

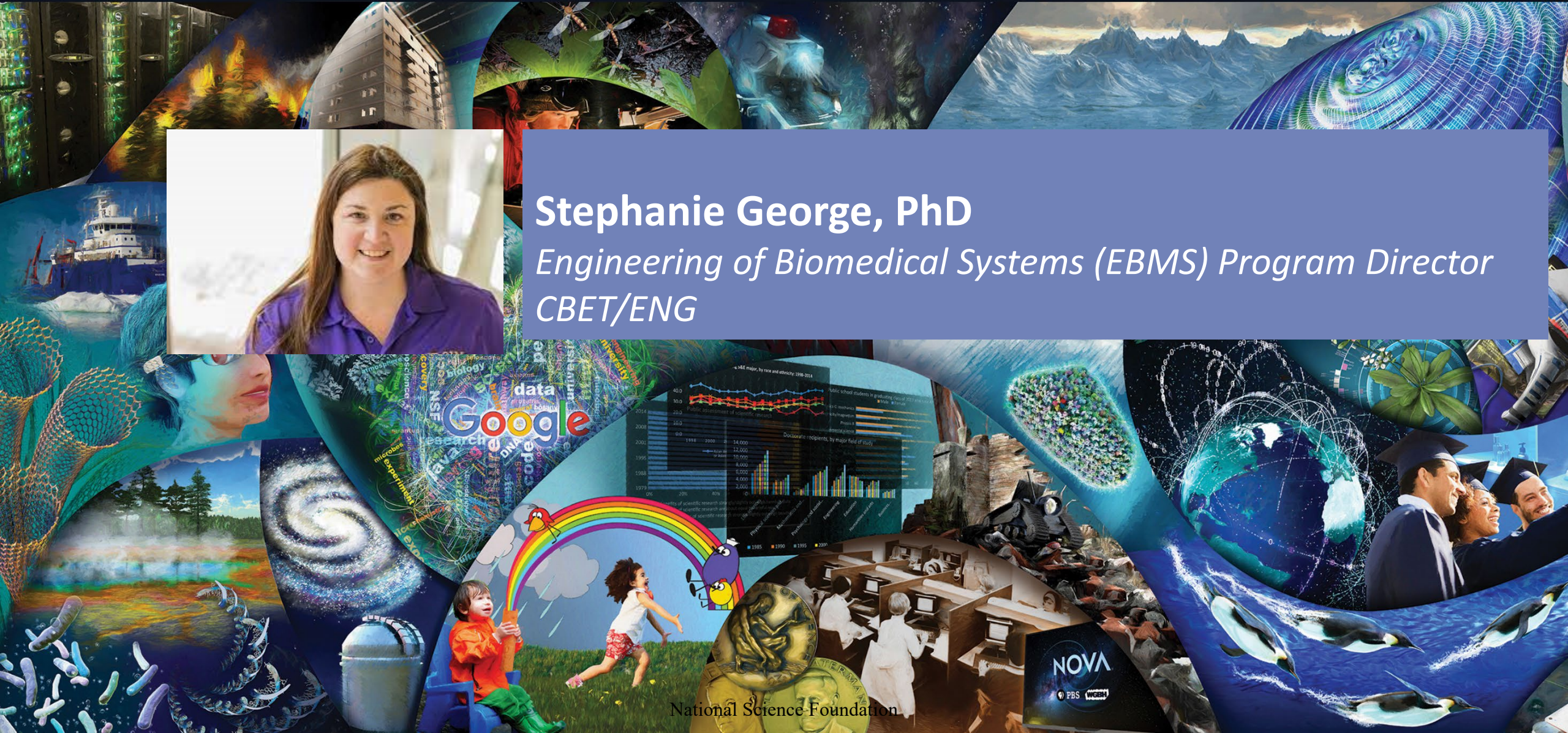


NSF @ ASIA

February 23, 2024



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*Engineering of Biomedical Systems (EBMS) Program Director
CBET/ENG*



National Science Foundation



What you can expect in this talk

- NSF Mission & Eligibility**
- Proposal Preparation**
 - Biomechanics at NSF
 - Funding Mechanisms
 - How to contact the program director
- NSF Review Process**
 - Type/membership
 - What to expect and when to expect it
- Proposal Writing Tips**



