March 17, 2022

3:00PM-4:00PM

Webinar

Program Solicitation: NSF 22-557

Semiconductor Synthetic Biology Circuits and Communications for Information Storage (SemiSynBio-III)

Q & A

- **Submit questions using the Q & A icon in Zoom.**

Collaborating NSF Directorates and Divisions

- **Directorate for Engineering**
  - Division of Electrical, Communications and Cyber Systems (ENG-ECCS)
- **Directorate for Computer and Information Science and Engineering**
  - Division of Computing and Communication Foundations (CISE-CCF)
- **Directorate for Biological Sciences**
  - Division of Molecular and Cellular Biosciences (BIO-MCB)
- **Directorate for Mathematical and Physical Sciences**
  - Division of Materials Research (MPS-DMR)

Webinar Panelists

Program Directors:

- Dr. Usha Varshney, ECCS/ENG
- Dr. Mitra Basu, CCF/CISE
- Dr. Ramon Gonzalez, MCB/BIO
- Dr. Paul A. Lane, DMR/MPS
- Dr. Shadi Mamaghani, DMR/MPS

Admin Staff:

- Ms. Sara Rudolph, ECCS Program Specialist
- Mr. Michael Thomas, Media Specialist

SemiSynBio Solicitations

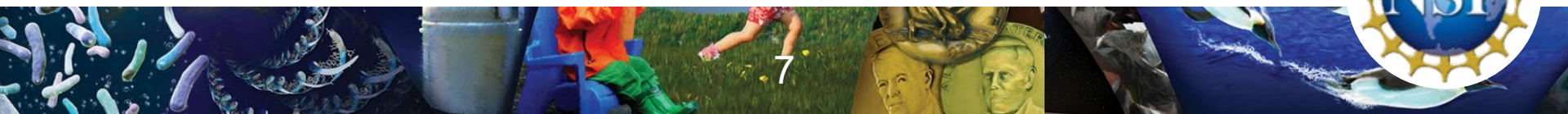
- **Semiconductor Synthetic Biology for Information Processing and Storage Technologies** (SemiSynBio), NSF 17-557
- **Semiconductor Synthetic Biology for Information Storage and Retrieval** (SemiSynBio-II), NSF 20-518
- **Semiconductor Synthetic Biology Circuits and Communications for Information Storage** (SemiSynBio-III), NSF 22-557

Background

- Recent breakthroughs in synthetic biology has shown suitability of biomolecules as carriers of stored digital data for memory applications.
- Semiconductor industry has accumulated unique tools and expertise in the design and fabrication of complex hybrid systems to incorporate unconventional materials that can meet information storage needs.
- Next-generation of devices and systems with use of biomaterials are visualized to have the capability to store data for more than 100 years and with storage capacity that is 1,000 times more than current storage technologies.
- Theory projects a few kilograms of nucleic acid with the proper encoding could meet all the world's data storage needs in a form that is chemically stable for centuries.
- This feature is not matched by the projected electronic, magnetic, or optical technologies based on inorganic semiconductors.

Research Goals of the Program

- Foster exploratory and multidisciplinary basic research leading to high payoff solutions for information storage.
- Explore high-risk/high-return interdisciplinary research that will exploit synergies between synthetic biology and semiconductor technology.
- Seed collaborations among researchers in biology, physics, chemistry, materials science, computer science, and engineering disciplines.
- Stimulate nontraditional thinking facing the semiconductor industry for integrating biomolecules in the next generation of hybrid systems.



Educational Goals of the Program

- Educate a new cadre of students, scientists and engineers that will meet the need of industries stemming from the interfacing of semiconductors with synthetic biology.

- Develop curricula that will model and integrate concepts, tools and methodologies needed for joint expertise in semiconductor and synthetic biology.

Research Themes

- **Research Theme 1**:- Developing computational and experimental models of bio-molecular and cellular-based systems.
- **Research Theme 2**:- Addressing fundamental research questions at the interface of biology and semiconductors.
- **Research Theme 3**:- Designing sustainable biomaterials for novel bio-nano hybrid architectures and circuits that test the limits of transient electronics.
- **Research Theme 4**:- Fabricating hybrid biological-semiconductor electronic systems with storage functionalities.
- **Research Theme 5**:- Scaling-up and characterization of integrated hybrid synthetic bio-electronic storage systems.

Each proposal must select Theme 3 and at least one from Themes 1 and 2, and at least one from Themes 4 and 5. The proposal should comprehensively address the most ambitious goals within the chosen approach for information storage.

Proposal Submission Guidelines

- Full Proposal Submission Deadline: April 25, 2022
  (due by 5 p.m. submitter's local time)
- The title of the proposal should begin with "SemiSynBio-III:"
- Anticipated Type of Award: Standard Grant or Continuing Grant
- Estimated Number of Awards: 8 to 10
- Anticipated Funding Amount: $12,000,000
- Individual projects will be funded at up to $1,500,000 for three years depending on the availability of funds.

Proposal Submission Guidelines (Cont'd)

- There are no restrictions or limit on number of proposals per organization.
- An investigator may participate as PI, co-PI or senior personnel in no more than one proposal submitted in response to this solicitation.
- If a proposal involves multiple organizations, it must be submitted as a single proposal with subawards.
- Separately submitted collaborative proposals are not permitted and will be returned without review.

Key Characteristics for PI & Co-PIs

- A minimum of one PI and two co-PIs must participate.
- PI and co-PIs must represent expertise in at least three disciplines selected from Biological Sciences, Materials Science, Computer Science, and Engineering.
- Proposal must specify in a separate paragraph in the introductory section, how the three disciplines are integrated in their research approach.
- A lead investigator addressing each of the three Research Themes must be identified.

Key Characteristics for PI & Co-PIs (Cont'd)

- Role of each team member in the proposal must be clearly described and justified.
- Team members may be from a single organization or multiple organizations.
- Budgets should be commensurate with project roles and goals.
- Collaborative culture that values and benefits from shared research and interdisciplinary training is highly encouraged.

Merit Review Criteria

Intellectual Merit: What is the potential for the proposed activity to advance knowledge and understanding within its own field or across different fields?

Broader Impacts: What is the potential for the proposed activity to benefit society or advance desired societal outcomes?

- To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
- Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
- How well qualified is the individual, team, or organization to conduct the proposed activities?
- Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Additional Solicitation Specific Review Criteria

- Extent to which the project comprehensively addresses at least three themes within the chosen approach, including one from Theme 1 and Theme 2, and one from Theme 4 and Theme 5. Every proposal must include Theme 3.
- Extent to which the project integrates expertise from at least three disciplines selected from Biological Science, Material Science, Computer Science, and Engineering, with each discipline represented by either the PI or a co-PI on the proposal.
- Extent to which the project fulfills the objective of educating a new cadre of students that will meet the need of industries operating at the interface of semiconductor technology and synthetic biology.

Special Award Condition

- Recipients of awards under SemiSymBio-III program are required to include funds for travel to attend at least one annual Principal Investigators' (PI/ Co-PI) meeting in person organized by NSF during the award period.

Questions

NSF 22-557

https://www.nsf.gov/pubs/2022/nsf22557/nsf22557.htm

Proposals to be submitted via:

Research.gov or Grants.gov

Send ?

SemiSynBio-III@nsf.gov

Recording and Transcript of the Webinar

A recording and the transcript of the webinar, along with the slides will be accessible from the event page shortly after the conclusion of the webinar.