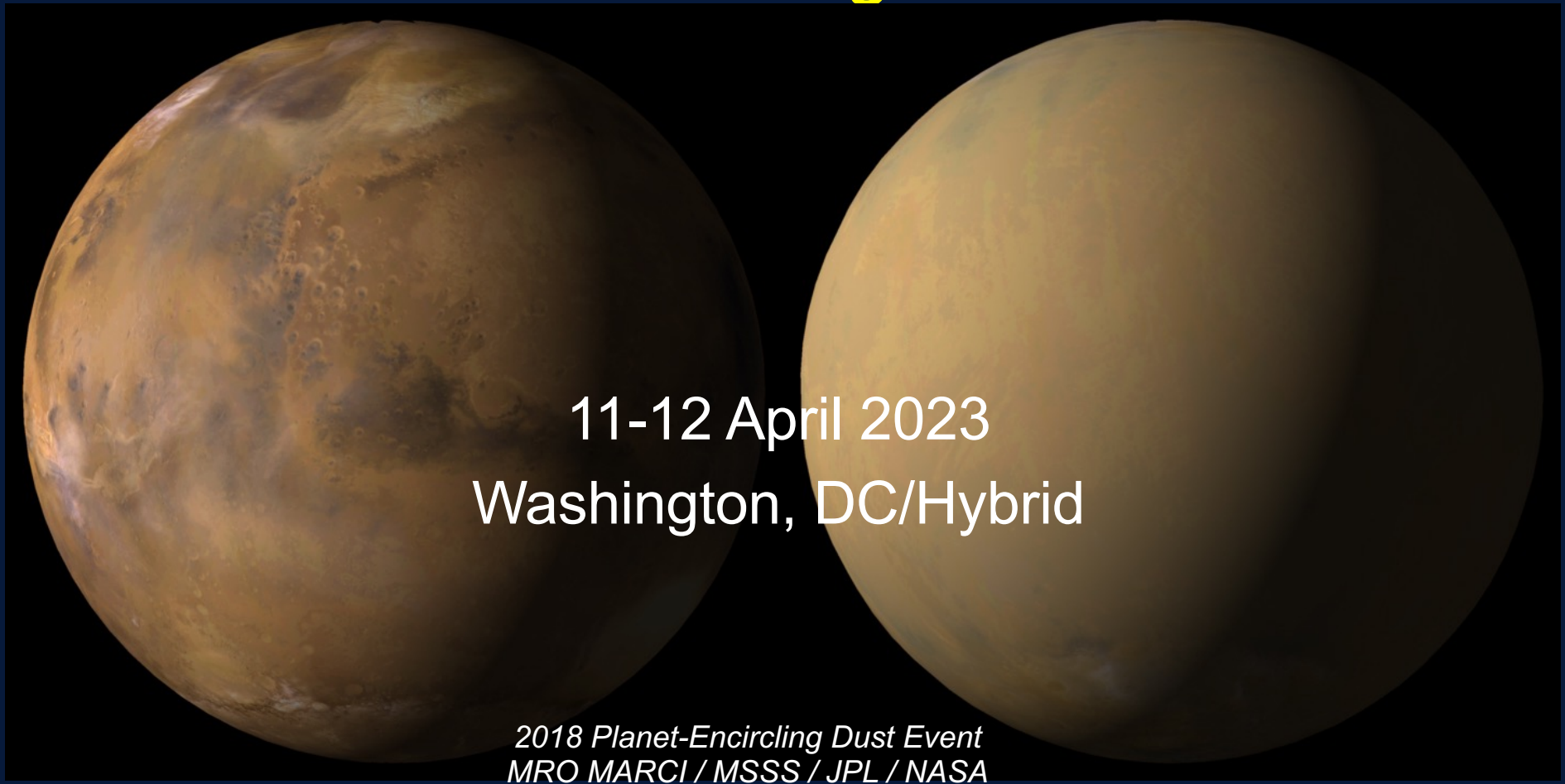
- Mars orbiters are conducting critical science and rover data relay but are operating long beyond their design lifetimes. The need for continued reconnaissance science and systematic monitoring has been identified by several studies, and the orbiters' relay burden will not decrease given the anticipated lack of missions to be launched in the next 5-10 years -- the loss of these critical assets would be damaging to future science.
- As acknowledged by Initiative 2 of the draft MEP future plan, we must address critical/aging infrastructure; approaching future communication relay, reconnaissance, and critical event coverage needs by design, rather than by happenstance, will maximize resources for the entire MEP, especially for small-class missions with potentially limited communications capabilities.
- *MEPAG encourages the MEP to provide specific details on an infrastructure plan as soon as possible, including a target launch date and the feasibility of re-engagement with the International Mars Ice Mapper, to ensure adequate support of current assets and enable planning for future missions before we are faced with a gap.*

Backup

Full text of MEPAG findings from MEPAG #40
11-12 April 2023, Washington, DC

MEPAG Meeting #40

Findings



11-12 April 2023

Washington, DC/Hybrid

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

MEP Draft Future Plan, I

- MEPAG understands the significant effort that has gone into the MEP draft future plan and the broad range of community inputs that were considered in its development.
- Even as NASA is realizing the nearly 50-year strategic goal of returning samples from Mars, it is looking ahead to continuing exploration of the Red Planet; the plan includes exciting opportunities for lower-cost, small-class missions, the Decadal Survey-recommended medium-class mission, technology development, engagement with the commercial sector and international partners, expanded interactions with the human flight program, and plans to enable the participation of all communities (see Slide 4) in Mars exploration.

- *MEPAG supports the overall goals of the draft future plan and appreciates the opportunity to review and comment on the plan.*

MEP Draft Future Plan, II

- MEPAG understands that MSR is on the verge of entering its peak spending phase and that the budget available for additional activities during this period currently is limited; unfortunately, this results in a significant gap in new launches that extends to 2028, whereas the 2023 Decadal Survey (OWL) envisioned an ongoing MEP that could support small, low-cost missions in the period leading up to the launch of NASA's MSR flight elements.
- It is crucial to MEP flight missions, as well as the Moon-to-Mars initiative, that scientific expertise is not lost during this timeframe; the MEP draft future plan has identified a number of activities that can be undertaken to maintain preparedness and community engagement.

- *MEPAG encourages PSD/MEP, as part of the regular budget planning cycle, to seek the budget augmentation required to enable the launch of small-class missions earlier than currently envisioned in the draft future plan and as implied by the Decadal Survey.*
- *MEPAG strongly endorses the preparatory elements of the draft plan, including mission-enabling technology development activities, support for research and analysis (R&A), and increased interaction with commercial entities with interest in Mars flight opportunities; these may take the form of mission-enabling incubator programs, enhanced support for Mars data analysis, and increased participation by scientists in extended missions, all of which can serve to ensure that the Mars science community is ready to implement novel, high science value mission concepts as soon as possible.*

MEP Draft Future Plan, III

- One of the four initiatives in the MEP future plan is the support and furtherance of Diversity, Equity, Inclusion, and Accessibility (DEIA), in response to the "State of the Profession" chapter in the Decadal Survey recommendations for improving DEIA in the planetary community.
- MEPAG applauds the efforts that NASA PSD and specifically, MEP (as codified in the MEP future plan), is making with respect to DEIA issues; however, during our meeting, it was apparent that: (1) members of the community are not aware of all the programs that exist, (2) on what the programs are focused and how they are conducted, or (3) their reach with respect to underserved populations, which may make it difficult to discern where gaps may exist (e.g., in the areas of recruitment and retention).

- *MEPAG is excited to see the MEP implement these initiatives as soon as possible;, it would be of great benefit if PSD were also to develop a website identifying (and linking to) ongoing DEIA initiatives in the MEP and more broadly within the Division (including those conducted by missions), and the opportunities for community engagement. Engaging the cross-AG IDEA (aka DEIA) Working Group to support identification of gaps or other key information may be beneficial.*

MEP Draft Future Plan, IV

- Lower cost, small-class missions are a key, and welcome, component of the MEP draft future plan that would enable continued progress in addressing outstanding critical questions in Mars science; they represent an important scientific bridge across the expected 15-year gap between the launch of Mars 2020 and the Decadal-recommended medium class (Search for Life) mission.
- These missions are a source of enthusiasm in the community; MEPAG envisions that they may have the potential to offer additional opportunities for diverse members of the community to become involved in MEP flight missions, with substantial consequences for maintaining scientific expertise in the community without them.