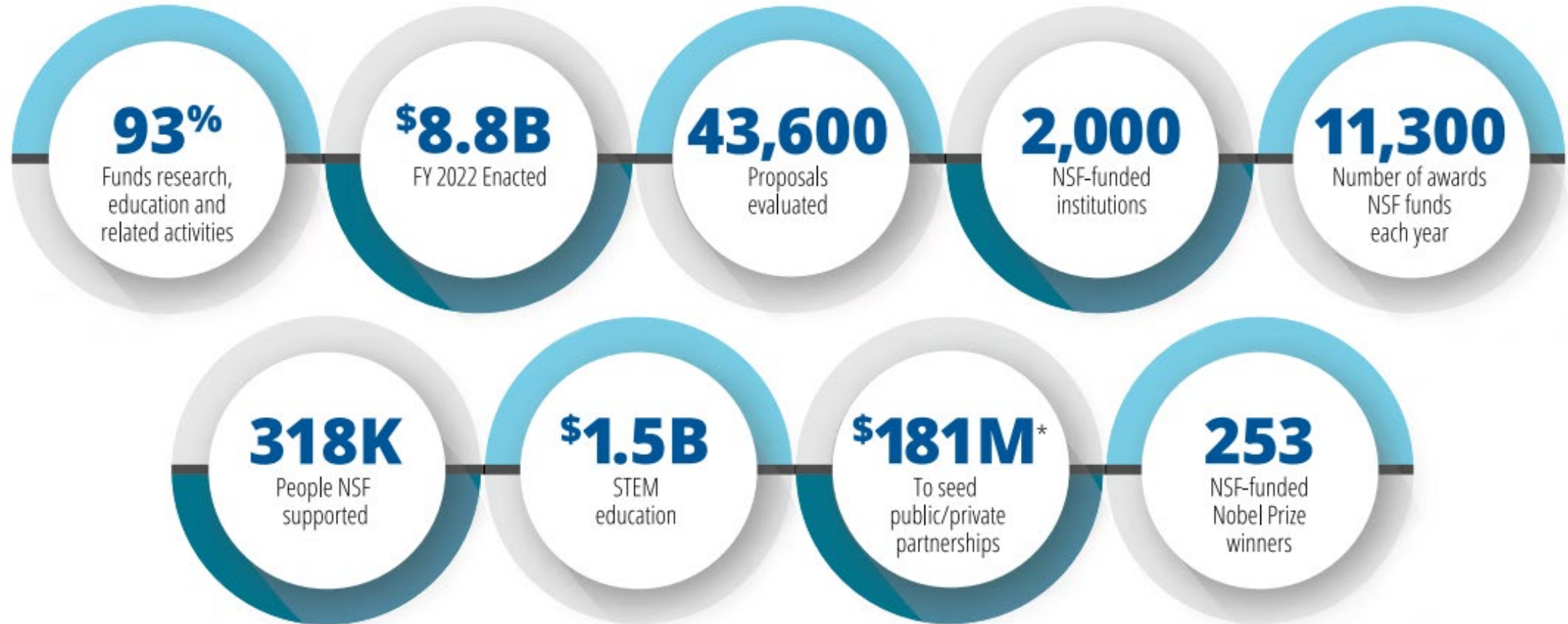
NSF Mission

To promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense; and for other purposes.

[National Science Foundation Act of 1950, P.L. 81-507]



NSF by the Numbers



Data represents FY 2021 Actuals unless otherwise indicated.

**Corresponds to NSF investments initiated in FY 2021 and spanning multiple years.*



Eligibility (PAPPG 23-1)

- ❑ **NSF makes awards to US-based organizations**
 - ❑ ***Generally to*** Institutions of Higher Education, Non-profit non-academic organizations, for-profit organizations, state and local governments, and occasionally unaffiliated individuals.
- ❑ **Institutions decide who can serve as PI.**
 - ❑ NSF welcomes proposals on behalf of all qualified scientists, engineers, and educators.
 - ❑ The Foundation strongly encourages women, minorities, and persons with disabilities to participate fully in its programs.



Proposal Preparation

- Identify the program (or special solicitation) for your proposed work.
 - Read the program description (or solicitation) carefully!

- Good-to-know: Biomedical Engineering/Biomechanics research is supported by multiple programs (in multiple Divisions and Directorates) at NSF.**

Rehab: <https://nsf.gov/eng/rehab.jsp>



Programs in ENG/CMMI

Biomechanics and Mechanobiology (BMMB)

Program Objectives:

- Fundamental biomechanics and/or mechanobiology research
- Theoretical, computational, and experimental approaches are supported

Key Components:

- Multiscale mechanics approaches are encouraged
- Integration across molecular, cell, tissue and organ domains is desirable – with link to organism-level physiology or biology

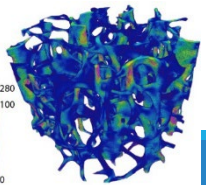
Mind, Machine, & Motor Nexus (M3X)

Program Objectives:

- Fundamental research at the intersection of mind, machine, and motor
- Integrated treatment of human intent, perception, and behavior in interaction with engineered systems mediated by motor manipulation

Key Components:

- How mind interacts with motor function in manipulation of machines
- How machine response and function shape and influence mind and motor functions





