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HELIOS Mission to Proxima Centauri b

"The mission has been christened "HELIOS" – Habitable Exoplanetary Life Inspection & Orbital Studies. This name reflects the dual nature of our mission: to inspect the habitability of Proxima Centauri b and to perform comprehensive orbital and terrestrial studies of the planet.

Proxima Centauri B is an exoplanet that is 1.07 times the size of Earth that orbits an M-type star called Proxima Centauri. The exoplanet takes 11.2 days to complete one orbit of its star and is 0.04856 Astronomical Units (4,513,934 miles) from its star. Its discovery was announced in 2016 and is classified as a super-earth planet type. This exoplanet is 4.24 light-years away from Earth.

The mission will include an orbiter and lander, both of which will extensively map and examine the planet. The orbiter will observe Proxima Centauri b from above, mapping its terrain and analyzing the planet’s atmospheric conditions."

The History of the HELIOS Mission

Despite all we have learned about the HELIOS mission and the early history of our exploration of Proxima Centauri b, there are some basic things we don’t understand very well. We don’t know all the details of the planet's interior composition, and this happens to be a critical missing piece in our understanding of its habitability. Some theories about the planet's formation suggest that its core may hold valuable insights into its potential for sustaining life. We also don’t know the full extent of the planet's geological activity, or precisely how and where its magnetic field is generated. Further, it is unknown how deeply rooted the planet's unique features and atmospheric conditions are. And scientists yearn to understand what powers the planet's unique characteristics. These mysteries make it clear that although Proxima Centauri b's surface and atmosphere get most of the attention, some of the most enticing mysteries lie hidden beneath the surface, waiting to be discovered by the HELIOS mission."

A Five-Year Journey to Proxima Centauri B

The HELIOS mission's voyage to Proxima Centauri B will span a total of approximately five years. While this may appear to be a lengthy duration, the mission's flight plan leverages gravitational assists from celestial bodies to expedite its travel. The spacecraft initially charted a course through the inner solar system. Two years after its launch in 2024, it utilized

a gravitational assist from Earth to gain the necessary momentum for its onward trajectory.

In July 2029, the HELIOS mission will execute a critical engine burn, allowing it to achieve orbit around Proxima Centauri B and commence its scientific exploration of the exoplanet."

A Solar-Powered, Spinning Spacecraft for Deep Space Exploration

Proxima Centauri B orbits its star at a distance approximately 0.04856 Astronomical Units from Proxima Centauri, receiving significantly less sunlight than Earth. To address this challenge, the HELIOS mission utilizes cutting-edge solar panel technology, enabling the spacecraft to operate effectively in the distant reaches of space. These advanced solar panels are engineered to capture the limited solar energy available and convert it into power for the mission's instruments.

The HELIOS spacecraft is equipped with three expansive solar panels that extend outward from its hexagonal body, forming an impressive span of 66 feet (20 meters). This design allows the spacecraft to maximize its solar energy collection capabilities.

Furthermore, the HELIOS mission incorporates a meticulously planned orbit and orientation strategy to ensure that the solar panels consistently face the distant star, Proxima Centauri. While in orbit around Proxima Centauri B, the spacecraft executes a precise spin motion twice per minute. This spin not only enhances the spacecraft's stability but also affords each scientific instrument the opportunity to observe the exoplanet effectively."

Orbiting Proxima Centauri B's Poles: A Bold Exploration

Upon reaching Proxima Centauri B in 2024, the HELIOS spacecraft will embark on a pioneering mission, circling the exoplanet along a trajectory that traverses its polar regions. This orbit type, commonly used for planetary mapping and monitoring missions in our solar system, has never before been employed for Jupiter-like gas giants such as Proxima Centauri B, making HELIOS the first spacecraft to provide an in-depth examination of the exoplanet's polar regions.

Each orbit of Proxima Centauri B will span approximately 14 days, while the exoplanet itself completes a rotation in just 11.2 Earth days. Mission planners meticulously crafted HELIOS's flight plan to ensure that the spacecraft passes over different sectors of the exoplanet's surface during each orbit. Over the course of its planned 33 science orbits, HELIOS will systematically cover the entirety of Proxima Centauri B.

