



NATIONAL SCIENCE FOUNDATION
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ALEXANDRIA, VIRGINIA 22314

NSF 23-055

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

February 15, 2023

Dear Colleagues:

As stated in the National Science Board's Vision 2030 report, "[The U.S.] must do more to ensure that discoveries are translated into innovations."¹ Bioinspired design is a powerful means of addressing this imperative which also aligns with Strategic Goal 2 – Discover: Create new knowledge about our universe, our world and ourselves and Strategic Goal 3 – Impact: Benefit society by translating knowledge into solutions in the NSF 2022-2026 Strategic Plan². As envisioned in this Dear Colleague Letter (DCL), bioinspired design is the process by which investigators take inspiration from the natural world (from molecular and cellular to organismal and higher scales) to discover general principles about biological and/or engineering systems and use them to inform and generate new design directions for engineered systems or products. Investigators formulate how these principles and phenomena can be converted into specific, high-impact solutions (such as human-built devices, materials, products, processes, systems, and systems of systems) for problems faced by society.

Bridging the gaps between foundational and use-inspired research as well as the translation of research results to practice requires transdisciplinary collaboration. To encourage such collaborations, this DCL will support productive transdisciplinary teams that work together to (1) test hypotheses about the functioning of living things that are of interest to biologists and engineers; (2) create an iterative process that generates ongoing feedback between the workflows of foundational and use-inspired research in order to design a device, machine, algorithm, and/or a workflow that solves a practical problem; and (3) develop prototypes based on these activities as part of a process of exploring pathways to larger societal and economic benefits.

To facilitate the translation of knowledge generated through research in the biological and engineering sciences to solutions and prototypes needed for societal and economic impacts,

this DCL seeks to leverage current NSF programs 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.

With this DCL, participating programs in the Divisions of Integrative Organismal Systems (IOS) and Molecular and Cellular Biosciences (MCB) in the Directorate for Biological Sciences (BIO); the Divisions of Civil, Mechanical, and Manufacturing Innovation (CMMI) and Chemical, Bioengineering, Environmental and Transport Systems (CBET) in the Directorate for Engineering (ENG); and the in Division of Translational Impacts in the Directorate for Technology, Innovation and Partnerships (TIP) invite (a) full proposals to certain longstanding programs and (b) supplemental funding requests to existing awards.

To be considered, proposals and supplemental funding requests will couple strong grounding in biology and engineering design with a plan for how the foundational and use-inspired research can be extended toward prototype development which, in the longer term, aims to solve a specific societal or economic challenge. Any partner(s) who will contribute to the process must be clearly identified. Prospective investigators are encouraged to consider inclusion of one or more partner(s) who have a deep understanding of the practical problems to be addressed. Proposals and supplemental funding requests must also adhere to guidelines for submission in the [NSF Proposal & Award Policies & Procedures Guide](#) (PAPPG) as well as in the relevant solicitation (see solicitations listed with contacts below), and full proposals must include "BioDesign:" in the title after any solicitation-specific title requirements, followed by a brief descriptive phrase. As part of a proposal's broader impacts, plans may be included for broadening participation and educating the next generation of BioDesign innovators.

SUPPLEMENTAL FUNDING REQUESTS:

A separate section labeled "Pathway to Translation" must be included in the Summary of Proposed Work for supplemental funding requests. The overall strategy and coordination that would link the foundational and/or use-inspired research and potential translation of the research into societal and economic benefits should be explained and justified in the "Pathway to Translation" section. Specifically, this section must include the:

- Proposed project's overall strategy for moving the resulting scientific advancements toward translation;
- Current status of the work, the final translational goal, the steps required to achieve that goal, and which of those steps will be supported by the proposed project; and

- Nature of the collaboration among the transdisciplinary investigators and plans for the coordination of the effort.

FULL PROPOSAL SUBMISSIONS:

Proposals that describe a pathway to translation, including the overall strategy and coordination among interdisciplinary collaborators that would link the foundational and/or use-inspired research and potential translation of the research into societal and economic benefits, are especially encouraged. Proposals should summarize the current status of the work and identify the final translational goal, the steps needed to achieve that goal, and which steps are part of the proposed project. It is expected that proposals submitted to participating programs and solicitations in the BIO and ENG directorates will emphasize their foundational research components. In contrast, proposals submitted to the TIP directorate should emphasize use-inspired translational research, translation to practice, and technology development.

Investigators are strongly encouraged to speak to a BioDesign program director – listed below as divisional representatives of programs and solicitations – before submitting a proposal or supplemental funding request.

Directorate	Division	Programs, Clusters & Solicitations	Representative	
BIO	IOS	IOS Core Programs (23-547) Plant Genome Research Program (21-507)	Kathy Dickson Gerald Schoenknecht	kdickson@nsf.gov gschoenk@nsf.gov
	MCB	MCB Core Programs(23-548)	Manju Hingorani	mhingora@nsf.gov
ENG	CBET	Biosensing (20-7909)	Aleksandr Simonian Steven Zehnder	asimonia@nsf.gov szehnder@nsf.gov
		Cellular and Biochemical	Steven Peretti	speretti@n

		Engineering (20-1491)		sf.gov
		Disability and Rehabilitation Engineering (20-5342)	Grace Hwang	ghwang@nsf.gov
		Environmental Engineering (20-1440)	Mamadou Diallo	mdiallo@nsf.gov
		Environmental Sustainability (21-7643)	Bruce Hamilton	bhamilto@nsf.gov
CMMI		Biomechanics and Mechanobiology (19-7479)	Laurel Kuxhaus	lkuxhaus@nsf.gov
		Engineering Design and Systems Engineering (19-072Y)	Kathryn Jablokow	kjabloko@nsf.gov
TIP	TI	Partnerships for Innovation (23-538)	Jesús Soriano Molla Samir Iqbal Debora Rodrigues	jsoriano@nsf.gov smiqbal@nsf.gov derodrig@nsf.gov

Sincerely,

Simon Malcomber
Acting Assistant Director
Directorate for Biological Sciences

Susan S. Margulies
Assistant Director
Directorate for Engineering

Erwin Gianchandani
Assistant Director
Directorate for Technology, Innovation and Partnerships

REFERENCES

¹ National Science Board, "Vision 2030." May 2020 Report #: NSB-2020-15, page 7.

² [National Science Foundation 2022-2026 Strategic Plan](#)