

FINDINGS FROM SBAG 20, JANUARY 29-31, 2019

1. SBAG expresses gratitude to the Lunar and Planetary Institute, NASA, NRESS, and all the individuals who helped to organize and host the SBAG meeting despite the government shutdown. We also wish to thank all of the NASA employees and contractors who worked without pay during the shutdown to keep NASA missions alive and moving forward. The most serious impact of the shutdown has been on research funding, particularly for young investigators. We have also seen proposal timelines pushed back, and cancellation, postponement, or poor attendance of conferences. SBAG implores the federal government to recognize the necessity for the planetary community to be funded properly, be allowed to work, and receive funding on time.

NASA Response:

NASA is grateful to LPI for hosting, and to NRESS for organizing, the SBAG meeting at a particularly challenging moment. NASA appreciates the efforts of all those connected with the agency who were affected by the partial government shutdown, especially those whose pay was not guaranteed. Many NASA contract employees took on the responsibilities of furloughed staff, making it possible to mitigate some negative effects; for instance, thanks to their efforts it was possible to keep preparations for a number of panels on track and to hold those panel meetings on schedule almost immediately after the shutdown ended. NASA also appreciates that members of the community have stepped up and volunteered for proposal reviews on short notice, or have adjusted to schedule changes. NASA is aware that delays in solicitation releases, selection decisions, and funding can adversely affect both research and careers, and is doing what is feasible to reduce the impact.

2. SBAG endorses the recommendations of the recent report on Strategic Investments in Instrumentation and Facilities for Extraterrestrial Sample Curation and Analysis from the National Academies of Sciences, Engineering, and Medicine. A key conclusion from the report is that “If future instrument funding decisions must be made under the constraint of flat or decreasing overall funding levels, then the several competing demands of sample return science will likely exceed available resources, necessitating a focus on a few highest priority needs.” Indeed, the trend in investment in major facilities for sample analysis has been decreasing over the past 10 years. The situation is particularly critical as several sample return missions are ongoing, several are in the planning stages, and sample return missions will likely be emphasized in future decadal plans. The small bodies community is among the interested parties for that form of exploration. Hence, SBAG endorses the recommendations of the report in full, including an increase in investments to maintain and renew planetary equipment with the introduction of new capabilities, to sustain technical staff over the long term, and to train the next generation workforce.

NASA Response:

NASA is preparing its response to the National Academies’ study report on Strategic Investments in Instrumentation and Facilities for Extraterrestrial Sample Curation and Analysis, and expects to issue it soon.

3. SBAG reasserts the importance of including high-quality studies of potential small bodies missions as part of the pre-Decadal Survey process. These studies should include, but not be limited to, large or medium-sized missions to Ceres and the Pluto system, as recommended by the report of the Committee on Astrobiology and Planetary Science on Getting Ready for the Next Planetary Science Decadal Survey.

NASA Response:

NASA is working to enable and support a wide range of studies of potential planetary missions, as part of the pre-Decadal process, through the Planetary Mission Concept Studies (PMCS) program element appendix to the ROSES 2018 Announcement of Opportunity. The PMCS solicitation was released on February 14, 2019, and NASA is looking forward to reviewing the many interesting proposals that were received before the May 22, 2019 deadline.

4. SBAG congratulates NASA and its partners on the recent successes of several small body spacecraft missions, such as the completion of Dawn’s low altitude final extended mission at Ceres, Hayabusa2’s arrival and investigation at Ryugu, OSIRIS-REx’s arrival and investigation at Bennu, and New Horizons’s flyby of 2014 MU₆₉. These missions have produced valuable datasets that will be analyzed for decades, and have demonstrated the diversity of small bodies. SBAG looks forward to continued scientific discoveries coming from these datasets, and looks forward to continuing the exploration of small bodies with the Lucy, Psyche, and DART missions.

NASA Response:

NASA fully agrees, and congratulates all of the mission teams, especially our colleagues at the Japan Aerospace Exploration Agency for the ongoing success of Hayabusa2.

5. SBAG encourages NASA to support preparatory work dedicated to maximizing planetary science from both ground-based and space-based assets, including analysis tools and specialized workshops, and to identify the programs in which such efforts will be supported. SBAG recognizes the historic and ongoing importance of astrophysics assets to small-body science, on the ground and in space, and thanks the NASA Committee for Planetary Science with Astrophysics Assets for their work aimed at optimizing future use of such assets. There is great near-term potential for small-body science with LSST, and longer-term prospects with TMT, GMT, WFIRST, and other facilities. We note that many of the tools that will allow the planetary community to make full use of the data from these assets have not been developed and there is no planned development by the astrophysics projects.

NASA Response:

NASA has been encouraging such preparatory work for several years, starting with sponsored workshops at the 2015 and 2016 DPS meetings. NASA continues to support the development of tools for planetary science through the Planetary Data Archiving, Restoration, and Tools (PDART) program element (ROSES 2019 Appendix C.4), and accepts proposals for topical workshops through the Topical Workshops, Symposia, and Conferences (TWSC) program element (ROSES 2019 Appendix E.2). The Committee for Planetary Science with Astrophysics Assets, which is not a NASA committee but rather a community-based group organized through SBAG, solicited community input in 2018 and has since completed a white paper for the

Astro2020 Decadal Survey. While this white paper discusses telescope capabilities in general terms, its implicit emphasis is on space-based assets. Future ground-based observatories are not currently in the purview of NASA, and SBAG could consider communicating its views to the agencies and organizations more directly involved in their development.

