Opportunity Title: Using AI to Power Synthetic Biology Applications
Opportunity Reference Code: ICPD-2025-30

Organization	Office of the Director of National Intelligence (ODNI)
Reference Code	ICPD-2025-30
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 3 pages.**

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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.

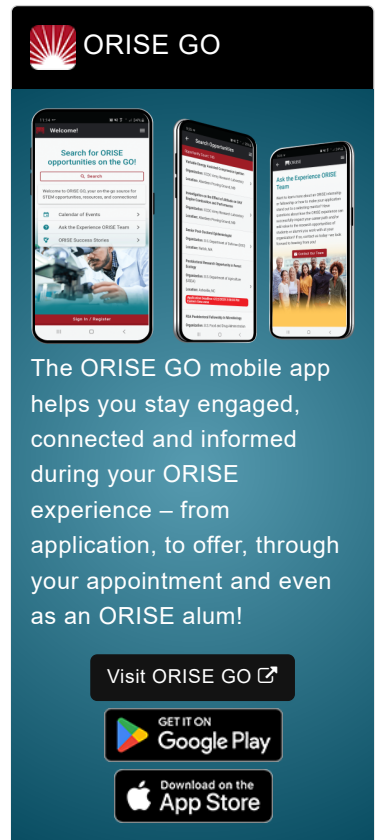|	
Application Deadline	3/4/2025 11:40:00 AM Eastern Time Zone
Description	**Research Topic Description, including Problem Statement:**

The increasing availability and volume of multi-omics data, technical knowledge and tools, and the advance of Artificial Intelligence (AI) capabilities is revolutionizing science. AI powered synthetic biology stands to alter the biological threat and opportunity paradigm and raises unique challenges that need to be better understood.

Synthetic biology is an evolving and diffusing technology, new developments in AI, and notably the improvement of generative AI, have opened the door to additional creativity in synthetic biology. For example, large language models (LLMs), have been adapted to the genetic code by replacing words with the nucleotide bases. This enables LLMs to optimize experiments to generate new DNA sequences (and thus new virtual organisms) precisely, quickly and cheaply. The resulting molecules organisms and knowledge promise to be useful in accelerating drug discovery, food engineering, conservation of biodiversity, climate remediation and the understanding of life. Generative AI could be used to predict the outcomes of gene editing experiments. This will reduce time spent investigating eventual dead ends, broadening the scope of testing and deliver savings in cost and time. Those applications are like software engineers' use of generative AI to test code.

What are the possible applications stemming from AI powered synthetic biology? What are the risks and vulnerabilities of employing or not employing AI powered or supported synthetic biology? What do international research trends suggest are the major development or investment directions? How might potential concerns be mitigated?

Example Approaches:

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Research proposals could approach this issue from a variety of disciplines, or as a cross-disciplinary effort. The challenge touches on aspects of synthetic biology, AI, future applications, transnational issues, ethics and privacy. Proposals could consider (but are not limited to):

- The utility of AI platforms to; enhance current or develop novel synthetic biology tools/techniques and/or generate novel tools/techniques for the detection of modified organisms.
- Combining AI and multi-omics data, including proteomics, genomics, metabolomics, and transcriptomics to provide a more holistic view of biological systems.
- The use of generative AI to accelerate synthetic biology applications.
- With respect to AI development trends, evaluate the coordination among domestic and global stakeholders for monitoring, assessment and mitigation of risks associated with advances in synthetic biology research and applications.
- Evaluating the international societal effects and public policy implications, with respect to privacy and social license guardrails, of synthetic biology research and development.

Relevance to the Intelligence Community:

Using AI to power synthetic biology applications raises unique national security, ethical and privacy challenges. AI's ability to automate, accelerate, and scale synthetic biology has the potential to expedite and magnify many of the associated risks:

- National security:
  - Changing an organism's natural function into a threat, such as toxic products or infectious agents.
  - Intentionally corrupting genomic data (e.g. altering sequences or annotations) to delay or skew research programs.
- Privacy and ethical:
  - Population surveillance, oppression and extortion of citizens, military, and intelligence personnel.
  - Discrimination or leverage against individuals based on disease risk, mental health and physical characteristics.
  - Public acceptance and social license relating to certain applications of synthetic biology.

References:

- Jun Cheng et al., (2023) 'Accurate proteome-wide missense variant effect prediction with AlphaMissense'. Science, DOI:10.1126/science.adg7492.
- Artificial Intelligence Powering Synthetic Biology: The Fundamentals | S&P Global (spglobal.com)
- https://www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/csiro-futures/future₁industries/synthetic-biology-roadmap

Key Words: Multi-omics, Synthetic Biology, Artificial Intelligence.

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 appointment start date
- 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

Point of Contact [Keri](#)

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Doctoral Degree.
- **Discipline(s):**
    - **Chemistry and Materials Sciences** ([12 👁](#))
    - **Communications and Graphics Design** ([3 👁](#))
    - **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** ([11 👁](#))
    - **Other Non-Science & Engineering** ([2 👁](#))
    - **Physics** ([16 👁](#))
    - **Science & Engineering-related** ([1 👁](#))
    - **Social and Behavioral Sciences** ([30 👁](#))