**Opportunity Title:** Exploration and Characterization of the Regolith of Microgravity Bodies
**Opportunity Reference Code:** 0299-NPP-MAR26-GSFC-PlanetSci

**Organization** National Aeronautics and Space Administration (NASA)

**Reference Code** 0299-NPP-MAR26-GSFC-PlanetSci

**How to Apply** All applications must be submitted in Zintellect

Please visit the NASA Postdoctoral Program website for application instructions and requirements: How to Apply | NASA Postdoctoral Program (orau.org)

A complete application to the NASA Postdoctoral Program includes:

1. Research proposal
2. Three letters of recommendation
3. Official doctoral transcript documents

**Application Deadline** 4/2/2026 6:00:59 PM Eastern Time Zone

**Description** **About the NASA Postdoctoral Program**

The NASA Postdoctoral Program (NPP) offers unique research opportunities to highly-talented scientists to engage in ongoing NASA research projects at a NASA Center, NASA Headquarters, or at a NASA-affiliated research institute. These one- to three-year fellowships are competitive and are designed to advance NASA's missions in space science, Earth science, aeronautics, space operations, exploration systems, and astrobiology.

**Description:**

The interior characteristics and sub-surface regolith of small bodies such as comets, asteroids, and small moons around Mars and the Giant Planets have never been probed, though they have certainly been modeled. In the case of Bennu, the target of the OSIRIS-REx asteroid sample return mission, models of the interaction between the regolith and the 30-cm diameter TAGSAM (Touch And Go Sample Acquisition Mechanism) head were very different from what happened. TAGSAM was predicted to penetrate a few centimeters into the surface. However, the 62-N constant-force spring in the robot arm that held the head onto the surface as the sample was collected was never measurably compressed and the head penetrated 48 cm into the surface. Penetration was not halted by TAGSAM's interaction with the regolith, but by a combination of TAGSAM's release of the 3000-psi nitrogen gas jets used for fluidizing the regolith and collecting the sample, and the activation of the spacecraft thrusters to leave the surface of Bennu. We do not yet have a sufficient understanding of the interiors of small, microgravity bodies. This task will begin to develop measurement techniques to characterize the regolith structure, temperature at depth, thermal conductivity, and volatile content. We will also develop techniques for anchoring sensors in microgravity regolith to make larger-scale measurements of microgravity bodies. Small, microgravity bodies

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hold clues to the formation and evolution of both terrestrial planets and giant planets in our solar system and throughout the galaxy. From a scientific perspective, it is essential that we begin to base our models of such bodies on measured characteristics of their interiors rather than on educated guesses. . From a practical perspective, small, microgravity bodies will be the targets of both robotic and human exploration, primarily for the extraction of resources needed for space exploration. Understanding the near-surface regolith and the interior of a targeted small body is an essential element in ensuring the safety of such missions.

We will develop a projectile-based probe to measure key properties of the regolith and interiors of small, microgravity bodies such as comets, asteroids, and small moons. We will conduct experiments to optimize the penetration into and recording of the structure of the regolith. We will conduct a trade study to select a method to stabilize the probe in flight and before penetration into the target regolith. The probe will carry a three-axis accelerometer to record deceleration through the regolith and a thermal probe to measure the temperature, thermal conductivity, and volatile content at depth. Experimental studies at the Tower Test Facility will be conducted to optimize the probe and to develop test protocols for the wide range of microgravity bodies - comets, asteroids, moons - in our solar system. Experimental studies will also be conducted to generalize the probe techniques to deploy additional sensors or to explore the potential to do other jobs during exploration activities such as serving as anchors. All aspects of probe technology applicable to the regolith of microgravity bodies could be subject to experimental testing.

**Field of Science:** Planetary Science

**Advisors:**

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**Applications with citizens from Designated Countries will not be accepted at this time, unless they are Legal Permanent Residents of the United States.** A complete list of Designated Countries can be found at: https://www.nasa.gov/oiir/export-control.

Eligibility is currently open to:

- U.S. Citizens;
- U.S. Lawful Permanent Residents (LPR);
- Foreign Nationals eligible for an Exchange Visitor J-1 visa status; and,

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- Applicants for LPR, asylees, or refugees in the U.S. at the time of application with 1) a valid EAD card and 2) I-485 or I-589 forms in pending status

**Questions about this opportunity?** Please email npp@orau.org

**Qualifications** An educational background in geology, materials science, soil mechanics, or planetary sciences is required to prioritize development of appropriate techniques and measurement strategies that will aid in both the exploration of small solar system bodies as well as lead to a deeper understanding of their origin and evolution under a variety of conditions. Practical knowledge in the design, construction and execution of experimental studies on regolith materials or their analogs would be extremely useful for the design and execution of new experimental studies of regolith probes.

**Point of Contact** Mikeala

**Eligibility Requirements**

- **Degree:** Doctoral Degree.