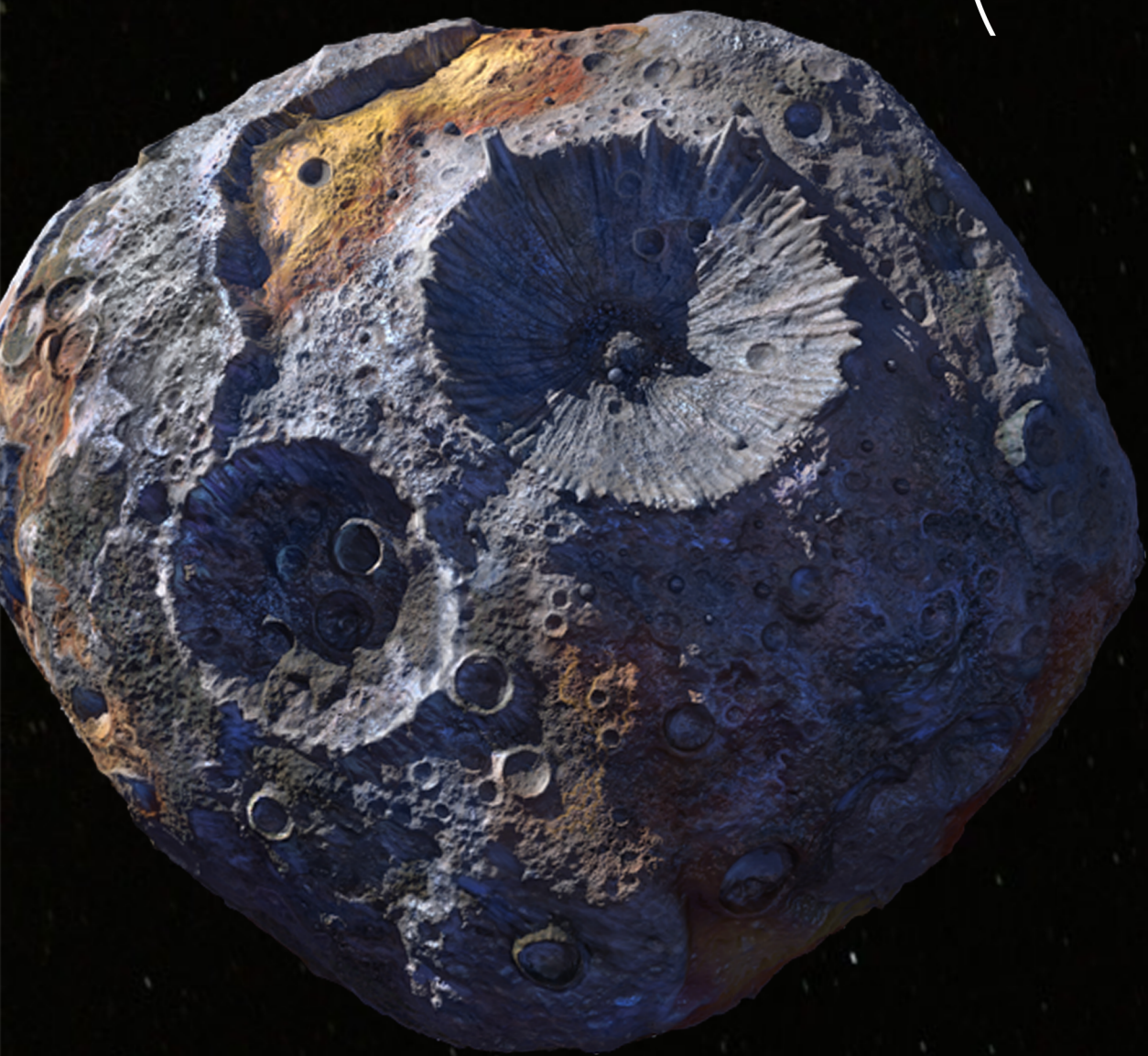