Programs in ENG/CBET

Engineering of Biomedical Systems (EBMS)

Program Objectives:

- Develop novel ideas into transformative solutions for biomedical problems
- Advance engineering and biomedical sciences, integrating the two disciplines

Key Components:

- Development of validated models of normal and pathological tissues and organ systems
- Design of systems that integrate living and non-living components for improved diagnosis, monitoring, and treatment of disease or injury
- Advanced biomanufacturing of 3D tissues and organs
- Design and subsequent application of technologies and tools to investigate fundamental physiological and pathophysiological processes

Disability & Rehabilitation Engineering (DARE)

Program Objectives:

- Develop understanding, interventions, & technologies to improve the quality of life of persons with disabilities
- Support research directed to the characterization, restoration, and/or substitution of human functional ability or cognition
- Novel engineering approaches to understanding human motion
- Understanding injury at the tissue or system-level



Programs Outside of ENG

Physiological Mechanisms and Biomechanics (BIO/IOS)

Program Objectives:

- Fundamental research to advance understanding of whole-organism functional morphology, biomechanics, and biomaterials



Perception, Action and Cognition (SBE/PAC)

Program Objectives:

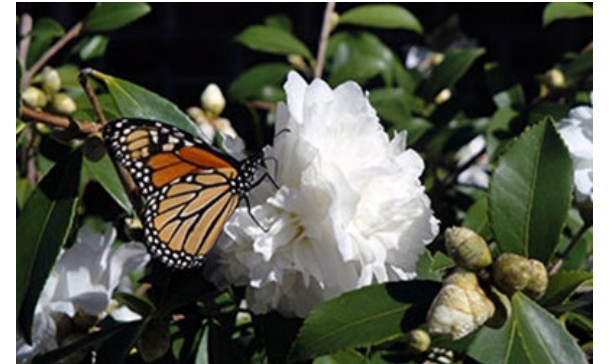
- Fundamental, **theoretically motivated** research aimed at understanding typical human behavior
- Supports a wide range of computational and experimental approaches, including individual differences, symbolic and neural-inspired computation, ecological approaches, genetics and epigenetics, nonlinear dynamics and complex systems, et.



Physics of Living Systems (MPS/PHY)

Program Objectives:

- Theoretical and experimental research exploring fundamental physical processes that living systems utilize to perform functions in dynamic and diverse environments





Funding Mechanisms

- ❑ **Unsolicited proposals to a specific program - Standard funding mechanism for all levels of investigators**
 - ❑ Some Programs have Deadlines; ENG programs do not.

- ❑ **Solicited proposals – Responsive to a specific solicitation**
 - ❑ Typically has scientific topic or PI/Institution eligibility constraint
 - ❑ Typically has a deadline.

- ❑ ***Clinical trials?* NSF supports advancement of fundamental knowledge.**
 - ❑ Proof-of-concept work with humans (or animals) may be necessary for the proposed work. (Proof of clinical practice is not supported.)



Can I talk to the Program Director? *(Why should I do that?)*

Meetings with PD's can provide researchers with good general guidance on proposal writing

Program Directors can help you connect to other opportunities.

Best Practices:

Before submission:

- Start with an email
- Include a one-page summary about the work that you want to do.

After submission:

- Reach out after receiving reviews to discuss.



Review Process

Merit Review

- ❑ 3+ reviews per proposal
- ❑ Panels are formed *de novo* each time
- ❑ Panel dates and membership are strictly confidential.
- ❑ Additional practices vary with Program, Division, Directorate

What you can expect

- 3 reviews
- A panel summary (if it was discussed in a panel)
- ...in about 6 months.

Can I be a reviewer?

- Yes, once you have a terminal degree.
- Reach out to the cognizant Program Director to express your interest.



NSF Review Criteria *approved by the NSB*

Intellectual Merit:

- Does the proposed work advance and contribute knowledge in its own field or across different disciplines?
- Does the proposal involve creative and original concepts?
- Is the proposal well-conceived and organized?
- Is the PI (or team) qualified to conduct the proposed work?
- Does the team have sufficient access to resources to conduct the work?

There may also be solicitation-specific criteria; be sure to look for those!

Broader Impact:

- Does the research and related activities contribute to the achievement of societally relevant outcomes?
- May include activities that:
 - Broaden participation in STEM
 - Improve STEM education
 - Increase public scientific literacy

**Reviewers must consider both criteria;
NSF Program Directors must consider both criteria when making final recommendations.**



Proposal Writing Tips

- Contact the Program Director
- Find the best home for your work – send in a whitepaper
- Carefully read the Program Description
- Look at what has previously been funded by the Program
- Write for the expert and semi-expert
- Have other people read your proposal
- Suggest reviewers
- Contact the Program Director

Facilitating Research at Primarily Undergraduate Institutions - Research in Undergraduate Institutions (RUI) and Research Opportunity Awards (ROA)



RUI proposals support PUI faculty in research that engages them in their professional field(s), builds capacity for research at their home institution, and supports the integration of research and undergraduate education.

