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Maximizing Dawn's Scientific Mission at Ceres: SBAG Report

A Dawn at Ceres Participating Scientist program has broad community support and has been the subject of a number of supportive findings by SBAG for more than a year. The NASA Planetary Science Subcommittee in January 2014 also made a finding that a Dawn at Ceres Participating Scientist opportunity is important and that such a program should be established. These findings demonstrate the scientific community's assessment that a Participating Scientist Program has substantial value for maximizing the science return of the Dawn mission at Ceres, particularly in the context of the spectacular discoveries about Ceres (e.g., Herschel Space Observatory's detection of water vapor) made since the Dawn proposal was drafted almost 15 years ago.

At the last SBAG meeting, it was implied that the Dawn at Vesta Participating Scientist Program had not been fully successful. To gain insight into the issue, SBAG undertook a confidential survey of all the U.S. Dawn at Vesta Participating Scientists, receiving responses from 15 of 18 individuals. A sixteenth person did not want to participate. Responses ranged from extremely positive to deeply negative. The details provided indicated no hesitation on the part of the respondents to voice their opinion and provide specifics. Overall, 9 indicated very positive and productive experiences, 4 both positive and negative, and 2 deeply negative. 12 of the 15 respondents would propose to a Dawn at Ceres Participating Scientist Program. While some participating scientists had serious issues, the SBAG survey did not find evidence that the Dawn at Vesta Participating Scientist Program would offer a basis for not proceeding with a Dawn at Ceres Participating Scientist Program.

Criticisms reported in the SBAG survey, however, should not be ignored. There were reports of inconsistent application by mission management of the Dawn Rules of the Road across the science team, instances of some instrument teams failing to share necessary data products with the rest of the science team in a timely fashion, and a dysfunctional relationship between mission management and NASA Headquarters causing wasted time and resources. These are issues that can be effectively dealt with by improved management practices by the mission and oversight by NASA Headquarters.

Another reason that has been given for the lack of a Dawn at Ceres Participating Scientist Program is that there is nothing for Participating Scientists to contribute to for the mission at Ceres because all the mission operations at Ceres are being finalized at the present time. Consultation with personnel on the Dawn mission suggests that this statement is false. The Dawn team indicates that there is a level of flexibility built into operational planning to ensure that Level 1 requirements are achieved while also being able to accommodate observational changes due to new discoveries. An example might be the discovery of surface features indicating the existence of hydrological activity, the astrobiological importance of which would be significant. Coverage by the Visible-InfraRed mapping spectrometer is sparse at the Low Altitude Mapping Orbit, and the longitudes of observation (by adjusting the timing of the shift to LAMO) could be easily adjusted to ensure coverage of such identified structures. Another example would be final filter selection for the High Altitude Mapping Orbit, allowing for the tuning of sensitivities to different mineralogies, which will not be made until data from the third Rotational

Characterization observations (made as Dawn arrives at Ceres) are evaluated. In both examples, the expanded expertise afforded by the inclusion of Participating Scientists on the science team would be of great value.

In addition, the Dawn team (with inputs from the Dawn PI and Co-Is) has offered the following additional science objectives for a potential Dawn at Ceres Participating Scientist Program, heavily motivated by the significant discoveries made about Ceres since Dawn was selected in 2001:

- Determining and modeling the processes (e.g., cometary, cryovolcanism) giving rise to detected water vapor at Ceres;
- Characterizing and modeling the state of a Ceres atmosphere, including the variability and volume of water vapor emission;
- Determining the existence and state of subsurface reservoirs of liquid water and/or ice-rich layer;
- Determining the distribution and abundance of volatiles at the surface and within near-surface materials;
- Identifying, mapping, and characterizing geomorphological features and processes related to the presence of ice and/or water and their chronology.

An additional point of contention has involved discussions of the differences between a “Participating Scientist Program” and a “Guest Observer Program.” The intention of the previous findings of the scientific community is for NASA to fully realize the potential of their investment by maximizing the science return of the Dawn mission at Ceres. Any program in which funded scientists are integrated as members of the Dawn science team, support the Ceres encounter, are given full access to the Ceres data with the rest of the science team under the Dawn Rules of the Road, and are able to pursue their funded investigations could accomplish this, regardless of program title. However, time is of the essence, as the Dawn spacecraft is less than a year from reaching Ceres. An AO for a program should be announced immediately and every effort made to make selections and fund selectees within four months of the proposal due date, so that NASA may fully realize the unique scientific opportunity provided by Dawn becoming the first spacecraft to encounter Ceres.