- *MEPAG encourages NASA to identify lessons learned from SIMPLEx and CLPS and to incorporate these into the proposed new low-cost mission program within MEP (these lessons learned have value to non-MEPAG constituencies as well).*
- *MEPAG also encourages NASA to regularly engage the MEPAG community regarding issues specific to carrying out small-class missions at Mars (such as planetary launch windows and mass of communications hardware if relay is absent).*

Mars Sample Return

- After nearly 50 years of study, and as reaffirmed by the latest Decadal Survey, Mars Sample Return remains the highest scientific priority of the PSD and the MEP as well as an Agency priority. The MEPAG community is pleased that the US contribution to this international mission appears to be on track to complete the KDP-C milestone this calendar year and supports the convening of a second Independent Review Board to assess the MSR Program's progress.
- Nonetheless, there is genuine concern in the MEPAG community about the possibility of increases in costs for MSR and SRP and the pressure that could place on the draft future plan for the Mars Exploration Program and the broader Planetary Science Division budgets and priorities.

- *MEPAG encourages the PSD, MSR, and Sample Receiving Project (SRP) Program leadership to continue to openly engage with the MEPAG and PSD community on the known or anticipated impacts of MSR and SRP costs on other priorities and what mitigations are being pursued to minimize those impacts (e.g., following Decadal Survey recommendations). Providing information to these communities, as soon as possible, will permit them to proactively adapt to an evolving budgetary landscape and update exploration priorities for the next decade as needed.*

Mars Sample Receiving Project, I

- Work on the MSR SRP represents an important and exciting opportunity to articulate to the broader science community and the public the specific Solar System-level science that can be achieved from the combination of Mars exploration efforts to date with comprehensive analysis of returned samples.
- Interactions and collaborations between sample scientists (e.g., in MEPAG, ExMAG, and internationally) and scientists in other disciplines is critical; working together on the SRP will lead to getting the best science out of the laboratory studies and understanding their implications for the past, present, and future exploration of Mars and other planetary bodies.
- The MEPAG community understands that planning for the SRP, including the cost and details of the process guiding allocation of samples to the broader community is still in progress and looks forward to future updates, as well as the results of an upcoming Measurement Definition Team.
- *The call for volunteers to participate in a Measurement Definition Team is a welcome opportunity for wide community participation in keeping with previous such invitations and MEPAG looks forward to the announcement of the MDT membership.*

Mars Sample Receiving Project, II

- Despite regular updates to the MEPAG community and past opportunities for community participation in SRP planning activities, there remain concerns and confusion about science community involvement in the SRP planning process as well as the cost of its associated facility.

- *MEPAG encourages NASA to: 1) continue to regularly engage with MEPAG and update the wider sample science community beyond MEPAG on SRP progress and opportunities to participate in this key aspect of deriving the best science from the samples once they are returned from Mars, as well as 2) follow Decadal Survey recommendations with respect to cost (where the total cost of MSR was stated to include NASA's contribution to the Sample Receiving Facility).*

Moon to Mars

- As noted at the *Science Objectives for Human Exploration of Mars Workshop* in 2022, the Moon to Mars effort will benefit from early, vigorous communication among the stakeholders with respect to the high-priority science that could be accomplished by crewed missions to Mars; MEPAG continues to have concerns as to how science community input will be integrated into planning efforts on an ongoing, iterative basis.

- *MEPAG looks forward to a near-term demonstration by NASA of the formal pathway by which science planning will be integrated into Moon to Mars strategic planning and strongly supports the immediate inclusion of science discussion and input into the ongoing development of detailed, Moon to Mars objectives that will reduce risk and maximize science return.*

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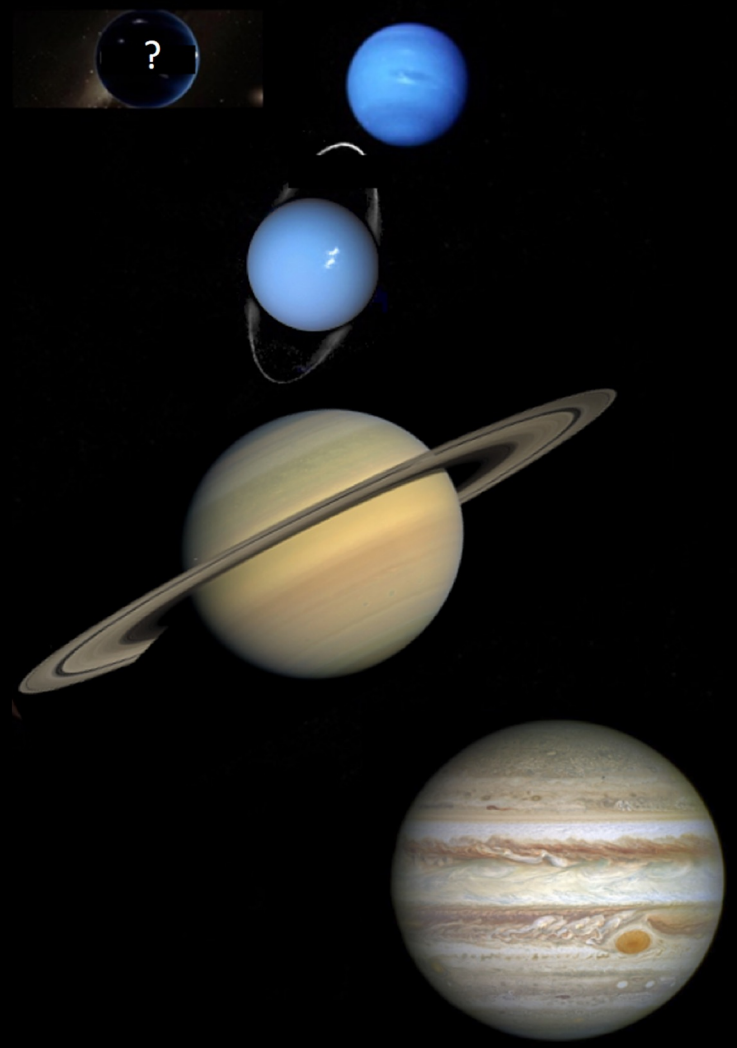
OPAG

OPAG Update to the Planetary Science Advisory Committee (PAC)

Amanda Hendrix, OPAG Chair, PAC Meeting, 22 June 2023

Outer Solar System: Many Worlds to Explore



OPAG *is* the Comparative Planetology AG

Large KBOs:

Finding 1. Budget transparency

- **The OPAG community is concerned about the cost growth of Mars Sample Return** and its effects on the outer planets mission portfolio, and requests more information from NASA on the current MSR budget situation. Specifically, OPAG would like NASA to comment on how close MSR currently is to the yearly OWL-recommended ceiling (35% of PSD yearly budget) and overall OWL-recommended budget (no more than a 20% increase over a total cost of $5.3 billion). OPAG encourages NASA to follow the decadal recommendation that the cost of MSR not be allowed to undermine the long-term programmatic balance of the planetary portfolio. **What is NASA's plan if MSR goes over budget - beyond the threshold set by OWL - and Congress does not provide more funds?** Furthermore, OPAG would like to understand the impacts of the 20% reduction to Dragonfly's FY24 budget (launch delay, etc.).

Finding 2. Uranus Orbiter and Probe (UOP)

- As reported in the OPAG findings from the 2022 Fall Meeting, the community identified a **strong scientific desire that the UOP tour in the Uranian system start before equinox (2049)**. OPAG is glad to see an FY25 budget for UOP in the President's FY24 budget request, and notes that UOP continues to appear in the budget projections through FY28. The OPAG community supports NASA's previously announced intention to start focused studies (e.g., study UOP's trajectory options including launch dates to arrive well ahead of equinox, and mission design), and **encourages NASA to start these focused studies as soon as possible**.