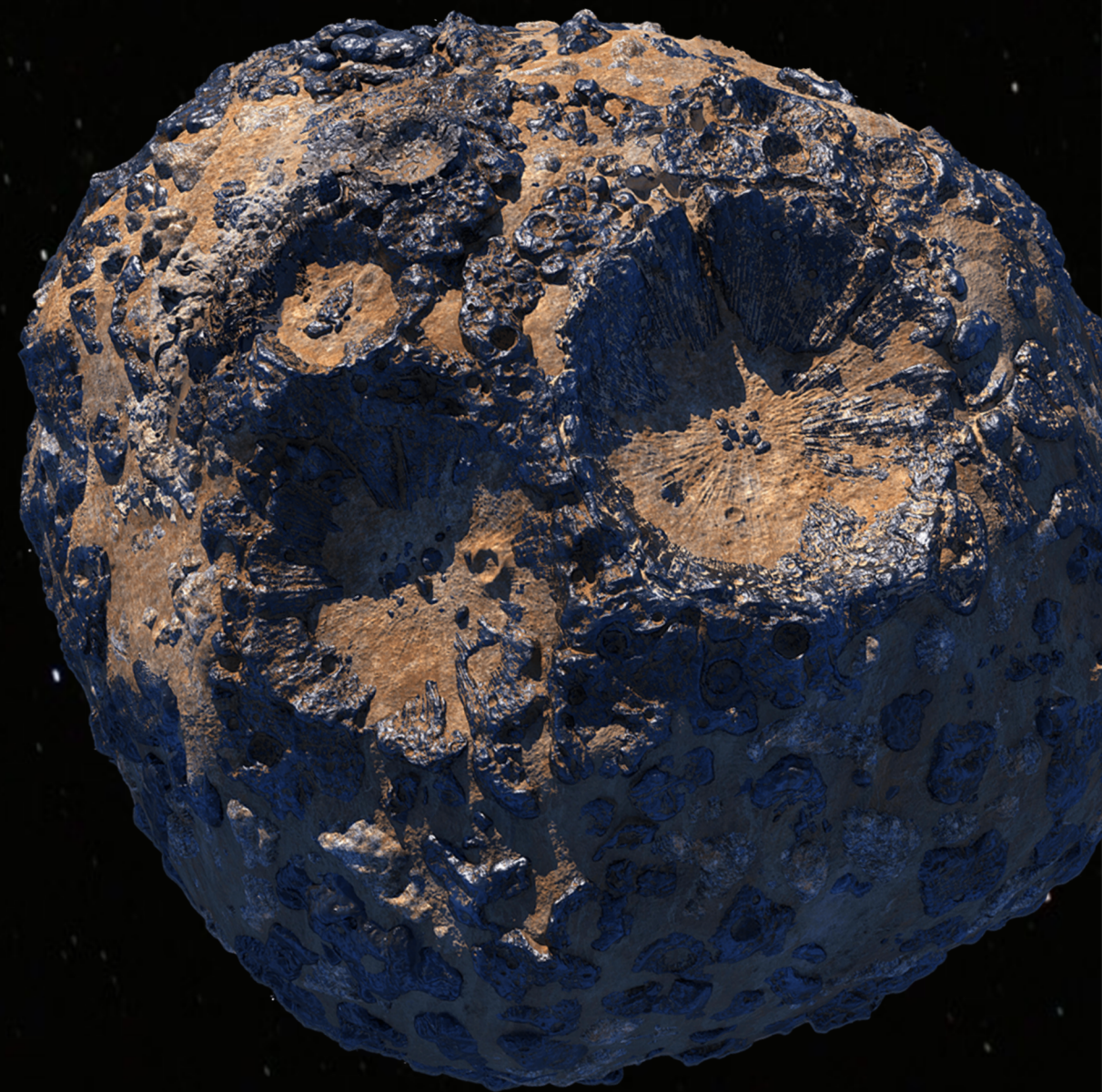