To gather precise data regarding the exoplanet's gravitational and magnetic fields, HELIOS must approach Proxima Centauri B closely. During each orbit, the spacecraft will come within a mere 3,100 miles (5,000 kilometers) of the exoplanet's cloud tops. To put this into perspective, if Proxima Centauri B were scaled down to the size of a basketball, this distance would be equivalent to approximately one-third of an inch (about 0.8 centimeters).

HELIOS's close orbit offers the additional advantage of avoiding the most hazardous area of Proxima Centauri B's radiation belts, concentrated near the exoplanet's

equator. In this region, minuscule but high-velocity particles, including ions and electrons, race at nearly the speed of light. Despite their diminutive size, these particles possess considerable energy and have the potential to inflict damage upon a spacecraft's electronics.

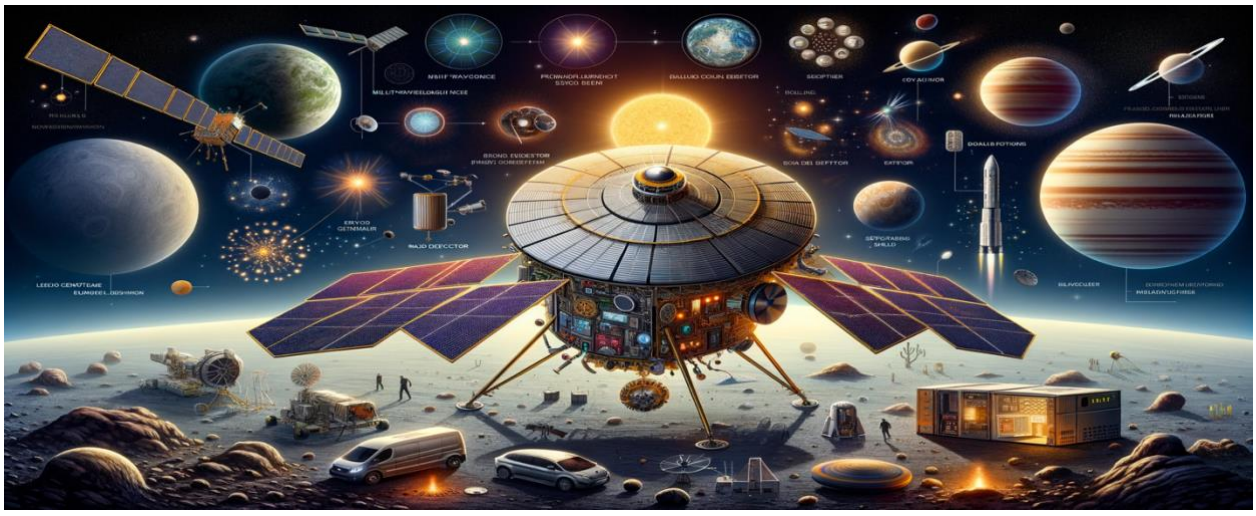
However, even with this specialized orbit, HELIOS anticipates exposure to an extreme dosage of radiation over the course of a year, equivalent to more than 100 million dental x-rays. This formidable radiation level poses a significant challenge to the mission's electronic systems. To mitigate this risk, HELIOS incorporates a titanium vault that shields its most sensitive electronics. Inside this protective enclosure, the spacecraft's hardware will encounter radiation approximately 800 times less intense than the external environment.

Following approximately a year in orbit, HELIOS's mission will conclude with a deliberate plunge into Proxima Centauri B's atmosphere. This final maneuver ensures the complete destruction of the spacecraft, preventing any potential contamination of Jupiter's potentially habitable moons by resilient microorganisms that might have inadvertently hitched a ride from Earth."

Launch Earth	July=2024
flyby Jupiter	October 2024
arrival	July2050
Endofmission	February2100

missionhelio:

https://bslockharts.github.io/MEEP/index.html



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