

## **Abstract**

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# **Precursor Missions to Interstellar Exploration**

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### **Perspective:**

Technology advances in the space exploration arena appear to be accelerating at a rate difficult to have predicted only a short time ago. Our vision of missions that might be have often fallen behind what could be. This paper suggests that interstellar exploration is a vision that can provide a mission and technology roadmap worthy of the pace that new technology concepts and ideas are now becoming reality.

Although very advanced propulsion is clearly a requirement for enabling travel in our "stellar neighborhood", other technologies must also be developed that require a similar leap in imagination. These new advanced technologies provide a stairway to ever more ambitious missions leading to travel to new star systems.

### **Precursor Missions:**

This paper describes a preliminary mission roadmap leading to the exploration of star systems within 40 light years of our Solar System. The precursor missions include technology demonstrations as well as missions that return significant new knowledge about the space environment reached.

Propulsion technology candidates are described, and three candidates are selected on the basis of allowing eventual travel to the nearest star in 10 years. One of the three propulsion technologies is applicable to early missions (prior to 2010) - the Solar Sail. Using early sail missions other supporting technologies can be developed that will later enable interstellar travel.

Example precursor missions described are a solar storm warning mission using a simple sail, a solar polar imaging mission using an intermediate sail, and a 200-AU Heliosphere Explorer using an advanced solar sail. Missions later than these on the roadmap will require types of fusion propulsion, antimatter-matter annihilation propulsion, or enhancements to the sail technology to propel us to the stars in the relatively short trip times desired. The sail enhancement envisioned at this time uses an Earth-based laser in what is termed as a beamed-energy approach.

Mission and technology strategy, science return, and potential mission spin-offs are also described.

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