Finding 3. Radioisotope Power Systems (RPS) (background)

- RP Systems are critical enabling technology for Uranus Orbiter and Probe (UOP) and other outer planet missions. The Decadal Survey identified that three units of Next Generation Radioisotope Thermal Generators (NextGen RTGs), each producing about 300 W upon launch, are required for the UOP mission. OPAG is concerned about two aspects of preparing RTGs for UOP and other missions:

a. **Pu238 and clads.** OPAG is concerned about the availability of the **availability of Pu238** to fuel the three units of NextGen RTGs for UOP to launch in time to arrive at the Uranus System before the 2049 Equinox. The recent IG report noted that the current Pu238 production plan, which aims to produce up to 15 fuel clads per year, is not sufficient to support UOP in a timely manner; even if the production rate of 15 clads per year is achieved immediately, more than a decade is needed to produce the 192 clads to fuel three NextGen units. At the OPAG Spring Meeting Len Dudzinski confirmed that, at the current Pu238 production rate, UOP launch cannot be supported before the mid- to late-2030s. Thus, as noted in the IG Report, **the Pu238 production capability is insufficient to support missions recommended by the Decadal Survey, including UOP**. In particular, OPAG is concerned that the Pu238 production issues may delay the mission and thus prevent observations of Uranus at a scientifically critical time period before the 2049 equinox.

b. **RPS units.** OPAG is concerned about the readiness of NextGen RTG technology for UOP. The IG Report found that the NextGen Mod1 RTG, which builds on the Galileo-heritage General Purpose Heat Source RTG (GPHS-RTG) heritage, is at high risk of not being ready for UOP in a timely manner, and recommended that the RPS Program implement a rigorous external review to monitor its development. OPAG is similarly concerned about the development of the NextGen Mod0 RTG, which is being built using components of the last remaining flight spare of the Galileo-heritage GPHS-RTG. Len Dudzinski stated that the RPS program is not planning to implement an external review on the status of the Mod0 development. OPAG is concerned that, without formal external reviews, any delay in the Mod0 development may not be addressed. A Mod0 NextGen RTG might be key to power prior (i.e. pre-UOP) missions, offsetting the gap between RPS needs and availability, thus allowing Mod1 RTGs to be developed on time and in sufficient numbers for UOP.

Finding 3. Radioisotope Power Systems (RPS)

- **Finding:** OPAG encourages NASA to work with DOE to increase the production rate of Pu238 material and fuel clads to ensure supply such that UOP can arrive at the Uranus System before the 2049 Equinox, in addition to ensuring sufficient supply for other missions requiring RPSs over the next decade. OPAG also encourages the RPS Program to implement a stringent external review analogous to flight program reviews, as recommended by the IG Report, to monitor the developments of NextGen RTG Mod0 and Mod1.

RTGs for next missions

- DOE has identified availability of ~30 kg of Pu238 for NASA missions
  - Until that is used up the clad production rate is likely the limiter
- There are two upcoming missions to be concerned about: NF5 (if RPS-enabled) and UOP
  - The potential NF5 mission could use up to 2 MMRTGs (32 clads per RTG), launch in first half of 2030s
    - 32 * 2 clads = 64 clads
  - The Uranus mission needs 3 NGRTGs (64 clads per RTG), to be launched also in the first half of the 2030's
    - 64 * 3 clads = 192 clads
  - Total = 256 clads that must be built in 8-10 years … just for these 2 missions
- What does HQ need to do now to be ready?
  - Clads – the production rate needs to be increased to ~30-40 clads/year compared to the current production rate of 10-15/year
  - Pu238 production – blend newly-produced Pu238 into the old stock as quickly as it is produced

- Other notes:
  - After these two missions the Pu238 inventory will be used and the clad production rate will be determined by Pu238 production
  - The NF4 Dragonfly mission will use the remaining MMRTG (supplies are allocated)
  - In addition there might be a Discovery mission, as well as a lunar rover (Endurance)

Finding 4. Planetary Mission Concept Studies (PMCS) (background)

- The OPAG meeting included a panel discussion that reviewed lessons learned from the Planetary Mission Concept Studies (PMCS) conducted as a ROSES element in preparation for the OWL Decadal Survey.
    - Overall, the community responses to the PMCS program were **positive**, particularly in terms of providing the opportunities to flesh out new ideas and determine how they fit into different mission classes, as well as to enable access to early career people to participate in studies. The community is excited about the PMCS program's potential to make the mission concept development more open and broaden community participation in the mission formulation process. In particular, the program offered early and mid-career researchers the opportunity to lead mission concept proposals.
    - **Repeating PMCS calls in the inter-decadal period** would enable refining existing concepts and examining new ideas in response to new scientific discoveries so that more high-fidelity concepts can be ready in time for the next decadal survey, and more time is available for more feasibility and costing studies (e.g., CATE in V&V and TRACE in OWL) during the decadal survey process.
    - The PMCS program could further broaden participation and allow for the study of more innovative concepts **if the mission design centers were not limited to JPL, GSFC and APL**. We suggest that future rounds of PMCS programs could solicit two categories of mission concepts; (1) concepts mature enough to merit from high-fidelity point design and cost model only available at JPL, GSFC and APL, and (2) early concepts that examine innovative designs that can be studied at other centers. To broaden participation, future PMCS calls could include Points of Contacts at various participating design centers as was done in the C.23 Planetary Science Deep-Space SmallSats (PSDS3) program in 2016.
    - Discussion of how PMCS reports were incorporated into the decadal survey process did emphasize a few challenges. In particular, **PMCS studies of flagship concepts were conducted under varying assumptions regarding launch vehicle (e.g., availability of SLS), cost constraints, and allowable trajectories (i.e., launch dates).** In some cases (e.g., Neptune Odyssey) the assumptions used by the PMCS team were not compatible with constraints known at the time the decadal survey was reviewing the concept. Given that the PMCS team had already been disbanded before the decadal survey started, it was difficult to modify the concept to accommodate known constraints prior to the TRACE process. When developing future PMCS calls, we encourage NASA to consider these issues (especially for flagship-level concepts). Potential mitigations could include a more stringent set of parameters to be described in the PMCS AO **or additional funding specifically allocated for the PMCS team (and associated mission design center) to permit limited design modifications to be conducted during the next decadal survey in order to accommodate constraints emerge after the initial PMCS report is delivered.**

Finding 4. Planetary Mission Concept Studies (PMCS)

Finding: The OPAG community thanks NASA for empowering the community to take part in formulating future mission concepts through the PMCS program in preparation of the OWL decadal survey. Given the significant value offered by the PMCS program, OPAG encourages NASA to:

a. Make PMCS a recurring ROSES element (more than once per decade).
b. Structure the program so that more mission design centers can participate (beyond JPL, GSFC and APL), in order to broaden participation of community members and allow more innovative concepts to be studied.
c. Consider options to allow for design modifications during the decadal process by PMCS teams.

Furthermore, OPAG encourages NASA (in coordination with the Academies) to make more time available during the decadal process so that more mission concepts can be costed.

OPAG Statements of Concern & Support

- **R&A statement of concern.**
- **NF-5 concerns.**
- **Support for Europa Clipper.**
- **Dragonfly.**
- **Demographic survey.**
- **Deep Space Network (DSN) Support.**
- **New Horizons.**
- **Ocean Worlds Working Group (OWWG).**
- **Discovery.**
- **Lessons learned.**
- **Education.**

OPAG Statements of Concern & Support - 1

- **R&A statement of concern.** As noted in the statements of concern from the OPAG 2022 Fall meeting, the OPAG community continues to be concerned about the drop in NASA PSD ROSES proposal submissions in the last few years. We thank Stephen Rinehart for taking steps to understand the problem and collecting feedback, but OPAG would like see a survey conducted, which would allow for anonymous inputs, and will work with the American Astronomical Society's Division for Planetary Sciences (DPS) to conduct such a survey to reach the whole community along these lines.

- **NF-5 concerns.** OPAG awaits the response from NASA HQ on our concerns about the NF-5 cost cap and fixed Phase E cost reported in response to the draft AO in March 2023, as well as clarifications on questions submitted to HQ by the community. We reiterate that the New Frontiers Program is particularly important for the outer planets community as the cost cap for Discovery missions is typically not sufficient to enable outer planets missions, and Flagship missions occur at a low cadence. We hope that outer planet destinations will continue to be accessible via NF-5 and future New Frontiers solicitations. While OPAG understands the need to control costs, the New Frontiers program is critical for outer planets missions and we urge PSD to strike a balance to allow for outer planet science in the New Frontiers program.

OPAG Statements of Concern & Support - 2

- **Support for Europa Clipper.** OPAG continues to strongly endorse Europa Clipper and commends the team (and NASA HQ support) on tremendous progress as it moves to launch in Oct 2024. OPAG also supports the activities of JUICE-Clipper Steering Committee (JCSC) and its consideration on addressing Jupiter System Science Objectives by the two missions.
- **Dragonfly.** OPAG strongly supports the Dragonfly mission and commends the team on a great job passing PDR, as they push on to Confirmation Review. The Dragonfly Guest Investigator Program is terrific, in its increasing access to students from universities that do not have planetary science programs, and OPAG looks forward to seeing this program extended to include postdocs and also seeing similar programs on other upcoming missions across the PSD portfolio.
- **Deep Space Network (DSN) Support.** OPAG acknowledges that the DSN is a critical asset to enable current and future missions. OPAG appreciates the presentation on the DSN, and the effort to improve the capabilities to address critical needs. It has been pointed out that DSN utilization could benefit from increased use of Ka-band, as the communication rate is more efficient, and requires less resources than other lower bands (e.g., X-band). We agree with encouraging the proposer and user communities to take these DSN recommendations into consideration, in order to reduce the load and resource stress on the DSN.

