

**Opportunity Title:** Early Warning Threat Identification via Phenotypic

Expression

**Opportunity Reference Code:** ICPD-2022-10

**Organization** Office of the Director of National Intelligence (ODNI)

**Reference Code** ICPD-2022-10

### 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](mailto:ICPostdoc@orau.org). Please include the reference code for this opportunity in your email.

**Application Deadline** 2/28/2022 6:00:00 PM Eastern Time Zone

### Description

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

Chemical and Biological threat agents can be present in environmental samples due to natural expression, accidental release, or deliberate addition. A lack of persistent samplers and accompanying field analysis tools for threat awareness, results in a lag or lack in effective chemical & biological threat response. This response is further slowed by a typical sample grab to laboratory requirement for analysis. Novel hyperspectral and other imaging tools have shown proof of concept ability to provide rapid threat characterization and indicate presence of a threat agent. However, studies to date have relied on subject matter experts to carefully curate machine learning datasets and select specific phenotypic traits to train upon and track. This supervised curation and training limits broad transferability of the algorithms for extension to multiple organisms, sample locations and/or various threat agents. A transparent computation tool, which is broadly extensible and can provide contextual rationale for its output would be an ideal means to bolster chemical and biological defense.

**Example Approaches:**

LiDAR, SAR, multi-spectral spectroscopy, and holographic imaging, coupled with controlled laboratory samples and environmental collects as input into machine learning pipelines containing algorithms such as LSTM, transformers or other multi-parameter attention mechanisms.




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**Relevance to the Intelligence Community:**

The Intelligence Community requires new capabilities to effectively respond to emerging and novel threat agents that we otherwise rapidly detect. Novel threat agents significantly restrict our ability to rapidly assess and respond to a threat event. Rapid detection of variable phenotypic expression of biological organisms may provide an early warning system that could permit a rapid response to save lives.

**Key Words:** Chemical & Biological Defense, Microbe; Hyperspectral, Machine Learning, Neural Networks, Phenotype

## 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 )