

Mercury Exploration Assessment Group (MExAG)

February 15, 2022

Steven A. Hauck, II, MExAG Chair

Case Western Reserve University



MExAG Steering Committee



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



Gang Kai Poh
Catholic U./ NASA GSFC
Early Career Member



Suzanne Imber
U. of Leicester
International Liaison



Shoshana Weider
NASA HQ
NASA Liaison

MExAG Annual Meeting Summary

- February 1–3, 2021 [virtual] (3 hrs/day)
- >250 registrants, ~55% US/45% international
- 85–120 participants per day
- 53 presentations
- 3 additional sessions (2 early career, 1 networking)
- Working Sessions to refine the Goals Document

IDEA-WG

- MExAG is committed to Inclusivity, Diversity, Equity, and Accessibility (IDEA) principles and supports the efforts of the IDEA working group. MExAG recommends that NASA defines, formalizes, and supports both its relationship with the IDEA working group and, in consultation with the other AGs, the IDEA WG's relationship to the AG ecosystem.

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.

BepiColombo IDS/GI Programs

- MExAG thanks NASA for working with ESA to include and support U.S.-based scientists on the BepiColombo team as an Interdisciplinary Scientist (IDS)/Guest Investigators (GIs).
- MExAG encourages NASA to work with its international partners to secure the opportunity for U.S. participation in any future BepiColombo IDS/GI calls run by ESA and/or JAXA. In particular, MExAG would welcome an increase in the number of NASA-supported scientists who can participate, especially given the high-level of Mercury-science interest and expertise in the U.S. Such participation would also continue to leverage NASA's significant investments in building Mercury expertise through the MESSENGER mission and analysis of the data it collected.
- In addition, MExAG notes that the previous call for BepiColombo Interdisciplinary Scientists and Guest Investigators stated "The aim of this AO is to appoint up to six IDSs and up to eleven GIs for the BepiColombo mission" without noting how many of those were potentially available to U.S. scientists. MExAG encourages NASA to provide explicit guidance for any future BepiColombo IDS/GI calls regarding the likely number of investigators that would be supported by NASA for this program, i.e., so that potential proposers are fully aware of the programmatic parameters.

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.

Scientific Information Policy (SPD-41)

- MExAG supports increasing the openness and reproducibility of science, the primary ideals behind SPD-41.
- MExAG recognizes that the policy is currently open for public comment, but also emphasizes that as currently written, SPD-41 is vague and ambiguous. Examples include which software “provide users some degree of scientific utility” and must be archived, as well as how software and data produced under a combination of NASA and non-NASA (including non-governmental) support shall be treated. MExAG encourages NASA to make the policy sufficiently precise that it can be implemented.
- MExAG also encourages NASA to consider, in collaboration with the scientific community, a comprehensive set of policy initiatives to develop effective implementations that both encourage greater openness and interoperability, while balancing the potential for increased costs and stress on the R&A programs. Such steps should also include an assessment of how SPD-41 implementation differentially impacts various elements of the community as well as how to implement a process that is equitable in its expectations and burdens.

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.

Upcoming Mercury Meetings and Events

- LPSC, 7–11 March 2022
- Mercury 2022: Current and future science of the innermost planet, 7–10 June 2022, Orléans, France
 - Continuation of meetings to bring together MESSENGER, BepiColombo, and broader Mercury science communities
- BepiColombo:
 - Mercury Flyby 2, 23 June 2022

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

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