OPAG Statements of Concern & Support - 3

- **Demographic survey.** OPAG recognizes the critical importance of maintaining a diverse and inclusive workforce and of having a holistic view of participation in our field in order to identify where specific barriers to participation may lie. Understanding the current state of our community, and how both internal and external factors (i.e., DEIA efforts, COVID, etc.) have affected participation in our field is therefore of significant importance. As such, we will work with the cross-AG DEIA working group to discuss how best to survey the community to constrain the current state of demographics and diversity within the planetary science community. While the identification of barriers that prevent full participation by all members of our community would be the central goal, survey results could be utilized as a baseline to inform succession plans for long duration missions, with an eye towards ensuring team member diversity over mission lifetimes. Such plans should address both short- and long-term approaches related to representation on mission teams and on ROSES proposals (e.g., diversity of PIs, Science PIs, and Co-Investigators), and should be careful to consider demographics along multiple axes and to incorporate the effects of intersectional identities on mission and proposal team members. OPAG further encourages that NASA SMD provide funding to employ the necessary professional expertise in survey methodology and statistical analysis for this work in accordance with the NASEM Study on Advancing Diversity, Equity, Inclusion and Accessibility in the Leadership of Competed Space Missions, Recommendation 9 to regularly assess the state of the profession.

OPAG Statements of Concern & Support - 4

- **New Horizons.** New Horizons has been a groundbreaking mission and has provided numerous important results in the Kuiper Belt. OPAG supports the use of the New Horizons spacecraft and instruments for accomplishing science in the planetary, astrophysics and heliophysics areas, and supports the continued search for a new close flyby KB target for the New Horizons spacecraft.

- **Ocean Worlds Working Group (OWWG).** Ocean Worlds are compelling targets for geology/geochemistry, habitability and astrobiology investigations, and given that most Ocean Worlds discovered thus far orbit around the outer planets, the Ocean Worlds community is considered an integral part of the OPAG community. OPAG is happy to endorse the newly formed Ocean Worlds Working Group and looks forward to engaging this part of our community through its new co-chairs, Cynthia Phillips and Michael Bland.

- **Discovery.** OPAG is glad to see Discovery in the FY25 budget and encourages a call to go out for a new mission as early as programmatically viable, without impacting parameters for NF5, UOP, and Dragonfly.

- **Lessons learned.** OPAG recognizes the importance of understanding lessons learned, both from PMCS Leads (as noted in the panel presentations of the OPAG Spring 2023 meeting) as well as from the panel chairs of the OWL Decadal Survey. OPAG encourages NASA HQ to make these lessons learned public, so that future PMCS calls (if implemented) and the next Decadal Survey can benefit from, and improve upon, what occurred last time.

- **Education**. During a presentation on and subsequent discussion of Team Psychological Safety by Dr. Kim Barnette, the importance of K-12 education was emphasized. OPAG recognizes the importance of K-12 education in stimulating participation in STEM career paths. For long duration outer planets missions, current K-12 students will be the future leaders of the mission operational phases. OPAG encourages NASA to provide a funding opportunity for outreach that is not tied to specific mission teams and is at the scale of individual centers and/or personnel, as opposed to large-scale conglomerates like the Science Activation Teams.

ExoPAG

PAC June 2023

Natalie Hinkel on behalf of the ExoPAG EC

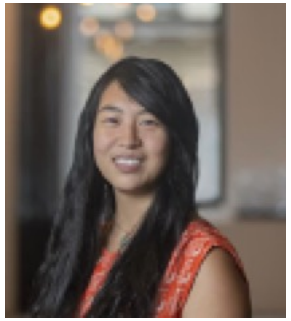
New ExoPAG EC Members

Ian Crossfield
University of Kansas
Exoplanet formation, composition, detection, characterization & instrumentation.

Kate Follette
Amherst College
Direct imaging of young exoplanets and circumstellar disks, adaptive optics.

Samson Johnson
Jet Propulsion Laboratory
Survey design and yields of the Roman Galactic Bulge Time Domain Survey (microlensing).

Lily Zhao
Flatiron Institute
Data-driven methods for extreme precision radial-velocity and detecting low-mass planets.



Malena Rice
Yale University
Planet formation and evolution, stellar spectroscopy, orbital architectures.

Natalie Hinkel
SwRI → Louisiana State
Stellar abundances and the chemical interplay between stars and planets (Hypatia Catalog).

Two New SAGs!

- Benefits of a Starshade + IROUV Chronograph (Sara Seager, Stuart Shaklan)
  To elucidate the unique/critical interdisciplinary science and identify key measurements needed to establish Earth-like habitable conditions, especially in prep for the Habitable Worlds Observatory (HWO). This SAG just met with the EC (yesterday) and it will be presented to the APAC (next week), then it will need approval from Mark Clampin.

- Exoplanet Atmospheric Retrieval (Ty Robinson, Renyu Hu)
  Still in preliminary stage, but already has involvement from planetary scientists. The EC will receive a presentation from them at the Aug ‘23 meeting, it will be presented at the Fall APAC meeting, then approvals will be needed.

ExoPAG at the DPS-EPSC meeting (Oct ‘23)

- The EC voted to hold the ExoPAG28 meeting just before the joint DPS-EPSC 2023 meeting in San Antonio, Texas.
- One of the major focuses for the ExoPAG EC is to strengthen the connections between the astronomy (exoplanet) and planetary communities.
- All PAC members are welcome to attend. Also, please come find me!

MAPSIT

Mapping and Planetary Spatial Infrastructure Team (MAPSIT)

Findings for the Planetary Advisory Committee (PAC), June 21–23, 2023 Meeting

MAPSIT Steering Committee

Brad Thomson (Univ. Tenn.), *Chair*

Julie Stopar (LPI), *Vice Chair*

Brent Archinal (USGS)

Ross Beyer (SETI/NASA Ames)

Sander Goossens (NASA Goddard)

Justin Hagerty (USGS), *Ex Officio*

Trent Hare (USGS)

Jay Laura (USGS)

Sam Lawrence (JSC), ESDMD rep, *Ex Officio*

Myriam Lemelin (Université de Sherbrooke, Canada)

Jeannette Luna (Tennessee Tech Univ.)

Becky McCauley Rench (NASA HQ), *Ex Officio*

Moses Milazzo (Other Orb), *Ex Officio*

Jani Radebaugh (Brigham Young Univ.), *past Chair*

David Williams (Arizona State Univ.)

MAPSIT Findings (1 of 4)

Finding: NASA should support efforts to produce analysis-ready data in a platform-agnostic format

- One example is USGS effort to process and upload Mars data into Amazon's Open Data Registry (a cloud-based service)
  - Includes >155,000 HiRISE images, ~5000 DTMs, up to 2 petabytes (2048 TB)
- Analysis-ready data can be directly accessed via an API (Application Programming Interface), maximizing the diversity of software platforms that one could use for data access
- One such platform or data interface is GeoStac: https://stac.astrogeology.usgs.gov/geostac/

MAPSIT Findings (2 of 4)

Finding: NASA should continue to fund and support production of lunar maps (with an emphasis on geologic maps but also tactical maps, resource maps, hazard maps, etc.) at multiple scales

- Follows the recommendations of the Lunar Critical Data Products LEAG/MAPSIT Special Action Team (Stickle et al., 2021; doi:10.5281/zenodo.7236426)
- Multiple *map scales* are necessary to bridge the gap between orbital resolution and the much higher spatial resolution of landed mission data. Global and regional scale products provide important context for high resolution mission maps
- MAPSIT is encouraged by the convening of a Lunar Surface Science Workshop, *"Geological Mapping to Support Artemis Strategic Decisions"* Aug 16–17, 2023 (Virtual). Organizers: J. Skinner (USGS), A. Huff (ASU), J. Luna (TNTech), R. Watkins (NASA HQ)
- Could lunar map production be a highlighted element of a future LDAP call? Or, is a Lunar Critical Data Product call necessary? (similar to prior Mars Critical Data Product calls)

MAPSIT Findings (3 of 4)

Finding: MAPSIT encourages continuing support for planetary SDIs (Spatial Data Infrastructure)

- The Lunar SDI has great traction in the community right now and it pushing ahead with engagement and standards definition. https://psdi.astrogeology.usgs.gov/moon/about/
- The Europa SDI is about to release a defined horizontal datum that will be of immense value to missions like Clipper and JUICE https://psdi.astrogeology.usgs.gov/europa/about/

MAPSIT Findings (4 of 4)

Finding: MAPSIT should be formally consulted as the US Government ponders aspects of implementing potential changes to the lunar reference system.

