

Opportunity Title: Active Neutron - Gamma ray Instrumentation for in situ Planetary Bulk Elemental Composition Measurements

Opportunity Reference Code: 0114-NPP-NOV23-GSFC-PlanetSci

Organization National Aeronautics and Space Administration (NASA)

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Application Deadline 11/1/2023 6:00:59 PM Eastern Time Zone

Description An instrument development program is in progress to adapt technologies long used in the oil industry to planetary science applications. The Bulk Elemental Composition Analyzer (BECA) instrument mounted on a planetary lander or rover would make complete in situ bulk subsurface elemental composition measurements on a wide variety of solar system bodies such as Venus, the Moon, Mars, the moons of the outer planets, comets and asteroids. BECA consists of a pulsed neutron generator that excites the planetary material with 14 MeV neutrons; a gamma ray spectrometer to measure the energy and intensity of the characteristic gamma rays emitted by the excited nuclei; and neutron detectors to measure the rate of the moderated neutrons emerging from the planet. The energy and intensity of the resulting gamma rays measured at the surface yields the bulk elemental composition over ~ 1 square meter in area and down to 50-100 cm below the surface. The penetrating nature of 14 MeV neutrons and 0.5 - 10 MeV gamma rays allows this instrument to measure elemental composition below the surface without the need for digging.

This research opportunity is for a postdoctoral fellow to not only participate in the experimental tests of BECA prototypes but also to lead in the analysis of the resulting gamma ray spectroscopy data. This work will involve computer modeling of neutron transport as well as outdoor experimental tests at a neutron and gamma ray test facility located near GSFC. Here a 14 MeV neutron generator can be operated safely outdoors, away from all structures and controlled from a building > 200 “~ away from large (6’ x 6’ x 3’) test samples of granite and basalt. A successful candidate will have a background strong in nuclear physics and radiation detection, will be familiar with planning and performing hands-on experimental work and have the necessary computer modeling skills to run Monte Carlo simulations of the experiments. Relevant skills include gamma ray and neutron detector development and testing, instrument modeling and data analysis.

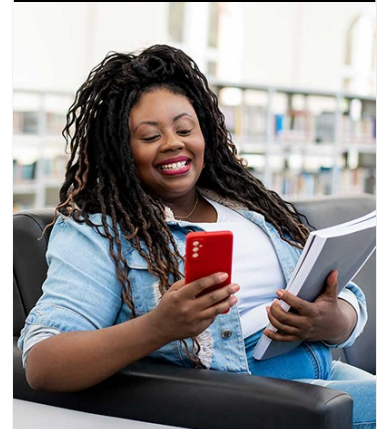
Location:

Goddard Space Flight Center
Greenbelt, Maryland

Field of Science: Planetary Science

Advisors:

Ann Parsons
Ann.M.Parsons@nasa.gov
301-286-1107



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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/oiiir/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,
- 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

Eligibility Requirements

- **Degree:** Doctoral Degree.