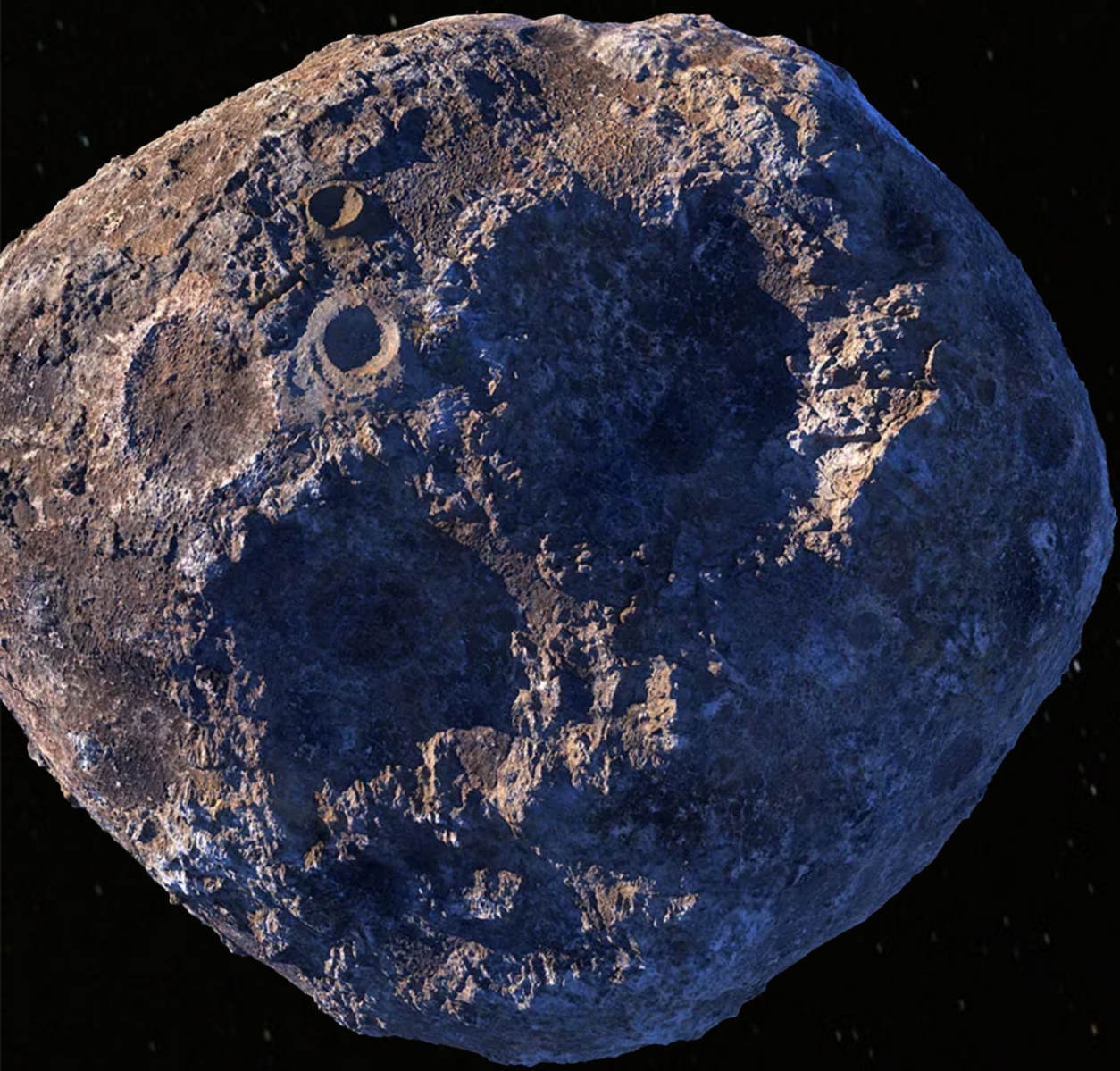
What is M-Class Asteroid (16) Psyche? Is it...