- There is currently a debate about whether and how to refine the current lunar reference system
- Within the MAPSIT Steering Committee (and community at large), there is a lack of consensus on the best way to resolve the issue
- Suggest establishing a SAT (Special Action Team) to develop a community consensus on this topic

Upcoming activities

- 6th Planetary Data Workshop (PDW): June 27–30, 2023, in Flagstaff, AZ, in hybrid format
  - Organizers: Trent Hare (USGS)

- Lunar Surface Science Workshop, *Geological Mapping to Support Artemis Strategic Decisions:* Aug 16–17, 2023 (Virtual)
  - Organizers: Jim Skinner (USGS), Alexandra Huff (ASU), Jeanette Luna (TNTech), and Ryan Watkins (NASA HQ)

- Planetary Geology Mappers' Meeting: Oct 15–18, 2023 as part of GSA Annual Meeting in Pittsburg, PA. Hybrid format.
  - Organizers: Jeanette Luna (TN Tech) and Jim Skinner (USGS)

ExMAG

Extraterrestrial Materials Analysis Group (ExMAG)

PAC meeting, June 22, 2023

Barbara Cohen, Chair

ExMAG.community@gmail.com

Recent Activities

ExMAG provided public comment to the “Support for Planetary Sample Science (SPSS)” CAN

1) ExMAG supports NASA facilitating community members' access to the NASA collections housed at JSC and the unique opportunities associated with the JSC curatorial facilities. However, the current SPSS CAN does not consider support for analysts to use advanced analytical capabilities and facilities available outside of JSC and as such, is not in line with other ongoing facilities support efforts by NASA such as the PSEF.
2) ExMAG supports the CAN inclusion for training activities to make best use of the NASA collections. ExMAG further recommends that training in software skills for sample analysis be considered as well.
3) ExMAG recommends that the SPSS CAN also include training for investigators on current, NASA-compliant data repositories available to archive planetary sample analysis data with the expectation that data generated from work done via the CAN be appropriately archived.
4) ExMAG stands ready to work with NASA in the future to help understand how the community uses these CAN functions, how often they are needed, what unique access they provide, and how support for sample collection access, analysis facilities, and data archives might evolve to better support our community.

Recent Activities

- ExMAG Mars Subcommittee met with Michael Meyer and Lindsay Hays regarding MSR plans to define returned sample science and analysis priorities and allocations. We have invited them to the ExMAG meeting Aug 3 to discuss with the committee and community and will continue to engage.

- Participation in the upcoming Endurance Science Workshop for sample return from the SPA basin highlights the continuing issue of sample exchange with China. ExMAG understands NASA has been looking for avenues for cooperation. Is there any other way we can help our science community – multilateral agreements, guidance on participation, etc. Could the NASA Chief Scientist engage here?

- Nothing pressing that we need the PAC's help with ☺

MExAG

Mercury Exploration Assessment Group (MExAG)

June 22, 2023

Steven A. Hauck, II, MExAG Chair

Case Western Reserve University

Ongoing Findings and Notes

- Ground-based Observatories
  - Request: Work with optical telescope facilities on which NASA acquires time (e.g., Keck Observatory) and their Telescope Allocation Committees (TACs) to ease the scheduling of twilight-time observations for Mercury.
- Discovery
  - Note: MExAG is the sole AG community for which Discovery is the only potential avenue for exploration in the next decade. This fact, compounded by the long cruise times for missions to Mercury, means that any delays or reductions in the Discovery AO cadence will disproportionately impact opportunities for exploration of the innermost planet and the health of the Mercury community.

Complete Findings are in the additional slides

Mercury and MExAG Activities

- Science Goals Document: On target to complete the first MExAG Science Goals Document in Q3 2023 – Full draft to be circulated to community this summer for feedback.
- New Members: Recruited four new members and selected new Vice-Chair via open call.
- Technology and Community Goals Documents: preparing to initiate these processes in the next 12 months.
- BepiColombo: Completed Mercury Flyby 3 on June 20

Additional MExAG Materials

Finding: Ground-based Observatories

- Ground-based optical, infrared, and radio/radar observations play a critical role in the study of Mercury. MExAG encourages NASA to work with key facilities to address procedural/logistical obstacles that create serious challenges for proposals to observe Mercury, particularly during the coming years when support for – and coordinated science with – the BepiColombo mission is vital to provide increased science context.
- MExAG encourages NASA to:
  - Work with optical telescope facilities on which NASA acquires time (e.g., Keck Observatory) and their Telescope Allocation Committees (TACs) to ease the scheduling of twilight-time observations for Mercury. Many telescopes require half-night or even full night proposals; however, Mercury is only available for 1-2 hours at the beginning or end of the night, substantially disadvantaging observers of the innermost planet.
  - Engage with Goldstone and Green Bank Telescope, to ensure that there are equitable opportunities for planetary science observations, particularly now that Arecibo is no longer an option.
  - Allow observers to obtain letters of endorsement from NASA for Mercury observations in support of the BepiColombo mission during the upcoming flybys and orbital mission.

Finding: Discovery Program

- MExAG is disappointed that problems with the Psyche mission have led to substantial negative consequences for other PI-led missions. The MExAG community supports the principle that each competitively selected, PI-led mission should have the opportunity to proceed through the development process, including reviews and key decision points, on its own merits to achieve the science for which it was selected.

- Further, MExAG notes that within the context of the recommended program for missions in the most recent Decadal Survey, *Origins, Worlds, and Life*, it is the only AG community for which Discovery is the sole potential avenue for exploration in the next decade. This fact, compounded by the long cruise times for missions to Mercury, means that any delays or reductions in the Discovery AO cadence will disproportionately impact opportunities for exploration of the innermost planet and the health of the Mercury community.

Finding: Decadal Survey Mission Assessment Process

- The Decadal Survey applied independent cost and risk (TRACE) assessments of the mission concepts. However, the extraordinarily brief TRACE outcomes presented in Appendix C of *Origins, Worlds, and Life* lacks documentation of the specific drivers of cost and risk in their assessments. These drivers are vital for NASA and the planetary science community to identify technologies in need of investment.
- MExAG encourages NASA to ensure that all future assessments of cost and risk of mission concepts associated with the Decadal Survey be disclosed with at least the same level of detail as any pre-Decadal Survey mission study programs. Decadal Survey related mission studies and their results should be disclosed consistent with all Open Science expectations at NASA, without exception.

Decadal Survey – Highlighted Recommendations

- R&A constitute 10% of PSD budget.
- Technology be 6–8 % of PSD budget.
- New NF concepts due to new discoveries be evaluated before NF-7.[a]
- Plutonium-238 needs be evaluated against mission portfolio and increased as needed.[a]
- Expanding support for ground-based telescope observations and planetary astronomers.[a]
- Reviewing current radar infrastructure to meet community needs, including replacing capabilities lost with Arecibo.[a]

[a] MExAG has presented findings to the PAC in 2021 & 2022 consistent with these recommendations.

