

Opportunity Title: Development of Methods to Identify, Detect, and Describe Synthetically Derived Biological Systems

Opportunity Reference Code: ICPD-2021-41

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.

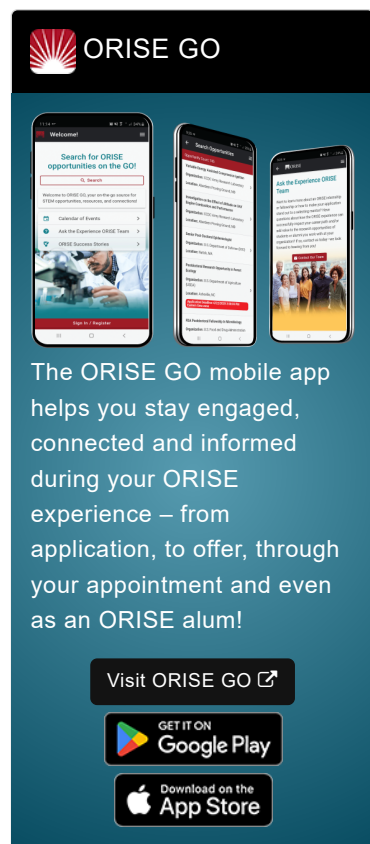
Application Deadline 3/1/2021 11:00:00 AM Eastern Time Zone

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

Synthetic biology offers innovative approaches for engineering new biological systems or redesigning existing systems for useful purposes. It has been described as a disruptive technology capable of delivering new solutions to global healthcare, agriculture, manufacturing, and environmental challenges. There are, however, concerns that synthetic biology may also expand the pool of agents of concern, creating a need to develop detection, identification and monitoring systems, and to proactively build countermeasures against these new or redesigned threats. Many labs can now design and construct relatively complex gene networks capable of producing a wide variety of designer molecules in a range of host cells. The application of artificial intelligence/machine learning promises to further reduce the time and cost of such processes in the future.


Example Approaches:


Synthetic biology is driving significant change in biomedicine including the development of chimeric antigen receptor (CAR) technology, which engineers immune cells of patients to recognize and attack cancer cells. Genetically engineered viruses are being used to correct defective genes in individual patients and could be extended to target populations. Work on vectors capable of carrying larger genetic loads is helping to produce more efficient therapeutics and vaccines. Optimization of antibodies that are in an editable format will further reduce cost and time. The Human Genome Project-Write has set its sights on building entire human chromosomes. Work in whole cell and cell-free systems can be used to develop sensors of multiple specific biomarkers, which would assist in earlier detection of diseases. Synthetic biology offers the opportunity to create responsive multifunctional materials by integrating biochemical components from living organisms with inorganic components; such materials would be able to sense their environment. Cell-free environments offer a powerful route for flexible and controllable production systems. Using nanoparticles made of semiconductor materials or quantum dots can be used to enhance enzymatic activity in cell-free environments. Multistep enzymatic pathways can be tethered to nanoparticles to increase reaction rates several hundredfold. This dual use technology offers great benefits but could also be used to cause harm.




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Relevance to the Intelligence Community:

Synthetic biology is a disruptive technology that could be used to cause (either intentional or inadvertent) harm to humans or the environment. The ability to engineer viruses to be more effective vectors of genetic information may also lead to the creation of even more deadly pathogens by those intent on harm. The technological advances in molecular biology with an ever-decreasing barrier to entry in the same field could pose an existential risk to everyone involved and would directly impact national security. Efforts to find solutions for identification, detection, and interpretation for synthetic biological problems is a critically relevant and immediate need.

Key Words: Synthetic Biology, Disruptive Technology, Biosystem, Future Trends and Developments, Biodesign Automation, Responsible Research and Innovation, RRI

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** ([17](#))
 - **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](#))