

Opportunity Title: Enhancing thermal management in space environments

Opportunity Reference Code: ICPD-2023-23



Organization Office of the Director of National Intelligence (ODNI)

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How to Apply

Create and release your Profile on Zintellect – Postdoctoral applicants must create an account and complete a profile in the on-line application system. **Please note: your resume/CV may not exceed 2 pages.**

Complete your application – Enter the rest of the information required for the IC Postdoc Program Research Opportunity. The application itself contains detailed instructions for each one of these components: availability, citizenship, transcripts, dissertation abstract, publication and presentation plan, and information about your Research Advisor co-applicant.

Additional information about the IC Postdoctoral Research Fellowship Program is available on the program website located at:
<https://orise.orau.gov/icpostdoc/index.html>.

If you have questions, send an email to ICPostdoc@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 2/28/2023 6:00:00 PM Eastern Time Zone

Description **Research Topic Description, including Problem Statement:**

Numerous technologies in space assets generate waste heat during operation that can reduce operational efficiency and can decrease component or system longevity. Heat rejection in space environments is particularly challenging as convection and conduction to the surrounding environment is effectively zero. Similarly, repeated large temperature cycling of components in space during cycles of solar exposure/occlusion and operation/inactivity can accelerate degradation mechanisms thus compromising longevity and/or performance. Novel heat exchanger and heat rejection designs that maximize the radiative heat loss from space assets could enable more efficient operation of devices and enhance longevity. Designs that avoid or minimize extreme temperature swings and maintain temperature within a small range (even if slightly elevated compared to nominal) could be beneficial to minimize degradation mechanisms induced via temperature cycling.

The aim of this call is to identify postdoctoral researchers investigating novel heat management and rejection designs for electronics that can greatly improve upon established methods to manage and reject heat in space environments. Opportunities may even exist to make purposeful use of this heat before it is rejected if sufficient specific energy (W/kg) can be demonstrated. A systems-level approach leveraging iterative design/modeling is anticipated to be needed.

Example Approaches:

Novel radiative cooling materials and structures (including micro and nano structured materials) have demonstrated promise for terrestrial cooling applications (Fan, S., Li, W. Nat. Photon. 16, 182–190 (2022)). Thermal batteries of multiple capacities, speed, and form factors have been used to store and release heat at specific intervals. Several solid-state heat engines, including thermoelectric, have been considered for waste heat harvesting (though with limited output).

Relevance to the Intelligence Community (IC):

The IC deploys many electronics on satellites and other space assets that generate heat during operation or reach high temperature due to solar insolation. The high temperatures and repeated temperature cycling can compromise components or systems that jeopardize mission effectiveness and longevity. The development of new technologies and approaches to better manage (and possibly use) heat on these assets should allow greater capabilities to be deployed on the same platforms and/or longer durability of assets deployed in space.

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Qualifications

Postdoc Eligibility

- U.S. citizens only
- Ph.D. in a relevant field must be completed before beginning the appointment and within five years of the application deadline
- Proposal must be associated with an accredited U.S. university, college, or U.S. government laboratory
- Eligible candidates may only receive one award from the IC Postdoctoral Research Fellowship Program

Research Advisor Eligibility

- Must be an employee of an accredited U.S. university, college or U.S. government laboratory
- Are not required to be U.S. citizens

Key Words: #Radiative Heat Transfer, #Heat Exchangers, #Radiative Cooling, #Electronics Thermal Management, #Thermal Batteries, #Solid State Heat Engines, #Thermoelectric, #Additive Manufacturing

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
 - **Communications and Graphics Design** (5 )
 - **Computer, Information, and Data Sciences** (17 )
 - **Earth and Geosciences** (21 )
 - **Engineering** (27 )
 - **Environmental and Marine Sciences** (14 )
 - **Life Health and Medical Sciences** (48 )
 - **Mathematics and Statistics** (11 )
 - **Other Non-S&E** (2 )
 - **Other Physical Sciences** (12 )
 - **Other S&E-Related** (1 )
 - **Physics** (16 )
 - **Social and Behavioral Sciences** (29 )