

Opportunity Title: Advancing Isotopic Analysis of Metabolites for Geo-Spatial Attribution

Opportunity Reference Code: ICPD-2022-12

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.oua.gov/icpostdoc/index.html>.

If you have questions, send an email to ICPostdoc@oua.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:**

Numerous forensic studies of stable isotope ratios involving human subjects have demonstrated the ability to provide information regarding a person's geographic origin and history of travel. Further, such approaches have been applied to extract forensic information from environmental samples, plants, drugs, explosives, foods, poisons and many other sample types of interest. Traditional approaches for isotope ratio analysis rely on the use of magnetic sector isotope ratio mass spectrometers (IRMS) that generally measure analytes after molecules have been converted into low molecular weight gases by pyrolysis, combustion, or other means. During this process, the majority of the intramolecular isotopic information contained within molecules is lost. Additional drawbacks of IRMS include the need for relatively large sample quantities, on the order of milligrams, and laborious sample preparation procedures to increase sample volatility. Recent advances in high-resolution accurate-mass (HRAM) mass spectrometry instrumentation paired with soft ionization techniques, such as electrospray ionization (ESI), have created the opportunity for alternative isotope ratio mass spectrometric approaches with the potential to overcome the shortcomings of traditional IRMS methodologies. The aim of this call is to identify postdoctoral researchers investigating the application of ESI-HRAM mass spectrometry instrumentation (e.g., Orbitrap class) to explore stable isotope ratio analysis of common metabolites, lipids, carbohydrates or proteins for forensic geography.



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Attribution

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Example Approaches:

IRMS has been used to investigate of the source of chemically indistinguishable compounds in a variety of scientific disciplines, most prominently in forensic science. Many investigative studies have analyzed the relationship between the isotopic composition of human bones and tissues and the subject's geographic origin, diet and health. While these studies have traditionally been conducted using IRMS instruments, recent work published in the Journal Analytical Chemistry demonstrated the potential for using an ESI-Orbitrap approach for stable isotope analysis using nitrate as a model (Anal. Chem. 2021, 93, 9139-9148).

Relevance to the Intelligence Community:

Isotopic ratio studies of metabolites derived from human tissues or bodily fluids are useful for Intelligence Community and Law Enforcement investigations because they allow for the prediction of an individual's recent whereabouts or geographic origins. The IC often receives samples with unknown history or origin. The development of ESI-HRAM-MS technologies for stable isotope ratio analyses has the potential to reveal intramolecular isotopic fingerprints as well as whole molecule isotopic distributions from reduced sample quantities without the need for derivatization.

Key Words: Multi-Omic, Metabolomics, Lipidomics, Glycomics, Mass Spectrometry, Orbitrap, Stable Isotope Analysis, Isotopic Abundance, Forensic Geography, Informatics, Bioinformatics

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 )

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- **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 )