6. SBAG encourages NASA and the small bodies community to determine the science and planetary defense goals for the 2029 Earth flyby of (99942) Apophis, and evaluate the opportunities, both in space and on the ground, that the flyby affords. The 2029 close encounter by this potentially hazardous asteroid is a once-per-thousand year natural experiment that provides an opportunity for advancing small body knowledge for both science and planetary defense. During the Apophis flyby, observations by radar will provide a unique opportunity to understand potentially hazardous asteroids, and spacecraft could offer further understanding. With launch for missions to rendezvous with Apophis well before Earth encounter likely to occur circa August 2026, preparation time is running short. SBAG encourages NASA to sponsor relevant workshops and to invest in possible mission concept studies.

NASA Response:

NASA acknowledges the rare opportunities afforded by the 2029 close approach of Apophis, and anticipates intense interest for this on the part of the small bodies community. The PDCO intends to announce shortly start of a future roadmap study for which it is expected the Apophis encounter, and discussion of possible lower cost missions, could play a prominent part. There is also the potential to propose to the Topical Workshops, Symposia, and Conferences (TWSC) program element of ROSES 2019 (Appendix E.2) for a forum specifically focused on Apophis.

7. SBAG supports recent and on-going Interstellar Probe mission design studies that consider both heliosphere and planetary science products that could be generated by such a mission. We encourage collaboration between science communities, especially early in the mission design process, to maximize the science return of spacecraft missions.

NASA Response:

NASA is aware of the interdisciplinary and cross-divisional scientific opportunities presented by the Interstellar Probe concept, but notes that such a mission has not been a high-priority recommendation of any Decadal Survey. Further development of this concept within the interested communities may be beneficial for identifying and refining the fundamental science questions that could be addressed uniquely and unambiguously by such a mission.

8. SBAG urges NASA to encourage further applications of occultation techniques, both in support of specific missions, and more generally as a complement to other ground-based observations. The striking success of stellar occultation campaigns in characterizing the size, shape, and orbital characteristics of 2014 MU69, and the planned use of such campaigns in support of the Lucy mission, underscores the scientific potential of occultations for enabling small body science.

NASA Response:

NASA enthusiastically supports occultation campaigns, as it has done in the past for New Horizons and continues to do for both New Horizons and Lucy. Occultation observations can

involve personnel and equipment deployments to foreign countries, suggesting opportunities for international partnerships, some of which can be groundbreaking. NASA encourages the community to plan for such campaigns early, as international deployments can require the participation and approval of multiple agencies in multiple governments.

9. SBAG endorses NASA's efforts to improve diversity in mission teams and to encourage the demographics of the planetary science field to more closely resemble the demographics of the nation at large. Studies show that diverse teams lead to diversity of thought and better scientific outcomes. We believe that the small bodies community should lead by example and we urge our colleagues to be inclusive when putting together teams for science investigations at any scale, whether they are small research and analysis efforts, telescopic observation teams, impending Discovery proposals, or future New Frontiers opportunities.

NASA Response:

NASA strongly encourages diversity on all NASA projects in general, and in mission teams in particular. In his recently webcast colloquium, “Writing Successful Proposals: Observations from NASA,” (see <https://science.nasa.gov/researchers/new-pi-resources>) SMD Associate Administrator Thomas Zurbuchen stated, “Research shows that excellence of teams and diversity go hand-in-hand, especially in innovative activities; excellent teams require diverse opinions and perspectives, and foster a sense of community by encouraging healthy behavior through actions. While there are no specific evaluation criteria for team diversity, NASA Science cares about all dimensions of diversity across our entire portfolio... [When] diversity is ignored...we limit the number and types of ideas and implementations, and open ourselves to the risk of group-think adding weakness to proposals. Team size should match the work required and the skills needed; teams should be built with diversity in mind from the beginning, not as an afterthought.”

10. SBAG reiterates its support for the NEOCam asteroid survey mission, which could provide a major contribution towards the fulfillment of the George E. Brown congressional goal of discovering 90% of the near-Earth asteroid population larger than 140 meters in size, while characterizing the diameters of a significant fraction of that NEA population. SBAG remains concerned that despite the fact that NEOCam was selected for Extended Phase A funding in the 2016 Discovery round and despite a significantly increased FY19 budget for Planetary Defense, the full NEOCam mission has not yet received funding to enter Phase B with launch still many years away. SBAG notes that diameters and albedos of NEAs could be derived by a space-based infra-red survey such as NEOCam, with better accuracy than an optical survey, and would provide a dataset important for small-body science, human exploration, resource utilization, and planetary defense.

NASA Response:

NASA agrees that a space-based IR NEO survey mission is the most capable system to achieve the GEB congressional goal within a “reasonable” period of 10 years. The just released NASEM study makes the benefit of this approach clear. However, the Planetary Defense Program does not currently have sufficient budget to pursue the full mission at this time.