*A porous, fractured
metallic planetary
core?*



*Or a metallic object
covered by silica or
carbon-rich materials?*



*Or a metal and silicate
object that is well-mixed,
like a pallasite
meteorite?*

NASA's Psyche mission will find out!



ARRIVING 2029

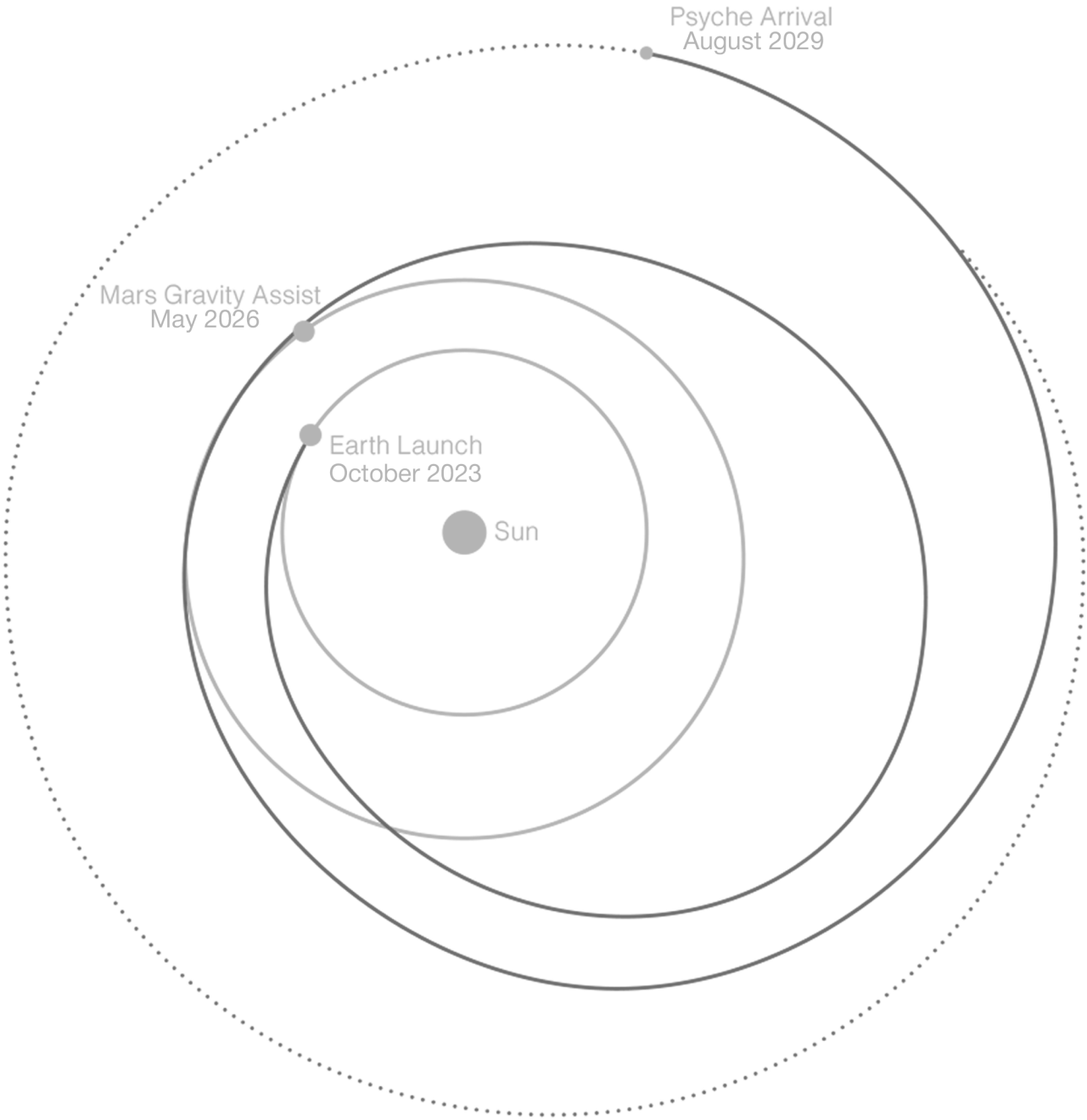
Meet the Psyche Mission

Spacecraft journey

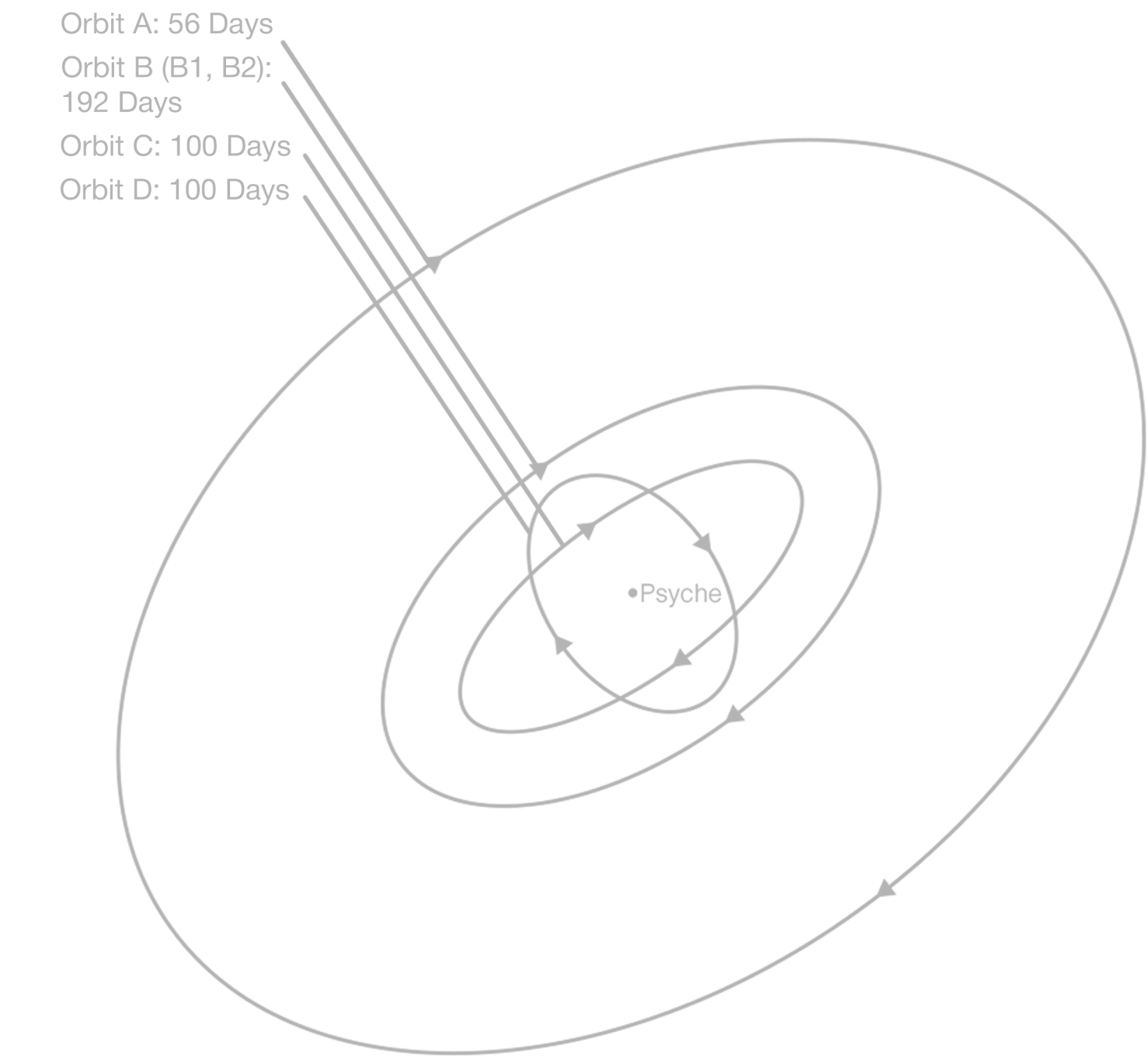
NASA's Psyche mission is the first to a metal-rich asteroid, which is also named Psyche. The spacecraft launched on Oct. 13, 2023. The mission rode to space on a SpaceX Falcon Heavy rocket from NASA's Kennedy Space Center in Florida.

Cruising through space with a super-efficient solar electric propulsion system, the Psyche spacecraft is expected to arrive at the asteroid to begin science operations in 2029. It will orbit this unique world for at least 26 months.

Attached to Psyche is the Deep Space Optical Communications technology demonstration, a NASA experiment that is testing optical, or laser, communications beyond the Moon.



Orbiting the Psyche asteroid



3. Three science instruments and a gravity science investigation on the spacecraft will help sort out these solar system origin stories.

Psyche's magnetometer will look for evidence of an ancient magnetic field at the asteroid Psyche. A residual magnetic field would be strong evidence the asteroid formed from the core of a planetary body.

The orbiter's gamma-ray and neutron spectrometer will help scientists determine the chemical elements that make up the asteroid. Figuring out what Psyche is composed of will enable scientists to better understand how it formed.

The spacecraft's multispectral imager will provide information about the mineral composition of Psyche as well as its topography.

The Psyche science team will harness the telecommunications system, used to send commands to and receive data from the spacecraft, to conduct gravity science also. By analyzing the radio waves the spacecraft communicates with, scientists can measure how the asteroid Psyche affects the spacecraft's orbit. From that information, scientists can determine the asteroid's rotation, mass, and gravity field, gaining additional insights into the composition and structure of the asteroid's interior.

