

## IPEWG Summary

IPEWG 2011 was the second in the series of meetings of the International Primitive Body Exploration Working Group, the first having been held in 2008 in Okinawa, Japan. In 2011, 88 participants traveled from 8 countries and a wide variety of institutions and provided 54 abstracts, 20 papers and 17 sessions worth of discussions.

Day 1 centered on agency-level priorities and the science and engineering background for the workshop. Recent and ongoing missions (Hayabusa, Dawn, Rosetta, etc.) are returning exciting results and, though a slow economy exists, prospects for primitive body exploration are good (Hayabusa 2, Marco Polo-R,, OSIRIS REx, etc.). In the US the recently released Planetary Science Decadal Survey has emphasized their importance, while worldwide, primitive body missions and investigations continue to receive wide support.

There is continuing international interest for primitive bodies but **a short document or inventory of planned and funded missions, science investigations, and instrument development is needed to develop a coordinated strategic plan for future international collaboration.** The Small Bodies Assessment Group (SBAG) has developed an exploration roadmap that gathers input from the community about the nature of the technological and scientific developments needed to support ongoing and future missions to small bodies. This document is meant to evolve as a function of the interests of the small bodies community. It may serve as a template for an IPEWG-initiated white paper or roadmap.

As IPEWG was only recently formed, some clarification is yet needed about membership and roles. Currently the members are “agencies”, but this needs to be made more official through appropriate signatories. The steering committee and invited qualified personnel make up the majority of the IPEWG members.

Joe Nuth and Patrick Michel led vibrant discussions on the state of knowledge of primitive bodies science, and highlighted the gaps in our knowledge that could be addressed by future missions. It was found in the science overview that there exists a broad definition of primitive bodies – many perceptions exist from various related communities (e.g. NEO experts, cosmochemists, etc.). **Clearer usage parameters should be derived.**

Within planetary defense, a great deal of characterization still needs to be completed. Multi-asteroid missions would help capture the diversity of properties across the population, and such an ambitious exploration goal will require the coordinated efforts of different communities with synergistic effects. **The first step to coordinated NEO missions will be the global support and commitment on a roadmap or goals** – and this itself may derive from synergy between communities and technologies. In the past, community specific constraints have hindered

collaborative activities – International community stakeholders must support any frame-working activity to achieve success. Technical memos may serve as a stronger mechanism, and seem to appeal to scientists and engineers. Unfortunately, combining budgets between disciplines (science, engineering and human missions) seems difficult, which makes synergies difficult to realize. **Synergistic technical memos may require an organization like IPEWG.** As SBAG serves as NASA's "internal IPEWG", its discussions can serve as a starting point for an IPEWG white paper. It may also be important to invite more policy-makers to future IPEWG workshops, such as representatives from UN-COPUS or MPC. Such a coordination effort has recently been undertaken by Paul Abell.

Days 2 and 3 provided a summary of missions, technologies and future steps. The community has been very active in carrying out primitive body missions in the past decade, including Hayabusa, Dawn, Rosetta and NEOWISE. Future observation campaigns include LSST [Large Synoptic Survey Telescope], which offers the capability to detect 90% of > 140m asteroids in 10-12 years. **These types of surveys are important for all areas of primitive body interests.**

Future missions require technology development, and it has been identified that several enabling technology should be funded in order to prepare for the implementation of future ambitious missions to small bodies. In particular, contamination control must be evolved and streamlined.

Like other activities, space exploration provides for and thrives on synergistic activities. For instance, upcoming science missions may double as precursors to human exploration. But international cooperation is required and technology needs and developments must be identified, e.g., propulsion and radiation protection. Yet, some of these communities may not exist, such as a community specializing in in-situ resource utilization.

During the conference, several recommendations were made, with a desire to implement them before IPEWG 2013. Nice has been recommended as a potential host site for this meeting.

- First and foremost, negotiate to obtain formal recognition of IPEWG by the various international agencies. Strong participation of the agencies will provide the context and relevance of all subsequent IPEWG activities.
- Revise Charter to reflect comments from the community, including membership and roles.
- Continue discussions between IPEWG conferences, led by current and future conference chairs, regarding discussion points.
- Lay out an international strategy for the exploration of NEOs (to limit scope and identify areas where international collaboration is most suitable). Create inventory of missions/activities that are already approved / planned in order to identify niches.

- A common voice amongst various stakeholders should be expressed, but meat is needed to support it – build a technical memo in support of the international strategy.
- Establish common policies across agencies for planetary protection and data storage for primitive bodies.

We found IPEWG 2011 to be an exciting and productive meeting, and the goals of the group appear to integrate well with other activities and groups. However, many of the recommendations from 2008 regarding sub-working groups were not implemented – hence, IPEWG 2011 recommended that **ongoing discussions are needed between IPEWG workshops** (e.g., upcoming ACM meeting).

IPEWG offers a forum for the community at large to stay abreast of the status quo in small bodies exploration, in terms of the scientific interest of various communities, but also in terms of the programmatic interests of space agencies worldwide. It is the only venue yet that offers the opportunity for this diverse community to gather and discuss potential collaborative efforts at the international level.