

# Mercury Exploration Assessment Group (MExAG)

June 21, 2022

Carolyn Ernst, MExAG Vice-Chair

*JHU APL*



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# Recent MExAG and Mercury Activities

- Collected MExAG comments on SPD-41 and submitted a response to the RFI.
- MExAG Town Hall
  - May 10, 2022 [virtual]
  - Focused on MExAG community discussion of the Decadal Survey
- Goals Document Development
- Search for new Steering Committee member
- Mercury 2022 (originally Mercury 2020) – held 7–10 June 2022 in Orléans, France

# Decadal Survey

- The MExAG community is extraordinarily thankful for the incredible efforts of everyone who served on the Decadal Survey and produced such a detailed and comprehensive strategy for astrobology and planetary science in the coming decade.

# Decadal Survey – Notable Mercury

- Decadal level Mercury science was highlighted throughout *Origins, Worlds, and Life*, indeed in most of the priority question topics.
- Technological challenges, and the to address them, of Mercury's extreme environment were highlighted as well.
- Dozens of mentions of the need for samples and *in situ* measurements of Mercury underscore the importance of landing a spacecraft on the planet.

# 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.<sup>a</sup>
- Plutonium-238 needs be evaluated against mission portfolio and increased as needed.<sup>a</sup>
- Expanding support for ground-based telescope observations and planetary astronomers.<sup>a</sup>
- Reviewing current radar infrastructure to meet community needs, including replacing capabilities lost with Arecibo.<sup>a</sup>

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<sup>a</sup> MExAG has presented findings to the PAC in 2021 & 2022 consistent with these recommendations.

# Finding – Documentation of TRACE results

- 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 requests that the complete TRACE outcomes be released to the public in a level of detail and fashion consistent with the input to these assessments, the reports of the Planetary Mission Concept Studies.

# Upcoming Mercury Meetings and Events

- EPSC 2022, 18–23 September 2023 – Mercury session
- AGU Fall Meeting, 12–16 December 2023
- Mercury 2024 – To be held in Japan
- BepiColombo:
  - Mercury Flyby 2, 23 June 2022

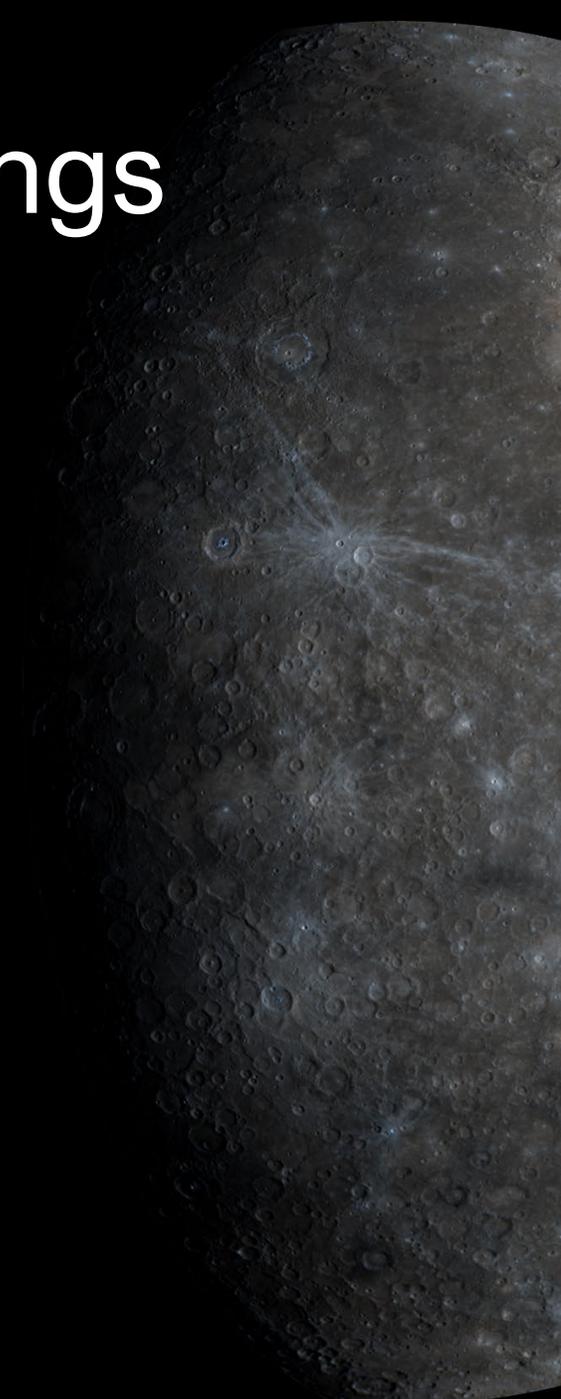
MExAG: <https://www.lpi.usra.edu/mexag>

Twitter: [@ExploreMercury](https://twitter.com/ExploreMercury)

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# Backup – Recent MExAG Findings



# New Frontiers

- MExAG is concerned that the delay in the New Frontiers 5 (NF-5) call, especially without the scope to update the NF-5 destination list in the upcoming Decadal survey, substantially hinders NASA's ability to respond to outcomes of its own missions (both NASA-led missions and missions led by partner agencies) and other mission-enabling activities. By maintaining the NF destination list defined in *Vision and Voyages* (2011), MExAG highlights that NASA is relying on guidance written more than 10 years before the upcoming NF-5 call. For Mercury science, specifically, this means that the guidance was provided before the MESSENGER orbital mission and the subsequent revolution in the study and understanding of the innermost planet. This situation, however, is not unique to the study and exploration of Mercury. In addition, MExAG recognizes that the NF-4 call created a precedent for including themes responsive to new discoveries. This approach, therefore, could be used again to mitigate the challenges posed by the NF and Decadal cadences.
- MExAG encourages NASA to develop a defined and transparent mechanism for re-evaluating, and considering additional, NF destinations, especially when more than five years have elapsed since the recommended destinations were originally published.

# Radioisotope Power Systems

- Radioisotope power systems (RPS) are crucial tools for exploring the solar system, particularly in its most extreme environments, such as the surface of Mercury. An RPS system would be an essential element of a future Mercury lander (e.g., as demonstrated in the PMCS study of the NF-class Mercury Lander for the Decadal Survey process), which would likely operate during the Mercury night or within permanently shadowed regions where solar power is not possible.
- The RPS Program currently only follows the guidance of the Decadal Survey, which explicitly excludes Discovery-class missions and cannot foresee the mid-decade inclusion of RPS-enabling NF destinations, such as the Ocean Worlds theme that NASA added to (and selected from) the NF-4 call. MExAG, therefore, encourages NASA to ensure a sufficient supply of RPS and fuel to adequately meet the needs of exploration in the Flagship, New Frontiers (NF), and Discovery lines throughout the solar system – including Mercury.

# 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.