

Opportunity Title: Air Conditioners 2.0
Opportunity Reference Code: ICPD-2020-07

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

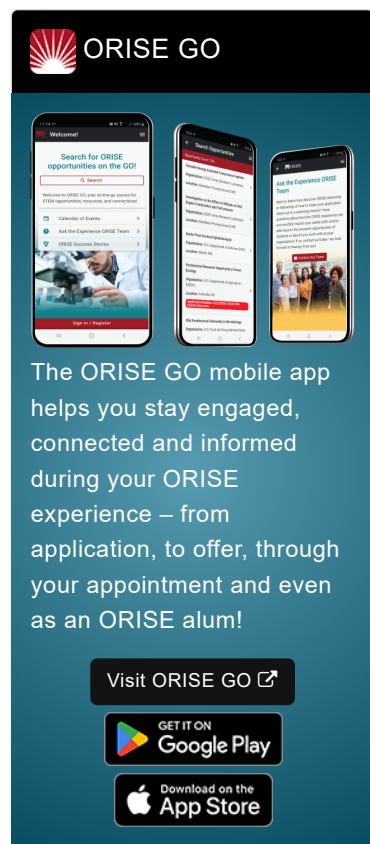
Description **Research Topic Description, including Problem Statement:**

Exciting new developments in material sciences creates opportunities for gaseous direct air capture. These could be used for local remediation of specific pollution sources or applied against global atmospheric problems. Attending to pollutants that exacerbate resource scarcity would mitigate environmental factors that drive migration and local extremism. Resource scarcity and severe weather patterns are creating global instabilities that seriously threaten international security, especially large-scale migration and violent extremism. Environmental, ecological, and severe weather disruptions are recognized as a multifaceted challenge to national security. Some models suggesting a modest adaptability range and a short but sufficient period of time in which to react and transition from traditional fuels may be inaccurate. More immediate, broadly employable and inexpensive measures to remove pollutants from the atmosphere would provide a much needed transition buffer. With severe weather characterized by +45 degree Celsius /+113 degree Fahrenheit heat waves, air conditioning and refrigeration are a growing necessity. Unfortunately, this contributes to the problem they are intended to alleviate. Air conditioners' ubiquity also means they could serve as an in-place decentralized infrastructure for direct air capture. Several companies have already commercialized modular direct air capture, thus proving the technology for removing specific molecules from the atmosphere—rather than at the source--exists. For air conditioners to contribute to direct air capture, a low cost filter that--ideally could be affixed to existing infrastructure-- is required.

Example Approaches:

Though the technology for gas molecule direct air capture exists, more must be done to lower costs and dramatically scale employment. Several approaches exist for further exploration.

- Porous coordination polymers (PCPs) or metal-organic frameworks (MOFs) are emerging as a promising class of crystalline porous materials for gas adsorption and storage. Several teams have successfully tested engineered Zinc II-Dipicolylamine, and other researchers have recently shown good absorption and recyclability.
- Different academic teams have discovered new methods for creating carbon-nitrogen bonds in an electrochemical carbon monoxide reduction reaction. The reaction can be used to produce



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chemical amides, which are useful in a variety of industries, thus providing an economically beneficial product aside from a fuel compound.

- Finally, work has shown single atom metal catalysts as a promising new area that demonstrates high selectivity and efficiency of homogenous catalysts and high recyclability of heterogeneous catalysts. Follow on research is focusing on strategies for reliably consistent production of this substrate.

Relevance to the Intelligence Community:

Severe weather and associated resource scarcity represents a significant instability threat that can breed conflict and violent extremism. It is critical to understand how severe weather issues impact certain regions, as water scarcity, food and energy shortages etc. can foster an unstable operating environment that becomes a catalyst for human migration and/or that violent extremist organizations look to exploit for their own gain. Efforts to find employable means to counter these negative trends are relevant to the Intelligence Community (IC) because they attend to upstream radicalization and radicalization factors and have the potential to mitigate future instability threats and diminish IC's mission burden.

Key Words: Severe Weather, Gaseous Scrubbers, Material Sciences, CO₂, Direct Air Capture, Air Conditioning, Air Conditioners, Crowd Oil, Radicalization

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](#) )