OPAG Report to PSS

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The Outer Planets Assessment Group is a NASA-supported forum for scientists and engineers and other interested parties to discuss exploration of the outer solar system and to enhance communication between the outer planets community and NASA.

The meeting of OPAG held in Washington, DC was held in the brief interval between two major blizzards that paralyzed the nation’s capitol. As such the nominal two-day meeting was started at noon on the first day to allow attendees sufficient time to arrive (those coming from overseas, into Dulles, had an easier time than many attempting to fly from the west coast). When it became clear that the second blizzard would rival the first, it was decided to accelerate the schedule to break at noon on the second day. Nonetheless, many were delayed in leaving for an additional 1 to 2 days. It was, however, a productive meeting, attended by over 40 people initially, dwindling towards the end, and with a large number listening in or participating through Webex. Snow and ice are hardly an anathema to devotees of the outer solar system.
Special Weather Statement for District Of Columbia, DC

Issued by The National Weather Service
Baltimore/Washington, MD
8:24 am EST, Wed., Feb. 10, 2010

... EXTREMELY DANGEROUS WINTER WEATHER CONDITIONS THIS MORNING FOR THE BALTIMORE-WASHINGTON REGION... THE EASTERN PANHANDLE OF WEST VIRGINIA...

DO NOT ATTEMPT TO DRIVE THIS MORNING AND EARLY AFTERNOON. LIFE THREATENING BLIZZARD CONDITIONS HAVE DEVELOPED RAPIDLY ACROSS THE BALTIMORE-WASHINGTON REGION THIS MORNING.

AT 7:27 AM THIS MORNING... A WIND GUST WAS RECORDED TO 60 MPH AT MANASSAS VIRGINIA. NUMEROUS WIND GUSTS OVER 40 MPH HAVE OBSERVED AROUND THE REGION ALONG WITH WHITE-OUT CONDITIONS.

IF YOU GET STRANDED IN YOUR VEHICLE... DO NOT LEAVE YOUR CAR TO TRY TO WALK FOR ASSISTANCE... YOU CAN QUICKLY BECOME DISORIENTED IN WIND DRIVEN SNOW AND COLD. THIS STORM WILL SUBSIDE EARLY THIS EVENING... SO WAIT IN YOUR CAR FOR EMERGENCY HELP TO ARRIVE. PERIODICALLY RUN YOUR ENGINE FOR ABOUT 10 MINUTES EACH HOUR FOR HEAT. ENSURE YOUR EXHAUST PIPE IS CLEARED OF SNOW AND ICE. CRACK YOUR WINDOWS TO AVOID CARBON MONOXIDE POISONING. TIE A COLORED CLOTH TO YOUR CARS ANTENNA TO BE VISIBLE TO RESCUERS. FROM TIME- TO-TIME... MOVE YOUR ARMS... LEGS... FINGERS... AND TOES TO KEEP BLOOD CIRCULATING.
Snow Party protesters
Presentations:

• Planetary Science Division (PSD) Update – James Green (NASA HQ)
• Outer Planets Future (OPF) Mission Update – Curt Niebur (NASA HQ)
• Planetary Science Subcommittee (PSS) Report – Fran Bagenal (UC Boulder)
• Planetary Science Decadal Survey – Heidi Hammel (SSI) & John Spencer (SwRI)
• Future Titan Exploration – Ralph Lorenz (APL)
• Titan’s Lakes (Science Talk) – Alex Hayes (Caltech)
• Report from Joint NASA-ESA OPF SDT – Bob Pappalardo (JPL) & Olivier Grasset (Univ. Nantes)
• Synergistic Magnetospheric Science with More than One Spacecraft – Norbert Krupp (MPI)
• EJSM Jupiter Science – Amy Simon-Miller (GRC), Leigh Fletcher (Oxford), & R. Pappalardo (JPL)
• ESJM Satellite Tour Assessment – David Senske (JPL), R. Lock (JPL) & Olivier Grasset (Nantes)
• EJSM general science and discussion – Bob Pappalardo (JPL) & Ron Greeley (ASU)
• Outer Planets Program future directions – C. Niebur (NASA HQ)
1) Europa Jupiter System Mission