MExAG Steering Committee 2022–2023

Steven A. Hauck, II
Case Western Reserve U.
Chair

Carolyn Ernst
JHU APL
Vice Chair

Ronald J. Vervack, Jr.
JHU APL
Exosphere Discipline Member

Stephen Parman
Brown University
Geochemistry Discipline Member

Christian Klimczak
U. of Georgia
Geology Discipline Member

Catherine L. Johnson
UBC & PSI
Geophysics Discipline Member

Gina DiBraccio
NASA GSFC
Magnetosphere Discipline Member

Ariel Deutsch
NASA ARC
Early Career Member

Ryan Dewey
University of Michigan
Early Career Member

Suzanne Imber
U. of Leicester
International Liaison

Shoshana Weider
NASA HQ
NASA Liaison

MExAG Steering Committee Changes

2022 – 2023

- Steven A. Hauck, II – Chair
- Carolyn Ernst – Vice-Chair
- Ron Vervack – Exosphere
- Stephen Parman – Geochemistry
- *Christian Klimczak – Geology*
- Catherine Johnson – Geophysics
- *Gina DiBraccio – Magnetosphere*
- *Ariel Deutsch – Early Career*
- Ryan Dewey – Early Career
- Suzie Imber – International Liaison
- Shoshana Weider – NASA Liaison

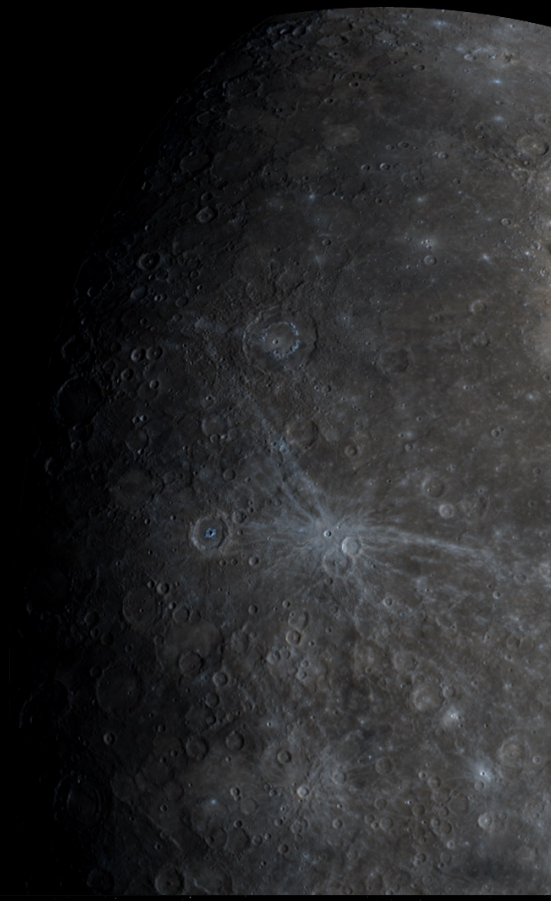
2023 – 2024

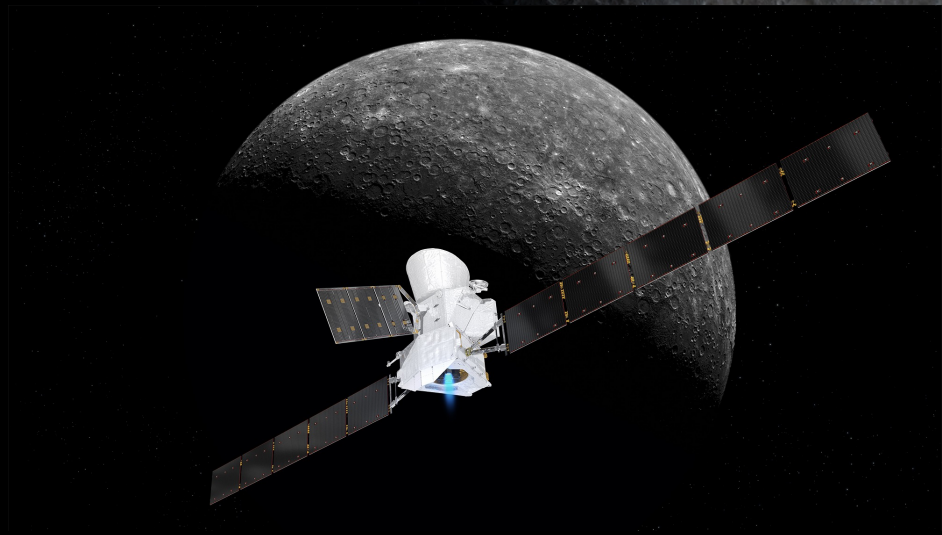
- *Carolyn Ernst – Chair
- *Stephen Parman – Vice-Chair
- Ron Vervack – Exosphere
- *To be filled – Geochemistry*
- *Mallory Kinczyk – Geology*
- Catherine Johnson – Geophysics
- *Jim Raines – Magnetosphere*
- Ryan Dewey – Early Career
- *Megan Mouser – Early Career*
- Suzie Imber – International Liaison
- *Océan Barraud – International Early Career*
- *Steven A. Hauck, II – Past-Chair
- Shoshana Weider – NASA Liaison

Member rotating off the SC *New member* ** = New role on MExAG SC*

Upcoming Mercury Events

- DPS/EPSC 2023, 1–6 October 2023
- AGU 2023, 11–15 December 2023
- MExAG 2024, February 2024
- Mercury 2024, To be held in Japan
- BepiColombo:
  - Mercury Flyby 4, 5 September 2024





MExAG: https://www.lpi.usra.edu/mexag

Twitter: @ExploreMercury

VEXAG

PAC meeting March 1, 2023

VEXAG

VERITAS
Findings in light of ROSES 2023
Venus Exploration Strategy
Upcoming Activities

Noam Izenberg	Applied Physics Laboratory, Chair
Debra Buczkowski	Applied Physics Laboratory, Deputy Chair
Natasha Johnson	Goddard Space Flight Center
Stephen Kane	University of California at Riverside
Molly McCanta	University of Tennessee
Jason Rabinovich	Stevens Institute of Technology
Siddharth Krishnamoorthy	Jet Propulsion Laboratory, EC Representative
Sara Port	Glenn Research Center, EC Representative
Chuanfei Dong	Boston University, EC Representative
Eric Grosfils	Pomona College
Erika Kohler	Goddard Space Flight Center, EC Representative
Alexander Akins	Jet Propulsion Laboratory, EC Representative
Tracy Gregg	University of Buffalo
Michael Way	Goddard Institute of Space Studies
Anna Gülcher	Jet Propulsion Laboratory, EC Representative
Daniel Nunes	Jet Propulsion Laboratory
Darby Dyar	Mt. Holyoke College, Chair Emeritus
Natalie Punt	Scribe
Nick Lang	NASA HQ, ex officio

PAC meeting June 22, 2023

VEXAG

VERITAS

Current Status: TBD launch in 2031 or later

1. VERITAS has supplied budget profiles for launches in ’29, ’31, and ‘32
2. Waiting for HQ response

SMD criteria for VERITAS restart:

1. JPL must address issues from the Psyche IRB to SMD’s satisfaction ✓
2. SMD must secure funding in the appropriate years. ✗
3. NISAR and Clipper must stay on schedule ✓

Budget: President’s budget cut $811M (FY23-27) from VERITAS, far more than Psyche overrun

1. ~$584M removed from Discovery line

Schedule: A reality based, soon-as-possible launch date for VERITAS would reduce technical and cost risk, and increase stability across the portfolio.

Questions:

- How will SMD fund VERITAS?
- How will SMD mitigate partner impacts and other risks?
- When will a launch date be specified?

PAC meeting June 22, 2023

VEXAG

Activities benefitting the Venus community, all upcoming Venus missions, and planetary science

- The standing up of VeSCoor and the future of potential future joint science activities
- Organization of national and international lab capability and cooperation
- Wider community access to Magellan (including quad maps and stereo) and PV data for deeper new analysis and re-analysis
- Ensuring support for all 3 missions and all their stages

Recent Activity Highlights

March LPSC: Sessions, EC, Town Hall, Strategy
May EnVision Science Team Meeting (Berlin)
June: Venus Laboratory Workshop (Wesleyan)

Upcoming Activity Highlights

October: GSA session
October 30-31: 21st VEXAG, Albuquerque, NM
November 1-3: LPI Venus Initiative Meeting #3, Albuquerque, NM
December 11-15: AGU Session

VEXAG Venus Strategy Study Analysis Workgroup

Mandate

Develop a community-supported strategy for Venus exploration for the coming decade and beyond:

> "NASA should develop scientific exploration strategies, as it has for Mars, in areas of broad scientific importance, e.g., Venus and ocean worlds, that have an increasing number of U.S. missions and international collaboration opportunities"
>
> *Origins, Worlds, and Life*, p. 22-10

> "NASA… asserts that specific scientific exploration strategies <u>should be community generated</u> by bodies such as the Analysis Groups, advisory committees, and NASEM's standing boards and commissioned studies"
>
> *NASA's Initial Responses to the 2023–2032 Planetary Sciences Decadal Survey, 22 August 2022*

Approach

Solicit community feedback to update 2019 VEXAG strategic documents in light of the 2021 selections of VERITAS, DAVINCI, and EnVision, and the comparative planetology recommendations relevant to Venus in *Origins, Worlds, and Life*.

