



NATIONAL SCIENCE FOUNDATION
2415 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22314

NSF 24-050

Frequently Asked Questions (FAQs) for EFRI Biocomputing through EnGINEering Organoid Intelligence (BEGIN OI)

1. [Is a Letter of Intent \(LOI\) required?](#)
 2. [What information needs to be present in the Letter of Intent \(LOI\)?](#)
 3. [EFRI projects are team-based. What are the requirements for members of the team?](#)
 4. [Can the project have international collaborators?](#)
 5. [How is biocomputing defined in this solicitation?](#)
 6. [Does a proposal need to address all three research threads?](#)
 7. [How is "organoid" defined in this solicitation?](#)
 8. [Can organoid research funded through this solicitation include non-living or synthetic components?](#)
 9. [Does organoid research funded through this solicitation need to be composed of mammalian, or more specifically neural cells?](#)
 10. [Is learning/memory essential or is a closed-loop controller acceptable? For instance, information goes into the construct, information comes out of it and actuates something, but does the construct need to actually 'learn' something?](#)
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1. Is a Letter of Intent (LOI) required?

A one-page Letter of Intent is required. The letter should be submitted via Research.gov no later than the date specified in the solicitation ([NSF 24-508](#)). There are two review cycles for this solicitation. For the first review cycle, the LOI is due by January 17, 2024. For the second review cycle, the LOI is due by September 12, 2024.

2. What information needs to be present in the Letter of Intent (LOI)?

The subject heading of the LOI should include a brief title for the proposal and the name of the lead organization. Each letter must include the following:

- THE TITLE - Title of the EFRI proposal, preceded by the words "EFRI BEGIN OI:".
- THE TEAM - Names, departmental and organizational affiliations, and expertise of the Principal Investigator and at least two co-Principal Investigators.
- THE SYNOPSIS (GOALS) - Brief description of the specific goals of the proposal (maximum of 250 words).

3. EFRI projects are team-based. What are the requirements for members of the team?

A minimum of one PI and two co-PIs must participate in each proposal. Either the PI or one of the co-PIs must have a full-time, tenured or tenure-track faculty appointment within a College/Department of Engineering. Ethical, Legal, and Social Implications (ELSI) scholar(s) must be integrated as active collaborators within the research team. A maximum of 4 co-PIs can be listed on a proposal.

Each investigator may participate as either PI or co-PI on only a single proposal submitted in one fiscal year.

4. Can the project have international collaborators?

The EFRI Program participates in the National Science Foundation (NSF) and US-Israel Binational Science Foundation (BSF) Collaborative Research Opportunities ([NSF 20-094](#)) activity which provides for an international collaboration arrangement whereby U.S. researchers may receive funding from the US NSF and Israeli researchers may receive funding from the BSF.

As specified in Chapter I.E.2(c) of the NSF Proposal & Award Policies & Procedures Guide ([PAPPG](#)), NSF rarely provides direct funding support to foreign organizations. NSF will consider proposals for cooperative projects involving U.S. and foreign organizations, provided support is requested only for the U.S. portion of the collaborative effort. Preliminary inquiry must be made by sending an email to efri2024-2025@nsf.gov that explains the unique capability of the international collaborator(s). If permission is granted, a written statement from the cognizant NSF PD must be submitted as part of the proposal submission.

5. How is biocomputing defined in this solicitation?

The EFRI BEGIN OI solicitation defines biocomputing as the use of biological 'intelligent systems' to include capture of real-world input, autonomous processing in an engineered biological construct, and generating an output that drives an engineered system.

6. Does a proposal need to address all three research threads?

Yes, addressing all three research threads is critical to making significant advances in biocomputing and is required of each proposal submitted in response to this solicitation.

7. How is "organoid" defined in this solicitation?

In the context of this solicitation, the term "organoid" has broad meaning, capturing a range of designer three-dimensional cellular constructs and microphysiological systems.

8. Can organoid research funded through this solicitation include non-living or synthetic components?

Recent advances in understanding the biological mechanisms involved in development and learning and new computational and engineering tools lay the foundation to leverage the capability of cells, tissues, and organoids for biological computing. Thus, biological cells are envisioned to be the main focus of a project. However, the solicitation does not prohibit research that involves non-living or synthetic components in a supporting role. Sensing may be achieved with living (sensory organoids) or non-living components.

9. Does organoid research funded through this solicitation need to be composed of mammalian, or more specifically neural cells?

Cells used to construct organoids need not be mammalian, for example deploying 3D plant cell- or biofilm-based constructs for biocomputing is allowable, and diversity of cell types is encouraged.

10. Is learning/memory essential or is a closed-loop controller acceptable? For instance, information goes into the construct, information comes out of it and actuates something, but does the construct need to actually 'learn' something?

'Intelligence' and 'learning' have unique meanings for different communities in biology, cognitive science, computer science, and engineering. EFRI BEGIN OI supports a broad interpretation of in vitro biological 'intelligent systems' to include capture of real-world input, autonomous processing in an engineered biological construct, and generating an output that drives an engineered system. The EFRI BEGIN OI solicitation asks investigators to define the bounds of 'intelligence' and 'learning' needed to achieve responsive and adaptive biological computing and control in engineered systems. That is, the BEGIN OI program encourages broad and creative approaches to the realization of novel in vitro biological intelligent systems. These approaches should not be overly constrained by terminology, but they should be focused instead on the transformative potential of the systems under study.

