OPAG Report to PSS

October 3, 2012
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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.

OPAG met for two days (29-30 March 2012), with an emphasis on hearing new reports from the Europa Science Definition Team, which was charged with responding to the recommendations of the Planetary Science Decadal Survey. Extensive discussion and debate followed.

The next OPAG meeting was planned for Sept 18-19 in the Metro DC area.

NASA Participation in JUICE was announced in May 2012, with US proposals due 24 Sept 2012 and proposals to ESA 15 Oct 2012.

Accordingly, the planned fall OPAG meeting was postponed, to 9-10 January 2013 in Atlanta, GA.
OUTLINE

Brief updates to principal findings of March OPAG meeting

Report from Io Workshop July 2015

Outer Planets Science Nuggets
2) Cassini Extended Mission and Senior Review

The Cassini extended mission should be funded and supported through the planned 2017 end-of-mission. OPAG is gravely concerned about effects of proposed reductions for FY 2013-2014 in terms of loss of personnel and increased risk.

**OPAG continues to strongly urge** that NASA fund the Cassini Solstice Mission at the level required to safely operate the spacecraft and to obtain and analyze the data required to accomplish the science objectives of the Cassini Solstice Mission.

*Cassini excelled in the senior review*
3) Jupiter Icy Moons Explorer

OPAG lauds the selection of the Jupiter Icy Moons Explorer (JUICE) by ESA as the next L-class mission in ESA’s Cosmic Visions program…

OPAG strongly urges NASA to enable meaningful U.S. participation in JUICE through provision of instruments, instrument components, and support for U.S. co-investigators and participating scientists.

OPAG emphatically applauds the tremendous efforts of NASA, OMB, OSTP to date…

NASA has committed $100M life-cycle for U.S. participation in JUICE

The Outer Planets Baton is being passed … but international collaboration remains strong and vital
4) President’s FY 2013 Budget

OPAG laments the 20% reduction to PSD, not the least of which because it eliminates the possibility, even within the notional outyear budget, of starting a descoped “flagship-science-class” mission to the Outer Planets.

Within the context of the PSD budget, OPAG urges that NASA make every effort to restore the cadence of PI-led Discovery and New Frontiers missions as recommended by the Decadal Survey…

A Falling Tide Grounds All Boats … and the Planetary Science Decadal Survey is at risk of being bound in the shallows
6) Cassini Participating Scientists and R & A

...OPAG is ... dismayed by the most recent selection rates for the Outer Planets Research program (OPR), which is a core research program in NASA’s R&A portfolio.

We urge NASA to bring these [OPR] selection rates up to a level consistent with other core R&A programs, and selection rates up overall.

CDAP 2012 selection rates promise to be similarly low (H. Throop). The nation is not fully reaping the benefits of its considerable investment.
7) Pu-238 Shortage

NASA should *continue to do* what is necessary to make sufficient amounts of plutonium (Pu-238) available for Outer Solar System (and other) missions. OPAG strongly supports PSD efforts to have DOE restart Pu-238 production with funds appropriated by Congress.

- OPAG further supports making ASRGs available in the next Discovery and New Frontiers calls.

*Progress is measured but steady!*
1) Europa Descope Mission Options

“Sense of the Community”

The strong majority view of the OPAG community is that the Multiple-Flyby option [Europa Clipper] offers the greatest science return per dollar, greatest public engagement, and greatest flow through to future Europa exploration.

This finding refers to the Europa options in the “interim” March report. See www.lpi.usra.edu/opag

OPAG looks forward to hearing the results of the enhanced mission & solar power option studies in January
1) Europa Descope Mission Options (summary)

... OPAG recommends going forward with a detailed design study of a single mission option, and strongly encourages a new start (when practical) for this mission.

When the Europa SDT stands down at the end of CY12, the NASA Europa effort ends
Io Workshop Report

• Io Workshop held at LASP, Univ. Colorado, July 10-11, 2012
  • Latest in series of Io Workshops held every 1-2 years since Galileo mission
  • Attended by ~35 Io scientists
• Discussed progress on wide variety of Io research:
  • Io global geologic map (Williams et al.) distributed to attendees
  • 26 oral presentations plus 2 posters on Io research, including Io geology, torus, atmosphere, magnetosphere, based upon Voyager-Galileo-New Horizons data analyses, Earth-based & HST telescopic observations, and geochemical & computer modeling

• Final group discussion on “Future of Io Exploration”
  • Consensus to recommend that OPAG, LEAG suggest inclusion of Io Observer & Lunar Geophysical Network for competition in NF-4 selection (Letter by D.A. Williams & F. Bagenal to OPAG, LEAG Chairs)

Download map from:
http://pubs.usgs.gov/sim/3168/

Subsurface Ocean on Titan

• Six close gravity flybys analyzed to study Titan’s interior
• Large “solid” tides (10m high) detected in Cassini gravity and are indicative of a liquid water ocean under Titan’s ice shell
• Ocean may serve as reservoir to replenish Titan’s atmospheric methane, which is destroyed on geologically short time scales

Model of Titan’s interior
Iess et al., Science, June 28, 2012
Titan’s Polar Hood Moves South

- Earlier in the mission, Titan’s polar hood rested over the north pole region, dissipated, and is now forming over the south pole.
- Cassini’s visible camera and near infrared spectrometer have spotted the appearance of the polar hood over Titan’s south pole (aided by inclined geometry of Solstice mission orbits).
- Downwelling over the south pole is causing high-altitude haze concentration and polar vortex.
- Cassini instruments will look for associated cloud activity as the southern hemisphere moves into winter.

Cassini imaging subsystem image (June 26, 2012)

Cassini visible & near-infrared spectrometer images
- May 22, 2012 (left), June 6, 2012 (right)
- red arrows point to polar hood
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Uranus in November 2011

Keck Observatory captured interacting cloud features on Nov 10, 11 and 13
*Sromovsky et al., Icarus 220, 2012*

Hubble Space Telescope captured aurorae on Nov 16 and 29
*Lamy et al., GRL 39, 2012*
Mysterious Iapetus

Origin of equatorial ridge by giant impact, either direct infall of impact debris ring (Levison et al., Icarus 2011) or tidal decay and breakup of primordial impact-generated satellite (Dombard et al., JGR 2012)

Saturn moon Iapetus' huge landslides stir intrigue
Giant ice avalanches on point to low friction mechanism (Singer et al., Nature Geoscience 2012)
Backup
1) Europa Descope Mission Options (cont)

“Sense of the Community”

1) the Europa Multiple-Flyby mission (a jovian orbiter optimized for the study of Europa with a science payload specifically tailored to the task) will provide more data (nominally 30+ flybys) and involve more of the scientific community than the Europa orbiter;

2) the Europa Multiple-Flyby mission addresses the habitability question far more directly than the Europa Orbiter;

3) the Multiple-Flyby’s strong emphasis on remote sensing (imaging and radar sounding) has strong and direct public appeal; and

4) the Multiple-Flyby mission does a remarkable job addressing a primary science goal – whether liquid water (plus any materials therein) reach the surface. The latter is a high priority with the public and the Decadal Survey, and the Multiple-Flyby mission would provide the data necessary to choose a scientifically compelling and safe landing site for any future landed mission.