

**Opportunity Title:** Physics of the Cosmic Dawn

**Opportunity Reference Code:** 0187-NPP-NOV23-GSFC-Astrophys

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

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

**Description:** This research opportunity is for astrophysical research to understand how the structures of the modern universe originated and developed. How did the small density variations observed in the CMB slowly develop into the dense galaxies and megastructures we can observe in the present-day universe? What regulated the development of overdense regions into the galaxies halos? How did the first stars form and how did their light impact the surrounding environment? How did massive black holes form and develop at the centers of these galaxies, and how did they interact to structure their environments? How did mergers of these early galaxies lead to the galaxies and structures we observe in today's universe?

Astrophysical simulations are beginning to provide a theoretical picture of the processes which may have contributed to the formation of the objects we see in the universe today. At the same time great advances in observing technology will allow us to probe into the early processes of the the high-redshift universe like never before. Observations will span a variety of wavelengths and astronomical messengers. For example, JWST will allow us to study light from the stars of these early galaxies, Athena will observe X-rays from their massive black holes, and LISA will observe gravitational waves from these black holes as they merge. Many other current and proposed missions will also contribute to our understanding. The research related to this opportunity will explore advances in theory which can provide more robust interpretations or better observing strategies for upcoming observations and/or clarify how expected observations from the suite of new instruments will constrain our understanding of the processes encoded these theoretical models.

**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/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.