Schedule

Community inputs currently being organized for summer draft

LEAG

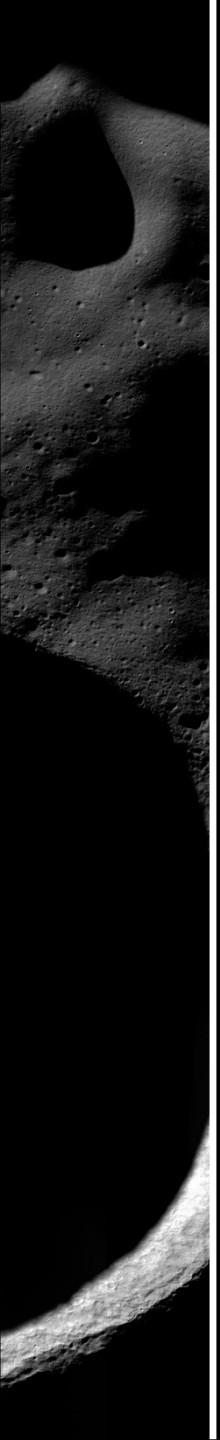
Lunar Exploration Analysis Group Updates and Action Requests-

June 2023 Edition

Dr. Amy L. Fagan, LEAG Chair

Presented to NASA Planetary Advisory Committee

22 June 2023



Responding to PAC Queries

Mechanisms for interacting with PSD/SMD
Community thoughts on Inclusion Plan Process

Dr. Amy L. Fagan, on behalf of
Lunar Exploration Analysis Group

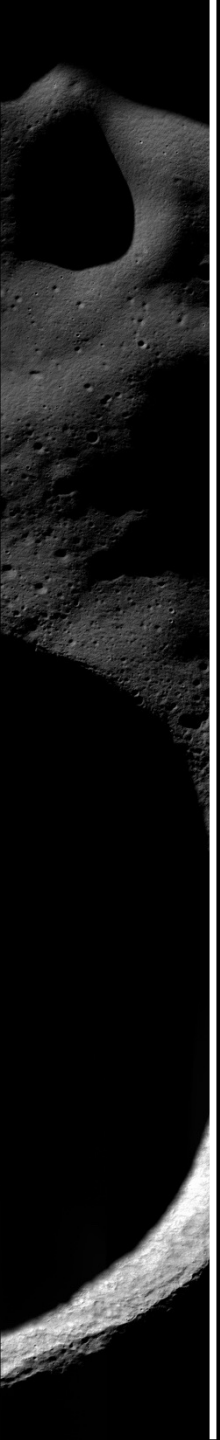
Given to NASA Planetary Science Advisory Committee

Thursday, June 22, 2023
https://www.lpi.usra.edu/leag/

LEAG Interacts with PSD/SMD in Several Ways that Work Well + Some Ideas for Growth Areas

- **Direct Communication with LEAG HQ Liaison: Dr. Sarah Noble**
  - E-mail
  - Teams

  } SAT Requests and updates, General questions, etc.
- **Communication with Dr. Lori Glaze:**
  - Morning meeting at LPSC – Clarification questions, updates on SATs, thank-you's
- **Planetary Science Advisory Committee**
  - Annual Meeting Findings
  - Other time-relevant items as they arise (e.g., NF5, Inclusion Plans)
  - Updates on Specific Action Teams (e.g., CLOC-SAT, AOA-SAT)
- **What is working?**
  - Open, easy, positive, dialogue with Dr. Noble, Dr. Glaze, and others (e.g., Dr. Jacob Bleacher, ESDMD)
- **Room for growth?**
  - Sometimes challenging to get our biggest push-points into the PAC Findings → Improving our own communication?
  - More formal mechanisms for receiving feedback on annual meeting findings?



The Lunar Community Continues to Adapt to Inclusion Plans and finds some positives among the growing pains

- **High-level feelings from the community:**
  - A bit early still… many waiting for reviews back on their first Inclusion Plans (e.g., PRISM) and some just beginning to digest theirs (e.g., SSERVI)
    - Will have more informed update in the Fall
  - Continuing to have a lot of frustration in developing plans and sense of defeat with inadequate plans that appear to be requiring a professional level of understanding of another field
- **The Good:**
  - Reviews are extremely detailed and constructive and can be used for improving in the future
  - NASA reiterating message that we are learning together
  - Appreciation for having conversations and developing mechanisms to ensure all are welcome
- **The Frustrating Points→ Needing more resources**
  - References and Training
  - Rubric
  - Uncertainty and burden of time and space

Expanded on next slide + some thoughts for improving process

The Lunar Community Continues to Adapt to Inclusion Plans and finds some positives among the growing pains

- **The Frustrating Points→ Needing more resources**
  - References and Training
    - Where to look? Which to use?
    - Differences in level of internal support resources at different institutions
    - NASA training/workshops too high-level without concrete actionable guidance?
  - Rubric
    - Some sense of how plans are evaluated?
  - Uncertainty and burden of time and space
    - Unsure of where to begin
    - Sense of being asked to become experts "overnight"
    - Reinventing the wheel→ but not functional/adequate?
    - Expectation of more details than could be provided within page limit? Longer ones in the future (+time)?

The Lunar Community Continues to Adapt to Inclusion Plans and finds some positives among the growing pains

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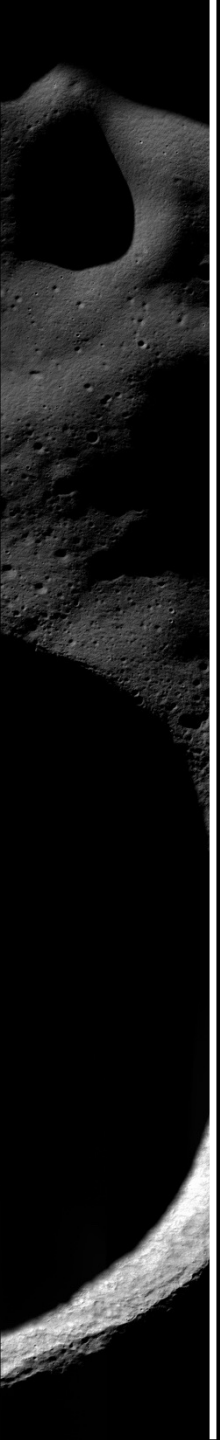
    - Sense of being asked to become experts "overnight"
    - Reinventing the wheel→ but not functional/adequate?
    - Expectation of more details than could be provided within page limit? Longer ones in the future (+time)?

- **Thoughts for Improving the Process**
  - Continuing to update website to potentially include:
    - More references with short statement of significance;
    - Rubric of evaluation;
    - Reputable sources for training;
    - Templates.
  - Active workshops with enough lead time to build IP collaboratively with experts available to guide, answer questions, provide live reviews
  - Training:
    - Ensure consistent training
    - Concrete, actionable items

More resources for Inclusion Plans will Benefit All

<u>Request to the PAC:</u> Encourage NASA to provide more resources (especially active workshops and training) for Inclusion Plan Development as we all learn and improve together.

1. **Recommended types of Workshops and Training:**
   - Active writing workshops to help community members build a better IP with experts on hand
   - Trainings to enable community to be more inclusive (e.g., Bystander Intervention, Conflict Resolution, etc.)
2. **Web Resources:**
   - Rubric, References, templates, etc. + regular updates to the Inclusion Plan resources website
3. **Benefits to the community:**
   1. Ensure high-quality training
   2. Minimize resource inequities between proposing institutions with varying support levels
   3. Provide real-time feedback during IP development
   4. Ease some anxiety related to becoming experts in another field
   5. Allow community to spend more time on the science and less on finding the right resources
   6. Facilitate stronger Inclusion Plans and more effective teams



Additional LEAG Slides for the PAC

Upcoming Annual Meeting: September 20-22, 2023
Seeking new members to Executive Committee
AOA-SAT Reconvened and will have results available soon for near-term priorities

Dr. Amy L. Fagan, on behalf of
Lunar Exploration Analysis Group

Given to NASA Planetary Science Advisory Committee

Thursday, June 22, 2023
https://www.lpi.usra.edu/leag/

LEAG's next Annual Meeting is in ~3 months

- **Submit an abstract**
  - Lunar science and exploration, with emphasis on:
    - Science and exploration enabled by Endurance mission concept
    - Lessons learned in the current era of lunar exploration
    - Landing sites and science goals;
    - Instrument concepts and payload
    - Science at the Artemis Base Camp
- **If you are early career, keep a look-out for information about:**
  - Applying for travel funding
  - Mentoring activities
- **Nominate a colleague for the LEAG Service Award**
  - 2022: Jeff Taylor & Carle Pieters
  - 2021: Wendell Mendell & Clive Neal

