

**Opportunity Title:** Astrophysics: Theoretical Multi-messenger Astrophysics

**Opportunity Reference Code:** 0131-NPP-NOV23-GSFC-Astrophys

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

**Reference Code** 0131-NPP-NOV23-GSFC-Astrophys

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

**Description** ??In accordance with NASA's Strategic Objective of discovering how the universe works and exploring how it began and evolved, we study particle interactions in the most powerful astrophysical objects and associated with particle dark matter. The goal of this research is to identify sources of astrophysical neutrinos and the highest energy cosmic rays and identify prospects for multi-messenger observations performed by gamma-ray, neutrino, UHECR, and gravitational wave telescopes. The research involves studying particle acceleration and interactions in astrophysical objects such as active galactic nuclei, gamma-ray bursts, pulsars, and structure formation shocks, as well as calculating fluxes of gamma rays, neutrinos, and cosmic rays from models of the annihilation or decay of dark matter. The fate of very-high energy gamma rays and ultra-high cosmic rays as they propagate through the infrared, optical, and ultraviolet background and the cosmic microwave background is also researched. In particular, we seek to determine how cascades of particles produced through these interactions impact astrophysical observations conducted at lower energies, especially gamma rays, and to determine the cosmogenic neutrino background. Also of interest are the intervening magnetic fields that deflect charged particles as they propagate over cosmological distances and their resulting impact on the fluctuation angular power of cosmological photon and neutrino backgrounds. Finally, in line with the aforementioned research, we seek astrophysical and observational probes of new physics, including photon-axion oscillations and Lorentz-invariance violation.

**Location:**

Goddard Space Flight Center  
Greenbelt, Maryland

**Field of Science:**Astrophysics

**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/oijr/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.



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