- Must include RUI Eligibility Statement, Title tag “RUI”, and RUI impact statement
- In core programs, similar to unsolicited proposals

ROAs similarly support PUI faculty research, but these awards typically allow faculty to work as visiting scientists at research-intensive organizations where they collaborate with other NSF-supported investigators.

- Includes a supplement to an existing NSF award to support ROA activities for PUI faculty.
- A certification of RUI/ROA eligibility is required

Eligible PUIs are accredited colleges and universities (including two-year community colleges) that award Associate's degrees, Bachelor's degrees, and/or Master's degrees in NSF-supported fields, but have awarded 20 or fewer Ph.D./D.Sci. degrees in all NSF-supported fields during the combined previous two academic years.

Search for NSF 14-579



Engineering Research Initiation (ERI) 22-594

- Proposals may only be submitted by the following:
 - Institutions of Higher Education (IHEs) not currently classified as a Doctoral University with “Very High Research Activity” (R1 institutions) according to the 2018 Carnegie Classification update: <https://carnegieclassifications.iu.edu/>.
 - This solicitation provides support for investigators who have yet to receive research funding from Federal Agencies to initiate their engineering research programs and to be in a more competitive position for future proposal submissions.

New Solicitation!!
Deadline: Sept 15, 2023

Boosting Research Ideas for Transformative and Equitable Advances in Engineering (BRITE)



- Mid-career and more senior researchers (tenured faculty or equivalent).
- Four Tracks – *must have topical relevance to a CMMI program!*
 - Synergy – *synthesize previous work -> new product and perspective.*
 - Pivot – *infuse new concepts from a different field.*
 - Relaunch – *back to active research after a hiatus.*
 - Fellow -- *intellectual creativity to explore divergent, bold, and ambitious research ideas (highly uncertain and, therefore, high-risk.)*

• Solicitation [22-559](#)

Deadline: Sept 28, 2023

• [March 17 webinar recording on Boosting Research Ideas for Transformative and Equitable Advances in Engineering](#)

Dear Colleague Letter (DCL): Bioinspired Design Collaborations to Accelerate the Discovery-Translation Process (BioDesign) (23-055)



This cross-agency DCL seeks to encourage early-stage, transdisciplinary collaboration of two or more investigators doing research in biological and engineering sciences with the potential for bioinspired design applications; and accelerate the translation of research findings into projects with potential societal and economic impacts that could be ready for commercialization.

NSF recently announced upcoming topics for the 2023 NSF's **Convergence Accelerator** Solicitation including Track M: Bio-Inspired Design Innovations. The topic hopes to bring together scientists and practitioners to develop concepts, approaches, and technologies that build and control in the same way nature does – capitalizing on millions of years of evolution – to find novel solutions to major societal and economic challenges. For more information, see: <https://www.nsf.gov/pubs/2023/nsf23066/nsf23066.jsp>



New Opportunities

- Emerging Frontiers in Research and Innovation (EFRI-2024/25) - Biocomputing through EnGINeering Organoid Intelligence (BEGIN OI) (NSF 24-508)
 - The EFRI Biocomputing through EnGINeering Organoid Intelligence (BEGIN OI) solicitation supports foundational and transformative research to advance the design, engineering, and fabrication of organoid systems that are capable of processing information dynamically while interfacing with non-living systems.
 - LOI due January 17, 2024
- Dear Colleague Letter: STEM Access for Persons with Disabilities (STEM-APWD) (NSF 23-160)
 - Proposals and supplemental funding requests are sought that address intersections between disability and fundamental science and generalizable research that addresses pathways from theory to application and use. Conferences and requests for supplements are expected to be wide-ranging, across topics and actions to support access to and engagement in STEM research, training and employment activities for persons with disabilities.
- Dear Colleague Letter: Global Centers Program Competition
 - Anticipated priority goals for the 2024 Global Centers competition are, but are not limited to, Leveraging Biodiversity Across the Tree of Life to Power the Bioeconomy, and Biofoundries (also called the Design-Build-Test-Learn process). Examples of research areas within this framework include data for the bioeconomy, biocomputing, microbial biodiversity, plant genomics, precision agriculture, green economy, economic and policy perspectives, ethical implications of bioeconomy technologies, metabolomics, bioengineering, synthetic biology, metabolic engineering, rapid prototyping of biological designs, and biorefineries.
 - Solicitation TBA



Engineering of Biomedical Systems (EBMS)

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CONTACT US WITH QUESTIONS

