

**Opportunity Title:** Determination of GMO and non-GMO Crops Multi-Spectral

Changes Post-Chemical Uptake

**Opportunity Reference Code:** ICPD-2019-02

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

**Reference Code** ICPD-2019-02

**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** 3/1/2019 6:00:00 PM Eastern Time Zone

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

The goal of this research topic is to identify stand-off spectral changes to Genetically Modified Organism (GMO) and non-GMO agricultural crops as a result of a specific chemical uptake. The chemical classes to be considered include: organo-phosphates; thiol esters; carbamates; N, S, or F hetero-substituted organic bridged bicyclics; carbon nano-structures, and piperidinones. Both GMO and non-GMO plant species need to be considered independently, since the genetic differences could impact the metabolic pathway of intrusive chemicals, and thus provide different spectral results. One research area should focus on how to identify chemically induced spectroscopic changes to a plant. Consider the following questions to focus the research:

- Which frequencies, or combination of frequencies, can be used to detect changes to a plant as a result of a chemical uptake?
- What chemical concentrations need to be present for spectral changes to be noted?
- How does the plant's lifecycle impact the chemical uptake and related spectral changes (both age at point of uptake and latency effects)?

A second research area should focus on how to determine the fundamental mechanism by which a plant ingests and metabolizes the listed chemical classes. This will allow for a correlation between the collected spectral data and the plant's mechanism, and allow for data extrapolation to other chemicals of interest. Research in this area will allow for a means to measure crop health, define composition, and detect any insults from a stand-off position.

**Example Approaches:**

Approaches to this project could use a variety of techniques, but are in no way limited to:

- Using single-, multi-, and/or broad-band spectroscopic techniques to measure *in vivo* changes to plant spectrums, due to a specific chemical exposure. Infrared (IR), near infrared (NIR), visible, and/or ultra-violet (UV) frequencies should be considered.
- Using field scale spectral measurements, identify plants that have been impacted by an



**ORISE GO**

The ORISE GO mobile app helps you stay engaged, connected and informed during your ORISE experience – from application, to offer, through your appointment and even as an ORISE alum!

Visit ORISE GO 

GET IT ON  
 Google Play

Download on the  
 App Store

**Opportunity Title:** Determination of GMO and non-GMO Crops Multi-Spectral  
Changes Post-Chemical Uptake

**Opportunity Reference Code:** ICPD-2019-02

exposure to the listed chemical classes.

- Using multi-element Nuclear Magnetic Resonance samples, mass spectrometry, as well as other analytical techniques, determine the metabolic pathway that the plants use to ingest the listed chemical classes. Additionally it would be of value to determine if any of the heteroatoms are retained in the plant's system.
- Develop chemical modeling techniques to theorize possible mechanistic chemical uptake and metabolism methodologies.

**Relevance to the Intelligence Community:**

Identifying spectral changes to agricultural crops would provide a means to measure crop health, define composition, and detect any insults from a stand-off position. Determining mechanistic pathways would provide the fundamental information on potential susceptibilities to other undefined chemical threats. Finally, identifying spectral changes as a result of exposure to the listed chemical classes would provide a theoretical means to detect chemical emissions by a non-intrusive means.

**Key Words:** flora metabolic pathway, spectroscopy, agriculture

**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** ([6](#) )
- **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** ([5](#) )
- **Physics** ([16](#) )
- **Science & Engineering-related** ([1](#) )
- **Social and Behavioral Sciences** ([28](#) )

**Opportunity Title:** Determination of GMO and non-GMO Crops Multi-Spectral  
Changes Post-Chemical Uptake

**Opportunity Reference Code:** ICPD-2019-02