Opportunity Title: High Resolution Imaging for Space Applications Using Low-mass Mirrors
Opportunity Reference Code: ICPD-2020-27

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 2/28/2020 6:00:00 PM Eastern Time Zone

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

Space-based high-resolution imaging has historically require large mirrors which result in high payload masses making the systems very expensive (e.g., the James Webb Space Telescope with its 6.5m segmented primary mirror will end up costing more than $10B). Various alternatives have been proposed: e.g., a 30m annular mirror mission[1], small-satellite swarms using annular coded phase reflectors[2], a piezoelectric actuated adaptive-optics membrane using formation flying nano-satellites[3], etc.

The goal of this research is to determine the pros and cons of various designs and to converge on a design for a low-mass, high-resolution space-based observatory using novel optics. In addition to being lightweight, other desirable attributes of the design include thermal stability, low-cost and rapid-fabrication[4].

Example Approaches:

- Rey, J. J., Wirth, A., Jankevics, A., Landers, F., Rohweller, D., Chen, C. B., & Bronowicki, A. (2014). A deployable, annular, 30m telescope, space-based observatory. Space Telescopes and Instrumentation 2014: Optical, Infrared, and Millimeter Wave. doi:10.1117/12.2057182
- Bulbul, A., Vijayakumar, A., & Rosen, J. (2018). Superresolution far-field imaging by coded phase reflectors distributed only along the boundary of synthetic apertures. Optica, 5(12), 1607. doi:10.1364/optica.5.001607
- Bekey, I. (1999). An Extremely Large yet Ultra Lightweight Space Telescope and Array (NIAC Grant # 07600-006).

Relevance to the Intelligence Community:

Low mass high resolution mirrors would result is significant cost savings and would result in greater GEOINT assurance since replacements would be cheap and could be fielded more quickly.

References:

1. Rey, J. J., Wirth, A., Jankevics, A., Landers, F., Rohweller, D., Chen, C. B., & Bronowicki, A. (2014). A deployable, annular, 30m telescope, space-based observatory. Space Telescopes

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and Instrumentation 2014: Optical, Infrared, and Millimeter Wave. doi:10.1117/12.2057182

2. Bulbul, A., Vijayakumar, A., & Rosen, J. (2018). Superresolution far-field imaging by coded phase reflectors distributed only along the boundary of synthetic apertures. Optica, 5(12), 1607. doi:10.1364/optica.5.001607
3. Bekey, I. (1999). An Extremely Large yet Ultra Lightweight Space Telescope and Array (NIAC Grant # 07600-006).
4. Lee, N., Backes, P., Burdick, J., Pellegrino, S., Fuller, C., Hogstrom, K., Wu, Y. (2016). Architecture for in-space robotic assembly of a modular space telescope. Journal of Astronomical Telescopes, Instruments, and Systems, 2(4), 041207. doi:10.1117/1.jatis.2.4.041207

Key Words: Optics, Mirrors, Space

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

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12)
  - **Communications and Graphics Design** (2)
  - **Computer, Information, and Data Sciences** (16)
  - **Earth and Geosciences** (21)
  - **Engineering** (27)
  - **Environmental and Marine Sciences** (14)
  - **Life Health and Medical Sciences** (45)
  - **Mathematics and Statistics** (10)
  - **Other Non-Science & Engineering** (2)
  - **Physics** (16)
  - **Science & Engineering-related** (1)
  - **Social and Behavioral Sciences** (27)