Interstellar Probe: A Cross-Divisional Mission in to the Galaxy

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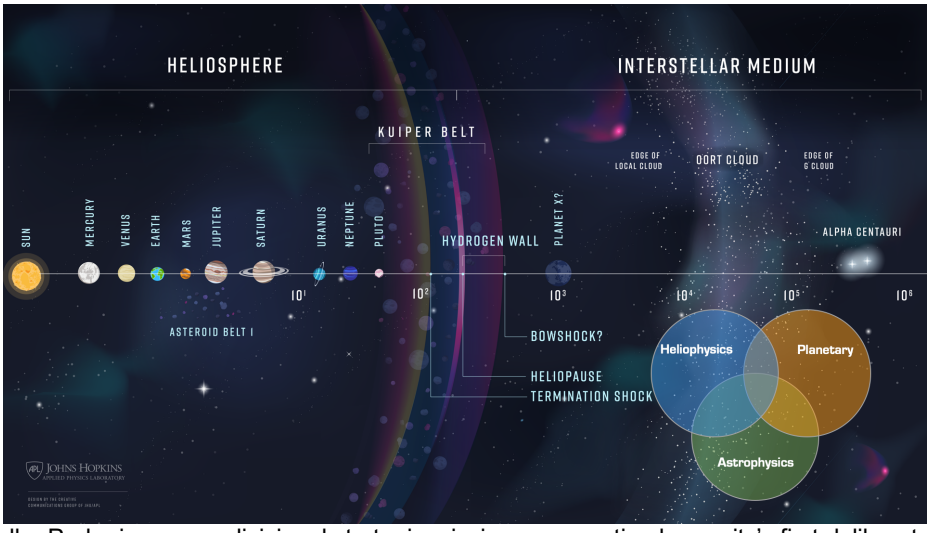

Interstellar Probe is a cross-divisional strategic mission representing humanity's first deliberate step in to the galaxy. Going beyond the Sun's sphere of influence enables the first views of our habitable astrosphere, circum-solar debris disk, and opens the IR window to early galaxy formation.

Inevitably humanity seeks to expand across the sea of space to other Suns. The Interstellar Probe represents humanity's first deliberate step in to the galaxy on that journey. Traveling beyond the Sun's sphere of influence, opens remarkable possibilities for astrophysics, heliophysics and planetary sciences:

1. Understand our heliosphere as a habitable astrosphere by acquiring external global images and measurements of its astrophysical interactions with the Local Interstellar Medium (LISM)
2. Understand the evolutionary history of the solar system by determining the large-scale distribution of the circum-solar debris disk and characterizing Kuiper Belt Objects on an outward trajectory.
3. Open the observational window to early galaxy and stellar formation by going beyond the obscuring Zodiacal cloud.

An Interstellar Probe Mission to the Local Interstellar Medium have been discussed and studied since about 1960 by multiple international teams. The more recent studies have begun to recognize its critical importance for all the three discipline, which has been fueled by the crossing of the heliopause of both of Voyager 1 and 2, and the New Horizons flybys of Pluto and MU69. Perhaps more importantly, with the exploding abundance of exoplanetary systems, a growing need is emerging for putting our heliosphere, solar system and debris disk in to context of all other astrophysical observations. For example, a heliosphere like our own has likely never been observed because of its relatively low UV intensity at those distances, which is preventing detailed understanding of the habitable properties of the astrosphere and its stellar wind. Also, despite the decisive importance of understanding the circum-solar debris disk, its large-scale distribution remains unconstrained, which is the ground truth for understanding planetary system formation and evolution in other circum-stellar debris disks.

In the past, stumbling blocks in the implementation of a pragmatic Interstellar Probe has often been found to be the lack of available, or near-term launch vehicles and propulsion technologies. A NASA-funded study is now under way that has provided the most detailed launch configurations and trajectories ever carried out. The concept assumes a New Horizons like spacecraft, and an SLS Block 1B with various kick-stage configurations, using a powered Jupiter Gravity Assist resulting in an asymptotic speed about three times faster than the Voyager missions.