The main focus of the meeting, after digesting the various informational reports, was to present in a community-wide forum, the substantial work of the of the joint NASA-ESA Science Definition (SDT) team for the Europa Jupiter System mission – the next large, flagship-class mission to the Outer Solar System. This mission, chosen as the result of two competitive scientific, technical, and management review cycles, is OPAG’s number one priority for a major new undertaking. Specifically, and consistent with all previous OPAG findings, **OPAG strongly supports the joint NASA-ESA mission to the Jupiter system, urges a timely entry to phase A for the NASA part of EJSM, the Jupiter Europa Orbiter (JEO).**

The SDT report should be finished this calendar year, and the intent of the OPAG presentations was to make sure that the nearly final details were broadly distributed to the outer planets community, and most importantly, that input and reaction from the community could be incorporated in the final report. Because of the adverse weather situation, this feedback was probably not as complete as SDT members had hoped, but a number of important issues were raised, and these will appear in findings below.
2) FY11 NASA SMD Budget

Both Jim Green and Curt Niebur outlined the new plan for the Planetary Science Division at NASA. Despite enormous media attention to the proposed changes to human exploration, little attention to NASA’s science plans. The outlook for Planetary Science seems particularly good, with modest but important budget increases for FY10 and FY11. In particular, there is support for JEO in this two FYs, sufficient support to produce an instrument AO, and to start phase A. However, and this was stressed, there is not sufficient budget flexibility in the out years to address the requirements for JEO. This ostensibly would greatly benefit from endorsement by the Planetary Science Decadal Survey, but it is unclear how all the competing priorities for major missions will play out in the Survey. OPAG was deeply gratified to see that the Cassini Extended-Extended (or Solstice) Mission was formally approved, which will allow for exciting, and new scientific results to continue to pour forth from the Saturn system until 2017.

Overall, OPAG and the outer planets community in general strongly support the President’s proposed FY11 budget for Planetary Science. OPAG recognizes the hard work at NASA HQ necessary to craft a realistic, exciting, and executable science program.
3) Supporting Research & Technology (SR&T) Working Group

The Planetary Science Subcommittee has recommended that a team of PSS members, spanning a cross-section of the scientific community, form an SR&T Working Group to evaluate all SR&T programs within PSD, and to provide advice to NASA on priorities for their support within the SR&T programs.

The SR&T Working Group will be very important for supporting the evaluation of R&A programs (e.g., re-balancing between programs – OPAG notes the recent low acceptance rate 17% for Outer Planets Research), as well as for evaluating funding for mission science within missions (the DA in MO & DA) vs. supporting mission science with R&A programs (the latter often occurs as mission resources become tight).

In addition, long-duration missions are a hallmark of outer planets exploration, and significant and substantial issues surround 1) the duration of NASA’s commitment to Co-Is, 2) heritability and transference of mission roles, and 3) pathways to bring new generations of scientists into such missions in meaningful ways.

**OPAG supports PSS in evaluating SR&T. OPAG further recommends that the PS SR&T Working Group evaluate the role of Co-Is/Interdisciplinary Scientists/Participating Scientists on long-duration missions (such as Cassini) and provide recommendations for future long-duration missions such as the next Outer Planets Flagship.**
4) Technology Panel

Technology issues are naturally crucial to all of PSD, but they assume particular importance for the Outer Planets given the often demanding and unique environments in the Outer Solar System (for example, the cold, dense atmosphere of Titan, or the radiation environment at Europa). The growing cost of Outer Planet missions can limit scientific productivity – new technology is needed to control the cost of these missions – i.e., it is not just a good thing to have, it may be crucial to Outer Planets survival as a healthy discipline.

Technology issues and recommendations were highlighted in OPAG’s white paper contributions to the DS. The Planetary Science Subcommittee has supported the formation of a panel to assess technology development projects within PSD, to develop a coordinated and integrated technology development plan, and to recommend process and policy changes to improve effectiveness and performance. OPAG understands that the Technology Panel is already underway and has outer planet representation.

