

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Small Bodies Missions and Technologies (Part 1) (4A)

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THE PSYCHE MISSION

**Abstract**

NASA's Psyche Mission, launching in August of 2022, aims to orbit and study the asteroid (16) Psyche. Psyche, discovered in 1852 by Annibale de Gasparis at the Astronomical Observatory of Capodimonte in Naples, is the largest M-type asteroid in the Solar System and a possible exposed core of a protoplanetary body. The mission payload includes a gamma ray and neutron spectrometer designed to determine Psyche's elemental composition, a pair of imagers which will perform topographic and spectral surface analysis, and a magnetometer (built by the Technical University of Denmark) which will investigate Psyche's internal structure and differentiation. All of the payloads will contribute to determine Psyche's origin and place in the formation of the solar system. The Discovery-class mission uses solar powered low thrust electric propulsion and carries an optical communications technology demonstration. Complex, innovative, and low cost planning have been required to produce an effective mission plan amidst COVID-19, a new spacecraft design build partnership between NASA and Maxar Space, and significant anomalies uncovered during spacecraft manufacture and test. The mission plans accommodate frequent thrusting with limited communications for most of the cruise phase, very early mission pressure from its technology demonstration, an intensive Mars gravity assist, high uncertainties in (16) Psyche's characteristics, and four successively lower orbits at the asteroid, the last being below one body radius above the surface.