

PRAXIS, NASA Mission to Graze Planet Rings

Prelims: Current events of national and international importance | Science and Technology

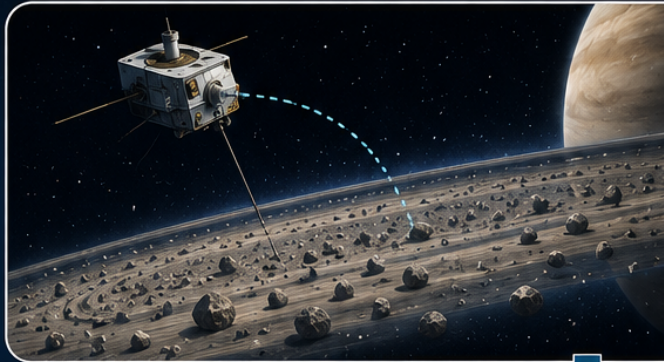
Why in News?

NASA has selected a novel mission concept called PRAXIS (Planetary Rings Autonomous EXploration with In-situ Sampling) for its NIAC 2026 Phase I funding.

- **Aim** - To directly **touch, collect, and analyse physical samples from ring particles** ranging from millimeter to centimetre scale) orbiting ringed planets like **Saturn, Uranus, and Neptune**.
- It is for the first time in space exploration history.
- **Barrier of Direct Penetration** - Planetary rings consist of millions of fast-moving particles ranging from microscopic dust to house-sized boulders made largely of water ice mixed with rocky material.
- Flying a spacecraft directly through the dense ring plane creates severe collision hazards that could instantly destroy the probe.
- **Unresolved Science Post-Cassini** - While the historic Cassini mission provided groundbreaking close-range photography, it could not directly capture or analyze real particles in-situ.
- Thus, PRAXIS bridges this gap.

BIO-INSPIRED TOUCH-AND-GO SAMPLING

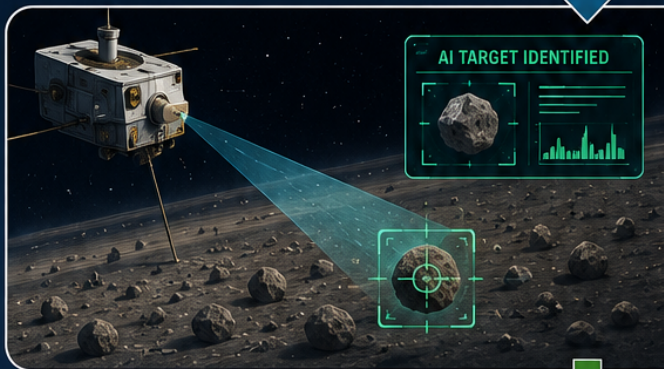
HOW THE SPACECRAFT COLLECTS DEBRIS SAMPLES SAFELY



1 SAFE POSITION



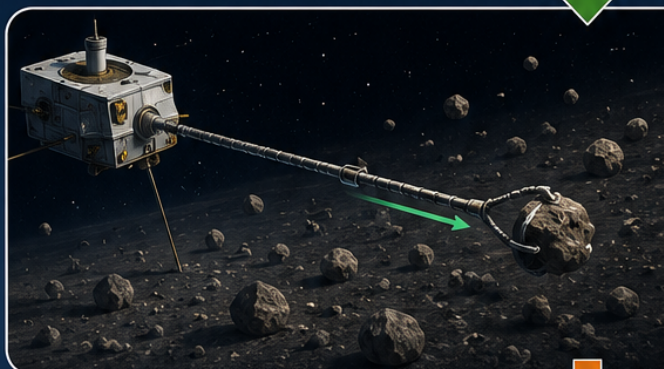
Spacecraft hovers safely outside the ring plane to avoid colliding with moving debris.



2 AUTONOMOUS TARGET IDENTIFICATION



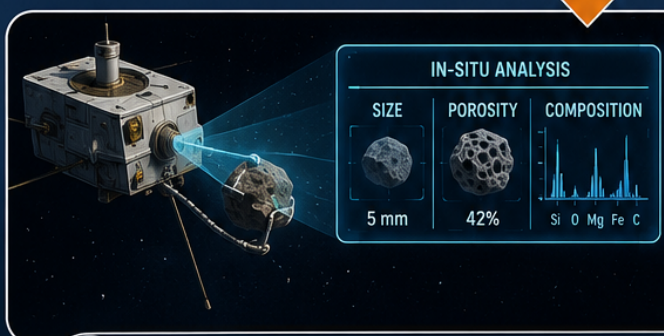
Onboard AI models identify suitable millimeter- to centimeter-scale target particles in real time.



3 BIO-INSPIRED "TOUCH-AND-GO" SAMPLING



A long, deployable flexible boom (inspired by chameleon feeding mechanics & sport fishing) shoots out, snags a target particle, and instantly retracts before collision occurs.



4 IN-SITU ANALYSIS



Onboard miniaturized instruments evaluate particle size, porosity, and chemical composition on the spot.



This innovative approach enables **safe, efficient, and detailed** sampling of debris particles without risking collisions in a dynamic ring environment.

- **Technology** - Rather than penetrating the hazardous ring structure, PRAXIS relies on autonomous robotics and AI to "graze" the ring plane.
- **NIAC Progression** - Phase I selection allows the development team to

run computer simulations and refine system designs.

- Advancing to Phase II will allow the creation of physical prototypes.
- **Multi-Target Versatility** - The sampling system is designed to explore dense ring systems (Saturn) and faint/tenuous rings (Uranus and Neptune), as well as ringed Centaurs like Chariklo and Chiron.

Reference

[The Hindu | PRAXIS: a NASA mission](#)

