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Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond (4)

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A VISION FOR PLANETARY AND EXOPLANETS SCIENCE: EXPLORATION OF THE
INTERSTELLAR MEDIUM – THE SPACE BETWEEN STARS

Abstract

A vision is proposed in which planetary science and exoplanets merge into a common discipline with common goals and inter-related scientific discoveries. As we learn more about our own solar system we can apply the known aspects of our solar system as a test case (laboratory) to the observations of distant stars and resident exoplanets.

The paper also describes a 4 teared program that encompasses:

- En masse exploration of the interstellar medium (ISM) using a large number (≤ 100), of small satellite explorers for the in-situ exploration of the local ISM at the distance of 100-100 AU. Imagine a plethora of small Voyager-1 spacecraft deployed in many different directions reaching the Heliopause and the local ISM in 8-10 years. Only using such a volume of in-situ explorers can we really learn about the complex interaction between our Sun and the ISM.
- Small number (4-5) deep space probes in the pristine ISM region of 200 – 300 AU. These would be medium size robotic explorers that would take 10-15 years to reach such distances and deploy a more robust set of instrumentation for detailed measurements in the pristine ISM.
- Delivery of an imaging telescope 1m in diameter to the Solar Gravity Lens Focus area at a distance of ≥ 500 AU for the multi-pixel imaging of exoplanets. Such an observatory would be the ultimate telescope for the multi-pixel imaging of exoplanets as it will use the gravitational magnification of the Sun to concentrate photons from the exoplanet.
- Finally, the fourth component of the proposed vision and program is a specific technology development program to demonstrate technologies that will one day allow our robotic explorers to reach another exoplanet. As of today, there are a few proposed options including beamed energy, e-sails, and other techniques, but, all of these are in very early stage of development. Such a program would encourage early technology demonstrations on a small scale, with options for scalability to larger formats and to faster speeds of travel.

Stakeholders for such a proposed program include: Planetary Science, ExoPlanets, Astrophysics, and Heliophysics. A roadmap for this program will also be presented, highlight major missions and milestones, along with critical technologies.