4. The Psyche spacecraft will use a special kind of super-efficient propulsion system for the first time beyond the Moon.

Powered by Hall-effect thrusters, Psyche's solar electric propulsion system harnesses energy from large solar arrays to create electric and magnetic fields. These, in turn, accelerate and expel charged atoms, or ions, of a propellant called xenon (a neutral gas used in car headlights and plasma TVs) at such high speed, it creates thrust. The plasma, or ionized gas, will emit a sci-fi-like blue glow as it trails behind Psyche in space. Each of Psyche's four thrusters, which will operate only one at a time, exert at most the same amount of force that one AA battery would exert on the palm of your hand. Over time, in the frictionless void of space, the spacecraft will slowly and continuously accelerate.

Psyche's propulsion system builds on similar technologies used by NASA's Dawn mission, but it will be the agency's first mission to use Hall-effect thrusters in deep space. To date, Hall thrusters have been used only by an ESA (European Space Agency) mission to the Moon.

1. NASA wants to learn more about the origins of our solar system. Investigating the asteroid Psyche is important because the asteroid could be part of a building block of an early rocky planet.

Judging from data obtained by Earth-based radar and optical telescopes, scientists hypothesize that the asteroid Psyche could be part of the metal-rich interior of a planetesimal, a building block of a rocky planet. (The rocky planets are Mercury, Venus, Mars, and our home planet, Earth.) It could be that Psyche collided with other large bodies during its early formation and lost its outer rocky shell.

Humans can't bore a path to Earth's metal core – or the cores of the other rocky planets – so visiting Psyche could provide a one-of-a-kind window into the history of violent collisions and accumulation of matter that created planets like our own.

5. Psyche is a collaboration.

The Psyche mission is only possible by drawing together resources and know-how from NASA, universities, and industry.

The mission's leader – Principal Investigator Lindy Elkins-Tanton – is based at Arizona State University (ASU) in Tempe. The partnership with ASU enables collaboration with students nationwide. This offers greater opportunities to train future instrument and mission leads in science and engineering, and to inspire additional student projects involving art, entrepreneurship, and innovation. Over a dozen other universities and research institutions are represented on the mission team.

NASA's Jet Propulsion Laboratory in Southern California, a leader in robotic exploration of the solar system, manages the mission for the agency's Science Mission Directorate in Washington. Managed for NASA by Caltech in Pasadena, JPL is also responsible for system engineering, integration and test, and mission operations.

NASA's Launch Services Program at Kennedy Space Center manages launch operations and procured the SpaceX Falcon Heavy rocket.

Maxar Technologies is a key commercial participant in the mission. Its team in Palo Alto, California, delivered the solar electric propulsion chassis – the main body of the spacecraft – and most of its engineering hardware systems.

2. Psyche is so unusual, it could also surprise scientists and suggest a different story of how solar system objects formed.

While rocks on Mars, Venus, and Earth are flush with iron oxides, Psyche's surface – at least when studied from afar – doesn't seem to feature much of these chemical compounds. This suggests that Psyche's history differs from standard stories of planetary formation.

Scientists are excited to visit Psyche up close for the first time so they can learn more about its origin. If the asteroid is leftover core material from a planetary building block, they look forward to learning how its history resembles and diverges from that of the rocky planets. And if scientists discover that Psyche is not an exposed core of an early planetary building block, it may prove to be an even rarer kind of primordial solar system object, one that's never been seen before.

One of the most exciting aspects of this mission is the possibility of the unexpected.

6. The Psyche mission wants you to be part of the journey, too.

NASA and the Psyche mission team believe space exploration is for everyone. The general public, students of all ages, and teachers can find an abundant list of activities and opportunities on the mission's "get involved" webpage.

Opportunities include Psyche-focused undergraduate projects for senior capstone courses and an annual internship to interpret the mission through artistic and other creative works. Students and teachers can also find age-appropriate lessons, craft projects, and videos on the page.

The mission websites nasa.gov/psyche and psyche.asu.edu will post official news about the spacecraft's journey, along with glimpses of team members' workdays. NASA and ASU will also post regular social media updates on Facebook, Instagram, and X.

NASA's Eyes on the Solar System, a free web-based visualization tool, will track the location of the spacecraft in real time 3D. Visit go.nasa.gov/45k0OVY to see where Psyche is in the solar system.

Learn more at...



psyche.asu.edu