**OPAG strongly supports PSD in setting up the Technology Panel.** In terms of the distribution of resources, **OPAG emphasizes the need to balance evaluating technologies that could be brought up to flight Technical Readiness Levels (TRL) on OPF or close-term missions vs. developing lower TRL technologies to enable more future missions.**
5) Future Titan Exploration Technologies

Titan exploration remains a top priority for the Outer Planets community, both by means of continued Cassini operations at Saturn, and through planning for a second major outer planets mission (future flagship) or nearer-term missions (e.g., New Frontiers or Discovery class) to the Saturn system.

**OPAG emphasizes support for continuing technology development to enable future Titan exploration (e.g., the Montgolfière).** Given European interest and experience with Titan exploration (e.g., Huygens), **OPAG emphasizes the advantages of coordination with our international partners.**
6) Outer Planet Flagship Science Review Board

OPAG was especially impressed with the Joint NASA-ESA SDT presentations on greatly enhanced opportunities for Jupiter science, and for synergistic magnetospheric science from two platforms (JEO and JGO), for EJSM. These opportunities are reflected in the new traceability matrix (linked on the OPAG website). The SDT has been functioning so well that it was felt that continuing and similar science advice and input would be valuable as the OPF mission develops — even after formal submission of the SDT report.

OPAG recommends that some thought be given to formation of an ongoing Science Review Board, or science representation on existing review boards, between the time that the SDT formally dissolves and a Project Science Group can be formed. Such a Science Board, or suitable representation, may be valuable even after PSG formation.
7) Broadening Community Involvement in Cassini.

OPAG continues to be concerned about broadening scientific involvement in the ongoing Cassini mission, not strictly data analysis. We understand the constraints imposed on the Extended-Extended Mission which has recently been approved (and which we laud in no uncertain terms!), but if funding could be obtained, it would be of great benefit to create a path to augment (not simply replace) Cassini investigators.

OPAG recommends that NASA continue to seek pathways to broaden community involvement with the Cassini mission beyond the original investigators and their research associates. OPAG strongly supports the efforts of SMD to create a Cassini Participating Scientist program.
8) Plutonium Shortage

As in previous OPAG findings, we reiterate the central importance of radioisotope power systems to deep space exploration. We laud the planned availability of Stirling (ASRG) power sources in the upcoming Discovery AO. We are greatly encouraged by the detailed analysis in the 2009 NRC McNutt et al. report (*Radioisotope Power Systems: An Imperative for Maintaining U.S. Leadership in Space Exploration. National Academies Press, ISBN 0-309-13858-2*), and hope that Congress will act this year to approve restart of domestic Pu-238 production by DOE and NASA.

*OPAG continues to strongly encourage all relevant governmental agencies to explore ways to make sufficient plutonium available for future outer planets (and other) missions.*
Top 3 Recommendations

• OPAG strongly supports the joint NASA-ESA mission to the Jupiter system, and urges a timely entry into phase A for the NASA part of EJSM, the Jupiter Europa Orbiter (JEO)

• OPAG continues to strongly encourage all relevant governmental agencies to explore ways to make sufficient plutonium-238 available for future Outer Planets (and other) missions.

• OPAG strongly supports PSD in setting up the Technology Panel. OPAG emphasizes the need to balance evaluating technologies that could be brought up to flight Technical Readiness Levels (TRL) on OPF or close-term missions vs. developing lower TRL technologies to enable more future missions.
Some Science Highlights

• Confirmation of lakes on Titan
• Observation of lake evolution (shrinkage) on Titan
• Titan gravity indicates a partially differentiated interior
• Measurement of Enceladus plume composition – NH$_3$ and $^{40}$Ar detected
• Discovery of Phoebe dust ring
• Resolution of Iapetus hemispheric albedo dichotomy mystery
• Saturn equinox passed. Variety of three-dimensional ring structures seen for the first time.