LEAG is seeking new members for Executive Committee (ExComm) and working to increase transparency in process

- **Application Process:**
  - 2-page CV
  - Short Personal Statement

  } E-mail to LEAG Chair, Amy Fagan (alfagan@wcu.edu) by 11:59 pm PST on Monday, 7/24/2023
- **Detailed information for all and individual positions:**
  - Roles and Expectations
  - Requirements for participation
  - Time commitment
  - Compensation
  - Potential Benefits
- **Rubric used to evaluated degree to which candidates demonstrate requirements:**
  - Education
  - Communication Skills
  - Experience/Knowledge specific to position(s)
  - Engagement with LEAG and/or another lunar community group in past/present
  - Interest and enthusiasm for participation in LEAG ExComm

LEAG is seeking new members for Executive Committee (ExComm) and working to increase transparency in process

- **Roles to Fill (will be staggered):**
  - LEAG Chair
  - Human Exploration
  - Technology
  - Science
  - Operations
  - Workforce Development
  - Equity, Diversity, and Inclusion (+ Accessibility)
  - Astrophysics Liaison
- Communicating to the Community:
  - LSSW (May, 2023)
  - E-mail blast to Lunar-L and other e-mail lists
  - Posted on LEAG website: https://www.lpi.usra.edu/leag/

Questions?
alfagan@wcu.edu

Specific Action Teams (SATs) have been working to address important science and exploration needs

- **Artemis Analog Objectives Specific Action Team (AOA-SAT) [Dec. 2021-Jan. 2022]**
  - **Catalog and prioritize** objectives for science and science operations that can be achieved through analog activities

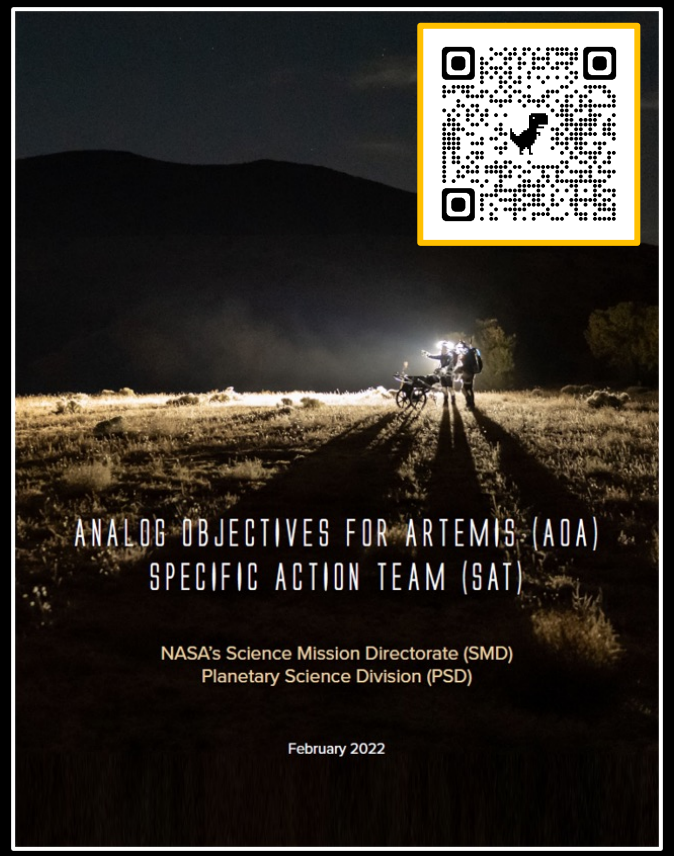
Reconvened in June to revisit near-term priorities

AOA-SAT Team:

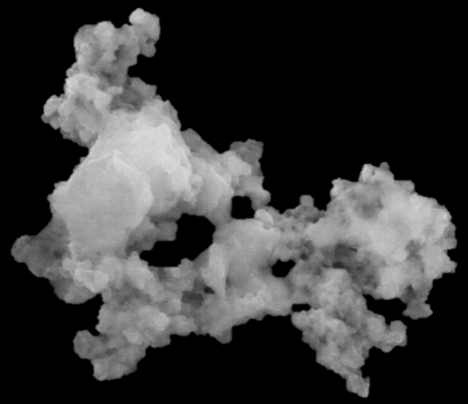
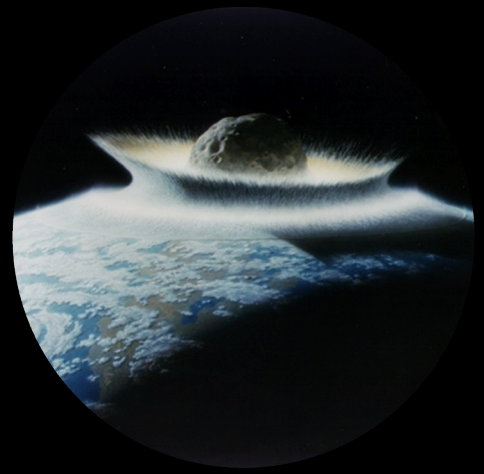
Kelsey Young- Chair, NASA Goddard
Jose Hurtado- Dep. Chair, Univ. of TX El Paso
Jessica Barnes- Univ. of Arizona
Ben Feist- Jacobs/NASA JSC
Trevor Graff- Jacobs/NASA JSC
Jennifer Heldmann- NASA Ames
Nick Schmerr- Univ. MD College Park
Gordon Osinski- Univ. Western Ontario
R. Aileen Yingst- Planetary Sci. Inst.

Analog Objectives:

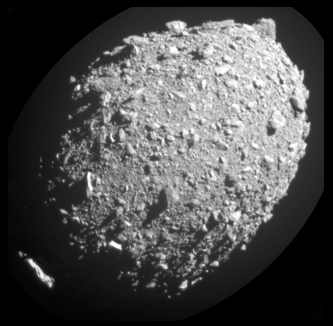
- Science Support Room
- Software and Instrumentation
- Human/Robotic Partnerships
- Complex Lighting Conditions
- Data collection: Imaging, Sampling, Tools, Documentation
- Advancing Technologies
- Communication
- Crew Autonomy
- Analog Science Training
- Location/Navigation
- Test Design



SBAG



Lori Feaga, SBAG Steering Committee Chair
Department of Astronomy, University of Maryland, College Park

March 1, 2023

NASA Planetary Science Advisory Committee (PAC)

www.lpi.usra.edu/sbag/

Government funding acknowledged

Current priority SBAG 28 Findings to be considered

#5. SBAG recommends that the future planetary defense rapid response reconnaissance mission be selected by an open competitive process.

#6. SBAG urges NASA to stress to all participants in the Inter-agency Radar Panel the urgency of their work, especially with respect to the future capabilities of planetary radar and planetary defense and asks that the details of its findings and actions to the community are publicly released at the Panel's conclusion.

#7. SBAG eagerly awaits the public release of a SIMPLEx program lessons learned draft and recommends that there be a period of community engagement and stakeholder input before the document is finalized.

Other Meeting and Steering Committee Updates

- Our next community meeting (SBAG #29) will be held July 11-13, 2023 in the Washington, DC area and in hybrid format.
- The Human Exploration Lead Steering Committee position is still open. The applicant response has been nonexistent.
- At-large and Early Career Steering Committee selections will be announced at SBAG #29.

Supporting slides

The Steering Committee

Present Steering Committee

Justin Atchison (JHU/APL), Technology Lead
Olivier Barnouin (JHU/APL)
Bonnie Buratti* (NASA JPL/Caltech), Past Chair
Michael Busch* (SETI Inst)
Lori Feaga (Univ of Maryland), Chair
Henry Hsieh (Planetary Science Institute)
Mihaly Horanyi* (Univ of Colorado, Boulder)
Stephanie Jarmak* (SwRI), Early Career Secretary
Prajkta Mane (LPI/NASA JSC)
Joe Masiero (IPAC/Caltech), Planetary Defense Lead
Stefanie Milam* (NASA GSFC)
William O'Hara* (Blue Origin), Human Exploration Lead
Timothy Titus (USGS, Flagstaff)

Thomas Statler NASA Headquarters Liaison
Jake Bleacher NASA Human Exploration and Operations Mission Directorate (HEOMD) Liaison
Paul Abell (JSC) HEOMD Observer

Steering Committee selects Chair and Steering Committee members from among nominations and applications. Requests go out on the DPS Newsletter, Planetary Exploration Newsletter (PEN), and our listserv. General membership is open to the community.

*Terms ending