Opportunity Title: Wireless Mesh Communication Networks
Opportunity Reference Code: ICPD-2020-05

Organization	Office of the Director of National Intelligence (ODNI)
Reference Code	ICPD-2020-05
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:**

Autonomous millimeter scale robots will be a powerfully effective and low cost tool with broad application. However, numerous challenges must first be solved, including mobility, energy, sensing, communication, and control. Moreover, these challenges must be solved simultaneously for microbots to work effectively on a specific problem. Microrobotics is an intensively interdisciplinary problem. The Intelligence Community Postdoctoral Fellowship Program, in the past, has funded research to continue innovative research on the "Design and Control of Heterogeneous Microrobot Swarms" based on aerial microrobot platforms, which uses electrohydrodynamic (EHD) thrust to fly silently, and with no moving parts. This research takes a unique approach to overcome thrust-to-weight challenges that trouble microrobotic development. True to the interdisciplinary nature of the field, initial success highlights the need for concurrent research and improvement in communication for sensing and control. This requirement points in the direction of wireless mesh networks for further research.

Example Approaches:

Wireless mesh networks provide bandwidth and redundancy advantages. Wireless mesh networks also create a single set identifier (SSID) providing access and encryption security. Challenges include effective throughput due to frequency band collisions from multiple devices communicating simultaneously resulting in data loss. This problem can be mitigated through effective channel assignment and thus study of different algorithms (e.g. Subramanian centralized, genetic, and greedy & Tabu-based algorithms) appropriate for either dynamic or quasistatic channel management techniques is one research approach. Nanophotonics is a less developed research area with great promise. In 2016, Chinese researchers at Zhejiang University created a broadband nanophotonic wireless network using integrated plasmonic antennas. Reported results noted a "100-fold enhancement in power transfer" across a greater telecommunication bandwidth. These and numerous other approaches are open for further research and exploration.

Relevance to the Intelligence Community:

Mircrorobotics represent a promising new future technological wave capable of meeting persistent

monitoring and surveillance requirements at low costs, but only if several vexing technical problems—including, mobility, sensing, communication and control—can be resolved. Progress in these areas would improve the ability to monitor, warn, and provide senior leaders the decision space to address numerous dangerous and destabilizing issues.

Key Words: Wireless Mesh Network, Microrobotics, Single Set Identifier, Nanophotonics, Robotics, SSID, Electrohydrodynamic, EHD

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 👁)