19th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and Development (1)

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EXPLORING PLANETARY SYSTEMS, IN THE SOLAR SYSTEM AND BEYOND.
THE ENABLING POWER OF INTERNATIONAL COLLABORATION

Abstract

How are planetary systems born out of the collapse of interstellar clouds? How does their evolution shape the assembly of planets, satellite systems and small bodies that they host? How may a few of these planets and moons become habitable and possibly host life? Addressing these key science questions from the "Planetary exploration, Horizon 2061" foresight exercise takes a convergence of scientific insight, technical know-how and resources that can be found only via international collaboration.

First of all, characterizing the huge diversity of exoplanets and of extrasolar planetary systems discovered in less than 30 years, and detecting a host of new ones, involves the design and operation of giant observatories, both in space and on the ground. In the Solar System itself, the huge diversity of objects (planets, small bodies, moons, rings, magnetospheres...) that populate it can be explored only via a share of targets and efforts at international level, using an equally broad diversity of in-situ or remote sensing measurement techniques paving the way to sample return missions from increasingly farther destinations. Beyond the reach of sample return, the ice giants Uranus and Neptune, the Dwarf planets and icy bodies that populate the Edgeworth-Kuiper belt are mostly unchartered territories. Beyond them, Humankind also needs to accomplish its first steps into the interstellar medium. This essential exploration of the outskirts of the Solar System will require a well-designed coordination of ambitious space missions and of giant Earth-based telescopes.

For such a share of targets and missions to produce the best possible science return, scientific data have to be freely distributed among all partners via world-class data infrastructures such as the Planetary Data System (https://pds.nasa.gov/) or the Planetary Science Archive (https://www.cosmos.esa.int/web/psa/psa-introduction). In the same spirit, rules for the curation and distribution of samples returned from the diverse destinations to the worldwide scientific community, currently under definition for the on-going Mars Sample Return campaign, will no doubt be applied to future sample return campaigns from Venus, asteroids, Trojans, comets and the icy satellites of the giant planets.

Finally, we wish the building of the cis-lunar gateway station by a consortium of space agencies, a prelude to the establishment of permanent robotic or human bases on the Moon and later Mars, to be only the first step towards an enhanced and sustainable international collaboration to better understand the fate of planetary systems, of the Solar System, and of our Mother Planet.